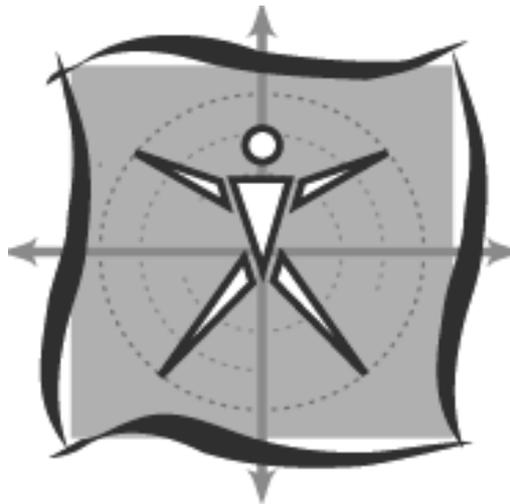


# *Australasian Musculoskeletal Medicine*



- **Management of chronic low back pain**
- **Pain and chronic low back pain: a new model**
- **Chronic neck pain: risk factors and prevention**
- **Cervical arthroplasty for the treatment of cervical spine disease**
- **Efficacy of 300 mW, 830 nm laser in the treatment of chronic neck pain**
- **Prolotherapy for peripheral joints**
- **Management of shoulder pain in general practice**
- **The orphan organ**
- **Individual medication effectiveness test comparing celecoxib with extended release paracetamol for osteoarthritis**

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# Editorial

It is a great honour indeed to accept the editorial baton for *Australasian Musculoskeletal Medicine (AMM)* from Dr Scott Masters. Scott has been a driving force for the Australian Association of Musculoskeletal Medicine (AAMM) these past few years. A plethora of articles from his word processor have graced the pages of this journal, *Medical Observer* magazine, and other learned tomes. Scott has been elected to the AAMM presidency. Congratulations Scott.

I become the latest in the editorial line, following in the footsteps of Drs Masters, Yelland, Palmer, King, and others before them. I wish to thank these hard-working, enthusiastic colleagues for their previous efforts for the Association. I will do my best to uphold their fine tradition.

The editor is, among other things, a conduit to help crystallize into print the thoughts and words, the sentiments and feelings of members and other colleagues, to record them for the purpose of education, enlightenment, and for posterity.

I wish to thank all contributors for their fine efforts in this edition, and to encourage more journal articles, more discussion and feedback, and more contributions via the letters pages.

The 33<sup>rd</sup> AAMM Annual Scientific Meeting (ASM) in Sydney on November 27-30, 2003, was a big hit. It focused on neck pain, and some speakers have kindly provided or contributed to articles in this edition of the journal. The conference dinner, a cruise aboard the MV John Cadman II, was memorable, especially for the views of Sydney Harbour at sunset. The meeting is reviewed by Immediate Past President Dr Steve Jensen in this edition of the Journal.

The ***Evidence-Based Management of Acute Musculoskeletal Pain*** was released with NHMRC approval in November 2003.<sup>1</sup> This was based heavily on work from Professor Nikolai Bogduk, Professor of Pain Medicine at Newcastle University, and other colleagues in the Australasian Faculty of Musculoskeletal Medicine (AFMM), as part of the National Musculoskeletal Medicine Initiative.

Dr Michael Yelland, new AAMM vice-

president, had his randomized controlled trial on prolotherapy published in *Spine* on January 1, 2004, to welcome the New Year. It has been praised for the quality of its conception, execution, and methodology.<sup>2</sup> Congratulations to Michael.

Professor Nikolai Bogduk had his article "Management of Chronic Low Back Pain" published in the *Medical Journal of Australia* on January 19. It looks at the evidence base, and highlights the reductionist approach, with precision diagnosis and treatment of chronic somatic lumbar spinal pain featured.<sup>3</sup> This very important paper is reprinted here with the kind permission of the *MJA*.

The first randomized controlled trial on IDET has been published in *Spine Journal* this year.<sup>4</sup> It showed significantly greater improvement in pain, disability, and depression in the IDET group compared to placebo, for treatment of discogenic low back pain. This was with six months' follow up, which has been shown in another study to be predictive of outcomes at 12 and 24 months.<sup>5</sup> It has been shown in controlled studies using precision diagnosis that internal disc disruption, which has more stringent diagnostic criteria than discogenic pain, is responsible for 40% of chronic low back pain.<sup>6</sup>

The Australian Pain Society ASM in Canberra on March 7-10 was also a notable event on the musculoskeletal pain medicine calendar, where the Association and Faculty were well represented in terms of lectures in the plenary sessions and topical concurrent sessions. The convenor, Dr Geoffrey Speldewinde, and his organizing committee did a fabulous job, well supported by DC Conferences Pty Ltd. I hope you enjoy my report in this edition.

The **26<sup>th</sup> Annual Scientific Meeting of the Australian Pain Society** will be held in **Sydney** in August 2005. It will be held in conjunction with the **International Association for the Study of Pain (IASP) 11<sup>th</sup> World Congress on Pain, August 21-26, 2005**, and should be well worth attending, so mark it in your diaries, and keep the time free. Details at <http://www.iasp-pain.org/05Cong.html>.

Dr Breck McKay has produced two papers on "Pain and Chronic Low Back Pain: A New Model" to follow his article in the last edition of *AMM*. Breck has followed on the work of Stefan Blomberg, our invited overseas speaker at the 2002 AAMM ASM held in Melbourne, and has a large case series of some 550 patients which certainly points to this approach being efficacious.

Dr Geoffrey Speldewinde has produced a paper on risk factors and prevention for chronic neck pain.

Dr Jonathon Parkinson and Associate Professor Lali Sekhon have co-authored a paper on cervical arthroplasty, used primarily for cervical myelopathy and radiculopathy.

There is an interesting retrospective study on laser treatment for chronic neck pain in primary care by Dr Roberta Chow as part of her PhD thesis into laser therapy for pain. This PhD is being supervised by Associate Professor Les Barnsley.

Dr Margaret Taylor has produced a provocative article on prolotherapy for peripheral joints. It too looks very interesting, with studies to support a useful role in treating musculoskeletal pain and dysfunction in the appendicular skeleton and soft tissues.

We have another article on management of shoulder pain in general practice especially with respect to imaging by Associate Professor Norm Broadhurst.

It confirms the lack of utility of ultrasound scanning for diagnosing the cause of shoulder pain.

There is a short paper documenting a case series highlighting the value of steroids for treating frozen shoulder from Brisbane rheumatologist Dr Bill Douglas, presented in Letters to the Editor.

Dr Peter Jackson brings us the latest thoughts on myofascial pain after the very successful New Zealand meeting in Queenstown in September. That meeting involved Drs David Simons, Nik Bogduk, and Sigfried Mense as invited international guest speakers.

Dr Michael Yelland espouses the value of individual medication effectiveness tests (IMETs), currently looking at Celebrex versus Panadol Extend

## Editorial

for osteoarthritis, and available free of charge though the IMET Service at University of Queensland.

The importance of the Red Flag Checklist is emphasized for assessing both acute and chronic low back pain, where it can help minimize unnecessary investigations, and reassure both doctors and their patients.

We say farewell to past president of the AAMM Dr John Martin Bosler, who passed away on December 24, 2003, and will be sadly missed.

We also have abstracts of some of the latest journal articles, with commentary by members of the association.

The Australasian Faculty of Musculoskeletal Medicine has reapplied to the AMC for recognition as a specialty. The outcome is awaited with great interest.

Certainly there are good arguments for this. There is a need for recognition of the role for specialist musculoskeletal pain medicine physicians to offer consultant assistance to general practitioners in the community to manage subacute and chronic musculoskeletal pain. This is rampant in the community and often managed suboptimally. There are a growing number of reliable and valid diagnostic procedures in pain medicine that can assist with accurate, precision diagnosis. This offers the option of precision treatment, and will reduce morbidity from incorrect diagnosis, and incorrect subsequent treatment.

So there is much happening in the musculoskeletal world of late and much at stake as we pursue the Holy Grail of Musculoskeletal Truth.

The life of Dr Brian Lovell, our new secretary, and our other new committee members, Dr Esther Langenegger, our new treasurer, and Dr Margaret Taylor, has changed, for the better of course – thanks to them. I have been co-opted onto the committee as well.

Thanks also to the rest of the committee who are staying on: Immediate Past President Jensen, Past Treasurer Dr Derek Davey, Drs Geoff Harding and Michael Oei, and Webmaster Dr Victor Wilk. Many thanks to the hard-working outgoing committee members, Drs Robert Gassin, Des Shimeld, and Philip Watson.

Remember to always look on the bright side of life.

David Roselt

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# From the AAMM President

One of my first jobs as president of the AAMM has been to award life membership to three doyens of the musculoskeletal (MS) field, namely John Murtagh, Norm Broadhurst, and Nikolai Bogduk. In the 1980s Professor Murtagh was largely responsible for bringing MS medicine into the view of GPs around Australia via regular articles in *Australian Family Physician* (AFP). Together with Clive Kenna, he toured extensively around Australia running workshops on managing spinal pain. These workshops were based on their book *Back pain and spinal manipulation* and were especially useful to rural GPs.

At a similar time, Professor Broadhurst was agitating for MS representation at a university level. He was successful in organising the first Australian-run postgraduate diploma course for musculoskeletal medicine, through Flinders University. Simultaneously, he was educating GPs in simple strategies to assist management of the common MS presentations to primary practice; for example, vertebral dysfunction, piriformis syndrome, slipping rib syndrome, tarsal tunnel syndrome, iliolumbar ligament sprain, and ischial bursitis. Summary articles on these and other topics gave handy office tips to GPs via the AFP journal.

Without the two professors the void in MS education for primary practitioners would have been terminal. Their enthusiasm and dedication helped spark an interest in the optimal management of MS pain and encouraged a critical analysis of the accepted wisdom. Thus the Bogduk juggernaut was born. Initially, Professor Bogduk was drawn into the fold by claims from Dr Rees that back pain could be cured by percutaneous rhizolysis of the nerves supplying the zygapophysial joints. Bogduk and others subsequently showed that the nerves were not being affected by Rees's treatment, and then went on to elucidate the role of medial branch blocks and radiofrequency ablation in the management of low back pain. Professor Bogduk's role in establishing a research base for musculoskeletal medicine, largely through the Australasian Faculty of Muscu-

loskeletal Medicine, has been enormous. His combinations of Herculean output with precision quality are unsurpassed in the world literature on MS pain.

On a sadder note, I received the news that one of our past presidents passed away this year. Dr John Martin Bosler from Tamworth was a member of the AAMM from the 1970s and ran a predominantly MS practice based on the Cyriax model. He will be sorely missed by family, community, and colleagues.

This year's annual conference will be held in Adelaide starting on October 29. South Australia is lovely this time of year and it is a perfect opportunity to mix some recreation with education. There will be a mixture of workshops and presentations to suit all tastes. In 2005 we will run our conference in Queensland towards the beginning of the year. The theme will be musculoskeletal problems in the elderly. The annual conferences are a great opportunity to expand your MS network, find out the latest research findings, and extend your practical skills.

The follow-up to the evidence-based guidelines first produced by the National Musculoskeletal Medicine Initiative is now available online. These guidelines were put together by the Australian Acute Musculoskeletal Pain Guidelines Group coordinated by Professor Peter Brooks, Dean of the Faculty of Health Sciences at the University of Queensland. The other three on the executive committee were Professor Nikolai Bogduk, Associate Professor Lyn March, and Professor Nick Bellamy. The five areas covered were acute low back pain, acute thoracic spinal pain, acute neck pain, acute shoulder pain, and anterior knee pain. The musculoskeletal fraternity were well represented amongst the review groups with Professor Bogduk, Professor John Murtagh, Dr Yelland, Dr Giles, Associate Professor Barnsley, Dr King, Dr Vivian, and me all contributing to the final document. You can visit the guidelines at [www.nhmrc.gov.au/publications/synopses/cp94syn.htm](http://www.nhmrc.gov.au/publications/synopses/cp94syn.htm).

Finally, I have a personal request of all members. I have recently received funding to perform an observational

study on acute shoulder pain in primary practice. If any members are interested in being involved, could they please contact me.

Scott Masters

# From the NZAMM President

Over the last six months, the NZAMSM executive committee has directed its attention to setting in place a training and education structure for members with differing needs and on upgrading the NZAMSM website.

The upgraded website includes a public section where general information on musculoskeletal medicine is available to the public, including the history of our organization, a public directory of musculoskeletal physicians and practitioners in NZ and a conference page. There are links to AAMM, AFMM, and FIMM. The "members only" section requires a member's password to gain access and I am gradually getting through our list of members setting this in place.

Within the "members only" section there is a full members directory, details on training and education, including a list of regional and national coordinators who will be responsible for meetings with GPs (CME meetings) and peer review or specific training meetings for local NZAMSM members.

The full registrar training manual for AFMM is available to download from the website.

There is a Journal Review page covering *Pain*, *Spine*, *AJSM*, *Manual Therapy*. The latest editions of these journals will be reviewed and articles of particular relevance and importance discussed.

There is also a Discussion Page that is now operational. Here specific problems can be presented; for example, a particular case presentation for members to comment on and contribute ideas on management or to learn from. The problem or case can be emailed to me (website administrator) and then members can directly enter comments, following a thread. It is anticipated this will be very beneficial to members who are isolated in their practice, but will be an important medium to discuss various problems, such as, "What is our position with regard to the meaning and use of the term *disc degeneration*?", which is used commonly by ACC, radiologists, and other medical specialists in NZ. We need a unified understanding and position on such

matters.

The NZAMSM is shortly to have a new logo. Feedback on this, which will be displayed on the website, or any other inspirational logo ideas are most welcome.

In the first week of March 2004, Professor Johannes Fossgreen, rheumatologist from Denmark, conducted a three-day course on myofascial release, followed by a three-day course on functional indirect technique (FIT) in Christchurch. FIT is a soft, safe osteopathic technique which can be applied to treat any painful restricted joint. This was Johannes's fifth teaching visit to NZ.

Thirty years ago Dr Barrie Tait, himself a rheumatologist with a strong interest in musculoskeletal medicine, met Johannes in Japan at a rheumatology conference. Barrie invited Johannes and Torbin Pripp out to NZ to a manual therapy course that was duly held in Auckland in 1975. This was the first course of its kind and heralded the beginnings of musculoskeletal medicine in NZ, with the formation of our Association a few years later.

In an historic moment during Johannes's recent course on myofascial release, at which Barrie was a participant, Johannes presented Barrie with original photos of their first manual therapy course in Auckland 30 years ago.

The NZAMSM owes a great deal to these two men for its existence and development over 30 years. The recent two courses were full, very well received and provided participants with very useful soft and safe techniques.

There are now three musculoskeletal physicians in Christchurch and seven in Auckland who have completed spinal injection training at Newcastle with Professor Nik Bogduk. Both the Auckland and Christchurch group have contracts with ACC to perform spinal injection diagnostic procedures such as medial branch blocks for zygapophysial joint pain, third occipital nerve blocks, transforaminal corticosteroid injections and sacroiliac joint injections.

In addition these two groups have just recently been granted exclusive contracts with ACC to perform percu-

taneous radio frequency neurotomy. Dr John MacVicar, musculoskeletal physician in Christchurch, is chairman of the Pain Intervention Committee set up by ACC to advise on such matters and procedures.

It is essential for our organizations, as we gain greater status and recognition in medicine, that we maintain and continually improve our professional standards and reporting, conduct proper trials and research on our management, particularly with regard to outcomes in whatever area of musculoskeletal medicine we are practicing. There is a strong need for outcomes-based, quality research on the various treatments we as musculoskeletal physicians are using in our daily practices.

Steve Bentley

# Letter to Editor

## Treatment of Idiopathic Frozen Shoulder with Oral and Intra-articular Corticosteroids

Oral corticosteroids were first used in the treatment of frozen shoulder in 1951.<sup>1</sup> Its use remains controversial. Since 1951, reported trials of cortisone or prednisolone in the treatment of frozen shoulder with or without the use of intra-articular corticosteroid suspensions have produced conflicting and generally disappointing results.<sup>2</sup> Reported studies have included patients with well-established adhesive capsulitis, one with a mean duration at presentation of 5.5 months before oral corticosteroids were trialled.<sup>3</sup> Included in these studies were patients with serious underlying shoulder disorders and insulin dependent diabetics.

MRI studies in frozen shoulder confirm the clinical impression that the acute painful or fibrinous phase is present during the first few months of the disease.<sup>4</sup> By five months the frozen shoulder has passed through the first phase of the condition and has entered the second or frozen phase when capsular adhesions and contracture occurs. Thus one could expect that early intervention with powerful anti-inflammatory preparations before four months have elapsed is likely to be effective. By five months, recovery from frozen shoulder is largely in the hands of Mother Nature and occasionally orthopaedic intervention.

Since 1993, I have treated 30 patients suffering from idiopathic frozen shoulder (16 males and 14 females) with a mean age of 55. All patients fulfilled the criteria for idiopathic frozen shoulder.<sup>5</sup> The mean duration of the initial phase with severe night pain and stiffness was 9.5 weeks before specialist referral. Plain x-rays and routine blood studies were performed for all patients. Sophisticated imaging studies were not usually indicated, although ultrasound of the shoulder was performed in five patients.

Therapy consisted of 1-2 intra-articular injections of one ampoule of Celestone Chronodose with 2 ml of 2% Xylocaine followed by oral prednisone. The prednisone dose was 15-25 mg per day (mean 15 mg) for two weeks. Oral steroids were then reduced and in

all cases phased out by eight weeks. No physiotherapy was given, although simple daily exercises and a home pulley for passive stretching of the shoulder capsule was advised. All patients in this group regained full range of movement of the affected shoulder with freedom from pain and without relapse. Average time to recovery from initiation of treatment was 4.5 weeks.

Insulin dependent diabetics were not included in this series. I believe bilateral frozen shoulders to which these patients are predisposed is a form of cherioarthropathy and thus has a different pathogenesis and prognosis to idiopathic frozen shoulder.

It is my experience with this series of patients with frozen shoulder that early intervention with local and oral corticosteroids is beneficial and warrants a formal trial.

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# Management of Chronic Low Back Pain\*

Professor Nikolai Bogduk, Director, Newcastle Bone and Joint Institute, Royal Newcastle Hospital

## Abstract

Treatment for chronic low back pain (pain persisting for over three months) falls into three broad categories: monotherapies, multidisciplinary therapy, and reductionism.

Most monotherapies either do not work or have limited efficacy (for example, analgesics, non-steroidal anti-inflammatory drugs, muscle relaxants, antidepressants, physiotherapy, manipulative therapy and surgery).

Multidisciplinary therapy based on intensive exercises improves physical function and has modest effects on pain.

The reductionist approach (pursuit of a pathoanatomical diagnosis with the view to target-specific treatment) should be implemented when a specific diagnosis is needed.

While conventional investigations do not reveal the cause of pain, joint blocks and discography can identify zygapophysial joint pain (in 15%-40%), sacroiliac joint pain (in about 20%) and internal disc disruption (in over 40%).

Zygapophysial joint pain can be relieved by radiofrequency neurotomy; techniques are emerging for treating sacroiliac joint pain and internal disc disruption.

## Introduction

Multiple, evidence-based guidelines worldwide have indicated how acute low back pain should be managed.<sup>1</sup> These are soon to be complemented by Australian guidelines, one set developed by the Royal Australian College of General Practitioners and another by the Acute Musculoskeletal Guidelines Group. These guidelines emphasise effective communication with the patient to provide explanation and assurance, allay fears, promote activity and avoid passive therapies. Followed conscientiously, these guidelines are safe, effective, and cost-effective. Over 70% of patients can expect to become pain-free, with a recurrence rate of less than 25%.<sup>2</sup>

For chronic low back pain, the situation is entirely different. By definition,

### Box 1. Evidence-based practice points\*

- There is no evidence of long-term efficacy for drug therapy with analgesics, non-steroidal anti-inflammatory drugs, muscle relaxants or antidepressants for treatment of chronic low back pain (E1);<sup>5-7</sup> opioids are only partially effective and do not improve function (E2).<sup>8,9</sup>
- Orthoses, transcutaneous electrical nerve stimulation, electromyographic biofeedback, traction, acupuncture, magnet therapy, injections into trigger points, and hydrotherapy are no more effective than sham therapy (E1);<sup>3,5</sup> manipulative therapy is barely more effective than sham therapy (E1).<sup>10</sup>
- While exercise therapy is more effective than other interventions, it has also not been shown to be better than sham therapy (E1).<sup>11</sup>
- Surgery is more effective than physiotherapy, but outcomes are modest (E2).<sup>12</sup>
- Multidisciplinary therapy based on intensive exercises improves physical function but has modest effects on pain (E1).<sup>13</sup>
- Conventional investigations do not reveal the cause of pain (E1),<sup>3</sup> but diagnostic joint blocks and discography can provide a diagnosis in many cases (E2).<sup>14-17</sup>
- Between 15% and 40% of patients have zygapophysial joint pain (E2);<sup>3,15,16</sup> about 20% have sacroiliac joint pain (E2),<sup>3,14</sup> and over 40% have internal disc disruption (E2).<sup>17</sup>
- Zygapophysial joint pain can be relieved by radiofrequency neurotomy (E2, E3),<sup>18,19</sup> and techniques are emerging for treating sacroiliac joint pain and internal disc disruption (E2, E3, E4).<sup>20-22</sup>

\* Grading of evidence is based on the system of the National Health and Medical Research Council:<sup>23</sup> E1 Evidence obtained from a systematic review of all relevant randomised controlled trials; E2 Evidence obtained from at least one properly designed randomised controlled trial; E3 Evidence obtained from pseudorandomised controlled trials or comparative studies; and E4 Evidence obtained from case series, either post-test or pre-test and post-test.

this is pain that has persisted for longer than three months.<sup>3</sup> In addition to the pain, patients typically suffer physical disabilities and psychological distress. They may be unable to work and depressed. No organisation has developed evidence-based guidelines for chronic low back pain. Yet evidence is not lacking. This article cites evidence distilled in two monographs,<sup>3,4</sup> supplemented by later systematic reviews (Box 1).

The prevailing approaches to chronic low back pain fall into three categories: monotherapies, multidisciplinary therapy, and reductionism.<sup>3</sup>

### Monotherapies

Monotherapies are interventions of a single, particular kind that a medical practitioner might prescribe as sole

treatment. Some might be used simultaneously, but there is no evidence that such combinations are more effective than monotherapies used alone.

*Paracetamol and non-steroidal anti-inflammatory drugs* (NSAIDs) may be of short-term benefit, but no published data vindicate their long-term use for chronic low back pain.<sup>3,5,6</sup> Intriguingly, willow bark has been shown to be superior to placebo and as effective as NSAIDs for treating relapses of recurrent low back pain.<sup>24,25</sup>

*Opioids* are more effective than naproxen or placebo for relieving chronic low back pain,<sup>26</sup> but the average effect is little more than a 10-point reduction on a 100-point scale.<sup>7,26</sup> Nor do they improve the psychological or functional status of patients treated.<sup>7</sup>

*Antidepressants* are slightly more

\* Bogduk N. Management of chronic low back pain. MJA 2004; 180: 79-83. © Copyright 2004. The Medical Journal of Australia - reproduced with permission.

effective than placebo for relief of chronic low back pain, but have not been tested for longer than eight weeks.<sup>8</sup> They provide only partial relief, and their utility is limited by side effects. Some muscle relaxants (for example, cyclobenzaprine) are effective for short-term relief, but are not available in Australia.<sup>9</sup>

*Orthoses, transcutaneous electrical nerve stimulation (TENS), and electromyographic biofeedback* show no evidence of efficacy.<sup>3,5</sup>

*Traction, acupuncture, magnet therapy, injections into trigger points, and hydrotherapy* are no more effective than sham treatment, placebo, or being put on a waiting list.<sup>3,5,27,28</sup>

*Manipulative therapy* was found in the latest meta-analysis to be slightly more effective than sham therapy (by 4 points on a 100-point scale), but not more effective than other forms of care, including care by a general practitioner, physiotherapy or exercises, "back school", or therapies known to be ineffective.<sup>10</sup> A contemporary review echoed these findings.<sup>27</sup>

*Massage* is a relative newcomer as a scientifically tested treatment for chronic low back pain. Three controlled trials show that it is more effective than sham therapy, self-care educational materials, acupuncture, muscle relaxation and remedial exercises.<sup>27</sup>

*Botulinum toxin* is more effective than placebo at eight weeks, but no long-term studies have been conducted.<sup>29</sup>

*Prolotherapy* (the injection of sclerosing agents into tender ligaments) has given mixed results in the past,<sup>3</sup> but was found in a recent study to be no more effective than placebo.<sup>30</sup> However, even the placebo treatment (injecting normal saline into tender points) achieved complete relief of pain that was sustained at 12 months in 20% of patients, and more than 50% relief of pain in just under half of all patients.

*Behavioural therapy* is better than no therapy and better than placebo, but it is not better than exercise therapy, and provides no additional benefit when added to other interventions.<sup>3,31</sup> Although some systematic reviews have concluded that back school is effective, this has been in the context of multidisciplinary treatment.<sup>3,5</sup>

*Exercise therapy* is more effective than usual care by a GP,<sup>32</sup> and better than back school; but the evidence is conflicting on whether exercise is more effective than an inactive, sham treatment.<sup>3,5,11</sup> There is strong evidence that strengthening exercises are not more effective than other types of exercises.<sup>11</sup>

*Surgery* for back pain lacks compelling evidence of efficacy.<sup>3,33</sup> The one controlled study showed it to be more effective than physical therapy, with more than 60% of patients feeling "much better" or "better" after surgery, compared with 30% of patients treated with physical therapy.<sup>12</sup> However, surgery was not curative; mean pain scores (on a 100-point scale) fell from 64 at baseline to 30 at six months, but reverted to 43 by two years.<sup>12</sup> Mean pain scores for patients treated with physical therapy did not differ from baseline at any time.

*Spinal cord stimulation and intraspinal opioids* are sometimes used to treat patients whose back pain has not responded to surgery. Their use is sustained only by consensus views based on descriptive studies.<sup>34</sup> Similarly, no data vindicate epidural lysis of adhesions.<sup>35</sup>

### Multidisciplinary therapy

There is no universal definition of multidisciplinary therapy. In the literature and in practice, it comprises various combinations of exercises, education, and behavioural therapy. When work-hardening is emphasised, it has been called functional restoration.<sup>3</sup> A distinguishing characteristic of all programs is that they address physical disabilities and patients' beliefs about their pain and resulting behaviour. Pain relief is not an overt objective. Nor are a diagnosis and specific anatomical treatment pursued.

While proponents of multidisciplinary therapy have published favourable reviews of its efficacy for chronic pain in general,<sup>36</sup> a review focusing on chronic low back pain was less encouraging.<sup>13</sup> There is strong evidence that intensive multidisciplinary biopsychosocial rehabilitation with functional restoration improves function, and moderate evidence that it reduces pain, when compared with

outpatient non-multidisciplinary rehabilitation or usual care. The evidence is contradictory on its effect on return to work. However, these conclusions apply to intensive rehabilitation, which means intensive exercises. The available trials of less intensive multidisciplinary rehabilitation did not show improvements in pain, function, or vocational outcomes when compared with non-multidisciplinary outpatient rehabilitation or usual care.<sup>13</sup>

Although intensive rehabilitation is more effective than some other interventions, outcomes are variable and limited.<sup>3</sup> One study found that this type of rehabilitation reduced disability scores from 15.5 (on a 30-point scale) to 8.5 at four months; yet another study from the same institution found that it improved disability scores from 16.9 (also on a 30-point scale) to only 12.1. In these studies, pain scores were reduced from 5.3 (on a 10-point scale) to 2.7, and from 6.1 to 5.7, respectively. Another study found that pain scores were reduced by only 17 points on a 100-point scale. In these terms, multidisciplinary therapy cannot be regarded as curative. For some patients, it offers the possibility of better pain control and improved function, but overall it amounts only to palliative therapy.<sup>3</sup>

### Reductionism

Reductionism describes the pursuit of a pathoanatomical diagnosis for chronic low back pain with the view to implementing a target-specific treatment.<sup>3</sup> In this regard it differs from monotherapies and multidisciplinary therapy, neither of which requires a classical diagnosis to be established. Pursuing a cure has been criticised on the grounds that it ignores the psychosocial aspects of chronic pain. Nevertheless, proponents of reductionism have persisted, as monotherapies and multidisciplinary therapy have not provided a satisfying solution to chronic low back pain.

### Pursuing a diagnosis

In most cases, causes for chronic low back pain cannot be found using conventional investigations, such as radiography and magnetic resonance imaging (MRI), with fewer than 10% of

## Management of Chronic Low Back Pain

cases diagnosed by these means.<sup>3</sup> Degenerative changes and conditions such as spondylolysis and spondylolisthesis are not valid diagnoses of the cause of pain, as they are no more common in patients with pain than in asymptomatic individuals.<sup>3</sup>

However, sources and causes of chronic low back pain can be established if less conventional investigations are used (Box 2):

- Joint blocks can be used to pinpoint pain from the sacroiliac joint or the lumbar zygapophysial joints.<sup>3</sup>
- Provocation and computed tomography (CT) discography can be used to diagnose discogenic pain and internal disc disruption.<sup>3</sup> The latter differs from disc herniation. It is characterised by radial and circumferential fissures in the anulus fibrosus of the affected disc, in association with a degraded nuclear matrix; externally the disc is intact.<sup>3</sup> This condition is not related to degeneration or age changes,<sup>37</sup> but appears to be caused by fatigue failure of the vertebral endplate after repeated loading.<sup>38</sup>

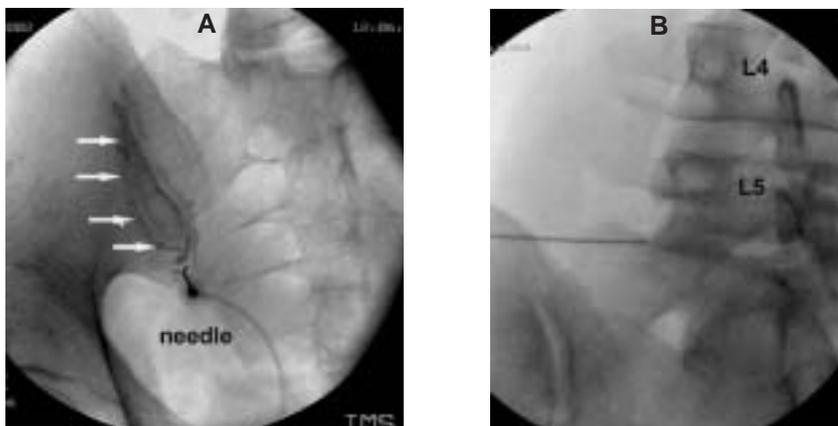
When diagnostic joint blocks are used, the source of pain can be traced to the sacroiliac joint in about 20% of patients,<sup>14</sup> while lumbar zygapophysial joint pain is found in about 15% of injured workers,<sup>15</sup> and as many as 40% of people with chronic back pain in older populations.<sup>16</sup> CT discography reveals internal disc disruption in at least 40% of patients.<sup>17</sup> These figures belie the assertion that 80% of patients with chronic low back pain cannot be diagnosed. This is true if investigations are limited to CT or MRI, but a diagnosis becomes possible if diagnostic blocks and discography are used.

These investigations are not indicated for every patient with chronic low back pain. They are indicated if there is a desire or need to know. They have diagnostic utility in that they bring about closure. They prevent the futile pursuit of a diagnosis by other non-valid means. They may have a beneficial psychological effect; patients may be relieved to have an explanation for their pain. For medicolegal purposes, establishing a diagnosis under controlled conditions protects patients from

### Box 2. Diagnostic and treatment methods for chronic low back pain

#### Joint blocks

Joints thought to be the source of pain can be anaesthetised by injecting local anaesthetic into the joint (Fig. A) or by blocking the nerves that supply the joint (Fig. B).



**A:** Oblique anteroposterior radiograph of a sacroiliac arthrogram. A needle has been inserted into the cavity of the sacroiliac joint and contrast medium (arrows) injected to confirm intra-articular placement, before injection of local anaesthetic (image kindly provided by Dr Paul Dreyfuss, Seattle, Washington).

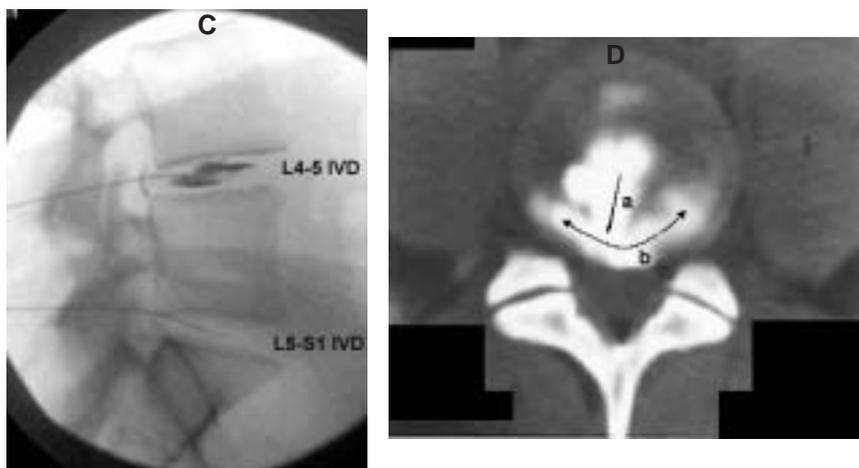
**B:** Anteroposterior radiograph showing a needle in place for a left L5 medial branch block.

#### Provocation discography (Fig. C)

To test if a particular intervertebral disc is painful, contrast medium is injected into the disc to distend it. The disc is deemed to be the source of pain if the patient's accustomed pain is reproduced at low pressure of injection, provided that stimulation of adjacent discs does not reproduce pain.

#### Computed tomography discography (Fig. D)

After a discogram has been performed, the internal architecture of the disc can be demonstrated by computed tomography (CT). Radial fissures correlate strongly with the disc being painful.



**C:** Lateral radiograph of an L4-L5 discogram, showing needles placed in the L4-L5 and L5-S1 intervertebral discs and contrast medium injected into the L4-L5 disc.

**D:** Post-discography CT scan of a painful L4-L5 intervertebral disc. Contrast medium outlines (a) a radial and (b) a circumferential fissure (arrows), diagnostic of internal disc disruption.

accusations of malingering or imagining their pain.

## Target-specific treatment

The ultimate measure of a diagnostic test is its therapeutic utility. In the past, pursuing a pathoanatomical diagnosis of low back pain could be criticised on the grounds that the diagnosis did not alter treatment. This is no longer the case.

*Zygapophysial joint pain* can be treated with radiofrequency medial branch neurotomy.<sup>3,18,19</sup> A controlled trial has shown that this treatment is not a placebo,<sup>18</sup> and an observational study has shown that, provided patients are carefully selected using controlled diagnostic blocks, and provided a correct surgical technique is used, some 60% of patients can expect at least 80% relief of their pain at 12 months, and 80% of patients can expect at least 60% relief.<sup>19</sup>

For *sacroiliac joint pain*, there is no established, proven treatment, but therapies involving denervation of the joint are emerging.<sup>20</sup>

For *internal disc disruption*, the mainstay of treatment has been arthrodesis. However, the hazards of this major surgery, and its questionable efficacy, have prompted the exploration of minimally invasive alternatives. One of these has been intradiscal electrothermal therapy (IDET), in which the fissures of the painful disc are coagulated percutaneously with flexible electrodes introduced into the disc. Launched on the basis of observational studies, this treatment became controversial for lack of controlled trials. One study has now shown that IDET is more effective than physical rehabilitation,<sup>21</sup> and a forthcoming study found it to be significantly more effective than placebo for relieving pain and improving function.<sup>22</sup> However, IDET is not a panacea for chronic low back pain. It is indicated only for patients with proven internal disc disruption, but even then fails to provide any benefit in 50% of cases. Nevertheless, some 20% of patients can obtain complete relief of pain, sustained at two years, and a further 30% obtain greater than 50% relief, associated with return to work.<sup>33</sup>

## Failed back surgery syndrome

Patients with chronic low back pain who fail to benefit from surgery can be difficult to treat. These patients have generally been treated with multidisciplinary therapy, spinal cord stimulation or intraspinal opioids. Although some patients can benefit from each of these approaches, they have not been universally successful.

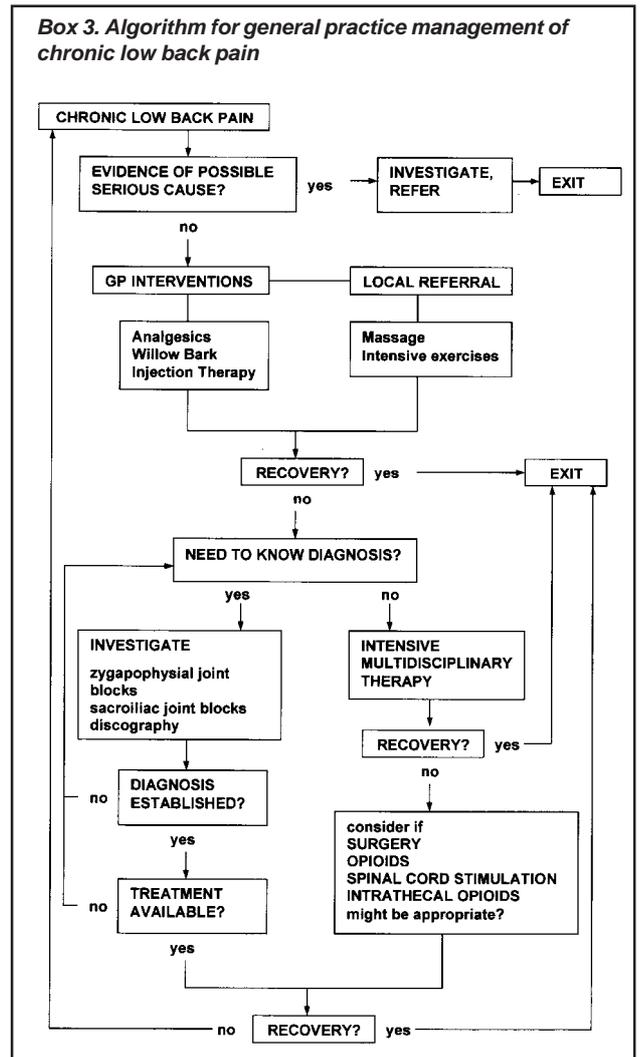
The prevailing attitude to patients with failed back surgery syndrome has been that it is futile to pursue a pathoanatomical diagnosis. Recent studies are reversing that attitude. If carefully investigated, a treatable lesion can be found in substantial proportions of these patients.<sup>39</sup> In those who have predominantly leg pain, unrecognised lateral stenosis is the most common cause. In those who have predominantly back pain, the most common cause is unrecognised internal disc disruption. Such findings are grounds for optimism that, in the future, patients with failed back surgery need not be relegated to symptomatic treatment only.

## Suggested approach

The evidence on treatment of chronic low back pain leaves GPs with few options. Established treatments either do not work or have limited efficacy. Emerging treatments may still be regarded as controversial, or are not widely available.

The evidence indicates that prescribing analgesics, tricyclic antidepressants and muscle relaxants is not the answer; nor is sending the patient for more physiotherapy or manipulative therapy. Nevertheless, some guidance can be formulated (Box 3). Information

Box 3. Algorithm for general practice management of chronic low back pain



for patients is summarised in Box 4.

For exacerbations of chronic low back pain, the evidence supports the use of willow bark. Massage is emerging as an innocuous but effective intervention that is commonly available. Injections into tender attachment sites for ligaments are a simple treatment that GPs can perform. The agent used is immaterial; even normal saline works if the injection is given with confidence. They can achieve complete relief of pain in 20% of patients and significantly reduce pain in 40%.<sup>30</sup> These figures are no worse than those for the best alternatives, and better than most.

If a diagnosis is required, diagnostic blocks and discography can be undertaken. This should be in consultation with a practitioner experienced in the technique and interpretation of results. If treatment is to follow, it should be in the hands of an experienced practitioner of the technique.

## Management of Chronic Low Back Pain

### Box 4. Messages for patients with chronic low back pain

- Drug treatment does not cure back pain.
- Opioids only partially relieve the pain and must be used carefully.
- Willow bark is effective therapy for exacerbations of pain.
- Massage can help relieve pain.
- Manipulative therapy is barely more effective than sham treatment, and other physical therapies and devices are no more effective than sham treatment.
- Exercises can be beneficial.
- Multidisciplinary therapy can help improve function, but will not completely cure pain.
- Surgery can help some patients to various degrees, but nearly half will not benefit.
- Spinal cord stimulators can help some patients who gain no relief from surgery.
- Tests are available to make a diagnosis when CT scans and MRI scans are said to be normal.
- Treatment is available for zygapophysial joint pain.
- New treatments are being developed and tested for sacroiliac joint pain and pain coming from intervertebral discs.

CT=computed tomography. MRI=magnetic resonance imaging.

If a diagnosis is not required or is not possible, the current mainstay of management is multidisciplinary therapy. The evidence requires that this be a program based on intensive exercises, as less intensive programs are not effective. Even so, neither GPs nor patients should be under the misapprehension that multidisciplinary therapy will be curative. While some patients may have outstanding responses, most will benefit only partially with respect to function and pain.

Opioids may be needed for patients with persistent severe pain, but should be used carefully. Patients must understand that they will not be cured of their pain; relief will be only partial. Opioid therapy is best undertaken under the aegis of a pain clinic, or according

to published guidelines if a pain clinic is not available.<sup>40,41</sup>

Although not proven in controlled trials, spinal cord stimulation or intrathecal opioids constitute a final option for patients with intractable back pain, particularly after failed surgery. They are costly but provide appreciable relief for up to 50% of those treated.

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# Pain and Chronic Low Back Pain: A New Model? Part 1. The Hypothesis and Model

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“Discovery consists of seeing things that everybody sees, and thinking what nobody has thought” - (Albert von Szert-Gyorgyi, Hungarian Biochemist, 1893-1986)

## Abstract

**P**ain and Chronic Low Back pain (CLBP) are subjective experiences presenting frequently, with wide economic, social, and community effects.

This new hypothesis compares the human body to a new computer, which initially “learns” and functions well, until finally the system “degenerates” and the hard disc “crashes”.

The human, from birth to death, follows a similar pathway, as it learns by simple repetition, of single stage behaviours, producing multiple Pavlovian conditioned reflexes, to survive and function in the ever-changing environment.

Parallel, but subservient conditioned reflexes, are the similar learnt behaviours to nociceptive inputs that are experienced as subjective “pain”. As the body ages or “degenerates”, the damaged tissues increase the cerebral afferents, causing vestibulo-autonomic controlled, postural changes via the balance between survival/function and pain responses.

The new hypothesis and model have been developed from, and are supported by, unexpected clinical results obtained by the author (reported in Part Two), while utilizing modified Blomberg spinal ligament injection protocols.

## 1. Introduction

Chronic low back pain (CLBP) is a major, but poorly understood and managed problem in every country of the world. It has a very high economic, social, and personal cost to every sufferer, employer, and associated family group.

To date, there have been very few programs that have provided either understanding or resolution to this difficult problem.<sup>1,2</sup> Dr Stefan Blomberg's

work in Sweden has shown positive outcomes in randomized trials,<sup>3</sup> although the full mechanisms of action of his para-sacroccygeal local anesthetic/steroid injections have not been fully elucidated.

McKay and Wall<sup>4</sup> provided a new concept for total human body function, both in health and following illness or injury, and this has assisted in providing a plausible reason for Blomberg's success.

By applying evolving modifications of Blomberg protocols in over 550 patients, the author has developed an hypothesis and model that may provide an alternative explanation for both the causation and continuation of CLBP and other pain conditions. It may also explain the overall improvement of the quality of life measures observed by the patients.

To produce the new model the author has utilized:

1. The principles of learning observed by Professor Ivan Pavlov in the formation of conditioned reflexes;<sup>5</sup>
2. Dr Edward de Bono's neural pattern formation model,<sup>6,7</sup> and
3. A non-mathematical conceptual application of Chaos Theory to explain the development of the learnt parallel survival/function and pain pathways from birth to death.

## 2. Hypothesis for Human Life: Survival, Function, and The Role of Nociception and Pain.

From birth to death, the human body parallels a computer, operating as a single functional human body, exposed to constantly changing internal and external environments.<sup>4</sup>

The total concurrent information processing might be described as resonating and reverberating chaotic systems with multiple constants, following prior learnt neural patterns of conditioned reflexes. These have developed to conserve brain processing demands at any point in time, while responding to the chaos of external and internal input stimuli.

### 2.1 The computer model (Fig. 1)

Simplistically, when a new computer is purchased, it consists of a fully functional unit consisting simply of the body, that is, case, CPU, I/O keyboard and components, floppy drives, CD ROM drives, etc. (BODY), as well as the basic operating software or background functions (OS), and the empty hard disk drive (HDD). The computer can “survive and function” to an expected protocol over its “life”.

During the “life” of the computer, the operator accepts the background, but essential functions of the OS, which

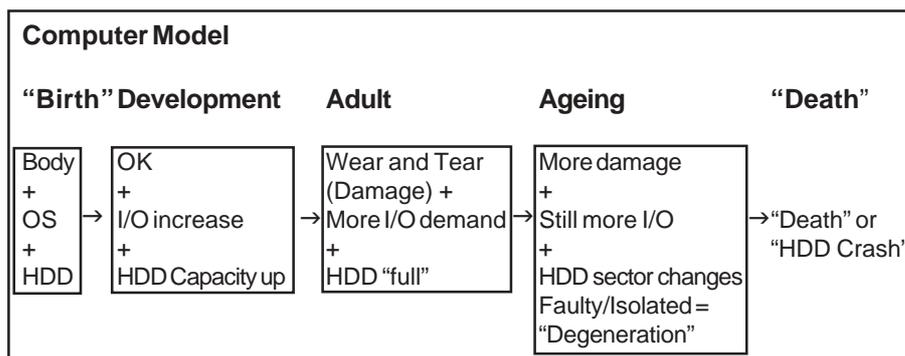


Figure 1. “Birth to death” of a computer

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keep the unit working. Via the various input/outputs (I/Os), gradually the HDD fills with data being used, stored, accessed, moved, and altered. As time goes on, available HDD space gradually fills up. This results in “wear and tear” (HDD “degeneration” in medical terms), developing “bad sectors”, which the OS isolates and avoids, thereby reducing total useable space.

At times, inputs can trigger audio-like microphone/amplifier feedback

loops, which cause accelerating malfunctions. To stop such feedback loops and malfunctions, the input must be blocked, volume decreased, or the amplifier turned off, just as in the audio feedback loop.

As the functional capacity of the HDD is reduced with increasing inputs, outputs, feedback, and storage accessing, it becomes less reliable and finally there is a HDD “crash”. A dead computer! Luckily a computer is

easier to resurrect than a human.

## 2.2 The human model (Figs. 2 and 3)

A newborn baby is very similar to such a computer. It is a unit that can “survive and function” to an expected protocol and consists of a body (BODY), an OS (consisting of all the tissues, central, peripheral, autonomic nervous systems, endocrine systems, and other input/output systems), and an “empty” hard disc drive (HDD) or

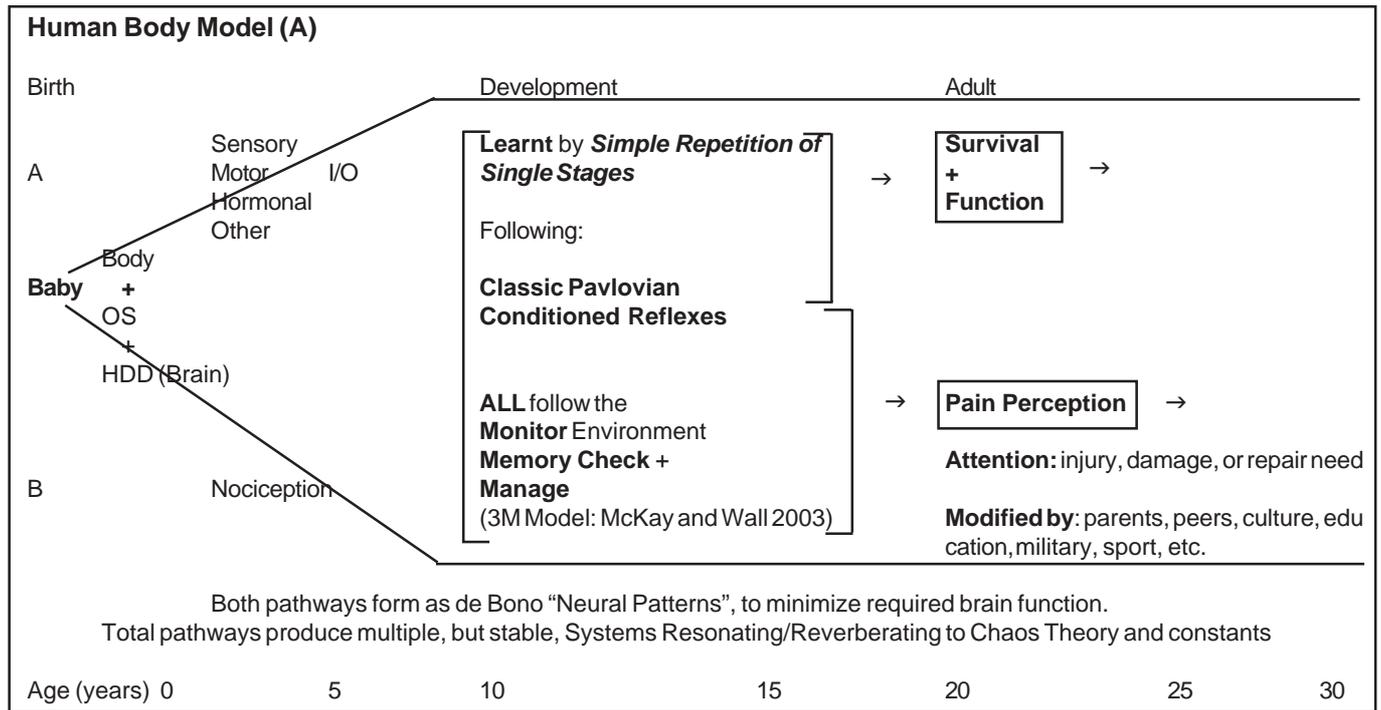


Figure 2. “Birth to adult” of human “computer” system

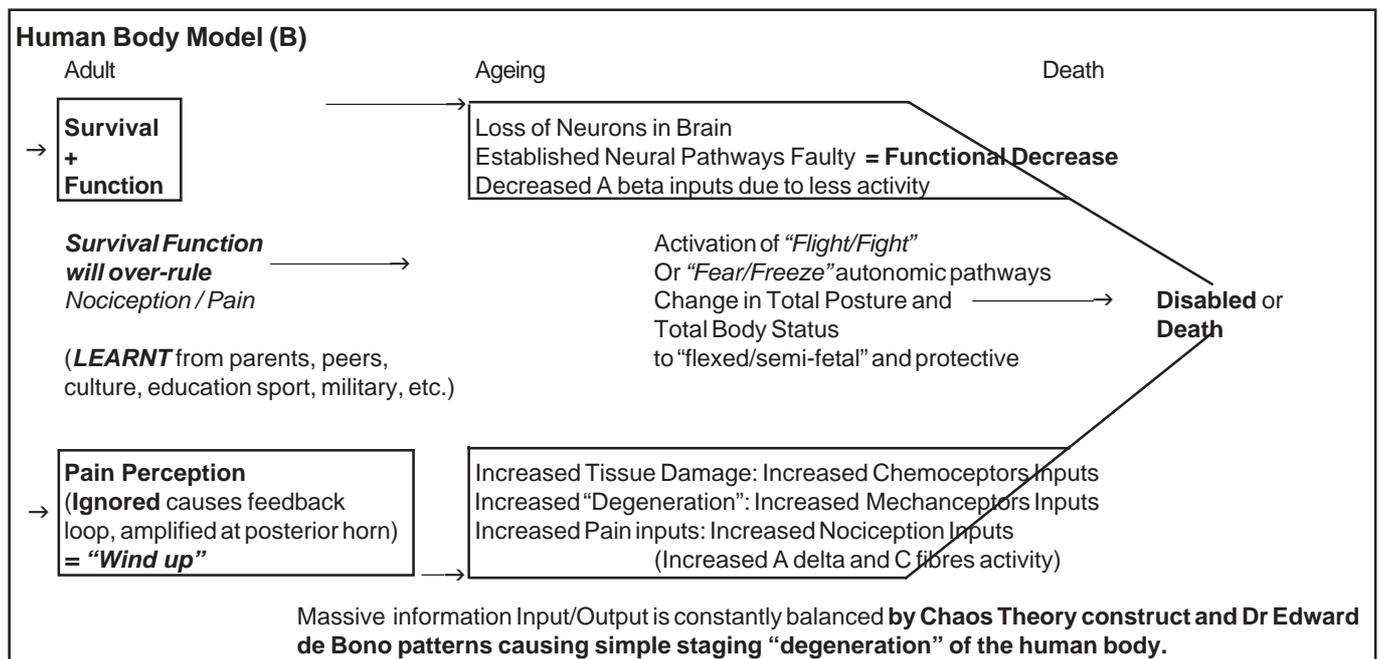


Figure 3. Stage two: “Adult to death” of human “computer” system

# Pain and Chronic Low Back Pain: A New Model? Part 1. The Hypothesis and Model

brain.<sup>4</sup>

The baby has the unique ability to grow its own brain/HDD in size and functions, maximally over the first five years, then continuously, but at a reducing rate, to adult stage. By utilizing inherent neural plasticity, the brain and nervous system can manage to vary its functions, at all times responding to massive volumes of concurrent data, (its multiple I/Os), which may appear to be chaotic, but are organized and simplistic in action (Fig. 2).

Sometimes there are inputs that trigger positive feedback loops, similar to the audio example of a microphone being moved too close to a speaker, with positive amplified feedback increasing sound. The resultant “feedback” or “wind up” (as in nociceptive input effects at the posterior horn of the spinal cord<sup>10</sup>) can be stopped only by suppression of the “input” at spinal level or from higher centres, blocking the “amplifier” effect. This is analogous, in the audio model, to adjusting the volume control, turning off the amplifier, or removing the microphone/inputs.

Then ageing starts to affect many parts of the body system (generically referred to as “degeneration”), changing and increasing the accepted inputs (mechano-receptors, nociceptors, chemoreceptors, etc.) to the HDD. The “damage”, due to fatigue failure,<sup>15</sup> results in loss, malfunction, or inappropriate functions of the HDD, which attempts to compensate via neural plasticity. Finally there is a systems “crash” or death. Unfortunately, computer-like resurrection is less simple with humans (Fig. 3)! During this “birth to death” of the human, the inputs/outputs can be grouped into two main categories: survival/function groups and nociceptive groups.

**Survival/Function groups:** These enable the human to live and respond to the ever-changing external and internal environments.

**Nociceptive groups:** These act as warning signals to the human that injury or tissue damage may occur, has occurred, or continues to occur.

Each proceeds along simple, then more complex learning paths, following classical Pavlovian reflex conditioning, changing from the uncondi-

tioned reflexes present at birth. ***Each new sequence is gradually Learnt by Repetition of Single Stages during the normal living experiences from baby to adult to death, always as a single, functioning whole human body, as proposed in the model by McKay and Wall.***<sup>4</sup>

This might be seen as reductionism’s different view of the **functional parts of the whole human body**, instead of the individual systems, organs, tissues, cells, and metabolic processes that have been considered to date.

## 2.2.1. Survival/function group

The learning of the survival/function responses may be observed while watching any new baby, with its many unconditioned reflexes,<sup>8</sup> responding to the environmental stimuli to gradually develop, with actions such as smiling, rolling over, sitting up, standing, walking, running, catching a ball, reading, writing, playing sports, driving a car, up to a surgeon operating, mechanic repairing a car, musician performing in a concert, etc.

They all have to be **Learnt by Simple Repetition of Single Stages**, then via multiple repetitions, memory storing, and modifying. There is created a single vast database of three-dimensional (3D) self-images in any space or for any activity, with concurrent, learnt functions or activities needed to survive. The input information is derived from special sensory organs and general sensory inputs relayed by A-beta, A-delta, and C fibers to the posterior horn of the spinal chord. Relay occurs, via the anterior horn, to autonomic ganglia at the same level, but mostly by direct or cross-over pathways ascending to the brain stem and higher centres.

The human interacts with the external and internal environments by Monitoring, orienting to any change, Memory checking the HDD, and Managing by applying learnt behaviours to whatever is confronted. This is the “3M” function from the McKay and Wall Model, based on classical Pavlovian conditioned reflex formation and modeling.<sup>4,9</sup>

## 2.2.2. Nociceptive group

The nociceptive management

protocols also have to be **Learnt by Simple Repetition of Single Stages**.

Whenever the baby’s nociceptive inputs are activated, that is, by noise, smell, noxious sensory input, etc., there is triggered an unconditioned reflex response or “hurt”.<sup>8</sup> This results in movement, fear, crying, withdrawing, etc., which can be observed by the protective adult or observers. The adult then *teaches* the baby acceptance or management protocols for each nociceptive experience. By reassurance, comforting, massaging, etc., the different nociceptive inputs can be accepted and responded to in many different ways. The input pathways are again via A-delta and C fibres which pass to the posterior horn and can be modulated by A-beta inputs, or the descending pathways from the periaqueductal grey matter (PAG).<sup>10,11</sup>

The *learnt response* is then observed as the baby’s “pain” and, and as the adult uses phrases such as “kiss it better”, “rub it better”, “ignore it”, “you’re a big ... now!”; the baby *Learns* to suppress the “hurt” response to less important, and pay attention to more important nociceptive inputs. As the child develops, friends, neighbours, school, sport, employment, etc., superimpose very definite culturally accepted behavioural patterns to the different nociceptive inputs. As the human grows, so it continues to contextually *learn* many different ways of accepting or rejecting the nociceptive inputs of different types and strengths. This is modified by adults, peers, community, culture, sport, military etc., and general community expectation. These actions create the descending modulating pathways that suppress the nociceptive A-delta and C fibres inputs arriving at the posterior horn.<sup>10,11</sup>

The learnt responses constitute “Pain” and each individual learns to suppress the different nociceptive inputs in many different ways, forming the individual pain perceptions and managements. This may be by increasing descending modulation or accentuation of A-beta based inputs, that is, rubbing, squeezing, and using rubefacients, or activity in the limbs.

Each person develops their own “pain” interpretation based on their

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personal, cultural, and past experiences.

By such *learnt nociceptive input suppression*, a person, when faced with the ultimate **survival/function** as opposed to **pain** challenge, can for example cut off their own hand to ensure survival. This was seen recently in USA rock climbing and NSW mining accidents. Sporting persons can ignore injury until play has finished, military personnel can suffer situations or injuries that others would not tolerate, *because they have learnt to do it*. In special circumstances many people can perform Herculean tasks, or achieve results that normally would never be anticipated. A farmer with a broken leg, can overcome severe pain to crawl long distances for help. Victims with severe injuries can get out of a life-threatening situation, for example, or assist others in ways that cannot be explained normally or by the simplistic adrenalin/noradrenalin effect.

Often these learnt pain modulation protocols continue into later life and are not recognized as such, because they occur in different contexts, and may be accepted as “normal” or “constant” by the individual, even though the overall resultant effect may be detrimental to the whole body function. The intensity needed for survival/function to override other factors such as pain due to injury or illness, was described in 1916 by Pavlov in his lecture on the intensity of “The reflex of purpose”.<sup>12</sup>

## 2.3 Chaos Theory - “feedback” (electronic) or “wind up” (nociceptive)

Chaos Theory describes the resonance and reverberation occurring in systems which can be modeled with differential mathematical equations, sensitive to even small changes to their constants. The Functional Whole Human Body<sup>4</sup> is such a resonating and reverberating complex system to the “chaos” of internal and external orienting stimuli. There are many constants, just as there are many variables in such human systems. Both may vary in reference to time only.

Following the modeling of Dr Edward de Bono,<sup>6,7</sup> as each new input experience repeats, a neural pathway is formed and then followed, until all such

subsequent similar stimuli pass along the predetermined and established pathway. Considering one of Dr de Bono's own models, this is like raindrops falling on dry dusty areas, where they initially form single wet spots. As further drops fall they start to coalesce forming tiny rivulets, which become larger. All subsequent raindrops will follow those preformed pathways. Hot water drops on a jelly mould form more permanent “memory” pathways.<sup>6,7</sup>

So it is with the human brain.

***Each and every established conditioned reflex follows the same previously established neural pathway, thus conserving the number of options that must be considered for each impacting stimulus. The brain can therefore manage vast amounts of input information very economically, utilizing the previously established pathways, and only responding otherwise to new or novel stimuli, as described by Pavlov.***<sup>13</sup>

Thus, once learnt, a particular conditioned reflex uses minimal neural pathways, and the human consciousness is permitted to consider other more novel stimuli or factors.

Examples are many, such as learning to drive a car or play an instrument, the Aborigine learning to follow animal tracks, or a doctor learning a particular surgical procedure. These initially demand a lot of conscious brain function, but once learnt, become clearly demonstrated subconscious reflex processes.

These follow the author's conceptual model of Chaos Theory, which describes altered resonance and/or reverberation to small or large constant changes. When a constant changes, the whole system changes, or restores as the constant restores. These neural systems also emulate de Bono's model of neural pathway formation and functioning.

A simple example of such a Chaos System and changes might be observed in an adult person who, totally blind from birth, lives and functions in their own “known” unit. The furniture is arranged, and its position is known. Unknown to the owner, a helpful person cleans the unit and moves a piece of furniture slightly, even though attempting to replace everything pre-

cisely. When the blind owner returns and runs into the moved piece of furniture, they fall over knocking many other items of furniture, and a new chaos system emerges. The constants have changed. Until the blind person has relocated every moved piece of furniture, the new chaos system remains. Once everything is replaced, the old chaos system restores with the old constants.

“Constants” in human body terms can be seen as the sensory or other inputs from any part of the body that occur regularly and follow the predetermined neural pathways of conditioned reflexes (de Bono patterns).

For example, the spinal muscles and associated tissues producing the upright posture, with their mechanoreceptor inputs, learnt during development when sitting, standing, walking, etc., on reaching the brain, are checked against the learnt “HDD” data base. This is analogous to de Bono raindrop pathways in dust. These indicate and maintain the body, wherever it is, functionally in a 3D virtual space, by learnt repetitive, conditioned reflex protocols developed over time.

Now activated in parallel are the nociceptive inputs, which act as warning signals of tissue injury or damage. These cause the human to orient to any affected area creating the input, and specific management decisions are made about whether to repair or correct the effect.

Does the human accept and action the cause, or ignore, and continue to function as before?

This is where the above survival/function protocols can over-ride nociceptive inputs, for the benefit and continuance of the whole human.

If the nociceptive input is ignored, and the threat of damage is great, there is a “wind up” pathway followed, which is similar to the audio feedback example given above.<sup>10,11</sup>

However, if the need to survive is greater, then those nociceptive “wind ups” can be fully suppressed by the learnt prior management protocols, which work by activation of the descending modulation pathways.<sup>10</sup>

To stop the “wind up”, which is analogous to audio feedback, it is necessary to:

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1. Stop the nociceptive activator input (move the microphone away);
2. Suppress the inputs by A beta activation or using chemicals (switch off the amplifier);
3. Modulate or suppress the nociceptive pathway from higher neural centers (adjust the volume control).

## 2.4. Ageing or “degeneration”

When tissue is damaged, due to acute injury or fatigue failure,<sup>15</sup> a “chemical soup” stimulates the chemo-, mechano-, and nociceptors.<sup>11</sup> This causes activation of the nociceptive pathways, until the damaged area is repaired, or a new constant input occurs, which the brain then accepts as a modification to the previous neural pathway or conditioned reflex.<sup>10, 11</sup>

With ageing (or “degeneration”), the many repairs required may never fully occur, and a new set of input “constants” (nociceptive, mechanoceptive, chemoceptive, etc.) develop, causing various “wind-up” activations. In keeping with Chaos Theory, there has been a total system change, which may vary from minor and unobserved, gradual and slowly observed, to major and obvious, all occurring over varying time periods.

Such a change occurs in the readily visible postural system in erect humans. The psoas muscles and associated paraspinal tissues have changed the *spine to femur angle* of 110 degrees in four-legged animals, and increased it to 190 degrees in the erect human posture. The erector spinae, multifidus, and psoas muscles now serve different postural purposes when compared to quadrupeds.<sup>14</sup> The psoas and scalene muscles in the neck still retain their direct involvement, however, in the flight/fight or fear/freeze responses, moderated via the vestibulo-autonomic brain stem pathways.<sup>15</sup>

When a threat occurs, they exert different and more pronounced biomechanical effects on the body. The effects on the neural and musculoskeletal control systems with ageing or “degeneration” of the tissues increase the normal and nociceptive inputs. Such increased inputs then rebalance the total system and the “most comfortable” position, with least activation of nociceptors, is generated as

a new “postural constant” or position, moderated by the changes in the vestibular-autonomic regulation of the nervous system and posture.<sup>15</sup>

This is most often seen as the whole trunk tilting forward. Fingers, forearms, and arms assume partly flexed positions, as do the legs. The whole body then assumes a more “protective” or flexed stance, as in the boxer’s ready or defensive position.

An alternative understanding of this may be seen when a person is confronted by a major totally overwhelming threat, such as a gun in their face in a confined space, an extremely loud threatening noise, or chemically irritating, blinding smoke. The natural protective action is to assume a “fear/freeze”, or even “flight/fight” posture, with a resultant semi-fetal position occurring.

*Pain* (either severe acute, intermittent, or constant, or chronic) is a similar, but internal threat to the whole functioning body system and the protective semi-fetal position is assumed gradually or suddenly. Acute pain can make a person “fold up” and become fetal-like in posture.

When the altered receptors are changed by physical or chemical input, including injections, or inactivated in other ways, it may partially or fully restore the previous “constant” neural input, and by applying the concept of Chaos Theory, restoration of the “constants” leads to restoration of the previous resonance and reverberation. The normal posture may be restored.

At the same time, the “wind up” or amplified inputs decrease, enhancing the result, and more normal position and function are restored. If activity levels are increased, the increased A-beta sensory inputs may sustain the restored posture. If the A-beta inputs reduce, and the other nociceptive inputs restore, then the change has only a temporary effect, and the prior abnormal condition can recur. This reinforces the need for associated activity programs after interventions.

With ageing, the HDD/brain is becoming faulty, with sector damage and errors both specific and functional. Concurrently the normal learnt inputs are still present, but the damage or “degeneration”, that is, fatigue fail-

ure<sup>15</sup> to all the tissues has resulted in more nociceptive and other inputs, and there is system overload and malfunction. This is similar to the computer HDD malfunctions prior to “HDD crash” (Fig. 3).

Age-related pain inputs also activate the autonomic, endocrine, and immune systems, so there is usually a visible gradual return of the whole body towards the “protective” or flexed fetal position. There is forward tilt of 10-35 degrees, with strain applied to the interspinous ligaments, due to the actions primarily of the psoas and scalene muscles, with flexion of all limb joints. This follows the normal activation of the fight/ flight/ fear/ freeze protocols and whole body function.<sup>4</sup> Although commonly seen in older or injured persons and especially in nursing home patients, it can occur in younger people with the same input activations.

The ageing process becomes more obvious externally, as the whole body returns to the fetal-like position. This challenges the current concept of osteoporosis and disc shrinkage being the major component of age-related kyphosis. Once treated with the author’s modified injections and gentle general manipulation, many elderly patients regain most of their upright posture, and have significant pain reduction and restored overall quality of life!

## 3. Discussion

Pain is experienced uniquely by each person and has always been a very difficult medical problem. Chronic low back pain has been difficult for family physicians, who by default, have to manage the problems long term. Published models or protocols have rarely provided comprehensive, whole-body functional explanations of causation, or provided useful long-term management benefits to date. Even using the current evidence-based medicine managements, the overall outcomes have usually been limited in their long-term benefits.<sup>1, 2, 16, 17</sup>

The above model considers an entirely different process, being from birth to death, and considers the whole functional human body as a single entity. A simple, rational, unifying ex-

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planation is possible for the involved mechanisms.

There are two major learning pathways involved, one permitting total animal survival and function, and the other identifying and restoring injured or damaged tissues.

The model is based on the concept of the whole functional human body<sup>4</sup> using a single operating system (OS) and a single unit (or computer complex), responding to environmental stimuli (internal and external) by the Monitor, Memory Check, and Manage, or 3M protocol, in which the person survives, functions, learns, repairs itself, and is able to reproduce, care for, and teach its young.

In the early 1900s, Professor Ivan Pavlov<sup>5</sup> became one of the last experimental physiologists to examine the total functioning animal, and described development of the conditioned reflexes as learning protocols. Dr Edward de Bono, in about 1969,<sup>6,7</sup> developed the conceptual models of how neural networks form in the human brain. Chaos Theory describes the reverberation and resonance occurring with concurrent multiple input/output processing at any point in time.

A conceptual model and hypothesis has been developed to link these concepts into the described single learnt management model. This model forms from repetition of single stages producing classical conditioned reflexes, which follow the same neural pathways, providing for economy of central neural function, while allowing attention to new or novel stimuli.

**The most important concept is that the human body responds to its complex environmental stimuli as a single functional unit, and not merely as the sum of its many detailed parts.** The ultimate response to the chaos of neural activity always follows the previously learnt behaviours, originally described by Pavlov as conditioned reflexes and de Bono as neural patterning.

The model and hypothesis developed from the author's clinical observations, and these are reported in Part Two. The model and hypothesis requires application and testing in clinical presentations to determine its validity and usefulness in the management

of pain-related conditions.

The human survives and functions, concurrently with injury and repair by utilizing simple learnt protocols to manage the chaos of input stimuli. When the human systems start to fail due to age or fatigue failure, the observable total body changes follow similar simple patterns of learnt behaviour.

## 4. Acknowledgments

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# Pain and Chronic Low Back Pain. Part 2. Observations and Clinical Material

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“Discovery consists of seeing things that everybody sees, and thinking what nobody has thought” - (Albert von Szert-Gyorgyi, Hungarian Biochemist, 1893-1986)

## Abstract

**P**ain and Chronic Low Back Pain are the clinical albatrosses of many medical practitioners, who have to manage recurrent presentations with available evidence-based programs that have high failure rates.

The author experimented with the Blomberg protocols and documented the changes occurring. This resulted in the formulation of a new hypothesis and model for pain and chronic low back pain development, as detailed in Part 1.

To determine which component(s) of the injections was/were active, a random group of 33 patients were treated with “needling”, “needling” plus local anesthetic, and “needling” plus local anesthetic and depot steroid. The results were unexpected.

Clinical observation of patient responses, especially the quality of life changes, suggest that such **injections protocols should be available in all medical, pain, and back clinics, and offered prior to any interventional surgery to the spine.**

The findings suggest that replication and multi-centre testing of the model and hypothesis would be an appropriate future step.

## A new challenge

Following attendance at the October 2002 musculoskeletal medicine conference in Melbourne, the author was encouraged by a determined patient to trial the Blomberg protocol.<sup>1</sup> Most of the outcomes were beneficial and unexpected. Many other patients were offered similar treatments, with appropriate monitoring. Realizing that similar problems were persisting, the author modified the protocol to treat the triangular areas from the PSIS to L5 bilaterally, and to the tip of the coccyx concurrently. The results are reported below.

Professor Nikolai Bogduk, professor of pain medicine at Newcastle University, questioned which of the three injection components in the Blomberg protocol was causing the observed effects. Was it the physical input by the needling of the ligaments, the local anesthetic, or the depot steroid, that was effective?

To address those issues, the author chose to treat the next 33 proximate patients to answer the question in January 2004. They were randomly assigned to the three possible treatments, with the expectation that there would be three different groups of results.

However 32 of the results were very similar, though there was notable grouping of some cases, and only one “failure”. Follow-up local area re-injections, and gentle general spinal manipulation of identified musculoskeletal dysfunctions, appeared to reduce the rate of relapse following the various injection protocols. Some patients requested total re-injection and multiple follow-ups were required.

Increased activity levels or return to previous activities also reduced the rate of recurrence.

At the same time, a male paraplegic injured in a motor vehicle accident 27 years ago, with damage at T9 but partial recovery to T12, volunteered to be a human “guinea pig.” He was treated with similar but more extensive injections, including interspinous ligament injections up to the T12 level.

The results of the experiments initiated by Professor Bogduk’s challenge are detailed below, and formed the clinical basis for constructing the new model and hypothesis. Further work is now required to extend the testing and validate the model, to replicate the findings of the author’s low back injection protocol, modified from but based on the original work of Stefan Blomberg.

The new model, hypothesis, and the

clinical protocols, have produced such positive care outcomes for the patients, who now find they can rely more on correctly skilled musculoskeletal physicians, family physicians, and general practitioners to diagnose and manage their clinical problems with greater confidence. There are economic benefits and improved total quality of life outcomes for the whole community at all age levels.

These management approaches are now demonstrating long-term efficacy augmented by activity programs, and usually only minor local area secondary interventions are required after the initial major procedure. Prospective long-term studies are now essential and should be conducted in musculoskeletal medicine, general practice, and family medicine settings. This would be in preference to back or pain clinics, apparently reluctant to change their “evidence-based models”, with faulty application of the existing medical scientific knowledge base. There is failure to appreciate the importance of the whole functional human body model,<sup>2</sup> and a tendency to concentrate on isolated regions and systems.

## 1.1. Clinical material supporting these models

All patients are taken through a similar anatomical and physiological explanation, and shown multiple colour prints from Grant’s Atlas, the Astra booklet on *The Pathophysiology of Pain*,<sup>3</sup> the Autonomic Nervous System chart, and two other charts of the vestibulo-autonomic pathways, and the French musculoskeletal medicine newsletter.<sup>4</sup> Coupled with this, the concept of Chaos Theory explained, using the blind person analogy, and the neurological construct of altering the obvious conditioned reflexes, was briefly modeled for them.

The author has found that, despite

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the complexity of the information base, patients can appreciate the principles, the interplay between Chaos Theory and conditioned reflexes, and the application to the management of their pain. This allows an equal sharing of the medical knowledge base, and they then “own the solution” to their own problem, with help from the treating doctor. They are empowered by this knowledge. The author’s main experience base is in mutual aid and self-help protocols<sup>5, 6</sup> and the above management fills these criteria. It allows the patient to make their own decisions about which treatment or management solutions they wish to follow.

Such consultations usually involve 30-60 minutes per patient.

Patients are advised that the treatment is experimental, and told that no promises or guarantees are made or to be expected. Side effects and complications are also discussed. It is then the patient’s own choice whether to participate. Most injections are given on a different day, except for patients travelling significant distances, when the whole process is done in two separate sessions on the same day.

### Injection method

The injection protocol consists of the patient being placed prone on a bed that breaks in the middle. 2.5 ml of 2% Xylocaine local anaesthetic is injected subcutaneously at one injection site per side, at the level of S2, 30 mm from the midline.

The triangulation injections use 5ml of 2% Xylocaine + 10ml saline + 2 ml Depo-Medrol, Celestone Chronodose, or Kenacort A-10, as the depot steroid.

Each injection region receives about 4 ml of the solution gradually injected, as the *multiple “sewing machine-like” needle actions* are made into the ligaments and tissues.

The two paraspinal ligament injections are done using a 20 gauge 3.5 inch spinal needle, from the level of S1 to tip of the coccyx, via the one penetration site only on each side at the level of S2. It is done using multiple sewing machine-like needle actions to the ligaments at their attachment to the edges of the coccyx and sacrum, with the left index finger giving per rectum control of needle location (Fig. 4).

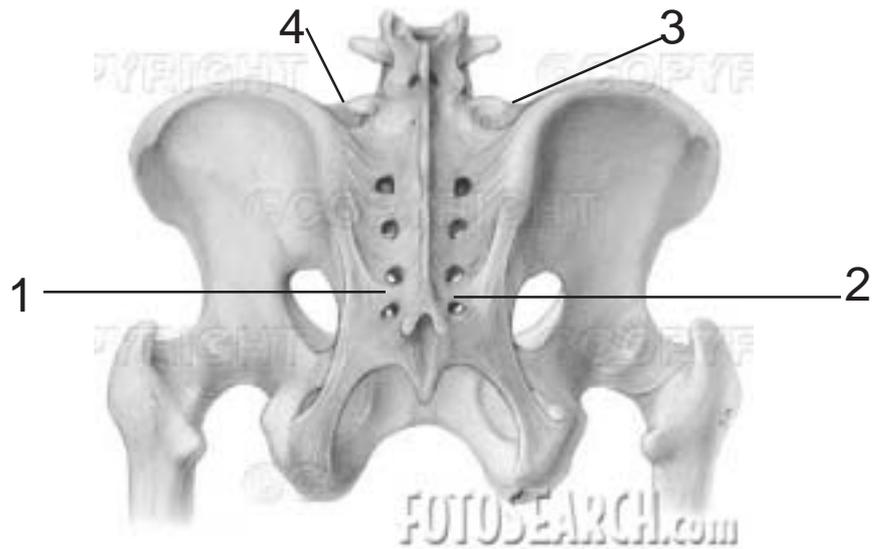


Figure 4. Author’s multiple injection sites from four skin sites: 1 and 2: Injection edges of sacrum and coccyx; 3 and 4: PSIS medial, lateral, and caudal. Original image copyright Fotosearch.com

Injections are then performed at the PSIS on each side, via the same entry point, with similar multiple needling actions to the muscle, tendon, and ligament attachments to the bone, laterally along the PSIS and medially to the L5 spine on each side to the length of the needle.

### 2. Results

The following results were accumulated since November 2002, without any attempt to prepare a specific scientific paper or trial. They are ad hoc results and are reported as such.

#### Previous treatments

- 68 patients had previously been treated with CT-controlled zygapophysial joint injections. One female endured needle penetration of her left L5 nerve root three times during the attempted injection and experienced persistent post-injection pain. She was referred to a pain clinic without benefit, but had full resolution of all pain with the author’s modified protocol first done in December 2002, and repeated in February 2004 after she reactivated the back pain lifting a child.
- Many patients (more than 110) had experienced previous lower back surgery, that is, laminectomy, spinal fusion, discectomy, and coccygectomy.
- 37 patients had been treated with epidurals, which all described as

painful and of little benefit.

- Five patients had been treated with prolotherapy.
- Three patients had been treated with ultrasound-guided piriformis muscle injections.

To 31 March 2004, 549 patients were treated, whose age ranged from 16 to 95 years. Fifty-two required full repeat protocols (at patient’s request). One patient required three extra treatments. Two patients required two extra treatments. Forty-nine patients required one extra treatment.

Total failures of whole procedure numbered 24 (November 2002 to June 2003).

Failures using the author-modified protocol: six cases (July 2003 to March 2004). One was a chiropractor masseur who had measured objective benefits, both immediately after the injections, and three weeks later, following competitive sailing in New Zealand, but subjectively claimed no benefits.

#### Major side effects

One patient was hospitalized for two large hematomas (undeclared warfarin use with INR unexpectedly high)

#### Common side effects:

- Local bruising
- Sweating at the time of injection in severe cases
- Discomfort from the PR control of injections initially,

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- Vasovagal episodes post-injection

### Overall responses

Eighty-nine per cent were 50% or better (some gave figures of 150-1000% improvement, after multiple other unsuccessful treatments), with reduced pain, restoration of mobility, increased quality of life, improved sleep, and the ability to return to activities previously ceased because of their disability.

The outstanding major benefit was the patients' stated improvement in their quality of life, and their ability to return to activities previously avoided!

Genuine radiculopathy with positive slumps test was rarely encountered in the 550 patients, but if present was revealed and more precisely defined following these injections to settle the somatic components of their pain.

Post-injection all patients were requested to maximally flex their spine by touching their toes, extend, laterally flex, and rotate at the thoracolumbar junction. Then they were asked to squat, kneel on each knee in turn, arise on the opposite leg, and balance on one foot with the eyes shut. Then they were asked to place one foot on the bed or chair and touch the toes with both hands on alternate sides, and finally to bend over the bed or chair to test the back in this flexed position.<sup>11</sup>

Elderly and frail patients were surprised at how much improvement they achieved immediately post-injection, with only some requiring assistance with balance while completing the tasks.

### Review

- All patients are reviewed one week later, and any persisting tender points or dysfunctions are treated by further injections or gentle spinal manipulation as indicated. Interspinous ligaments are normally injected with local anesthetic alone, although steroid can be used as well.
- This could not be done for patients attending from interstate, but telephone follow-up was performed. Some very severe cases had already had steroids re-injected with increasing benefit.
- Assessment of pain intensity, mobility, sleep changes, ability to sit or

stand, and restoration of normal functions are performed, and involves identification of persisting problems in need of further treatment.

### 2.1.1. Special subgroup of 33 patients (Bogduk Challenge January/February 2004)

These patients were selected from all presenting who lived locally, allowing urgent review if required. Allocation was performed by a receptionist blindly drawing markers from a container.

- |         |  |
|---------|--|
| Group A | Full protocol Steroid, local anesthetic and needling |
| Group B | Local anesthetic and needling                        |
| Group C | Needling only  |

### Outcome descriptions

It must be noted that all these patients had experienced their problems for many years and have been offered and tried almost every conceivable treatment and even multiples of each proffered treatment available, without continuing or acceptable benefit.

### General treatment groups

The most notable change was the immediate restoration of more normal posture and functions as demonstrated by the post-injection range of movement activities.

The persistence of benefit has occurred in most treated patients, and the most common persisting problems and causes for relapse were:

1. Unequal functional leg length (measured with blocks 2, 4, 6, 12.5, 19, and 25 mm thick blocks, each 100 x 250 mm in size).
2. Persisting single level tender spots (S1, S2, or S3 most commonly).
3. Other problems, for example, trochanteric tenderness, piriformis syndrome, shoulder pain syndromes, carpal tunnel syndrome, complex regional pain syndrome type 1 (CRPS Type 1), previously called reflex sympathetic dystrophy (RSD), etc.
4. Reactivation of PSIS sites.
5. SIJ dysfunction, paraspinal joint locking.
6. Interspinous ligament tenderness (located by palpation and flexion of

the spine).

7. Tenderness at the T4/5 location and medial edge of the scapula at the end of the spine.

### 2.1.2. Special subgroups (Bogduk Challenge) 33 patients total

One patient, who was allocated to the needle only protocol, had a surprisingly different reaction as she was being needled. She was a 32-year-old female with onset after a gymnastic injury involving a fall onto a flexed neck and sacrococcygeal area at age 14. This resulted in two weeks of partial total body paralysis, but she was able to return to the sport despite pain.

Physically needling the ligaments massively exacerbated her pain and the author switched to the full Xylocaine/steroid injectate with immediate benefit. Since injection (30 January 2004) she has experienced a 90% reduction in pain, full restoration of mobility, and has only required right gluteal trigger point injection and gentle general spinal manipulation. She is now able to fully backbend to the floor, and enjoys a fully restored quality of life.

Two other patients who received needling only are worthy of mention. A 74-year-old, former RAF male paratrooper, with internally fixed left ankle and damaged knee from a jump injury in World War 2, suffered from intractable bilateral lower limb edema, despite all treatments attempted by his cardiologist. He had restricted resting spinal posture in 20 degrees flexion, and was seemingly unable to extend. He was unable to sit or stand still for more than a few minutes. After treatment, he was totally pain free, the edema resolved, and normal posture was restored at follow-up one week later. This has been maintained with further PSIS and S1 injections two weeks and one month later.

An 85-year-old male with Parkinson's Disease had the typical shuffling gait, tilted forward 25 degrees, inability to stand or sit still for more than a few minutes, and limited exercise tolerance. Following needling injection he is almost fully upright, his gait is improved, his tremor is diminished, and he is able to walk daily for exercise. He required re-injection of the left PSIS and left trochanteric area six weeks

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later and continues to improve.

All others in the 33 patient subgroup have maintained their improvement (75-100% on each patient's own evaluation), with only seven requiring localized re-treatment, and four requiring management of other musculoskeletal problems.

### 2.1.3. Other notable results

Two patients, a 19-year-old female competitive ice and roller skater, and a 30-year-old female former gymnast, presented complaining of very widespread pain, with signs of multiple discrete complex regional pain syndromes (CRPSs). They both had a past history of injury involving the coccyx and sacrum. Following the author's modified injection protocol, both recovered and have minimal persisting problems. The 20-year-old subsequently fell in December 2003 while delivering pizzas, suffering a severe left gluteal hematoma, and reactivation of her widespread pain. Immediate re-injection relieved this again, and she notes reactivation appears after distance running on hard surfaces, but not with other low-impact exercise activities.

Five patients (four female and one male all over 65 years) indicated that they had been suicidal prior to treatment, and claimed they would have killed themselves if treatment failed. All have been successfully managed, with continuing quality of life improvement.

A 32-year-old female part-Aborigine had been totally disabled with back pain, and had received multiple assessments and treatment programs at Monash, Sydney, and Brisbane pain and back clinics without success, thus leaving her an iatrogenic, drug-dependent person suffering persistent disabling pain. Her initial benefit from the very first set of injections was profound, with almost complete initial relief, and she has now reduced her prescribed oxycodone and liquid morphine intake from over 140 mg daily to 10 mg twice daily, and is almost fully weaned after 75 days! Her back pain is negligible and well tolerated, and she can now manage her other pain by simple analgesics. She is further reducing her opiate requirements, as her underlying chronic pelvic inflam-

matory disease is being correctly diagnosed and managed.

The previously described T9 paraplegic patient had a standard paraspinal ligament injection series before Christmas 2003, which provided benefit initially for one week. After long discussions, a second series was done, but included interspinous ligament injections from the tip of the coccyx up to the T12/L1 level, with extensive parasacroccygeal ligament injections as well. At the same time punch biopsies were carried out on his mid left shin, producing no pain, only the expected spinal reflex movements.

Two days later he had throbbing and pain perception at the biopsy sites. One week later he had lost all swelling of his lower limbs, and had recovered pain perception to both legs and feet. A noticeable feature was a feeling his big toe was being painfully wrenched off, when caught slightly on the furniture. Previously there was merely an awareness of movement, even with overt tissue damage and bleeding from minor trauma.

He also reported a total loss of the cramping and burning pain in his limbs for the first time in 27 years, suggesting to him that they were not "phantom pains" of central origin. Other benefits have included improved bowel and bladder function, improved sleep, and improved sense of general well being. To date the benefits have persisted for more than nine weeks, and show no signs of diminishing. This well exceeds claims by critics of only limited duration of effect with the injected steroid.

It is such cases, and in fact the author's own personal experience as a patient himself, which have helped to formulate the new model.

### Discussion

The hypothesis and model presented in Part 1 of this paper evolved from observation of the clinical cases reported above. The Blomberg protocol and explanation given at the 2002 Australian Association of Musculoskeletal Medicine Annual Scientific Meeting in Melbourne did not satisfy the author, and failed to appreciate the importance of looking at the whole functional human body. A different explanation was required for what was clinically

observed.

The hypothesis and model in Part 1 were created to explain these observations.

When tissues are damaged, injured, or in need of repair, the whole body responds to the multiple sensory and nociceptive afferents, and via autonomic efferents, which alter vascular and other tissue level responses, the body attempts to correct, compensate, or repair the perceived tissue problems. Compared with the usual single dermatomal sensory/motor input/output systems, the primary autonomic response consists of one efferent preganglionic axon activating many levels of postganglionic axons.

A publication by Japanese researchers<sup>8,9</sup> demonstrated that single level L5 or L6 nociceptive input resulted in autonomic/sympathetic outputs affecting the L1 to S3 levels bilaterally.

CLBP may be associated with these multiple peripheral signs and symptoms of dysautonomia, now recognized by the author, and appears to resolve following the injections, with patients spontaneously reporting such improvements. The improvements also occurred when "needling" alone was used.

The autonomic activation mechanism may be an explanation for how CLBP causes the observed secondary pedal edema that appears unresponsive to medication, but was observed to ameliorate after the author's modified injection protocol in the specific group of 33 patients.

Similarly, this autonomic activation may be one of the mechanisms underlying complex regional pain syndromes (CRPSs), carpal tunnel syndrome, lateral and medial elbow pain and related conditions, shoulder pain syndromes, pruritis ani, finger joint swelling and arthritis, and other peripheral joint discomfort. These have improved or ameliorated completely in many patients, when their CLBP was treated with the author's described protocol.

While undergoing Blomberg-style injections for his own back pain and dysfunction, the author was confronted with the Bogduk question and challenge of what was the operative component of the injections? The challenge raised by Bogduk resulted in the

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simple mini-pilot study performed. The results indicated that the active multiple “needling” of the ligaments maybe a significant factor in the treatment, with 32 out of 33 results being successful, and essentially the same. These results needed to be explained.

The one significantly abnormal reaction, to needling alone, in the 32-year-old gymnast described previously may be a guide to how the model operates. Her injuries occurred at age 14 and by the age of presentation she had learnt to ignore and over-ride the back pain to function and look after her children, but not with the same success observed in older patients.

When injected by the needle only, the active pain pathways were initially further activated, resulting in perception of extreme pain. However, following reversion to all three components, with Xylocaine and steroid injected, she obtained the same effective suppression of her pain inputs, switching off her feedback or “wind up”. This allowed her to be able to increase her activity levels, increasing her A-beta inputs, and reduced her perceived pain.

As Pavlov noted during his identification of his Reflex of Freedom,<sup>10</sup> the unexpected and exceptional clinical result can often increase the knowledge of the whole response, or provide a basis for a totally different and unexpected interpretation and explanation.

In the older needle-only low back pain patients, the established conditioned reflexes were more successfully moderated from higher centers, and any pain increase from the initial injection was absent or much less marked. Yet the overall result was essentially the same, with no diminution in clinically significant effect. Other patients’ responses to injections and recorded results have reinforced and confirmed these observations.

In the paraplegic patient described, 27 years of swollen legs, burning and cramping pain, gut and bladder dysfunction, poor sleep patterns, and loss of general sensory perception below T12 have all changed. This result alone demanded a better explanation and understanding of how those signs and symptoms developed and persisted, and why they should change so dra-

matically following injections some 27 years later.

He had been **taught** during his initial hospitalization period that he would have to **learn to live with** his cramps and burning pain in the lower limbs, because they were “**phantom pains only in his head**”. He had successfully done this for 27 years, and tolerated the lack of any significant sensory feeling below T12. He also suffered chronic swollen lower limbs, ischemic toes, gut dysfunction, and bladder irritability, which he had accepted as part of the spinal injury syndrome.

The protocol that he had learnt was very similar to the current evidence-based back and pain clinic protocols, that require patients to **learn to live with and overcome the pain**, or more correctly to increase their efferent, central modulating output, to act on the spinal posterior horn cells.<sup>3</sup>

This man’s amazing results after 27 years of living with these signs and symptoms seriously challenges the evidence-based medical protocols. Perhaps the “base” in those methods may be at fault, and this new hypothesis and model will encourage alternative thinking and experimentation based on simple anatomy, physiology and biochemistry?

The “needling” action appears to reduce the combined afferent inputs from T12 to the coccyx, up to the medulla, brain stem, and associated nuclei. The resultant autonomic efferents have significantly decreased and the secondary effects of these extensive un-modulated A-delta and C fiber inputs (“wind up”) have been reduced. This can readily be visualized on an outline plan of the autonomic nervous system, by following the paths activated by adrenalin/noradrenalin in the flight/fight or fear/freeze pathways and the specific changes caused to the function of the different organs or tissues.

The author suggests that the above clinically-based model may also help to explain the long-term patient-perceived “failure” of many back clinic, zygapophysial joint local anesthetic/steroid injections, and pain clinic protocols, which often fail to appreciate the whole functional human body, the autonomic system effects, and the

benefits obtained from the Blomberg protocol.<sup>1</sup> General practice and family medicine doctors, who by default have to manage CLBP and other chronic pain problems over the longer term, frequently observe the many failed results. Patients often lose heart and fail to return to their specialists and clinics, and so are lost to follow up.

It raises a challenge to the appropriateness of the current back and pain clinic protocols, which teach pain patients simply to “learn to live with the pain,” and to get on with activities of daily living. Such patients often believe that those back and pain clinics do not believe or understand their genuine pain, and feel despondent because they then believe that their pain problem is “in their brain”.

The above results strongly suggest that their pain is a genuine physiological effect, which can now be remedied by the Blomberg or modified protocols, coupled with adequate follow-up and reactivation of the many normal activities that they have reduced or ceased. Those activities decrease their A-delta and C fiber inputs, improve muscle activity, and thus self-esteem and quality of life, which assists in preventing recurrence of their pain syndromes.

The above model has evolved to try and explain the clinical observations.

The overall results have been remarkable and often unexpected, further supporting Blomberg’s findings<sup>(1)</sup>, but the results published above, now place a challenge before every musculoskeletal physician, orthopedic surgeon, neurosurgeon, rheumatologist, or family physician, to consider offering the Blomberg protocol or the author’s modification, prior to any other invasive intervention for the treatment of acute or chronic low back pain.

A set of Blomberg ligamentous injections first is far less invasive or damaging than a discectomy, laminectomy, or other spinal surgery, yet promises a high chance of achieving successful, sustainable pain relief and return of function. Invasive procedures can be reserved till later if still needed.

The above “birth to death” model provides a plausible construct from which to consider an explanation of how and why the Blomberg protocols provide such good clinically observed

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results. The current modified protocol has only been in use for a relatively short period of time, and long-term follow-up of the patients will be performed. The results to date identify the immediate need for further controlled studies for validation or repudiation of the proposed model's hypothesis and results.

The most important single thing that all patients reported was the improvement to their quality of life.

The above model is a synthesis from many reductionist observations, and further illustrates the benefits of returning to first principle, basic medical sciences. The human is a single whole functioning human body, slowly evolved to survive and function, while responding to noceptive warnings of injury or damage, as it "degenerates" in response to age and fatigue failure. It has been possible to create the new model and hypothesis that improves the management of CLBP and other acute or chronic pain and dysfunction problems.

After all the human body, like any other species, does survive, function, reproduce, and enjoy life before dying, as a single entity, and not as a complex of seemingly unrelated systems, organs, tissues, cells and metabolic processes currently described in great detail in the medical literature! Pain and especially CLBP affects the whole functional human body and not just the low back or localized areas.

Professor Ivan Pavlov has shown us the correct pathway to use, by observing and understanding how the WHOLE human functions in the real world of high volumes of ever changing external and internal stimuli.

### 2.2. Future developments

Successful evaluation of this management of CLBP and associated syndromes using these methods will require the development of standardized questionnaires, examination, and injection protocols, with post-injection assessments for evaluation of outcomes immediately post-treatment and longer term. This might be implemented by interested musculoskeletal physicians, general practitioners, family physicians, or any other interested medical practitioners, so that multi-center trials

can be supported by those who manage the largest number of CLBP and associated pain patients in the community.

### Acknowledgments

Anastasia (0-4yrs), Elliot (0-2yrs) and Alexander (0-6/12 months), whom I observed during their growing and learning processes, as they responded to and learnt about the internal and external stimuli in their worlds. This helped me to formulate the model and hypothesis.

Sarah-Jane, Jean, & Donna, whose CRPS Type 1 responses forced a reconsideration of the pathophysiology involved in these persistent pain syndromes.

Phyllis G who challenged me in November 2002, and proffered her back as my first case. This opened a whole new world of management and concepts, from which this paper has evolved.

Also the other patients, who have provided the observable changes, supporting the model and hypothesis.

Professor Nikolai Bogduk, whose challenges and assistance have been vital in the production of the final concept, and for his challenge regarding which components of the treatment are active.

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My wife and daughter, whose CRPS Type 1 and Chronic Fatigue Syndrome (CFS) have now been partially explained. They have been through the saga since 1995, and have been amazingly supportive, appropriately critical, and yet demanding of simple common sense explanations.

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# Chronic Neck Pain: Risk Factors and Prevention

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This paper is a synopsis of a presentation on Risk Factors for Chronic Neck Pain presented at the Australian Association of Musculoskeletal Medicine Annual Scientific Meeting held in Sydney in November 2003.

This review is based on a Medline search of the last four years. I have not assessed the quality of the papers. I have looked not just at risk factors for onset, but also risk factors for "acute becoming chronic" (prognostic risk factors). It includes all forms of neck pain, not just motor vehicle related whiplash, and commonly but not always includes shoulder pain and sometimes arm pain. The literature frequently does not separate out these latter components.

There has been a burgeoning literature in the last five to ten years on risk factors for neck pain, including prospective, cross-sectional, retrospective, and cohort studies and these have been undertaken at clinics by postal surveys and by telephone surveys. These studies are based around industry and occupational arenas, and there are community-based studies such as general practices, and tertiary clinics.

There is a variable quality of the studies as is always the case and, whilst this is not assessed in any great depth for this descriptive overview, the following difficulties should be borne in mind: biases, confounders, drop-outs, end-points, control groups, return rates, etc. Often univariately significant factors disappear on multivariate analysis (Bogduk).

There are many conflicting data, especially in the realm of psychosocial issues, and as Bogduk stated in 1999 "factors that pertain to neck pain are different from those that pertain to back pain", but does that statement still apply in 2004?

## Incidence and prevalence of neck pain

- 34.4% Finland office workers, n=180/232, annual incidence
- 29% one-month period prevalence, n=5752 GP register adults
- 47% one-year prevalence, Hong Kong academic staff
- 34% one-year prevalence, nurs-

- ery school teachers
- 28% cumulative annual incidence, high school students
- 14.4% over a three-year period, n=1334 adults
- 17.9% one-year cumulative incidence, n=7669 on a GP register, UK
- 31% one-month incidence, n=314 hospital nurses in Japan

Recovery is often poor. Only 4% of patients sick-listed with neck pain had no present discomfort 12 years later (Sweden), n= 213. Compare this with about 25% in an average back pain group with no present discomfort.

Of children with neck pain at baseline, 20% had widespread pain at 12 months.

## "At risk" occupations

- Dental professionals
- ERCP endoscopists, 46% prevalence (cross-sectional survey)
- Physical therapists – lifetime prevalence 91%
- Bus drivers, especially after more than 10 years' employment
- Wheelchair users 66%
- Fighter pilots, (high performance) 50% reported in-flight or immediate post-flight neck pain

## Risk factors

For the purposes of this paper these have been grouped as follows:

### A. Physical Risk Factors

1. Work environment
2. Work patterns
3. Work movements
4. Injury factors
5. Miscellaneous

### B. Psychosocial Risk Factors

1. Job factors
2. Social factors
3. Psychological factors
4. Health issues

### A. Physical risk factors

#### Work environment

These risk factors have been described in the literature variously as poor physical environment, keyboard

placement, and poorly adjustable seats. For bus drivers, odds ratio (OR) = 3.52, and similar results for truck drivers.

#### Work patterns

This includes patterns which entail insufficient work breaks, high quantitative work demands, relative risk (RR) = 2.14, increased duration of employment (for example, bus drivers working for more than 10 years showed an OR of 3.43), and long work hours (for example, working a lot of overtime).

#### Work movements

- Neck flexion and rotation
- Neck flexion sustained
- Shoulder movements – repetitive
- Working at or above shoulder height
- High force (RR 2.0), high repetitiveness (RR 1.8), or both (RR 2.3), especially in monotonous manual work
- Prolonged desk sitting (RR 2.01), especially with forward head posture (RR 1.63)
- VDU users, but a negative study for typing per se

#### Injury factors

- Past history of neck/shoulder injury, RR = 1.7, 1.97
- Other musculoskeletal (MSK) strains/pains
- Severity of initial pain
- Radiation of initial period of pain beyond shoulders
- Pressure tenderness in muscles
- Motor dyscontrol of neck/shoulder muscles in acute injury

#### Miscellaneous

Causes include macromastia (uncontrolled study), and absent head restraint position in a motor vehicle.

### B. Psychosocial risk factors

These have been grouped as:

1. Job factors
2. Social factors
3. Psychological factors

# Chronic Neck Pain: Risk Factors and Prevention

## 4. Health issues

1.8-1.98

### Job factors

- Low job control
- Low job security
- Low skill discretion
- Low job satisfaction
- High job demands causing work stress, RR = 1.20-2.14
- Poor training opportunities
- Low decision authority, RR 1.60

### Social factors

- Low co-worker support, RR 2.43
- Low supervisor support
- Other people causing negative emotions
- Ethnicity/migrant worker groups

### Psychological factors

- Passive coping style
- Maladaptive suppressive coping behaviour
- Catastrophising
- Fear-avoidance behaviour
- "Perceived general tension"
- Recent development of adverse working conditions, RR 2.1-3.7 (vs endemic adverse conditions)
- History of personal physical, sexual, or domestic abuse
- "Psychosocial demands"
- Psychological distress (depression, poor mental health score, OR 1.68)
- Personality factors—NO SUPPORT
- Overall, psychosocial variables are more predictive than biomedical or biomechanical factors (Linton<sup>1</sup>)

### Health issues

- Low self-reported general health
- Unsatisfactory leisure time; for example, additional domestic workload – males
- Low physical exercise levels
- Genetic influences (twin study, Norway)
- Prior neck/shoulder injury, RR = 1.7 – 1.97
- Other MSK pains; for example, headaches, RR 2.3-2.8
- Pressure tenderness in muscles
- Obesity
- Smoking
- Increasing age (four studies positive, one study negative)
- Female gender (nine studies, but one also showed that women had worse conditions than men, RR =

### Neck pain prevention

Adequate prevention strategies require knowledge of risk factors, risk groups, and trends. Determining risk factors allows one to determine factors that may be amenable to intervention and then assess the effectiveness of such interventions. Good public health measures are built on an adequate epidemiological base.

The studies suggested the following strategies for prevention of neck pain:

- CBT (six standard sessions) was more effective than simple information delivery in reducing subsequent sick-leave three-fold, fear-avoidance behaviour and days with pain in non-patients who were experiencing neck or back pain.
- A software program that stimulated workers with neck pain (NP) to take breaks and do simple exercises: More than 55% vs 35% "recovered"; More than 20% vs 42% deteriorated.
- EXERCISE showed a stable "moderate benefit" in *preventing* neck pain – Linton literature review on PREVENTION.
- There were NO data to support "ergonomic interventions" in the same review.
- Regular 20 minutes "microbreaks" best reduced discomfort, with no loss of productivity.
- VDU operators reduced static electromyographic (SEMG) load on the trapezii when lighting was improved, optometric corrections were made, and the option of having the whole forearm and hand supported on tabletop was instituted, the benefit of which was sustained at two-year review.
- Regular weight training for fighter pilots seems helpful.
- In motor vehicles, the fitting of head restraints close to the head, or better ACTIVE head restraints, was associated with lower neck injury claim rates.

### Conclusions

Neck pain is common and endemic in the community across all ages and all occupations. Some ages and occupations are at higher risk, and it has

been shown that physical as well as psycho-social factors are operating in a broad spectrum of various contributing factors.

Prevention strategies are available and supportable, including sensible work environments for "fit" people, who can find their workplace an enjoyable place to be, having driven in vehicles with good quality head rests, and in years to come when we start flying to work, by avoiding excessive G-forces!

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# Cervical Arthroplasty for the Treatment of Cervical Spine Disease

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## Abstract

Cervical arthroplasty involves replacement of the intervertebral disc space with a prosthetic device designed to maintain motion. The interest in cervical arthroplasty has increased of late because of the perceived shortcomings of cervical fusion surgery. The Bryan<sup>®</sup> cervical disc prosthesis is the only currently available cervical disc prosthesis. Over the past four years, over 5,500 implants have been surgically placed in patients who predominantly had neural compression. The use of arthroplasty for the management of neck pain is being examined. The long-term implications of arthroplasty are not known but in the short-term hospital stays are short, motion is maintained, hip graft complications are avoided and a cervical collar is not required. The real issues relate to longevity of the implants, wear and particle debris, and potential protection of adjacent segments from degeneration. It will take at least 10 years of careful follow-up before the answers to these questions are derived.

## Introduction

Surgery for spinal disorders has been performed for over 50 years. Traditionally, the indications for spinal surgery for degenerative disease have been for neural compression. Simple laminectomy has been complemented by anterior procedures where total discectomy is performed. A variety of procedures are performed after this, including no placement of implants, or more commonly intervertebral bone grafting and sometimes plating. Surgery for primary axial neck pain is less well defined. Cord compression due to spondylotic disease termed cervical spondylitic myelopathy (CSM), and acute disc herniation, are common spinal disorder with controversy over the role and timing of surgical intervention as well as the optimal treatment.<sup>1-3,6-9,15,19,20</sup> Over the past 50 years, vari-

ous combinations of anterior and posterior instrumented surgeries have been devised and refined and continue to be utilized. In the absence of arthrodesis, kyphotic deformity is always a feared complication.<sup>5,17</sup> The problem with interbody or posterior cervical fusion is that typically a reduction in effective motion occurs and there are significant morbidities associated with bone graft harvest.<sup>16</sup> Coupled with this, the incidence of adjacent segment deterioration, requiring reoperation, has been quoted as being as high as 3% per year.<sup>14</sup> Consequently, there has been a more recent emphasis on surgical techniques such as cervical laminoplasty or cervical disc arthroplasty to maintain motion, avoid deformity, reduce adjacent segment stresses, and allow for an adequate decompression without having to use bone graft. The precise indications for arthroplasty are currently being explored and the biomechanics and changes with disease assessed.

## History

Spinal arthroplasty has a relatively short history. The aims of the ideal intervertebral disc prosthesis have included preservation of normal motion, ease of implantation, ease of revision, minimal wear, longevity, ease of revision and ease of postoperative imaging. All these goals have been achieved in a variety of permutations over the past 40 years. Despite the ease of access in the cervical spine, spinal disc replacement surgery has historically concentrated on the lumbar spine.<sup>7,8,10</sup> Fernstrom<sup>11</sup> in 1966 introduced an intracorporal endoprosthesis that consisted of a stainless steel ball inserted into the centre of a lumbar disc after laminectomy. Although Fernstrom focused on lumbar discs prostheses, he also placed these prostheses in the cervical spine. Cummins more recently has described his experience with the Cummins artificial cervical joint.<sup>7</sup> This prosthesis was basically a stainless



Figure 1. The Bryan disc prosthesis showing the milled endplates that allow for an interference fit of the prosthesis

steel ball-and-socket joint. A major shortcoming of this design has been the inability to instrument more than one level. They described implantation of 22 devices, designed within their unit, in 20 patients. Two patients were lost to follow up. Of the 18 remaining patients, x-rays demonstrated no movement at the level of implantation in two patients. This rate of failure to preserve normal motion can be considered unacceptably high. Wigfield *et al*<sup>3</sup> modified the Frenchay joint to allow more physiological motion. They published a pilot study in 2002 in which the device was implanted in 15 patients. The study demonstrated that implantation of the device is safe, and that motion is well preserved with the modified device in the short term. Follow up reports still support these conclusions.<sup>24</sup> Pointillart described a prosthesis in 2001 that allowed motion between a titanium based prosthesis with a carbon surface that articulated with the inferior endplate of the vertebra above the prosthesis.<sup>18</sup> However eight of ten patients fused within two years. New prostheses are expected to become available over the next few years.

The Bryan<sup>®</sup> cervical disc prosthesis (Medtronic-Sofamor Danek, Memphis, TN, see Fig. 1) was first reported as being used for the management of cervical spondylotic disease in 2002 by Goffin *et al*<sup>2</sup> and subsequently by Sekhon.<sup>22</sup> This cervical disc prosthesis consists of a polyurethane nucleus

## Cervical Arthroplasty for the Treatment of Cervical Spine Disease

designed to fit between two titanium alloy shells. Each shell has an outer titanium porous coating to encourage bony ingrowth and long-term stability. A polyurethane sheath surrounds the nucleus and is attached to the shells with titanium wire, forming a closed compartment. Sterile saline is placed into the prosthesis and titanium alloy seal plugs provide for its retention. This prosthesis requires precise milling for its placement and the technique aims at meticulous centering of the prosthesis. Multiple levels can be instrumented but must be visualized on fluoroscopy. Goffin *et al*<sup>12</sup> described the use of cervical arthroplasty in an attempt to maintain cervical motion and avoid arthrodesis after decompression. In their study, 60 patients underwent single level anterior cervical decompression and placement of an artificial disc prosthesis. Of note is that 93% of Goffin's patients had radiculopathy predominantly. They reported follow up at 12 months, with clinical success reported at between 85% and 90%. No subsidence of the devices was noted and possibly two patients had device migration. No spondylotic bridging occurred at the implanted disc space. Range of motion was preserved and no device had been explanted or surgically revised. They have subsequently reported on three-year results in this group and a similar one-year follow up on bi-level replacements, with equally acceptable results.<sup>13</sup>

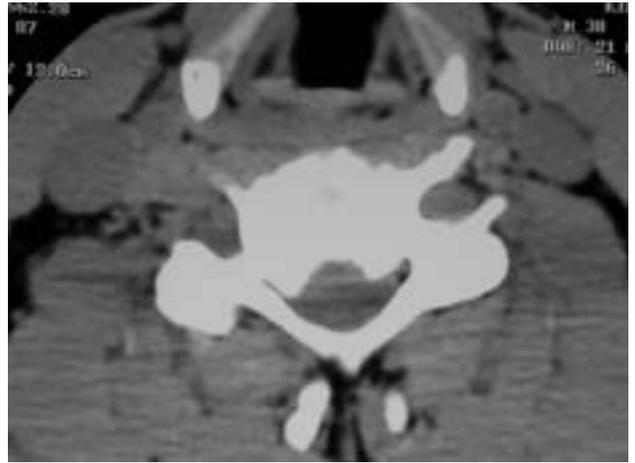
### Indications

The commonest indication for cervical arthroplasty is as an intervertebral disc replacement after total discectomy is performed. A typical case is shown in Figs. 2a and 2b. Acute disc herniations need to be distinguished from cervical spondylotic disease. Over time, the large and varied range of motion of this region places stresses on the cervical spine, resulting in inevitable degenerative changes, including desiccation of the discs, disc bulging, facet joint hypertrophy, narrowing of facet joints, and hypertrophy of ligaments. This process, ubiquitous in the adult population, is known as cervical spondylosis. The above changes may result in narrowing of the spinal canal or of the intervertebral foramen (or both) and

subsequently compression of the spinal cord or cervical nerve roots respectively may ensue. Acute cervical disc herniation, unlike spondylotic disease, tends to affect a younger population group. They may be associated with trauma, particularly with acute hyperflexion, rotation, or both. The annulus fibrosus and posterior longitudinal ligament may tear, allowing part of the nucleus pulposus to herniate into the spinal canal or intervertebral foramen. Again either the cervical spinal cord and/or the cervical nerve roots may be involved. However, unlike the case with spondylosis, it is the nerve roots that are most commonly affected. Frequently an acute disc herniation may be superimposed upon existing spondylitic change to cause a clinical problem.

Cervical nerve root compression typically results in neck pain and arm pain in a radicular distribution. The most commonly affected cervical nerve roots are C6 and C7. Paraesthesia may accompany the pain and these are typically dermatomal in distribution. Associated sensory loss, typically to pain and temperature, again in a dermatomal distribution, is not uncommon. Weakness and hyporeflexia (that is, lower motor neuron weakness) may also be present. The onset of these symptoms may be sudden or insidious and progressive. A chronic episodic presentation is more commonly caused by spondylitic change; however, an acute onset can imply either an acute disc herniation or spondylitic change. The presence or absence of trauma can be an important differentiating factor.

Cervical cord compression due to degenerative disease can present with a variety of syndromes. Most commonly patients describe stiffness in the upper and lower limbs and difficulty with fine movements in the hands. Examination generally reveals weak-



**Figure 2.** Preoperative (a) axial CT and (b) sagittal MR scans of the cervical spine showing typically spondylotic or disc bulges causing neural compression in a patient ideal for cervical arthroplasty



ness below the level of compression, with hypertonicity and exaggerated deep tendon reflexes including an extensor plantar response. Sensory changes tend to be less marked. Other spinal cord syndromes which may be associated with cervical cord compression include central cord syndrome, Brown-Sequard syndrome and anterior spinal artery syndrome. Typically with acute cervical disc herniation these syndromes will develop rapidly. An episodic and insidious onset implies spondylosis as the cause. Cord compression and myelopathy or root compression and radiculopathy can occur concurrently in either acute cervical disc herniation or cervical spondylosis.

When looking at axial neck pain, the selection of patients becomes more

# Cervical Arthroplasty for the Treatment of Cervical Spine Disease

difficult. Arthroplasty is not suitable for patients who have neck pain where the cause is thought to be myofascial disease, facet degeneration, or deformity. Neck pain related to degenerative disc disease is the only aetiology potentially treated with this intervention. Sekhon reported in seven patients that, if surgery was performed for cervical decompression of the spinal cord, neck pain often improved.<sup>21</sup> All these patients had surgery for neural compression and the improvement in neck pain was an incidental finding. In patients with neck pain as their primary symptom, selection is the key. CT scanning, static and dynamic fluoroscopy, MR scanning, and possibly multilevel provocative discography are all used to try and localize at least one painful disc segment. However, aside from exclusion, there is no clear diagnostic test. SPECT scanning with CT does not appear to have the same sensitivity in the cervical spine as it does in the lumbar spine and subtle spondylotic disease in facet joints does not appear to be as readily defined on CT. Subtle deformity plays a greater role in potential complications after surgery than in the lumbar spine and, with current designs, particularly in the case of unconstrained devices such as the Bryan® prosthesis, surgery is best avoided if kyphosis is present. Studies are currently underway to evaluate primary axial neck pain and its potential correction with arthroplasty but at the moment ideal candidates are those with a single degenerative disc on MR scanning, negative cortisone facet injections, negative bone SPECT scans, minimal posterior element facet spondylotic disease on CT, normal cervical lordosis or a straight cervical spine and motion on dynamic films with no evidence of instability. The role of discography is unclear.

### Investigations

Plain x-rays, CT, MR, and bone scanning all play a role in the work-up of patients for potential cervical arthroplasty. Plain x-ray is often the first investigation utilised by clinicians. Particular features of interest in this setting are the overall balance of the cervical spine, deformity, if any, and any potential instability on dynamic

films. Coupled with this, motion must be demonstrated at any levels where arthroplasty is contemplated. Aside from lack of motion or instability, other contraindications to cervical arthroplasty include active infection, an inability to visualize the disc space on lateral x-ray, osteoporosis, or ossification of the posterior longitudinal ligament (OPLL).

Computed tomography is also a useful investigation, primarily as it allows for accurate pre-operative planning of prosthetic size. The Bryan® disc ranges in size from 14 mm to 18 mm and occasionally in small individuals the smallest prosthesis available is too large and arthroplasty is not advisable. It is likely that smaller prostheses will be available in the future.

### Surgical technique

The initial portion of surgery where cervical arthroplasty is performed is identical to that for an anterior cervical decompression and fusion. Implantation of the Bryan® disc uses a simple gravitational reference system to identify the centre of the disc space. A series of levels and plumb lines help determine the centre of the implantation site. This will change with future incarnations and different implants. The reciprocating vertebral bodies are milled to precision to match exactly the implants convex outer surface. Bony ingrowth occurs into the roughened outer surface over time. This tight fit provides stability to the endplate. The end result is shown in Fig. 3, with postoperative images shown in Fig. 4. The current procedure is very dependent on intraoperative fluoroscopy.

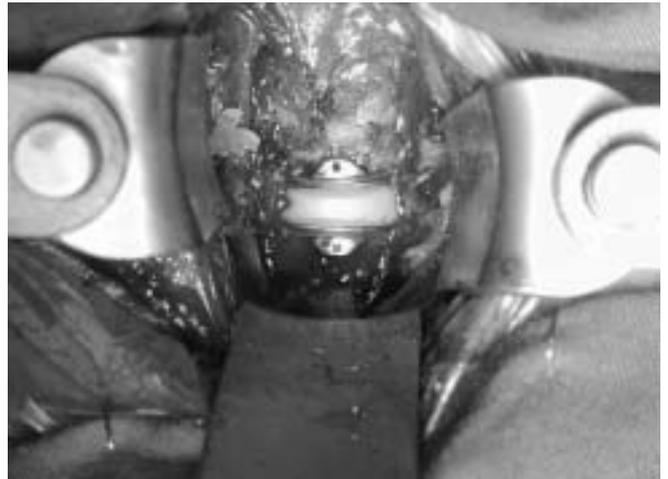


Figure 3. Intraoperative image of the Bryan disc prosthesis



Figure 4. Postoperative (a) lateral extension and (b) flexion films showing the normal motion at the level of the arthroplasty. The titanium shells but not the inner nucleus are visualized on this imaging.

### Wear and particle debris

In a situation analogous to hip and knee arthroplasty, there have been concerns raised in terms of the longevity of cervical implants, potential particle and wear debris and the complications that may occur with these. Again, the Bryan® cervical disc prosthesis appears to be the most robust and most thoroughly tested. Anderson *et al* published their data last year on their biomechanics of the prosthesis and wear characteristics.<sup>4</sup> Using cervical spine motion simulators, they reported minimal wear at 10 million cycles of motion, with 500,000 – 1,000,000 cycles being deemed equivalent to one year of normal cervical motion. Animal studies showed the polyethylene insert led to wear particles of a smaller size than that seen after hip and knee arthroplasty, but in the absence of an inflammatory reaction. No osteolysis was seen and they felt that the wear

# Cervical Arthroplasty for the Treatment of Cervical Spine Disease

characteristics were acceptable. No one knows how long the Bryan® disc prosthesis will last. Estimates suggest survivals of at least 10 years but possibly as high as 20-40 years, quite different to those seen after large synovial joint surgery. To date no implant has been removed because of device failure and particle debris seems only to be of theoretical concern.

## The future

It is possible, that the current prostheses available will not be the same used in 5-10 years. Refinements in techniques, clarification of indications, as well as improvements in biomaterials, should be realised over the next 10-20 years. The true incidences of adjacent segment disease need to be further realised and at some stage in the future, facet joint replacement may also be possible.

## Conclusions

Cervical arthroplasty has arrived, yet caution needs to be exercised in its use. The ideal patient has a soft disc herniation with normal lordosis. The limitations and indications are currently being defined. Long-term data are still needed. As newer prostheses become available and more data are made available on the results of current designs, we will become more adequately equipped to use a powerful new tool in the management of cervical spine disease.

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# Efficacy of 300 mW, 830 nm laser in the treatment of chronic neck pain: a survey in a general practice setting\*

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## Abstract

We evaluated the effectiveness of 300 mW, 830 nm laser in the management of patients with chronic neck pain, in general practice, between May 1998 and June 1999. Data were obtained from 78 patients who rated self-assessed improvement of symptoms on a Visual Analogue Scale (VAS). An average improvement of 67.5% was found in 48 patients who reported a positive response to treatment. Number of treatments was the only factor that correlated with a positive response, reaching a plateau by 15. Low Level Laser Therapy (LLLT) using this wavelength and power of infrared laser may provide a non-drug, non-invasive option for the management of neck pain. This study lends support for a randomized controlled trial to further evaluate this therapy.

## Introduction

The use of Low Level Laser Therapy (LLLT) in pain management is controversial.<sup>1</sup> The outcomes of randomized controlled trials vary widely<sup>2,3</sup> and studies are difficult to compare because of the many different laser devices in clinical use. There are no standardized treatment protocols and reviews of the literature attempt to combine trials using laser devices of different wavelengths, power, and energy densities being applied for varying lengths of time in numerous different conditions.<sup>4,5</sup> Furthermore, parameters used or methods of application are often reported in insufficient detail to permit them to be reproduced.<sup>6,7</sup>

The variety of laser parameters and techniques of application have thwarted even the most well-intentioned attempts at systematic review. The Cochrane Collaboration made one of the most

assiduous attempts at assembling the available data of laser use in rheumatoid arthritis, and concluded that factors such as wavelength, treatment duration of LLLT, dosage, and site of application may all influence the effectiveness of laser.<sup>8</sup> The same heterogeneity of reported techniques and wavelengths clouds the review of the use of LLLT in other areas of clinical medicine.<sup>9</sup> In particular, there have been limited studies using 830 nm laser in management of painful musculoskeletal conditions. This is the first published report in which a 300 mW continuous wave (cw), 830 nm laser has been used.

Notwithstanding the uncertainty of the available evidence, the proponents of LLLT argue for a strong, positive effect in routine clinical practice.<sup>10</sup> Therefore, there is a need for high quality, methodologically sound trials, using appropriate treatment protocols. As a preliminary step in designing such a trial, a retrospective, questionnaire-based study of patients who had received laser therapy for chronic neck pain was undertaken.

Chronic neck pain was selected for study as it a common cause of pain and disability in the community. Treatment in general practice is usually limited to the use of analgesics and anti-inflammatory agents with their attendant risks.<sup>11</sup>

A self-administered questionnaire was used to determine whether there was a clinically useful effect of 300 mW, 830 nm laser and, if so, the size of that effect and other factors that may have influenced response to treatment.

The chair of the Ethics Committee indicated that formal ethical approval was not required. Audits of general practice are part of the ongoing Quality Assurance (QA) activities of the Royal

Australian College of General Practitioners for vocationally registered general practitioners.

## Subjects and methods

The study was conducted in a general (primary care) practice in Sydney, Australia. This practice offers Low Level Laser Therapy as a routine part of primary care for acute and chronic musculoskeletal conditions.

Patients were predominantly self-referred, with a small percentage being referred from other medical practitioners. Many of the patients who attended the practice had typically tried many other modalities of treatment such as acupuncture, physiotherapy, chiropractic, naturopathy, and osteopathy but had failed to gain any long-lasting benefit. A number had attended pain clinics and had undergone interventional procedures such as cervical zygapophyseal joint injections. Patients had usually been extensively investigated by other medical practitioners prior to their attending the practice. Further investigations were not routinely performed unless there were clear indications such as fever, weight loss, or other unexplained symptoms. The survey included patients with work-related neck pain, neck pain following car accidents, and those involved in litigation.

The sampling frame was all patients who had attended the practice for pain management between May 1998 and June 1999.

Patients were recruited for the study if they had marked on a pain diagram any part of the neck as the site of pain at their first visit and had been treated with LLLT on at least one occasion. Patients were excluded if their pain was part of a systemic disease, such as rheumatoid arthritis, or was part of

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a pain syndrome involving other areas.

Questionnaires were mailed to 133 patients, with two subsequent reminder letters being sent to those who had not responded at intervals of one month following the first letter. The time between patients completing treatment and receiving the questionnaire varied from one to 18 months.

## Questionnaire

The questionnaire was developed by the author (RC) and aimed to determine whether patients had benefited from laser therapy or not and, if they had improved, to what extent, using a Visual Analogue Scale (VAS). Patients were also asked to select the primary cause of pain from a list provided: work injury, motor vehicle accident (MVA), arthritis, trauma (not work or car accident related), no obvious cause and other. There were two patients who did not complete this section.

## Response to treatment

Each patient was asked to indicate, by selecting from "yes", "somewhat", or "no" options whether or not their symptoms had improved following the laser treatment. They were then asked to indicate along a Visual Analogue Scale to what extent their symptoms had changed since the completion of treatment, where 0 was no change at all and 10 was complete relief of pain.

To provide assessment of the internal consistency of the answers to the questionnaire, the VAS scores were compared to the categorical (that is, no, somewhat, and yes) results. Because of the overlap between "somewhat" and "yes", these responses were considered to represent a positive response to treatment (Fig. 1). They were therefore analyzed together, providing a dichotomous outcome, that is, a "no" response or "yes" response.

## "No" responses

"No" responses were unambiguous. Of those who returned the questionnaire, 30 patients, 8 males and 22 females, stated that they had no response to treatment. They are referred to as non-responders. Two patients in the "no" group indicated that they were worse at the end of treatment.

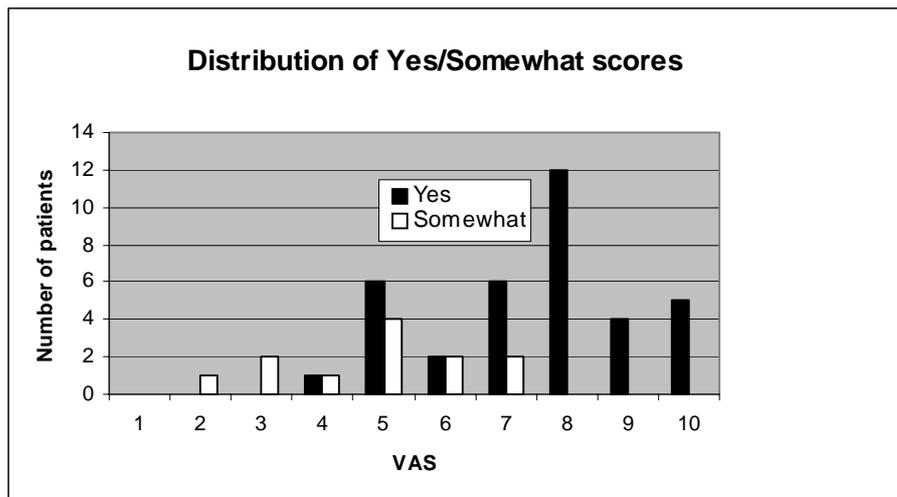


Figure 1. Distribution of yes/somewhat responses and VAS scores

## Response rates

Fifty-one replies were received (38%) after the first mailing and a further 27 responses were received following two subsequent letters. Seven questionnaires were returned as unable to be delivered. Therefore, of 126 possible respondents, 78 returned questionnaires: a response rate of 62%.

## Treatment protocol

The following treatment protocol was used in all patients.

## Equipment

All patients were treated with a Diolase (Diolase Corporation of Mountain View, California USA) 830 nm, 300 mW, continuous wave, hand-held semiconductor laser with a power density of 0.67 watts/cm<sup>2</sup>.

## Technical aspects of laser application

The laser was applied with firm pressure to all tender areas in the neck, without specific identification of the underlying anatomical structure. The laser hand piece, which was held at right angles to the skin, was centered over each area of maximum tenderness. The laser beam has a fusiform shape 15 mm in length and 3 mm at its widest diameter and is emitted from the diode located in the hand piece.

Laser was applied to each tender area until sensitivity to palpation was reduced or for a maximum of 30 seconds, whichever came first. The aim was to reduce tenderness on palpation during the course of the treatment. If there was no response within 30 sec-

onds, laser application to that area was ceased and other areas were treated. Once treated, tender areas were repalpated and, if still tender, were treated again. If there was no change in the patient's response after a total treatment time of 30 minutes, treatment was ceased.

Patients were instructed to avoid any activity which exacerbated the pain between treatments. General advice was given with regard to maintaining correct posture and attending to ergonomic factors in the work place. These strategies were utilized to assist in the overall management of the patient's pain.

Patients continued to take whatever medication they had been prescribed when they presented for laser therapy. This included analgesics, anti-inflammatory, and pain-modulating medication and drugs for other, unrelated medical conditions. Intake of analgesics in this patient group varied from those who took medication on an as-needed basis to those who took regular pain medication.

Over the course of treatment patients were free to use whatever analgesic medication they felt was necessary to control the symptoms. Those who were on pain-modulating drugs were asked to continue.

Patients were advised that a positive benefit would be likely to occur after the first or second treatments. If there was no substantial response by the second or third treatments, then additional treatments were unlikely to improve symptoms.

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This protocol was modelled on that used in several previously published case series.<sup>12,13</sup> In these case series, a 100 mW, rather than 300 mW laser was used. This is the first published report in which the more powerful 300 mW continuous wave laser has been used.

## Statistical analysis

Comparisons of continuous variables across groups were made using independent-samples t-test when the variables were normally distributed (age) and Mann-Whitney U-tests when the variables were not normally distributed (for example, number of treatments). Chi-square was used to test for association of categorical variable. The program SPSS Version 10 was used for analysis.

## Results

We analyzed data from 78 patients who returned the questionnaire. This group consisted of 58 females and 20 males who are referred to as participants. We also compared data from 55 patients (33 females and 22 males) who did not return the questionnaire, referred to as non-participants.

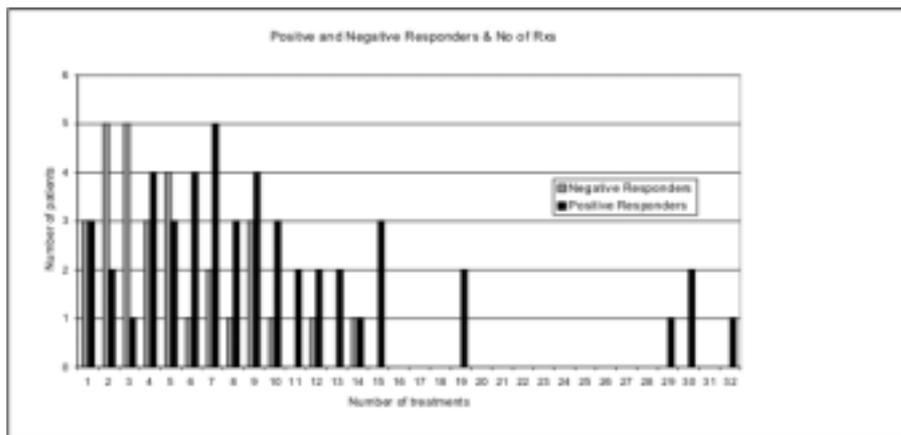


Figure 2. Comparison of number of treatments in responders and non-responders

## Demographics of participants and non-participants

The participant group was significantly older than the non-participant group, 51.3 years compared with 43.5 years ( $p < 0.001$ ). There were no significant gender differences between the two groups ( $p = 0.061$ ). Patients in the participant group had completed significantly more treatments, median number 7 (range 1-32) compared with a median number of 3 ( $p < 0.001$ ) in the non-participant group (Table 1). Non-participants were significantly more

likely to have attributed their pain to an Motor Vehicle Accident (MVA) ( $p < 0.05$ ) (Table 2).

## Demographics of the participants: Responders and non-responders

Data were compared between those who reported an improvement with treatment, referred to as “responders” and those who did not report any benefit from treatment, referred to as “non-responders”. Of the participant group, 48 out of 78 patients (61.5%) indicated they had experienced positive response to laser therapy (95% CI 50.7%-72.3%).

	Participants	Non-participants	Total	p values
Male	20 (26%)	22 (40%)	42 (32%)	$p = 0.061$
Female	58 (74%)	33 (33%)	91 (68%)	
Average age	51.3 years (range 21-76)	43.5 years (range 26-76)		$p < 0.001$
Median number of treatments	7 (range 1-32)	3 (range 1-6)		$p < 0.001$

Table 1. Demographics of participants and non-participants

Cause of pain	Participants	Non-participants	Total
Work Injury	23 (30%)	11 (20%)	34
MVA*	15 (20%)	21 (38%)	36
Other non-work injury	4 (5%)	7 (13%)	11
Arthritis	10 (13%)	4 (7%)	14
Other	24 (32%)	12 (22%)	36
Total	76 (100%)	55 (100%)	131

\* $P < 0.05$

Table 2. Suspected cause of pain in the participant and non-participant groups

	Responders	Non-responders	p values
Median number of treatments (range)	8 (1-32)	4(1-14)	$p < 0.002$
Males	12 (60%)	8 (40%)	$p = 0.87$
Females	36 (62%)	22 (38%)	
Mean age (range)	51.7 years (21-76)	49.9 years (30-69)	$p = 0.50$

Table 3. Demographics of responders and non-responders

## Age, gender, and number of treatments in responders and non-responders

There was no statistically significant difference in age between responders (mean 49.9 years, range 30-69) and non-responders (mean 51.7, range 21-76) (Table 3).

There was no difference between males and females in the likelihood of a positive response to LLLT ( $p = 0.87$ ) and those who did respond did so in the same number of treatments ( $p = 0.3$ ).

The median number of treatments for responders was 8 (range 1-32) and for non-responders was 4 (range 1-14) (Fig. 2). There was a statistically significant difference between the number of treatments given to the responders and non-responders ( $p < 0.002$ ).

There were a small number of patients in this group where the number of treatments was very much greater than the average. Four patients had between 29 and 32 treatments each. These outliers all had work or car accident-related neck pain.

## Efficacy of 300 mW, 830 nm laser in the treatment of chronic neck pain

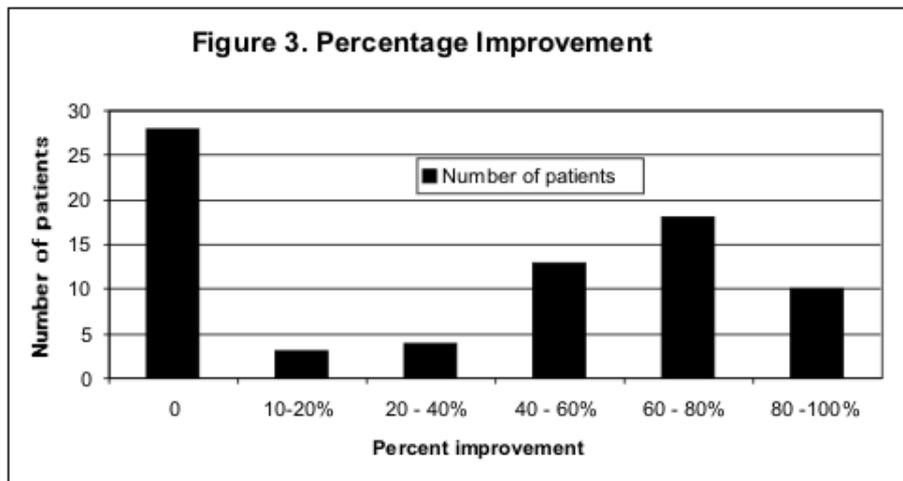


Figure 3. Percentage of improvement following laser therapy

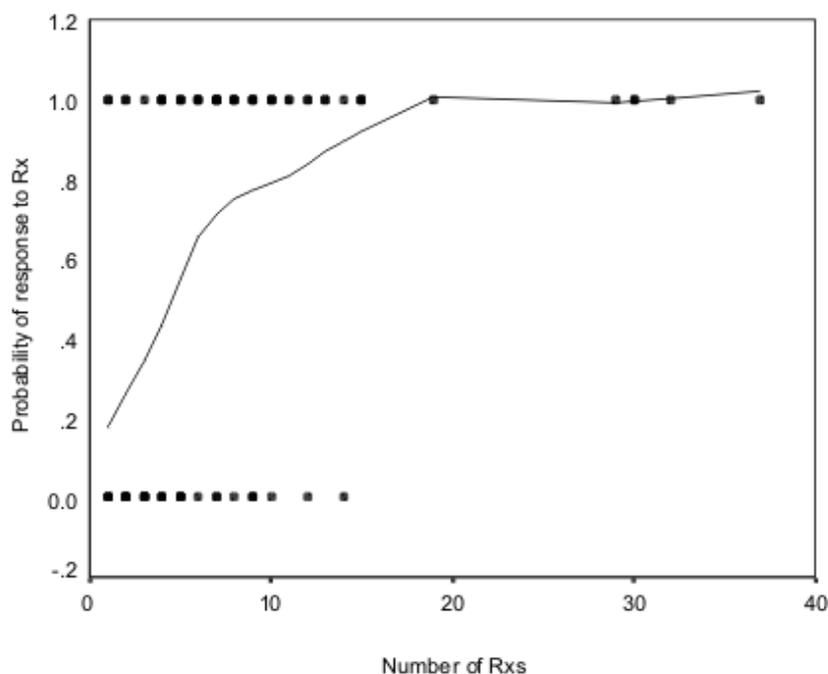


Figure 4. Probability of response to laser therapy and number of treatments

eight treatments, thereafter the probability of positive response slows and then plateaus at approximately at 15 treatments.

Fig. 4 depicts the probability of eventual response to number of laser treatments. Data points are circles. The solid line is a loess curve which is a non-parametric smoother.<sup>14</sup>

The graph shows an increasing probability of response to LLLT with an increasing number of treatments.

### Discussion

We found that 300 mW, 830 nm laser was effective in 62% of patients with chronic neck pain surveyed in a primary care medical centre. The probability of responding positively to treatment correlated with increasing number of treatments, plateauing at 15. Average self-reported improvement was 67.5%, which is a clinically useful effect.

Age and gender did not alter potential response to treatment and this has been demonstrated in previous studies of laser therapy.<sup>15</sup> Numbers were too small to make a statistical analysis of whether or not certain conditions were more likely to respond to laser therapy; however, data suggest that the greatest benefit occurred in patients with neck pain associated with "arthritis" of the spine and work-related pain. The least benefit was in the group who had no clearly definable cause.

The only factor demonstrated to have a positive association with response was increasing number of treatments. Probability of response was greatest for the first eight treatments, leveling off gradually to reach a plateau at 15 treatments. This number would be that recommended for a complete course of treatment.

The difference in median number of treatments in the responders was eight and in the non-responders was four. This was a significant difference and may underlie the importance of completing an appropriate course of treatment to obtain the maximum benefit. This is further corroborated by the fact that the median number of treatments in the non-participants was three.

A number of factors may be responsible for patients persisting with treatment. It is plausible that patients who

### Cause of pain and response to treatment

There was no statistically significant difference between responders and non-responders with regard to the cause of their pain. Seven out of 10 patients with "arthritis" experienced a benefit from treatment and 16 out of 23 patients with work-related neck pain reported benefit from laser therapy. Nine out of 15 patients with MVA-related neck pain experienced some benefit. Those with pain related to a non-MVA injury were least likely to benefit but the number in this group was very small. Two patients did not complete this section of the questionnaire.

### Extent of response to treatment

Patients indicated, on a Visual Analogue Scale, to what extent their symptoms had changed since the completion of treatment, where 0 was no change at all and 10 was complete relief of pain. Patients who responded positively experienced an average of 67.5% improvement in symptoms as measured by a Visual Analogue Scale (Fig. 3).

### Number of treatments and response to treatment

The relationship between the number of treatments and eventual response to treatment was assessed. There is rapid linear increase up to approximately

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responded early in the course of treatment persisted with the therapy, because of their positive initial response. Conversely, patients who did not respond rapidly did not persist with any additional treatments. It is not known whether persisting with treatment, if there is no initial early positive response, will produce a delayed but ultimately beneficial effect. Moreover, early response to initial treatments may be a prognostic indicator of sustained benefit from LLLT.

Only one non-responder completed what would be regarded as a full course of 14 treatments, experiencing a short-term response after each treatment that was unsustainable over the course of treatment. In the future a trial in which 15 treatments is given may answer this question of delayed response. There were a small number of patients, all females, who had a dramatic and positive response to treatment after one treatment. These rapid responders required only one or two treatments to resolve their symptoms significantly. This spectrum of response to laser therapy from extreme responsiveness to complete unresponsiveness has been recognised in a previous study of laser.<sup>16</sup> The mechanism for this is unknown.

Another factor operating as a barrier for patients to persist if response is slower than anticipated may be the cost of treatment. At our medical centre the cost of treatment was borne directly by patients except for those who were insured by either workers compensation or third party insurance. There was no pensioner discount for the consultation and the cost of laser therapy was not covered by any third party provider. This may have served as a disincentive for patients to continue treatment unless they perceived a real benefit occurring at the initial stages of treatment. This factor would be eliminated in a formal trial where there would be no cost to the patient.

There have been limited studies on the treatment of neck pain using laser therapy. Two studies have used pulsed lasers of 904 nm wavelength, though Soriano et al<sup>17</sup> treated patients with acute cervical pain and Ceccherelli et al<sup>18</sup> used laser for stimulation of acupuncture points. A more recent study

by Ozdemir, 2001,<sup>19</sup> used 50 mW, 830 nm, continuous wave laser, thought to be the most appropriate for musculoskeletal pain. This is the first study in the literature using 300 mW, 830 nm laser.

The mechanisms underlying an analgesic effect of laser in chronic pain remain to be fully elucidated although a number have been postulated. While the underlying mechanism is unknown, it has been demonstrated in animal studies that laser therapy results in a selective reduction of A delta and C fibre activity.<sup>20</sup> Analgesia may also occur due to the release of endogenous opioids following laser stimulation.<sup>21</sup> Anti-inflammatory effects have been demonstrated both in-vitro<sup>22</sup> and in-vivo<sup>23, 24</sup> and a direct effect on motoricity of lymph vessels,<sup>25, 26</sup> reducing interstitial fluid at the site of inflammation, has been described. Increased fibroblast activity and laying down of collagen in damaged ligaments may also contribute to long-term pain relief associated with laser therapy.<sup>27, 28</sup>

While the results of the study are suggestive of a clinically useful effect the limitations of this survey must be considered. This was explicitly an audit of practice and was not intended to be a formal trial; therefore there is no control group. Since the aim of a control group is to eliminate placebo or non-specific response, these results raise the question as to whether a positive response rate to treatment of more than 67.5% is likely to be due to placebo response.

The entire questionnaire had not undergone extensive evaluation, but key items in the questionnaire have established validity, for example, VAS.<sup>29</sup> Patients were familiar with this tool, as they had been required to fill in a pain diagram and a VAS at each treatment visit. All patients, who selected "yes" and "somewhat" as a positive response to treatment, consistently indicated improvement on the VAS. The positive correlation between these responses adds to the internal validity of the questionnaire.

We achieved a response to the audit of 62% which is less than ideal. However, even if all the non-participants were non-responders, 36.1% of the entire group would still have had a

positive response, still constituting a clinically useful effect in a difficult-to-treat condition.

As this was a retrospective analysis we had access to information concerning those patients who failed to respond to the audit questionnaire. Consideration of factors which may have led to non-response bias revealed that non-respondents were younger ( $p < 0.001$ ), had fewer treatments ( $p < 0.001$ ) and were more likely to have been injured in a car accident ( $p < 0.05$ ). The Saskatchewan health survey of neck pain prevalence demonstrated a preponderance of younger males in its group of questionnaire non-respondents.<sup>30</sup> A trend of higher rates of questionnaire return by older women, also seen in our survey, was demonstrated in the Saskatchewan study but did not reach significance. How these factors may have influenced the return of the questionnaire and their response to the treatment is not clear and would be a matter for further study.

Even if a worst case scenario is assumed, with none of those who failed to return the audit questionnaire experiencing any benefit at all, over one-third of surveyed patients would have experienced a positive outcome. Many within this group of patients had multiple prior unsuccessful treatments with other modalities. The phenomenon of "extinction of placebo response" or placebo "sag", a form of conditioned response to multiple failed treatments in which placebo response is eliminated, may make this level of response more significant than it otherwise might appear.<sup>31</sup>

There are several other issues arising from this audit which would be addressed in a randomized controlled trial, which were not and could not be answered in this retrospective analysis. These include the effect of pain severity and duration of pain on response to laser, the effect of concomitant medications on the response to laser therapy, and adverse effects of laser therapy.

### Conclusion

This audit demonstrated a clinically useful response in a notoriously refractory group of patients. Despite the limitations, there is no reason to be-

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lieve that the results of this audit are severely compromised. It revealed a positive response to 300 mW, 830 nm laser therapy in 62% of patients treated for neck pain due to a variety of causes. LLLT may offer an additional non-drug modality in the management of patients with chronic neck pain in general practice. This rate of response, in this difficult group of patients, would justify further scrutiny of the technique and is worthy of further study in a randomized controlled clinical trial.

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# Prolotherapy for Peripheral Joints

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In this article I have used trials and clinical reports where possible, and otherwise I have used my own clinical experience. Practical details have been included to enable a musculoskeletal medicine practitioner to carry out treatments without further instruction. This can be achieved because the solution used is benign and, in conjunction with the rest of musculoskeletal and sports medicine, is very effective. A useful, inexpensive textbook is *Diagnosis and Injection Techniques in Orthopedic Medicine* by TA Dorman and TH Ravin. It is published by Williams and Wilkins and is available from Dorman's website.<sup>1</sup>

## **Inflammation is necessary for healing**

Prolotherapy has been described as the use of growth factors or growth factor stimulation to promote tissue repair or growth.<sup>2</sup> This is of great benefit in ligamentous strain, where collagen fibres are stretched and undergo a plastic change but do not necessarily tear sufficiently to incite the inflammatory process that is responsible for normal healing (cell rupture releases cytokines, which attract polymorphs, macrophages then fibroblasts, which form procollagen).<sup>3</sup>

Using a needle with hypertonic glucose or some other irritant, we can stimulate the inflammatory cascade resulting in increased collagen fibril number, diameter,<sup>4</sup> and junction strength.<sup>5</sup> It is possible that the result is also due to the mechanical trauma of the needle at the enthesis.

As the procollagen matures into collagen and shrinks (losing water), ligaments, tendons, and joint capsules become thicker and stronger. Movement in lax ligaments stimulates pain mechanoreceptors, and it is thought that the pain relief with successive treatments of prolotherapy is due to the stability created by this connective tissue repair.

The use of prolotherapy in low back pain<sup>6-13</sup> and whiplash<sup>14</sup> has been extensively reported.

This article will review current practice in other joints.

## **Joint injury is a major risk for osteoarthritis**

A joint is only as strong as its weakest ligament. Ligamentous weakness allows excessive mobility in a joint which is conducive to increased wear and tear. This is the major factor in the development of osteoarthritis (OA). A healthy joint has a coefficient of friction less than a skater on ice. The study by Sutton et al showed that lifetime regular exercise does not increase knee OA but a prior knee injury increases the risk eight times.<sup>15</sup>

Similarly, Gelber used a longitudinal study of 1337 medical school graduates from 40 years previously, and found that knee injury before age 22 tripled risk of arthritis in that knee – typically by the mid-fifties. The risk rose to five fold if they also had a later injury.<sup>16</sup>

Prolotherapy, with its ability to stabilize joints, can be used to prevent OA shortly after the injury, or at any time in the decades of instability that lead to OA.

## **Strained entheses are tender**

The techniques of prolotherapy in the neck and back are best learned by observation, but there are some principles that are universal, and by experimenting in simple peripheral joints a practitioner can easily achieve good results. Bogduk says that "Injections into tender attachment sites for ligaments are a simple treatment that GPs can perform."<sup>17</sup>

Strained entheses are usually tender, so in assessing where to treat, the examiner's thumb is an excellent guide. For example, in the common sprained ankle, it is usually easy to find the insertion of the calcaneo-fibular ligament on the calcaneus and inject 0.5-1 cc at that point.

The injury will be greatest to the ligaments on the outside of the joint. For example, the medial ligaments of the knee will be more injured in a valgus injury, so we use our knowledge of anatomy to search for tender points at the insertion of the pes anserinus, and the upper edge of the medial tibial plateau.

## **Injections into joints**

Thirdly, the solution is often injected into the joint cavity as well as the surrounding ligaments. This is a difficult concept for most practitioners at first, as they are concerned that it may cause fibrosis in the joint. Actually the proliferant solution is also effective in promoting growth factors in osteocytes and chondrocytes.<sup>2</sup> It can be used to treat OA and other cartilage and intra-joint pathologies. The solution usually used in joints is 25% glucose with lignocaine. Three to four treatments are more effective and longer lasting than using Hyalan in osteoarthritis, and much less expensive.

## **Reeves' study of OA in knees<sup>18</sup>**

used only 10% glucose in order to have a non-inflammatory solution, to ensure the trial was properly double blind. In practice, he uses the usual 25% into the joint and 15% to the ligaments around the joint. He treated 38 knees devoid of cartilage in at least one compartment. There was a significant difference in the glucose group by 12 months in:

- pain - 44% decrease
- swelling - 63% decrease
- knee buckling - 85% decrease
- flexion range - 14% increase compared to the lignocaine only group.

Osteoarthritic x-ray findings stabilized or improved, and eight of 13 with anterior cruciate ligament (ACL) laxity were no longer lax after 12 months; that is, the anterior displacement difference (ADD) was less than 2 mm as measured on a goniometer. He has since published a three-year follow-up study of 16 patients with ACL laxity treated with 10 or 25% glucose, depending on patient preference. At three years, pain at rest, pain with walking, and pain with stairs had decreased by 45%, 43%, and 35%, respectively. ADD was normal in six knees by six months, nine were normal by 12 months, and 10 were normal at three years.<sup>19</sup>

Ongley, Dorman et al reported a series<sup>20</sup> of five very severely unstable knees treated with injections of the P2G solution into the insertions of the

anterior and posterior cruciate ligaments according to the technique described by Cyriax,<sup>21</sup> and also along the ligaments. This variously named P2G, P25G, or Ongley solution, is a strong solution of phenol 2.5%, glucose 25%, and glycerine 25%, added to an equal volume of 0.5% lignocaine. These knees had massive anterior displacement distances of 7-13 mm (mean 9.4 mm) at 90 degrees of flexion. Nine months after a series of prolotherapy treatments, this was improved to 4-8 mm (mean 6.2 mm), and the patients were able to run, play tennis, bicycle, etc, which they had been unable to do.

*Treatment for OA of the knee* is usually 5-6 cc of 15 or 25% glucose with lignocaine into the joint, and 0.5 cc to tender points on the medial coronary ligament (medial joint line), trying to contact both the upper edge of the tibial plateau and the lower edge of the femur. The insertion of the pes anserinus on the medial tibia will probably have 3-5 exquisitely tender points, which also need 0.5 cc each. Occasionally, the lateral ligaments will be tender instead. Four to six treatments will be necessary, and there should be very significant pain relief, sufficient to remain off non steroidal anti-inflammatory drugs (NSAIDs) indefinitely in middle-aged patients. The elderly will probably need regular treatments, perhaps every 2-3 months, but should also be able to avoid these dangerous drugs.

Rheumatologist Dr Steven Hall told the AAMM Annual Scientific Meeting (ASM) on Low Back Pain in General Practice in Melbourne in 1997 that NSAIDs caused more death and disability than any other drugs. He stated this is not taken seriously enough, particularly in the elderly.

Not only are NSAIDs dangerous in the elderly, they also reduce the strength of the healing ligament. In animals given ibuprofen during tendon repair, the strength of flexor tendons was decreased at four weeks from 12 newtons to 2.5 newtons.<sup>22</sup> In an Australian Army study of acute ankle sprains, piroxicam reduced pain and time to resume training, but at days 3, 7, and 14 there was greater instability measured on the anterior draw test.<sup>23</sup> During prolotherapy, it is usual to use simple analgesics instead of NSAIDs

for this reason.

*Recurrent dislocation of the patella* should be treated at a few spots (which will be tender) at the medial side of the patella, at both upper and lower attachments. The whole tibial insertion should be injected.

The tibial insertion is also the site for *Osgood-Schlatter disease*. Kidd reported a series of six knees in four males.<sup>24</sup> The teenagers responded in one or two treatments with complete pain relief. A 26-year-old with a 12-year history did not. He had bony ossicles in the tendon.

*Sporting injuries* should be treated individually, according to the type of injury and the points of tenderness. Theoretically, prolotherapy is usually reserved for chronic injuries that are not healing. However, there is no reason why the glucose solution cannot be used to increase growth factor production in the acute injury and hasten healing. In Europe, lignocaine alone is used, according to the principles of neural therapy. It is theorized that the strong polarization of cell membranes enhances cell function. This would certainly be kinder in an acute injury, but consideration could be given to using the glucose solution after a few days in an athlete who is very keen to get back to sport.

### Ankles and feet

Prolotherapy is very useful to the practitioner with a good knowledge of anatomy of the feet, as it is easy to find the strained ligaments by palpation. As well as sprained ankles, strained Achilles tendon insertions, etc, you can also relieve:

- metatarsalgia
- hammer toes and calluses - treat the outside of the curves
- calcaneal spurs
- Morton's neuromas - treat the ligaments between the metatarsal heads from the plantar or dorsal surface, depending on comfort
- bunions - treat the tender points on the medial side of the joint and put 1 cc into the joint
- tired, aching feet - treat the tender medial arch joints.

### Pubic symphysis

Instability after vehicle accidents,

sports injuries, and during and after pregnancy can be treated with prolotherapy. The joint is actually quite a large fibrous structure. It is often very tender in a severe pelvic injury, and the patient may be unaware of it. A sacroiliac belt may be useful during the treatment period to facilitate healing. Chakraverty reports a case in which the SI joint needed treatment as well, for an excellent result.<sup>25</sup> Treatment during pregnancy is not contra-indicated, and can be very effective in the weeks before birth, even though the levels of relaxin are still high.

### Groin injuries

Groin pain referred from the lumbar spine is more common than a true ligamentous or muscle lesion of the adductors. If there is no tenderness lateral to the spines of L4 and L5, the very localized insertion sites of the adductors on the pubic ramus can be found by looking for tenderness. They can be treated several times as needed. Of course, other musculoskeletal medicine approaches may also be used. Muscles that have been reflexly inhibited by pain may need to be retrained with specific exercises, and self-perpetuating increased muscle tone may be addressed. It has been noted that when the underlying ligaments are treated, and the pain is removed, muscles begin to function fully again, and these problems often correct themselves.

**Temporomandibular joint (TMJ)** pain and increased tone can be relieved by injecting the usual proliferant solution into the joint and tender ligament insertions on the zygoma and the mandible in small amounts to a total of about 1 cc. This solution consists of glucose 50%, lignocaine 2%, and normal saline in a ratio of 3:1:6 producing a solution with 15% glucose content. As usual, the number of treatments varies with the age of the patient and the chronicity of the condition. One woman in her thirties with a short history needed only two treatments. A 75-year-old man who had been able to eat pureed food only for many years needed six treatments in 1994, providing full relief for three years. Another five treatments in 1997 led to his re-

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maintaining pain free in 2004.

### Shoulder

The easiest structure to treat is the acromioclavicular (AC) joint. A fibrous joint, easily located and treated, it needs about 3-5 cc of 15% or 25% solution in 2-3 spots. Two to five treatments are needed depending on the severity of the disruption. The commonest shoulder structure to treat is the supraspinatus attachment on the humerus.<sup>26</sup> You may even need to treat at the musculotendinous junction, *medial* to the AC joint, with the arm elevated.<sup>27</sup> Most commonly though, the tender point is easily located on the humerus, and treated with 1 cc of 15% solution.

Other shoulder lesions also respond to prolotherapy:

- Subacromial impingement may be due to anterior or posterior rotator cuff lesions, as well as the supraspinatus - treat their insertions on the humerus if also tender.
- Both ends of the coraco-acromial and coraco-clavicular ligaments.
- The insertion of the short head of biceps on the inferior edge of the coracoid.
- Recurrent shoulder dislocation - treat along the anterior edge of the glenoid and use 5 cc into the joint. One sports physician, who had serious doubts as to the use of intra-articular prolotherapy, saw a recurrent post-traumatic dislocation with bilateral Bankhart lesions of the capsule on x-ray. The patient had read about prolotherapy and insisted on trying it. After two treatments all the laxity and apprehension tests normalised on the treated shoulder.
- The origin of the deltoid on the acromion and insertion on the humerus.

Theoretically, only partial tendon or ligamentous tears should respond to prolotherapy. However, it is surprising the relief possible in elderly patients with advanced age related changes on ultrasound scanning. One 70-year-old woman had "a full thickness tear with retraction of the anterior to mid fibres of the supraspinatus tendon. The posterior fibres are intact... Early

degeneration...at the superior margin of the AC joint." Four treatments in 1999 gave her complete relief of pain, until two falls in 2001 and 2002. Two treatments each time restored her pain-free state. It is always worth a trial of two treatments, bearing in mind the need for withdrawal from NSAIDs, as their inhibition of the inflammatory process is considered to be disadvantageous to the result of prolotherapy. However, there has been no study proving this to date.

### Elbow

Three recent studies cast doubt on the use of steroid in lateral epicondylitis.<sup>28-30</sup> Although steroid injections do well at six weeks, after a year only 69% had a successful outcome, compared to 91% for physiotherapy, and 83% for aspirin or NSAID.

### Steroids and inflammation

Are musculotendinous lesions which result from an injury inflammatory in nature? The general consensus now is that they are not. If so, why do steroid injections work at all? Cyriax suggested injecting 1 cc of steroid in 20 droplets "by a series of half withdrawals and insertions".<sup>31</sup> This is similar to the acupuncture technique, periosteal pecking.

Trauma is a very effective way of initiating the (inflammatory) healing cascade even in the presence of the steroid. It is likely that in non-inflammatory lesions, lignocaine would work equally well alone.

Steroid injections are not totally benign. The decrease in pain is due to decreased cytokines, which also decreases ligament and bone repair.

Effects of corticosteroid include:

- Decreased uptake of calcium by bone, possibly weakening the fibro-osseous junction
- Inhibition of growth hormone (important for soft tissue and bone repair)
- Inhibition of synthesis of protein, collagen and proteoglycans in cartilage by inhibition of chondrocyte production
- Inhibition of fibroblastic production of collagen, ground substance and angiogenesis
- Other side effects, for example,

atrophy of overlying skin, psychosis, etc.

Studies have shown that even after one steroid injection, cartilage remains biochemically and metabolically impaired. In an animal knee study, tibial chondrocyte count/mm decreased with intra-articular steroid. The decrease was even more significant if the animal was also exercised.<sup>32</sup> This is relevant in athletes who hate to stop training.

One US Naval study on 137 acromioclavicular joint injuries compared corticosteroid injections with those treated conservatively with a sling, with six months to 3.5 years follow-up. The corticosteroid treated first degree strains had a marked increase in the amount of long-term degeneration in physical findings, x-ray, and pain.<sup>33</sup>

This is not a complete review of corticosteroids, but the fact there is something else to offer other than steroids is exciting.

### Wrist and hand

Reeves also produced a double-blinded trial in the use of prolotherapy in OA of the fingers and thumb.<sup>34</sup> Thirteen patients with 74 OA joints were injected on medial and lateral aspects of each joint with 10% glucose and lignocaine, and 14 patients with 76 OA joints were treated with lignocaine alone. Pain VAS at rest, with movement, and with application of grip, improved more in the glucose group, but was only significantly better with grip. Flexion range increased by 8 degrees in the glucose group, and decreased by 8 degrees in the placebo group. You can view this and Reeves' other two studies in full on his website: [http://www.integrativemedicineresearchonline.com/prolotherapy\\_research.html](http://www.integrativemedicineresearchonline.com/prolotherapy_research.html).

### Conclusion

Consider glucose first, instead of steroid for musculoskeletal pain, to encourage inflammation instead of suppressing it, and promote connective tissue repair and healing.

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# Management of Shoulder Pain in General Practice

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## Introduction

During 2001 and 2002, the Health Insurance Commission was concerned about the unexplainable increase in shoulder ultrasound imaging compared to ultrasound imaging of other musculoskeletal structures, as seen in Fig 1. The advent of more specialised imaging equipment may in part explain this increase, but the important questions to ask concern whether such imaging is best practice and whether it improves management.

Shoulder pain is third behind back and neck pain as a musculoskeletal reason for presentation to general practice.<sup>1,2</sup> Despite the fact that 50–60% of acute shoulder pain resolves in 8–10 weeks, many patients present with the anticipation of requiring some kind of imaging.

The reason that pain may persist beyond three months is strongly related to personality traits, coping style, and occupational factors.<sup>3,4</sup>

Data are available that indicate that plain radiography for shoulder pain is uninformative and because ultrasound is operator dependent, there is a wide range of reliability that can be placed on the results.<sup>5</sup> In the best studies, ultrasound has high sensitivity and specificity for detecting rotator cuff tears, with a significant proportion being asymptomatic.<sup>6</sup>

## Proposal

In view of this, a proposal concerning the imaging for shoulder pain in general practice was presented to the Department of Health and Ageing. This proposal was in three parts.

### Stage 1

This stage correlated what was written on the request form with what was reported by the radiologist. Four radiology practices with expertise in musculoskeletal ultrasound were approached in Sydney, Melbourne and Adelaide to provide a sequential sample of requests and reports during a six-week period. This resulted in 329 requests and re-

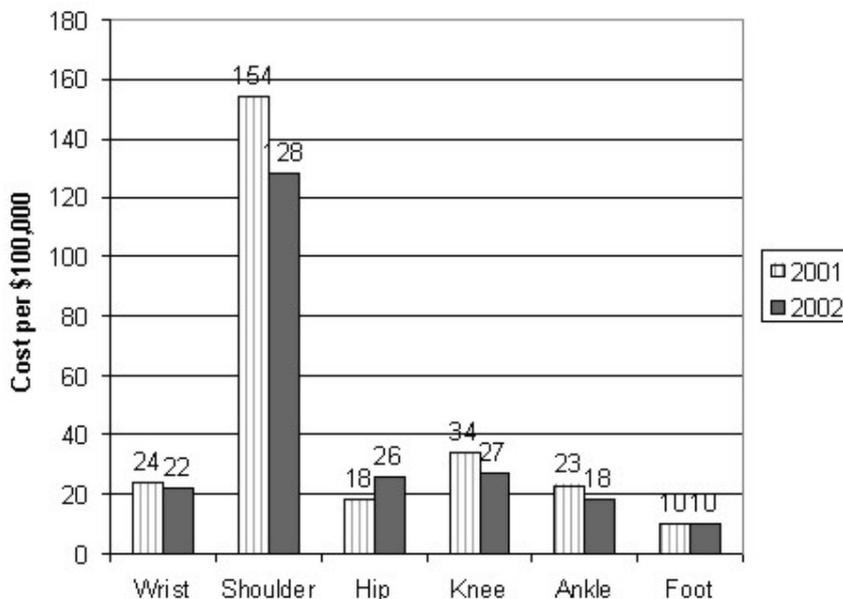


Figure 1. Musculoskeletal ultrasound costings: 2001/2002

ports being analysed.

The demographics were 176 females and 150 males, with three showing neither age nor gender. The average age for females was 56.7 years and that for males 52.1 years. The pertinent findings were:

- Eighty per cent (263) of reports listed pathology of some kind in the symptomatic shoulder but no comparison was made with the asymptomatic side.
- Thirty-four per cent (113) of requests had no contributory history for the radiologist.
- Tears were found in 37% (123) of patients. Eighty-nine (72%) were partial and 34 (28%) were complete. The average age for partial tears was 63.1 years while that for complete tears was 73.6 years. There were no comments on the reports that tears correlated with the patient's symptoms.
- When a diagnosis was made (169 or 51%) on the request form the agreement with the report was only 51%, that is, 86/169 or 25% overall.
- No report mentioned that in the process of the dynamic ultrasound investigation whether the patient's pain was reproduced.

Recommendations arising from Stage I included:

- More clinical details to be recorded on the request form.
- All ultrasounds to include both sides and comment by the radiologist as to whether pain was reproduced.
- Further study needed to determine what the practitioner does with the imaging findings.

### Stage II

This was a retrospective study from the University of Adelaide's database comparing the outcome of 100 patients who had imaging with 100 who had no imaging.

There were 17,733 patient visits recorded from July 1, 2000, to October 31, 2002, of which 1867 visits or 11% had shoulder pain. One hundred and eighty-three (84 with imaging and 99 without imaging) were selected on a random basis for the case notes review. Overall, one in four patients with imaging and one in 16 patients without imaging provided the data for this report.

## Study conclusions

1. There was no indication from history or clinical examination that would enable the study to identify

- why imaging was ordered. However, there were significant statistical parameters identified which would indicate the likelihood for a person to have imaging.
- Age 45-60 (p-value 0.009)
  - Pain on activity (p-value 0.001)
  - Pain present 5-13 weeks (p-value 0.002)
2. The presence of comorbidities has no influence on whether a patient was to have shoulder imaging or not.
  3. Approximately half the patients had some documentation about the cause of the pain and little about severity and location.
  4. The decision to image subsequently involved multiple visits, with the imaged groups averaging 5.4 visits and the non-imaged group 1.7 visits. Imaged at first visit was 69% and a further 20% at the second visit, with ongoing pain as the main reason at the second visit. There is no information from the notes as to how the results of imaging impacted on management.
  5. A physical examination was recorded at the first visit in 75% of patients. It is of some concern that 17% of patients had no record of a physical examination, with 12% of patients referred for imaging without a physical examination being recorded.
  6. Imaging revealed some pathology in 75% of patients, which is similar to Stage I (80%). Again, there was no evidence to indicate that any correlation was made between the pathology and the patient's symptoms. Neither was there any evidence of a comparison with the non-symptomatic shoulder.
  7. The imaging reports indicated that 23% of shoulders were normal, which reflects the results of Stage I (20%). When a diagnosis was proffered by the GP, the correlation with the imaging report was 25% which reflects Stage I (25%). Although subacromial pathology was the most frequent problem reported, it rarely appeared in the GP diagnosis.
  8. Of those who had imaging, 92% was for ultrasound either alone (60%) or in conjunction with plain films (32%).
  9. When medication was prescribed it was more likely to be NSAIDs, with the imaging group more likely to receive this type of medication (55% versus 30%,  $p=0.001$ ). However, there was no indication from the clinical notes as to the efficacy of the treatment. This is likely a reflection of the clinical assessment as to the severity of the presentation. Assurance and advice were more likely to be given to the imaging group (57% versus 39%).
  10. The subacromial space was the area reported with most pathology (62%). Tears were next with 13%, A/C joint 8%, tendonitis 8%, and capsulitis 2%. No comment was made regarding correlation with symptoms.
  11. Referral to a specialist was more likely to occur if the patient had imaging (45%) compared to non-imaging (6%). Similarly more referrals to physiotherapy came from the imaged group (32%) compared to the non-imaged group (23%).

### Project deficiencies

1. Two major omissions from the clinical record were the mention of occupation (50%) and the record of when pain first occurred (40%).
2. Given the inadequacies of a retrospective study, 70 – 80% of patients have no mention of their shoulder pain after four months from first presentation.
3. No mention in the clinical record could be found of the benefit or otherwise the specialist or the physiotherapist had on the outcome.
4. There was no indication of how imaging affected management or what management could be recommended following imaging.

### Stage III

A program of academic detailing is being conducted in two Divisions of General Practice. Approximately 100 GPs will look at imaging before and after the detailing, as well as including an outcome profile.

### Discussion

In considering the results of the data gathered from Stages I and II a fair conclusion would be that managing shoulder problems in general practice

has room for improvement. This is especially true in relation to the use of imaging modalities which, apart from "red flag" conditions, is rarely required for diagnostic purposes.

On the basis of Stages I and II as well as the National Musculoskeletal Medicine Initiative, the age of the average person presenting with shoulder pain will be in his/her early fifties. Generally at this age there are significant degenerative changes in the musculoskeletal system, much of which is asymptomatic or does not require a medical consultation. The duty of the GP is to take the relevant history and perform an adequate history to glean sufficient information which will allow elimination of "red flag" conditions followed by an appropriate management plan. Successful outcome depends partly on the natural course of the varieties of shoulder dysfunction and where in this pain continuum the patient presents. A knowledge of shoulder anatomy and biomechanics, as well as an appreciation of the reliability of tests reputed to identify some pathologies, adds further to the successful resolution of the presenting complaint in a high percentage of cases.

Pathology was reported in 80% of shoulders imaged and this must alert the practitioner to the fact that the presence of pathology does not necessarily mean a cause of symptoms. The correlation of symptoms, anatomy, and examination need careful assessment and should be adequate at first consultation to formulate a management plan without the necessity for referral and/or imaging.

The incidence of one-third of requests having no contributory information must be considered an omission and the reasons need clarification. How much is "let's x-ray" a function of "I don't know", or perhaps shoulders are poorly appreciated and resolution is due to natural events rather than medical intervention.

Tears in the rotator cuff are more common with age and how much these are related to symptoms is a cause for continuous debate. Many patients are diagnosed with complete tears and are only marginally impaired in their ADLs. Recommendation for a reconstruction in a patient over 70 years must be

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considered against many social and domestic issues, not the least of which is whether the dominant arm will be out of action for several months.

It is not acceptable medical practice to assess only the symptomatic shoulder—the asymptomatic shoulder must be examined in the same detail before a satisfactory management plan can be implemented as currently recommended in the Medical Benefits Schedule (2002, p. 415).

A correct diagnosis implies subsequent appropriate management; yet when a diagnosis was made, the relevant pathology was shown in only 10% of patients. Does this mean that a noticeable proportion of patients go on to chronic states or that no matter what we do the patients get better and all we add is palliative care?

The finding that the non-imaging patients visited the GP less frequently than the imaged patients (1.7 v. 5.4 visits) is interesting and may imply that the non-imaged patients were suffering less or had less pain at the first presentation. It also may be due to different disease and personal reasons which need more clarification. Patients who had imaging were more likely to have a long consult at first visit, have more medication and be referred, thus adding further costs to management.

The statistically significant factors for the GPs to order imaging were age (45-60), pain on activity, and pain longer than six weeks. None of these factors reflect clinical competence in managing shoulder pain, which means that this study cannot help provide clinical based guidelines for appropriateness of shoulder imaging.

For the most part, medication involved a mild analgesic and NSAIDs, the latter being prescribed more frequently when imaging was ordered. Self-treatment exercises did not appear in the case notes so it may be that any exercise regime was left for the physiotherapist to institute. Level I meta-analyses support the use of exercises, NSAIDs and intra-articular injections in the acute presentation.<sup>7</sup> It would not be difficult for GPs to learn a few non-specific stretches to be taught to patients which could be implemented at the first visit. This would be a worthwhile service as many patients do not

have “extras” cover, waiting lists at public hospitals are long, and in some rural areas physiotherapists are non-existent.

Referrals to specialists were to orthopaedic specialists but there is no indication in the case notes of the proportion which needed surgery. It is noted that all the patients referred to a specialist had imaging at the first visit prior to seeing the specialist. Although it is common practice to order some imaging which the patient takes to the specialist it might, if referral is necessary, be more economical to ask what imaging would be helpful prior to the specialist consultation.

## Practice recommendations

- In the absence of “red flags” the average person presenting with a shoulder problem in general practice is 50 years of age.
- At first consultation explanation, reassurance, stretches, analgesics and NSAIDs are indicated.
- Review in 2-4 weeks when injections or physiotherapy may be indicated.
- Referral may be required if adequate progress is not achieved.
- If ultrasound imaging is contemplated, compare the other side, and consider whether pain or symptoms are reproduced during the ultrasound examination.
- Guidelines for imaging of shoulder disorders similar to the Ottawa rules for knee and ankle are needed.

## Summary

The National Musculoskeletal Medicine Initiative has established that evidence based practice has less than 10% of patients being referred or imaged for shoulder pain. With shoulder pain presenting to general practice in 7-32% of presentation, it becomes a challenge for AAMM to actively pursue 2(c) of the Articles of Incorporation: “to educate physicians, other health professionals and the general public in the diagnosis and management of musculoskeletal disorders”.

There are few areas left in general practice that can be termed *hands-on activity*. The peace and joy to solve and manage problems is what comforts physicians and, while the knowl-

edge base is readily accessible, a continuous effort by each generation of the AAMM executive has to be directed in upskilling programs.

The author welcomes any discussion on how this could be implemented.

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# The Orphan Organ

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## Introduction

**M**usculoskeletal medicine has been called the bastard child of medicine, and muscle tissue the orphan organ.

Skeletal muscle, even without its subtending nervous system, must be the largest human organ but is generally treated with disinterest when it comes to pain-generating mechanisms.

There are decades and institutes dedicated to bones and joints but hardly a mention of the organ system that makes bone and joints function – skeletal muscle.

Cardiac muscle has been grasped with alacrity by cardiologists, the uterus by gynecologists, the detrusor by both urologists and gynecologists and the sphincter muscles by gastroenterologists, urologists and gynecologists, but none of the classical medical specialties appears to take interest in the pathophysiology of muscle.

It would appear that muscle tissue is the red-brown stuff that needs to be cut, burned, stretched, and retracted to access the zygapophysial joint or disc or alternatively the grainy grey stuff of images to be dismissed whilst studiously staring at the white or black stuff of bone, cartilage, or disc.

Modern medical practitioners have no difficulty in accepting that problems with cardiac muscle may cause a special pain called angina. Until fairly recently the pathophysiology of angina was not known. Modern medical practitioners have no problem with accepting that the uterus can be the source of pain or that there can be various forms of colicky pain resulting from dysfunctional smooth muscle. However, there is general scepticism that skeletal muscle can be the source of pain.

This is despite the great complexity of skeletal muscle, much more complex than the repetitive contraction of the cardiac muscle or peristalsis of hollow organ smooth muscle. For example, skeletal muscles are both the engine and brake of the locomotor system, and in fact a muscle such as the quadriceps can be engine and brake at the same time. Skeletal muscles can perform complex movements

as seen in gymnastics and dance or the prolonged stillness required of a microsurgeon or watchmaker. Skeletal muscle is important not only for movement and posture but also for the expression of emotion – witness facial expressions during laughing, crying, anger, and grief.

## Muscle pain

Terminology for muscle pain is controversial. There have been numerous descriptions over time, such as fibrositis, rheumatism, and myogelosis. One of the current terms is *myofascial pain*. This is the term I shall use in this article to attempt to explain one current paradigm. To date, there is no Bogdukian evidence to support the paradigm, and this evidence may be a long time coming because of the difficulty in performing randomized controlled trials and lack of research and funding. Pharmaceutical companies have not been able to find a product to support, other than Botulinum type A toxin, a fairly recent development. Also, there are clinical difficulties in locating the manifestations of myofascial pain.

There is no undergraduate training and very little postgraduate training in the clinical assessment of myofascial pain. For those interested in myofascial pain, there is no teacher or examiner. It is a skill that the interested person gradually acquires over a long period. However, myofascial pain is either primarily or secondarily associated with most of humanity's aches and pains, including those commonly treated with surgery, powerful drugs, and expensive psychological and psychiatric interventions. Individuals who have suffered both cancer pain and myofascial pain or fractured bones and myofascial pain frequently remark that myofascial pain is the more severe and distressing

## Considerations of myofascial pain

Myofascial pain can be considered a local or regional pain syndrome. Generally, myofascial pain is not widespread.

When a person with myofascial pain is given a pain diagram, he or she marks the area with a dot, dash, line,

or localised hash. There may be a vague myotomal appearance to the pain diagram from trigger points in the scalene group of muscles, gluteus minimus anterior and posterior, and piriformis, to name a few.

Current thinking is that myofascial pain develops as the result of a sick neuromuscular junction, making it a true neuromuscular disorder and, in fact, a minipathoanatomical entity that can respond to target-specific treatment.

Myofascial pain is one form of soft tissue pain that should be distinguished from the other common form of soft tissue pain, namely fibromyalgia. Myofascial pain can coexist with fibromyalgia and it may be that the nociceptive drive emanating from collections of sick neuromuscular junctions results in central sensitization that is thought to be at the heart of the etiology of fibromyalgia.

A cluster of loci of sick motor end plates (a myofascial trigger point) causes shortening of muscle which results in joint stiffness, a cardinal sign of the condition. Fibromyalgia, on the other hand, is characterised by hypermobility.

These loci result in a condition of weakened, centrally inhibited muscle without atrophy.

The muscles in which the trigger point loci are found develop indurated tight bands. This is not true muscle spasm as in muscle guarding associated with an inflamed viscus, such as an appendix, ovary, or gall bladder. The alpha motor neurones and their axons are electrically silent. Thus the terms "muscle spasm", "muscle tension" and "tension headache" are inappropriate and best avoided. Likewise, the rubric of mechanical back pain does not make sense unless it is hypothesised that tight muscle bands that cross the motion segment cause hypomobility of the zygapophysial and intervertebral joints.

The combination of local muscle tightness and motor weakness results in motor imbalance. This is very commonly seen in the many painful stiff shoulders that defy classic diagnostic labelling.

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When the loci are active, they spontaneously refer familiar pain to associated joints or entheses, causing the mistaken impression of joint disease. The intervertebral joints are most commonly affected. If the reported pain is not familiar, another etiology must be considered.

Dysfunctional motor end plate loci may be quiescent or latent and refer pain only when stimulated, usually by some sort of pressure. Latent trigger points may still cause roped indurated muscle bands and muscle fatigue, weakness, and incoordination in the absence of pain.

Autonomic components of the nervous system are also involved, and seen in scleral injection, excess lachrymation, vasomotor rhinitis, and certain pilomotor activity. For example, stimulation of a mid trapezius trigger point may cause "gooseflesh" over the lateral upper arm.

Afferent nociceptive information from many neck muscles enters the spinal cord at C 0-3 which is adjacent to autonomic nuclei in the medulla.

## Pathophysiology

A trigger point nodule is considered to be a cluster of numerous microscopic abnormal loci of dysfunctional motor end plates scattered through its substance.

These spontaneously release excessive acetylcholine at rest.<sup>1</sup> This has been identified by electromyography as "end plate noise".

The small packets of acetylcholine cause shortening of nearby sarcomeres without propagation of action potentials along the entire length of the muscle cell.

Acetylcholine results in depolarisation of the post junctional membrane which opens up receptor channels, resulting in miniature end plate potentials. Nonphysiological levels of acetylcholine cause increased ingress of Ca<sup>++</sup>, resulting in localized, prolonged supercontraction of sub-end plate sarcomeres, and swollen mitochondria and sarcoplasmic reticulum.

Miniature end plate potentials are the consequence of small, spontaneous synaptic depolarizations of muscle cell membranes in the end plate region in

the absence of electrical activity in the alpha motor neurone. Miniature end plate potentials are always sub-threshold, and are caused by random release of single packets of acetylcholine from presynaptic nerve terminals.

Miniature end plate potentials are evinced by electromyography as end plate spikes and they occur at active myofascial trigger points. Miniature end plate potentials are short-lasting membrane potentials caused by acetylcholine packet summation.

A normal end plate potential caused by the firing of an alpha motor neurone is normally super-threshold and makes the muscle cell membrane fire an action potential.

Contractures in many muscle cells produce a palpable taut band. Algogenic substances are released in the region of the dysfunctional motor end plates as found by a novel acupuncture needle containing a U tube with a special terminal membrane.<sup>2</sup>

This could account for local and referred pain and autonomic nervous system stimulation.

For some time there has been a comforting thought that myofascial trigger points were part of a simple pain afferent-efferent loop, which became a self-perpetuating vicious cycle. It was thought that nociceptive traffic sensitized the spinal segment, which in turn caused the resident alpha motor neurones to fire spontaneously, resulting in a tight band containing trigger points. The afferent limb is now thought to be provided by the sympathetic nervous system. It is known that noradrenaline causes abnormal acetylcholine release which, in turn, causes sustained sarcomere contraction.

There is a significant difference between algogenic substances at active and latent trigger points.<sup>3</sup>

## Testing methods

Bench-side testing methods for investigating myofascial trigger points have included the following:

- Specific needle EMG
- Surface EMG
- Ultrasound, which can capture a local twitch response caused by needle penetration of a trigger point
- Algometry.

Obviously, none of these modalities are available to doctors who practise outside multidisciplinary or institutionalised medicine.

## Prevalence

Those who have taken the time have found the prevalence of myofascial pain in general medical practice to be 30%, in a pain medicine centre, 85-93%, head and neck pain clinic 55%, and in a lumbo gluteal orthopaedic clinic, 21%.<sup>4</sup>

## Etiology

One of the problems of convincing sceptics about myofascial trigger points is its uncertain etiology.

Trigger points are said to be caused by direct stimuli, including:

- Acute overload of muscle
- Overwork fatigue including prolonged abnormal postures
- Radiculopathy
- Gross trauma.

Indirect stimuli include:

- Other trigger points
- Visceral disease
- Joint dysfunction
- Emotional distress, possibly by means of increased circulating noradrenaline levels.

All these phenomena are mediated via the central nervous system, and are under the influence of supra-spinal activity and the descending inhibitory pathways that are subject to endogenous serotoninopathy, although this point is conjecture.

Strong afferent nociception from primary trigger points spread in the internuncial neurons to adjacent segments, causing efferent activity resulting in secondary or satellite trigger points.

## Circuitry

Muscles have connections via the primary afferent neurone to the sensory transmission cells in the dorsal horn. These connections are continuously active and are called *effective* connections. They also have connections that relay deep referral and tenderness with sensory transmission neurones of other usually distal muscles. These are normally silent, and are called *ineffective* connections. Likewise, they have silent or ineffec-

tive connections with the sensory transmission neurones of skin and subcutaneous tissue that are associated with cutaneous referral and hyperesthesia. Finally, there are silent connections between inactive receptive fields on the cell membranes of the sensory transmission neurones of the trigger point-containing muscle and distal muscles. This substrate is the basis of the distal referral of active or stimulated trigger points to distal muscle in the vaguely myotomal distribution mentioned above, and to the overlying cutaneous tissue.<sup>5</sup>

In the neck, the opposite is true. Sensory disafferentation from many neck muscles, particularly the trapezius and sternomastoid, enters the spinal cord at the C0-3 segments and interfaces with the cervico-trigeminal nucleus. This results in various forms of headache, sometimes associated with autonomic phenomena as outlined in the introduction.

### Interrater reliability

Interrater reliability has attracted criticism, which is not surprising given the lack of teaching, knowledge of anatomy, and clinical skill required. Nevertheless, a study by Gerwin et al<sup>6</sup> provided the following kappa scores:

- .84 for spot tenderness
- .88 for familiar pain recognition
- .85 for palpable band
- .69 for referred familiar pain
- .44 for local twitch response

### Myofascial pain syndrome and fibromyalgia syndrome

Frequently there is confusion about these two common conditions.

Essentially, myofascial pain from trigger points

- does not have a female preponderance
- is regional rather than widespread general pain
- has local tenderness rather than widespread tenderness
- is associated with hard ropy muscles, not soft doughy muscles
- is associated with reduced range of motion not hypermobility
- is examined for characteristic trigger points not tender points
- has an immediate response to injections of trigger points rather than

a delayed or poor response to similar injections

- has responded to Botulinum A toxin, whereas fibromyalgia sufferers have not.

### The neuromuscular junction

Sensory and autonomic nerves and blood vessels accompany motor nerve fibres to the neuromuscular junction.

The endplate region of muscle is detected electromyographically by an initial negative deflection of the waveform followed by a positive first deflection.

End plates are found in the mid-region of each muscle fibre, and have a characteristic topography for each muscle.

When special intracellular needle electrodes are used, trigger points display characteristic low voltage spikes (end plate or acetylcholine noise), interspersed with high-voltage negative deflection wave forms (end plate spikes) that are interpreted as mini end plate potentials with intermittent summation to form the high amplitude spikes.<sup>7</sup> Whilst this waveform is characteristic, it is not pathognomonic as it may differ only in amplitude and frequency from the normal situation.

### Trigger points

Trigger points have been identified using needle EMG and acetylcholine staining. A trigger point appears to contain a number of dysfunctional motor end plates scattered, albeit concentrated, amongst normal motor end plates. The concentration of dysfunctional end plates has been called an "active locus". A number of active loci make up a trigger point.

Trigger point regions tend to occur where end plate zones cross taut bands.

Muscle midbellies usually contain the highest concentration of motor end plates. For this reason, it is important to be able to visualise the anatomy of muscle in a three-dimensional way.

Ultramicroscopy of active loci reveals closely spaced sarcomeres directly under the motor end plate which appear like a contraction knot. The sarcomeres on either side of the contraction knot are widely spaced as if stretched. On some occasions the

sarcolemma is devoid of contractile elements, and appears empty.

A closely concentrated collection of these contraction knots is called the central trigger point, and a number of these are found in the taut band. At either end of the taut band is a localised enthesopathy. This can be thought of as an attachment trigger point, although these have not been studied microscopically to identify whether they have a unique morphology.

It is comforting to think that trigger points cause taut bands; however, taut bands can occur in the absence of trigger points, and an alternative view is that these bands are a precursor to trigger points.<sup>8</sup>

This trigger point complex must be understood for clinical reasons. For example, when a patient is asked to point to the centroid of his/her pain, he or she will point to the attachment trigger point, not the central trigger point of which the patient will be unaware. Yet, this is the most important problem to treat and to prevent recurrence.

A common example is the gluteal group of muscles, which has the proximal entheses on the iliac crest and especially on the tuberosity. This is juxtaposed to the sacroiliac junction and joint and the distal entheses on the greater trochanter of the femur. Pain in these regions is exceptionally common. Multiple megalitres of steroids have been expended in the management of this pain, which can be considered a collection of attachment (traction) trigger points. The patient almost never points to the central trigger point, which is usually much more tender to palpation and much more important to treat. Other common examples are the trapezius, deltoid, wrist extensors, quadriceps, and abductor hallucis. Failure to identify and treat central trigger points may be a principal reason for the less-than-spectacular results obtained from published trials on the efficacy of trigger point therapy.

### Treatment

In the Australasian context, muscle pain is treated, from a non-pharmaceutical musculoskeletal perspective, in various ways:

- Mobilisation with impulse

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- Trigger point injections using local anesthetic
- Prolotherapy using local anesthetic and glucose
- Acupuncture
- Nesfield's procedure
- Blomberg's technique using local anesthetic and steroid
- Thermocoagulation of the medial branches of the posterior primary rami, or of the annulus fibrosus.

Most purport to work in different ways. However, with the exception of mobilisation with impulse, all have a final common pathway in that sharp objects pierce muscle cells and entheses.

It is possible that muscles crossing zygapophysial or intervertebral joints develop taut bands, resulting in spinal segments developing a functionally abnormal position that various practitioners call the "chiropractic lesion", "the osteopathic lesion", "joint blockage", "somatic dysfunction", or "minor intervertebral dysfunction". Mobilisation with impulse may work by acutely stretching the taut bands beyond the physiological limit. This therapy is most effective in acute spinal pain but less effective in chronic spinal pain, possibly because it cannot address the deactivation of trigger points as efficiently as in the acute situation.

The use of local anesthetic has never been considered therapeutic, but it is used as a mercy procedure. The type of anesthetic used, ester or amide, short- or long-acting, has no bearing on outcome measures.

A recent study<sup>9</sup> on the efficacy of prolotherapy in chronic low back pain concluded that significant and sustained reductions in pain and disability occurred with ligament injections, irrespective of the solution injected or the concurrent uses of exercises.

Nesfield's procedure uses a 32-34 mm thin scalpel blade to incise paravertebral and gluteal muscles in a non-discriminating way but in areas that are known to harbour myofascial trigger points.

Injectable steroids are popular and used intuitively because of the association of pain with inflammation. However, there is no evidence that myofascial pain is associated with inflammation, and studies of their use

have been disappointing.

Blomberg's technique has been recently popularized for injecting the parasacrococcygeal region and sacrospinous and sacrotuberous ligaments. These are enthetic regions of the gluteus maximus and longhead of hamstring, with trigger points that can cause lumbo-gluteal pain, including pain referred to the lumbosacral junction, sacroiliac joint, coccyx, and posterior thigh.

It has been suggested that steroid injections<sup>10</sup> unintentionally impale trigger points, thereby unknowingly inactivating them during joint injections. The relief of pain thus obtained would further reinforce the incorrect conclusion that inflammation of tissues including joints is responsible for pain.

Likewise, steroid injections of zygapophysial joints and the synovial sacroiliac joints pass through many central and attachment trigger points before the solution is injected and this may be one of the reasons why this treatment is sometimes effective.

It would appear that success in treating myofascial trigger points is due to the mechanical deactivation (destruction) of the active loci of dysfunctional motor end plates. It occurs irrespective of the injectate, whether it be the various types of steroid, local anesthetic either long- or short-acting, and the various forms of prolotherapy additives. The cataract blades used in Nesfield's procedure also destroy relatively superficial trigger points, as do dry needles when they are placed specifically into the collections of active loci and not just into the various acupuncture points as drawn on the meridians unless they actually overlay the central or attachment trigger points.

Post-isometric relaxation techniques, using the neurophysiological Golgi tendon reflexes augment the effect by stretching the sarcomeres immediately after the active loci have been ablated.

An emerging therapy is the use of Botulinum A toxin, which is showing promising results in early trials and has face validity.<sup>11</sup>

This may herald the third wave of interest in musculoskeletal medicine in Australia, and it is important that the few and the willing grasp this opportunity whilst it is possible.

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# Individual Medication Effectiveness Test Comparing Celecoxib with Extended Release Paracetamol for Osteoarthritis

*Dr Michael Yelland, Senior Lecturer in General Practice, University of Queensland*

In patients with osteoarthritis, there is often uncertainty about the effectiveness of anti-inflammatories versus analgesics. An Individual Medication Effectiveness Test (IMET) is a simple, but rigorous way of comparing the effectiveness of these two classes of medications to ensure that patients are receiving the most appropriate treatment. It is a randomised, double-blind crossover trial for individual patients that offers the highest level of evidence about the effectiveness of medications. The University of Queensland is now providing IMETs comparing celecoxib with extended release paracetamol for osteoarthritis.

## *How does the celecoxib vs extended release paracetamol IMET work?*

During the IMET, the patient undergoes three pairs of two-week treatment periods – a total of 12 weeks. During one treatment period of each pair, the patient takes celecoxib and a placebo, and during the other period they take extended release paracetamol and a placebo. This means that both the doctor and the patient remain blinded to the active medication at all times, which reduces bias in judging the effectiveness of the medications.

The patient records their pain, stiffness and functional levels and any other adverse effects in a symptom diary throughout the IMET. Upon completion of the IMET, the IMET unit matches the timing of each active treatment with the results and sends the doctor a report. This can be used to make informed decisions about future management.

## *Which patients would benefit?*

This IMET is most useful in patients on regular anti-inflammatories or analgesics who are uncertain about the effectiveness of their medication. It is open to adults with osteoarthritis pain for at least one month where long-term use of anti-inflammatories or analge-

sics are indicated. It is important that there are no contraindications to celecoxib or extended release paracetamol and that they have not had a depot corticosteroid injection in the last two months. They are available to patients anywhere in Australia at no cost to them or their doctors.

## *For further information*

Contact the IMET service on (07) 3346 4835 or 1800 038 464, or email [imet@sph.uq.edu.au](mailto:imet@sph.uq.edu.au), or Dr Michael Yelland on (07) 32755444 or email [myelland@bigpond.com](mailto:myelland@bigpond.com).

# Book Reviews:

## Medical Management of Acute and Chronic Low Back Pain. An Evidence-Based Approach, by N Bogduk and B McGuirk

Low back pain is a topic in medicine that hasn't enjoyed the publicity that it deserves. With its limited coverage in medical curriculae and hospital and GP training programs, one would be forgiven for thinking it must be an uncommon or unimportant complaint. Yet it is a popular topic in the media where cure claims abound. It is the leading cause of disability in the workplace and a very common cause of presentation to healthcare providers, often non-medical practitioners.

The authors seek to readdress many of the common misconceptions about low back pain by presenting an approach to diagnosis and management firmly supported by evidence. Many readers may be surprised to hear that

the evidence base for low back pain is stronger than for most other common conditions, but amongst this evidence lays little support for the traditional orthopaedic approach. The evidence is presented with great clarity and links very logically with the algorithms for diagnosis and management. These algorithms gravitate towards precision diagnosis and treatment of the anatomical sources of back pain when conservative therapy has failed.

It is essential reading for:

1. People involved in musculoskeletal medicine and medicolegal work
2. Rehabilitation providers
3. Physical therapists
4. Workcover and other insurance providers
5. Independent medical assessors.

It would be a very useful reference text for general practitioners and supersedes most other books in this arena, which all too often are laced with opinion and hyperbole. Especially useful are the sections on history, imaging and management. These sections will save a lot of nail biting amongst practitioners who are scared of missing dangerous conditions or who think they need to routinely refer low back pain patients to orthopaedic surgeons or rheumatologists. Health economists may also find the concepts in this book informative as cost savings abound in this billion dollar health expenditure pit.

**- Review by Dr Scott Masters, Musculoskeletal Medicine, Caloundra**

## Medical Orthopaedics. Conservative Management of Musculoskeletal Impairments, by Renee Cailliet

It is a monumental task to cover this huge topic in 200 pages. Professor Cailliet has, however, been writing on this topic for the last three decades and has a knack for simplifying complex subjects. He has previously found a receptive audience of over one million people. Undoubtedly, there is a thirst for knowledge in this field as it is a common reason for seeking healthcare, but one ignored in large by undergraduate training and hospital medicine, especially in Australia. A great pity indeed as a recent MJA article<sup>1</sup> revealed musculoskeletal disability to be the commonest cause of disability across all age groups in Australia.

In the Decade of the Bone and Joint it is encouraging that this black hole of medical education is receiving increasing attention. Professor Cailliet's book would be most attractive to the novice with little previous exposure to the

field. It is easy to read, well illustrated, and directive. The perspicacious reader, however, will be left unfulfilled. The peripheral joints are touched on so briefly I was left wondering why the author bothered at all. No mention was made of tendinopathies or frozen shoulder syndrome and the knee chapter was five pages long.

On the positive side there is reasonable coverage of low back and neck pain with the importance of ruling out red flags, avoiding rest, confident explanation, attention to psychosocial factors and limiting radiological exposure emphasised. Chronic regional pain (CRP) and fibromyalgia are awarded a chapter each. Both are syndromes whose pathophysiology are yet to be unravelled but describe a group of patients who seek help frequently and widely. Dissemination of quality information about both these topics is vital and this book helps in that task.

Strangely there is little reference throughout the text to the level of evidence for statements. Instead we are given statements such as "therapists agree", "exercises are desirable" and "salicylates are of value". I suspect many readers would like to know more about the effect size of treatments rather than these global type proclamations.

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**- Review by Dr Scott Masters, Musculoskeletal Medicine, Caloundra**

# Journal Abstracts

*This section aims to update the reader with some of the more significant musculoskeletal research published in the last year which is listed on the Medline and CINAHL databases.*

## NECK

**Ylinen J, Takala EP, Nykanen M, Hakkinen A, et al. Active neck muscle training in the treatment of chronic neck pain in women: a randomized controlled trial. *JAMA* 2003; 289(19): 2509.**

*Context.* Active physical training is commonly recommended for patients with chronic neck pain; however, its efficacy has not been demonstrated in randomized studies.

*Objective.* To evaluate the efficacy of intensive isometric neck strength training and lighter endurance training of neck muscles on pain and disability in women with chronic, nonspecific neck pain.

*Design.* Examiner-blinded randomized controlled trial conducted between February 2000 and March 2002.

*Setting.* Participants were recruited from occupational health care systems in southern and eastern Finland.

*Patients.* A total of 180 female office workers between the ages of 25 and 53 years with chronic, nonspecific neck pain.

*Interventions.* Patients were randomly assigned to either 2 training groups or to a control group, with 60 patients in each group. The endurance training group performed dynamic neck exercises, which included lifting the head up from the supine and prone positions. The strength training group performed high-intensity isometric neck strengthening and stabilization exercises with an elastic band. Both training groups performed dynamic exercises for the shoulders and upper extremities with dumbbells. All groups were advised to do aerobic and stretching exercises regularly 3 times a week.

*Main outcome measures.* Neck pain and disability were assessed by a visual analog scale, the neck and shoulder pain and disability index, and the Vernon neck disability index. Intermediate outcome measures included mood assessed by a short depression inventory and by maximal isometric neck strength and range of motion measures.

*Results.* At the 12-month follow-up visit, both neck pain and disability had decreased in both training groups compared with the control group ( $P < .001$ ). Maximal isometric neck strength had improved flexion by 110%, rotation by 76%, and extension by 69% in the strength training group. The respective improvements in the endurance training group were 28%, 29%, and 16% and in the control group were 10%, 10%, and 7%. Range of motion had also improved statistically significantly in both training groups compared with the control group in rotation, but only the strength training group had statistically significant improvements in lateral flexion and in flexion and extension.

*Conclusions.* Both strength and endurance training for 12 months were effective methods for decreasing pain and disability in women with chronic, nonspecific neck pain. Stretching and fitness training are commonly advised for patients with chronic neck pain, but stretching and aerobic exercising alone proved to be a much less effective form of training than strength training.

**Comment:** This study reports good results for both strength and endurance training exercises for chronic neck pain in women. Other RCTs have not had such good results. The authors speculate that there may be several reasons for this. Firstly, they excluded people with fibromyalgia and included only those motivated for rehabilitation. One hundred and eighty people were selected for the trial but no information was given on how many applicants were rejected and the reasons for their exclusion. This would have been valuable information on the utility of this treatment. The exercises were relatively low-tech involving theraband and dumbbells and being performed at home after initial supervision. – *Scott Masters*

**Sterling M, Jull G, Vicenzino B, Kenardy J. Characterization of**

**acute whiplash-associated disorders. *Spine* 2004; 29(2):182-88.**

*Study Design.* An experimental study of motor and sensory function and psychological distress in subjects with acute whiplash injury.

*Objectives.* To characterize acute whiplash injury in terms of motor and sensory systems dysfunction and psychological distress and to compare subjects with higher and lesser levels of pain and disability.

*Summary of Background Data.* Motor system dysfunction, sensory hypersensitivity, and psychological distress are present in chronic whiplash associated disorders (WAD), but little is known of such factors in the acute stage of injury. As higher levels of pain and disability in acute WAD are accepted as signs of poor outcome, further characterization of this group from those with lesser symptoms is important.

*Materials and Methods.* Motor function (cervical range of movement [ROM], joint position error [JPE], activity of the superficial neck flexors [EMG] during a test of cranio-cervical flexion), quantitative sensory testing (pressure, thermal pain thresholds, and responses to the brachial plexus provocation test), and psychological distress (GHQ-28, TAMPA, IES) were measured in 80 whiplash subjects (WAD II or III) within 1 month of injury, as were 20 control subjects.

*Results.* Three subgroups were identified in the cohort using cluster analysis based on the Neck Disability Index. Those with mild, moderate, or severe pain and disability. All whiplash groups demonstrated decreased ROM and increased EMG compared with the controls (all  $P < 0.01$ ). Only the moderate and severe groups demonstrated greater JPE and generalized hypersensitivity to all sensory tests (all  $P < 0.01$ ). The three whiplash subgroups demonstrated evidence of psychological distress, although this was greater in the moderate and severe groups. Measures of psychological distress did not impact on between group differences in motor or sensory tests.

## Journal Abstracts

**Conclusions.** Acute whiplash subjects with higher levels of pain and disability were distinguished by sensory hypersensitivity to a variety of stimuli, suggestive of central nervous system sensitization occurring soon after injury. These responses occurred independently of psychological distress. These findings may be important for the differential diagnosis of acute whiplash injury and could be one reason why those with higher initial pain and disability demonstrate a poorer outcome.

**Comment.** This study from the University of Queensland Physiotherapy Department analysed 80 whiplash patients looking to see if it was possible to divide them into subgroups for prognostic value. They found the main distinguishing feature between patients with severe levels of pain and disability and those with mild levels was generalised hypersensitivity to a range of stimuli. This suggested that central sensitisation occurred soon after injury. This sensitisation was unrelated to levels of psychological distress. The paper suggests that addressing the sensitisation issue early in WAD patients may provide new answers to management issues. – *Dr Scott Masters*

**Miettinen T, Leino E, Airaksinen O, Lindgren KA. The possibility to use simple validated questionnaires to predict long-term health problems after whiplash injury. *Spine* 2004; 1; 29(3):E47-51.**

**Study Design.** A prospective follow-up study.

**Objectives.** To evaluate the relation of the state of health before the accident and the significance of the symptoms reported soon after the injury to the situation 3 years after the injury. To evaluate the possibility of using simple validated questionnaires to predict long-term health problems after the injury.

**Summary of Background Data.** A whiplash injury is generally benign in its natural course. However, some of the patients have diverse and prolonged symptoms. Although several prognostic factors have been suggested for the poor recovery, in most cases the factors leading to prolonged disability re-

main unclear.

**Methods.** In collaboration with traffic insurance companies, we gathered information of neck injuries that occurred in traffic accidents in Finland in 1998. After the insurance company received a notification of a neck injury and consent from the injured party to participate in the study, they sent the information to the research team. The first inquiry was sent to the patients as soon as possible. One- and three-year follow-up questionnaires were posted to those who responded to the first inquiry. A total of 144 persons returned the 3-year follow-up questionnaires and form the material of this study.

**Results.** A poor state of health or frequent neck pain or headache before the accident did not have any significant relation to the poor outcome 3 years after the accident. The extent of neck pain and lower back pain reported soon after the accident was significantly associated to a poor outcome in the follow-up. The Neck Disability Index questionnaire was significantly related to the poor outcome after 3 years.

**Conclusions.** The subjective experience of a notably decreased level of activity because of the neck pain when supplemented by the enhanced score of Neck Disability Index questionnaire predicts well poor outcome in long-term follow-up and can be used as a tool to identify persons who are at risk to suffer long-term health problems after whiplash injury.

**Comment.** The interesting result of this Finnish study is the lack of relationship between pre-morbid health and outcome. The other results confirm previous studies associating poor outcomes with initial pain and disability levels. – *Dr Scott Masters*

### HEADACHE

**Govind J, King W, Bailey B, Bogduk N. Radiofrequency neurotomy for the treatment of third occipital headache. *J Neurol Neurosurg Psychiatry* 2003; 74(1): 88-93.**

**Objective.** To evaluate the efficacy of a revised technique of percutaneous radiofrequency neurotomy for third occipital headache.

**Methods.** The revisions included us-

ing a large gauge electrode, ensuring minimum separation between the three electrode placements, and holding the electrode in place by hand. The revised technique was used to treat 51 nerves in 49 patients diagnosed as suffering from third occipital headache on the basis of controlled diagnostic blocks of the third occipital nerve. The criteria for successful outcome were complete relief of pain for at least 90 days associated with restoration of normal activities of daily living, and no use of drug treatment for the headache.

**Results.** Of the 49 patients, 43 (88%) achieved a successful outcome. The median duration of relief in these patients was 297 days, with eight patients continuing to have ongoing relief. Fourteen patients underwent a repeat neurotomy to reinstate relief, with 12 (86%) achieving a successful outcome. The median duration of relief in these patients was 217 days, with six patients having ongoing relief. Side effects of the procedure were consistent with coagulation of the third occipital nerve and consisted of slight ataxia, numbness, and temporary dysaesthesia. No side effects required intervention, and they were tolerated by the patients in exchange for the relief of headache.

**Conclusions.** Use of the revised procedure greatly improved the rather low success rate previously encountered with third occipital neurotomy. Although the relief of headache is limited in duration, it is profound and can be reinstated by repeat neurotomy. No other form of treatment has been validated for this common form of headache.

**Comment.** The clinical research into RFN continues from Newcastle with an updated technique for the 3<sup>rd</sup> occipital nerve. The superior results with this technique suggest it should be standard for anyone performing the procedure. To date however, there is no formal accreditation procedure for RFN, and its usage around Australia remains very operator dependent. – *Dr Scott Masters*

### LOW BACK PAIN

**Fritzell P, Hagg O, Jonsson D, Nordwall A. Cost-Effectiveness of**

**Lumbar Fusion and Nonsurgical Treatment for Chronic Low Back Pain in the Swedish Lumbar Spine Study. A Multicenter, Randomized, Controlled Trial From the Swedish Lumbar Spine Study Group. *Spine* 2004; 29 (4): 421-34.**

*Study Design.* A cost-effectiveness study was performed from the societal and health care perspectives.

*Objective.* To evaluate the costs-effectiveness of lumbar fusion for chronic low back pain (CLBP) during a 2-year follow-up.

*Summary of Background Data.* A full economic evaluation comparing costs related to treatment effects in patients with CLBP is lacking.

*Patients and Methods.* A total of 284 of 294 patients with CLBP for at least 2 years were randomized to either lumbar fusion or a nonsurgical control group. Costs for the health care sector (direct costs), and costs associated with production losses (indirect costs) were calculated. Societal total costs were identified as the sum of direct and indirect costs. Treatment effects were measured using patient global assessment of improvement, back pain (VAS), functional disability (Oswestry), and return to work.

*Results.* The societal total cost per patient (standard deviations) in the surgical group was significantly higher than in the nonsurgical group. Swedish kroner (SEK) 704,000 (254,000) vs SEK 636,000 (208,000). The cost per patient for the health care sector was significantly higher for the surgical group, SEK 123,000 (60,100) vs 65,200 (38,400) for the control group. All treatment effects were significantly better after surgery. The incremental cost-effectiveness ratio (ICER), illustrating the extra cost per extra effect unit gained by using fusion instead of nonsurgical treatment, were for improvement. SEK 2,600 (600-5,900), for back pain. SEK 5,200 (1,100-11,500), for Oswestry. SEK 11,300 (1,200-48,000), and for return to work. SEK 4,100 (100-21,400).

*Conclusion.* For both the society and the health care sectors, the 2-year costs for lumbar fusion was significantly higher compared with nonsurgical treatment but all treatment effects were significantly in favour of surgery.

The probability of lumbar fusion being cost-effective increased with the value put on extra effect units gained by using surgery.

*Comment.* Hats off to the Swedish doctors who ran this study as it was a very comprehensive look at cost-benefit of surgical versus non-surgical treatments for chronic LBP. An assumption seems to be made in this study that these patients had discogenic pain. No mention of any diagnostic tests is mentioned. Considering it was Swedish, I wondered whether these patients had been through Dr Blomberg's "Stay Active" clinic before surgery. — *Dr Scott Masters*

**Pauza KJ, Howell S, Dreyfuss P, et al. 2003 Outstanding Paper Award. Nonoperative Science. A randomized, placebo-controlled trial of intradiscal electrothermal therapy for the treatment of discogenic low back pain. *Spine* 2004; 4 (1): 27-35.**

*Background Context.* Intradiscal electrothermal therapy (IDET) is a treatment for discogenic low back pain the efficacy of which has not been rigorously tested.

*Purpose.* To compare the efficacy of IDET with that of a placebo treatment.

*Study Design/Setting.* Randomized, placebo-controlled, prospective trial.

*Patient Sample.* Patients were recruited by referral and the media. No inducements were provided to any patient in order to have them participate. Of 1,360 individuals who were prepared to submit to randomization, 260 were found potentially eligible after clinical examination and 64 became eligible after discography. All had discogenic low back pain lasting longer than 6 months, with no comorbidity. Thirty-seven were allocated to IDET and 27 to sham treatment. Both groups were satisfactorily matched for demographic and clinical features.

*Methods.* IDET was performed using a standard protocol, in which the posterior annulus of the painful disc was heated to 90 C. Sham therapy consisted of introducing a needle onto the disc and exposing the patient to the same visual and auditory environment as for a real procedure. Thirty-two

(85%) of the patients randomized to the IDET group and 24 (89%) of those assigned to the sham group complied fully with the protocol of the study, and complete follow-up data are available for all of these patients.

*Outcome Measures.* The principal outcome measures were pain and disability, assessed using a visual analogue scale for pain, the Short Form (SF)-36, and the Oswestry disability scale.

*Results.* Patients in both groups exhibited improvements, but mean improvements in pain, disability and depression were significantly greater in the group treated with IDET. More patients deteriorated when subjected to sham treatment, whereas a greater proportion showed improvements in pain when treated with IDET. The number needed to treat, to achieve 75% relief of pain, was five. Whereas approximately 40% of the patients achieved greater than 50% relief of their pain, approximately 50% of the patients experienced no appreciable benefit.

*Conclusions.* Nonspecific factors associated with the procedure account for a proportion of the apparent efficacy of IDET, but its efficacy cannot be attributed wholly to a placebo effect. The results of this trial cannot be generalized to patients who do not fit the strict inclusion criteria of this study, but IDET appears to provide worthwhile relief in a small proportion of strictly defined patients undergoing this treatment for intractable low back pain.

*Comment.* A minimally invasive intervention for the management of discogenic back pain would be very handy indeed. The results of the first placebo-controlled trial into IDET have thus been eagerly awaited and have confirmed that the procedure is superior to placebo intervention. However, it is evident that a large part of the effect is nonspecific and probably just related to "having an intervention". The authors warn that no other surgical procedure for discogenic pain has undergone placebo-controlled trial and suggest that this should be compulsory before any acceptance as a legitimate intervention. Time will tell whether the disc replacement surgeons take up the challenge. — *Dr Scott Masters*

## Journal Abstracts

**Yelland MJ, Glasziou PP, Bogduk N, Schluter PJ, McKernon M. Prolotherapy injections, saline injections, and exercises for chronic low-back pain: a randomized trial. *Spine* 2004; 29(1): 9-16; discussion 16.**

**Objectives.** To assess the efficacy of a prolotherapy injection and exercise protocol in the treatment of chronic nonspecific low back pain.

**Design.** Randomized controlled trial with two-by-two factorial design, triple-blinded for injection status, and single-blinded for exercise status.

**Setting.** General practice.

**Participants.** One hundred ten participants with nonspecific low-back pain of average 14 years duration were randomized to have repeated prolotherapy (20% glucose/0.2% lignocaine) or normal saline injections into tender lumbo-pelvic ligaments and randomized to perform either flexion/extension exercises or normal activity over 6 months.

**Main outcome measures.** Pain intensity (VAS) and disability scores (Roland-Morris) at 2.5, 4, 6, 12, and 24 months.

**Results.** Follow-up was achieved in 96% at 12 months and 80% at 2 years. Ligament injections, with exercises and with normal activity, resulted in significant and sustained reductions in pain and disability throughout the trial, but no attributable effect was found for prolotherapy injections over saline injections or for exercises over normal activity. At 12 months, the proportions achieving more than 50% reduction in pain from baseline by injection group were glucose-lignocaine: 0.46 versus saline: 0.36. By activity group these proportions were exercise: 0.41 versus normal activity: 0.39. Corresponding proportions for >50% reduction in disability were glucose-lignocaine: 0.42, versus saline 0.36 and exercise: 0.36, versus normal activity: 0.38. There were no between group differences in any of the above measures.

**Conclusions.** In chronic nonspecific low-back pain, significant and sustained reductions in pain and disability occur with ligament injections, irrespective of the solution injected or the concurrent use of exercises.

**Comment:** This study by Michael

Yelland and colleagues from the University of Queensland and the University of Newcastle found no attributable effects of the glucose-lignocaine and exercise components of the prolotherapy treatment.

However, 20% of patients in the prolotherapy group with very persistent pain for average duration 14 years achieved complete relief from their pain at 12 months follow-up. Another 26% achieved greater than 50% reduction in pain from baseline. Nine per cent achieved zero disability scores. The trend was in favor of prolotherapy for all measures, but did not reach statistical significance.

The median of minimal acceptable reductions to make treatment worthwhile nominated by patients was 25% for pain and 35% for disability. At 12 months, the proportion of all participants who achieved this was 55% for pain, and 54% for disability.

The absence of effect of sagittal loading exercises contrasts with effects seen in other trials of exercise. Sagittal loading has less effect on muscles such as quadratus lumborum and piriformis, and also other ligamentous and capsular structures, which may be important, and may benefit from the addition of a rotational component to the stretching.

The trial's success rates in treating pain and disability are at least as good as reported outcomes for spinal cord stimulation,<sup>1</sup> surgery,<sup>2</sup> or multidisciplinary treatment.<sup>3</sup>

Possible causes of the effects obtained include regression to the mean. This is less likely to be an adequate explanation given the chronicity of the pain, and the fact that trial applicants with acute exacerbations of their pain were excluded from entry.

The similarity in results between the groups raises the question of the mechanism being a needling effect, independent of any injectant used.

There is evidence that six treatments is more effective than the three treatments used in the trial by Dechow et al, in which there was no change in mean pain or disability in either group at six months.<sup>4</sup> This suggests that the number of treatments may be very important. The other two randomized, double-blind trials of prolotherapy for chronic

low back pain,<sup>5, 6</sup> have utilized six treatments, saline and lignocaine controls respectively, and initial manipulation as a co-intervention.

Possibly there is some cumulative effect of the needling treatment, or is it that the patient with chronic pain is responding to confident treatment from a caring doctor?

There was a high incidence of transient, minor adverse effects, especially an initial increase in pain and stiffness, headaches, nausea, diarrhea, and other symptoms, so patients need to be forewarned about these. Interestingly, there was no difference in the incidence of these adverse effects between the active treatment group and the saline control group, irrespective of allocation to exercise or normal activity.

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- Dr David Roselt

### KNEE

**Raynauld J-P, Buckland-Wright C, Ward R, et al. Safety and efficacy of long-term intraarticular steroid injections in osteoarthritis of the knee:**

**a randomized, double-blind, placebo-controlled trial. *Arthritis Rheum* 2003; 48 (2): 370-77.**

*Objective.* To evaluate the safety and efficacy of long-term intraarticular (IA) steroid injections for knee pain related to osteoarthritis (OA).

*Methods.* In a randomized, double-blind trial, 68 patients with OA of the knee received IA injections of triamcinolone acetonide 40 mg (34 patients) or saline (34 patients) into the study knee every 3 months for up to 2 years. The primary outcome variable was radiologic progression of joint space narrowing of the injected knee after 2 years. Measurements of minimum joint space width were performed by an automated computerized method on standardized fluoroscopically guided radiographs taken with the patient standing and with the knee in a semi-flexed position. The clinical efficacy measure of primary interest was the pain subscale from the Western Ontario and McMaster Universities OA Index (WOMAC). Efficacy measures of secondary interest were the total score on the WOMAC, physician's global assessment, patient's global assessment, patient's assessment of pain, range of motion (ROM) of the affected knee, and 50-foot walking time. Clinical symptoms were assessed just before each injection.

*Results.* At the 1-year and 2-year follow-up evaluations, no difference was noted between the two treatment groups with respect to loss of joint space over time. The steroid-injected knees showed a trend toward greater symptom improvement, especially at 1 year, for the WOMAC pain subscale, night pain, and ROM values ( $P = 0.05$ ) compared with the saline-injected knees. Using area under the curve analyses, knee pain and stiffness were significantly improved throughout the 2-year study by repeated injections of triamcinolone acetonide, but not saline ( $P < 0.05$ ).

*Conclusion.* Our findings support the long-term safety of IA steroid injections for patients with symptomatic knee OA. No deleterious effects of the long-term administration of IA steroids on the anatomical structure of the knee were noted. Moreover, long-term treatment of knee OA with repeated steroid

injections appears to be clinically effective for the relief of symptoms of the disease.

**Comment:** This study from Montreal, Quebec, in Canada, is a major landmark double blind controlled trial looking at an important intervention for knee pain. Knee OA is a condition involving degradation and repair of cartilage, bone, and synovium.

There can be secondary components of inflammation. Clinically there is gradual onset of pain, stiffness, and loss of joint range of movement. There is some evidence from animal models of OA to suggest steroids exert protective effects, reducing severity of cartilage lesions, and the size of osteophytes.

Pain relief is still a major goal in treatment. There have been concerns that relieving the pain with steroids may lead to overuse, and aggravate joint and cartilage damage, or lead to tissue atrophy, especially if used repeatedly as a definitive treatment. Intra-articular steroids have been used for more than 40 years, but some clinicians have restricted their use to when obvious joint effusion is present, for fear of side-effects.

Published studies on long-term effects have been missing, with most studies restricted to follow-up of only several weeks. This is despite the fact in vitro and in vivo studies in experimental models have shown a reduction in progression of structural damage.

This important two-year, double blind, saline controlled study showed long-term injections of IA steroids over two years did not have a deleterious effect on knee anatomy. A strong trend towards greater clinical improvement in the IA group was shown over normal saline. The difference was statistically significant for pain and stiffness when area under the curve (AUC) analysis was made. It is more appropriate for capturing long-term differences in efficacy between the groups. Repeated IA injections of steroid for pain relief were not associated with accelerated disease progression, and appear to be safe. There were no infections or acute flares following steroid injections in this study. - *Dr David Roselt*

**Arroll B, Goodyear-Smith F. Corticosteroid injections for osteoarthritis of the knee: meta-analysis. *BMJ* 2004; 328: 869-73.**

*Objectives.* To determine the efficacy of intra-articular corticosteroid injections for osteoarthritis of the knee and to identify numbers needed to treat.

*Data sources.* Cochrane controlled trials register, Medline (1966 to 2003), Embase (1980 to 2003), hand searches, and contact with authors.

*Inclusion criteria.* Randomized controlled trial in which the efficacy of intra-articular corticosteroid injections for osteoarthritis of the knee could be ascertained.

*Results.* In high quality studies, the pooled relative risk for improvement in symptoms of osteoarthritis of the knee at 16-24 weeks after intra-articular corticosteroid injections was 2.09 (95% confidence interval 1.2 to 3.7) and the number needed to treat was 4.4. The pooled relative risk for improvement up to two weeks after injections was 1.66 (1.37 to 2.0). In the statistically significant studies the numbers needed to treat to get one improvement was 1.3 to 3.5 patients.

*Conclusion.* Evidence supports short term (up to two weeks) improvement in symptoms of osteoarthritis of the knee after intra-articular corticosteroid injection. Significant improvement was also shown in the only methodologically sound studies addressing longer term response (16-24 weeks). A dose equivalent to 50 mg of prednisone may be needed to show benefit at 16-24 weeks.

**Comment:** This important meta-analysis comes from the Department of General Practice and Primary Health Care, University of Auckland, and is hot off the press. Ten per cent of people in Western Europe aged 55 or over will have painful disabling osteoarthritis (OA) of the knee, with a quarter being severely disabled. Similar figures are likely to apply in Australia. Without joint replacement, treatment aims include pain relief and improvement of function. This is the first meta-analysis looking at this topic, and the first to show benefits of such injections in improvement of symptoms ex-

## Journal Abstracts

tending beyond 16 weeks. Trials have often used one injection at low dose in the past. The authors also felt that subjective pain scales may be an insensitive outcome measure in this setting. They felt that improvement in symptoms was a better measure than increases in range of movement or pain reduction.

The study highlights the therapeutic utility of this approach with low clinically significant numbers needed to treat, and validates this conservative office-based treatment approach that may have been underutilized to date. It included the study of Raynauld et al<sup>1</sup> that showed preservation of joint space at two years. Overall, no important side effects were encountered in the trials other than transient redness and discomfort.

The studies were small; however, statistical significance was achieved. The authors went to great lengths to identify all available research to minimize the impact of possible publication bias, where negative trials are not published, possibly leading to overestimation of positive benefits.

The evidence suggests that a dose of 20 mg of triamcinolone, which is equivalent to 25 mg of prednisolone, was efficacious in terms of pain control at two weeks. The only study using 40 mg with injections repeated every three months found benefit for night pain and stiffness at 24 months based on area under the curve analysis.<sup>1</sup> This suggests doses of 50 mg equivalent of prednisolone is needed to obtain benefit out to 16-24 weeks. No evidence to date supports promotion of disease progression by corticosteroid use.

One study found predicting benefit was not possible.<sup>2</sup> Another found that if synovial fluid could be aspirated, there was a better response.<sup>3</sup> This occurred only in the intervention group however, so it was not just a difference in the accuracy of needle placement, and suggests increased efficacy when clear evidence of synovitis and inflammation is present. The use of joint lavage in addition to corticosteroid injection probably warrants further study.

1. Raynauld J, Buckland-Wright C, Ward R, et al. Safety and efficacy of long-term intra-articular steroid injections in

osteoarthritis of the knee. *Arth Rheum* 2003; 48: 370-77.

2. Jones A, Doherty M. Intra-articular corticosteroids are effective in osteoarthritis but there are no clinical predictors of response. *Ann Rheum Dis* 1996; 55: 829-32.

3. Gaffney K, Ledingham J, Perry JD. Intra-articular triamcinolone hexacetamide in knee osteoarthritis: factors influencing the clinical response. *Ann Rheum Dis* 1995; 54: 379-81.

- Dr David Roselt

### **Bachmann LM, Haberzeth S, Steurer J, ter Riet G. The accuracy of the Ottawa knee rule to rule out knee fractures: a systematic review. *Ann Intern Med* 2004; 140 (2): 121- 24.**

**Background.** The Ottawa knee rule is a clinical decision aid that helps rule out fractures and avoid unnecessary radiography.

**Purpose.** To summarize evidence about the accuracy of the Ottawa knee rule.

**Data Sources.** Relevant English- and non-English-language articles were identified from PreMEDLINE and MEDLINE (1966-2003), EMBASE (1980-2003), CINAHL (1982-2003), BIOSIS (1990-2003), the Cochrane Library (2002, Issue 3), the Science Citation Index database, reference lists of included studies, and experts.

**Study Selection.** Articles were included if they reported enough information to determine the sensitivity and specificity of the Ottawa knee rule for detecting fractures confirmed either radiologically or in combination with follow-up.

**Data Extraction.** Two reviewers independently extracted data on study samples, the ways that the Ottawa knee rule was used, and methodological characteristics of studies.

**Data Synthesis.** Of 11 identified studies, 6 involving 4249 adult patients were considered appropriate for pooled analysis. The pooled negative likelihood ratio was 0.05 (95% CI, 0.02 to 0.23), the pooled sensitivity was 98.5% (CI, 93.2% to 100%), and the pooled specificity was 48.6% (CI, 43.4% to 51.0%).

**Conclusion.** A negative result on an Ottawa knee rule test accurately excluded knee fractures after acute knee

injury. However, because the rule is calibrated toward 100% sensitivity and actual fracture prevalence is usually low, large-scale, multi-centered studies are still needed to establish the cost-effectiveness of routinely implementing the rule.

**Comment:** This systematic review is from Zurich University, Switzerland.

The Ottawa knee rule, developed in 1995 by Stiell et al, has been validated in several clinical settings, and<sup>1</sup> consists of five "yes-no" items, asking

1. Is the patient 55 years or older?
2. Is there isolated tenderness of the patella?
3. Is there tenderness of the head of the fibula?
4. Is there inability to flex the knee to 90 degrees?
5. Is there inability to bear weight, both immediately, and in the emergency department, for four steps?

Patients with at least one positive answer are considered to have positive indication of knee fracture, and radiology is advised. There is evidence that an all-negative answer is highly effective in excluding fracture, without having to resort to unnecessary radiology, which is the purpose of the exercise. Even modest values for specificity can markedly reduce the number of unnecessary radiographs. The threshold for the Ottawa knee rule is calibrated towards very high sensitivity to avoid false negatives and missed fractures. There will still be a substantial proportion of false positives, which will be excluded by plain radiography or CT if indicated which remains the criterion standard for diagnosing bony fractures.

The pooled negative likelihood ratio was 0.05% (CI, 0.02 to 0.23) in adults. The study in children found a negative likelihood ratio of 0.16 (CI, 0.02 to 1.04). In the studies assessing the Ottawa knee rule in adults, the probability of fracture after a negative test result, assuming a fracture prevalence of 7%, based on previous studies, was 0.37% (CI, 0.15% to 1.48%).

In children, the probability was 2% (CI, 0.3% to 12%); hence the rule should not be relied on here.

The authors suggest there is still need for more validation studies, and

then an independent replication of the previous cost-effectiveness study.

Most knee injuries result from a direct blow, a fall, or a twisting injury. Blows and falls, blunt injuries, account for 25% of knee injuries, but more than 80% of all knee fractures.<sup>2</sup> The incidence of fracture after a blunt injury is four times higher than with a twisting injury, so injury mechanism has some predictive value, but was not considered by most of the studies examined by this review.<sup>2</sup>

1. Stiell IG, Greenberg GH, Wells GA, et al. Derivation of a decision rule for the use of radiography in acute knee injuries. *Ann Emerg Med* 1995; 26: 405-13.

2. Expert Panel on Musculoskeletal Imaging. American College of Radiology ACR Appropriateness Criteria. Acute Trauma to the Knee. Accessed at [www.acr.org/dyna/?id=apperit&pdf=0365-374\\_acute\\_trauma\\_to\\_knee\\_ac](http://www.acr.org/dyna/?id=apperit&pdf=0365-374_acute_trauma_to_knee_ac) on 22 August 2003.

- Dr David Roselt

# Education Committee Report

Montreux, September, 2004

*Dr Glen Gorm Rasmussen, Chairman Education Committee*

(Editor's Note: The following document has been edited from a PowerPoint presentation given by the chairman of the Education Committee to the General Assembly at Montreux, Switzerland. Any unintentional misunderstanding or any errors of interpretation are the sole responsibility of the Secretary-General.)

**T**his is not a long report, although it is pleasing to state that the Education Committee has never been better prepared to set prioritized goals and reach them. We are pleased with the standard of the work achieved and the effort undertaken by all committee members.

## **Members of the Education Committee, September 2002**

Marcus Hanna (Austria), vice-chairman  
Assisted by Prof Hans Tilscher  
Guido Brugnoni (Italy)  
Egon Frolich (Germany)  
Prof Joan Garcia Alsina (Spain)  
Marc-Henri Gauchat (Switzerland)  
Prof Michael Kuchera (USA)  
Jukka Manevaara (Finland)  
John Tanner (UK)  
Marie Jose Tessandier (France)  
Assisted by Jean Yves Maigne  
Prof Norm Broadhurst (Australia/New Zealand)  
Glen Gorm Rasmussen, chairman

Changes to the committee occurred in the summer of 2003 as follows: Massino Groppi (Italy) replaced Guido Brugnoni; Matthias Psczolla (Germany) replaced Egon Frolich; Jehan Lecocq (France) replaced Marie Jose Tessandier.

As chairman I would like to thank those retiring for their diligent work and contribution to the Education Committee of the FIMM.

The year in general had both good and bad aspects. Good news: not too much money spent. Bad news: too little work done.

Unfortunately it costs a lot of money for workshops and the ultimate progression of goals is reached through

the combined aspects of the workshops. With limited finances the speed of reaching goals is unfortunately slow.

During the year a subcommittee was established to review both the glossary and the inventory. The importance of definite terms has been emphasised by Scientific Chairman Jacob Patijn. Those serving on the subcommittee on the Glossary are Michael Kuchera, Jehan Lecocq, Matthia Psczolla, Joan Garcia Alsina.

## **Planning of EC program for coming year**

- Revision of strategy and long-range aims of the EC
- Redefining future tasks
- Further development of Masters course
- Interactive internet working groups
- Hands-on workshops on diagnostic and therapeutic procedures
- Defining tasks for Scientific Committee essential to the EC
- Implementing results from the SC into the education programs
- Further work on glossary/inventory – inventory of diagnostic and therapeutic procedures, including reliability and validity.
- Definition of manipulable lesion
- Co-operation with SC in establishing the Academy
- CD Rom edition of tests and techniques

## **Budget problems for the Education Committee**

The last workshop in Vienna 2002 had expenses of CHF 12,314 and the budget for EC 2002/3 was CHF 8,000.

The lowest cost for a workshop in Bratislava 2003 was estimated to be CHF 12,000. Following discussion with the president and treasurer, this workshop was cancelled.

The estimated budget for the 2004 EC function is about CHF 20,000. Therefore, a workshop may not be possible.

Costs for mini-meetings, internet activities, and co-ordination functions estimated to be CHF 10,000.

## **Planning of the EC for 2003**

- No workshop was possible
- President of FIMM together with the SC chairman and the EC chairman met in Amsterdam, June 20-21, for revision of strategy.
- Following the meeting the EC members requested for their opinion on the future tools and goals of the committee.
- Much more work to be done via email and later blackboard/chat on the internet.
- Propositions were sent out to EC members:
  - Further work on the FIMM Glossary with translation into different languages
  - Second and improved curriculum of the basic Education Course (300 hours)
  - Planning a Master's Degree (eventually a joint venture with universities)
  - Collection of programs from the different schools via internet
  - Preparing intervention for the different schools to participate with posters and workshops at the FIMM Congress in Bratislava, September 2004
  - Further development of the international exchange program
  - Inventory of diagnostic tests and therapeutic techniques, including CD Rom and video
  - Definition of segmental dysfunction/manipulable lesions
  - Definition of manual/musculoskeletal medicine education on diagnostic and therapeutic strategies
  - Establishing instructional course on reproducibility by the SC
  - A request for any other information from EC members

## **Results of questionnaire**

- Glossary subcommittee (four-language presentation)
- Inventories to include video/CD Rom
- Improved version of curriculum
- Collection of various national pro-

- grams
- Definition of segmental dysfunction/manipulable lesion
- Definition of manual/musculoskeletal lesion
- Masters degree
- Diagnostic/therapeutic strategies
- Instructional course on reproducibility
- Posters/workshops in Bratislava

There were two negative responses:

1. Defining of segmental dysfunction
2. Reworking the curriculum

Therefore, it was decided to set up workshops on the positives.

### **What FIMM needs**

Research  
Education  
Organization  
Money

### **Optimal working conditions**

One meeting of EC per year  
Active working groups  
Society assistance

### **Top Priority**

Basic curriculum  
Advanced curriculum  
University/Masters degree  
EBM attitude orientated education  
Glossary and definitions  
Active participation of EC and Society schools in Bratislava

### **Conclusion**

I wish to thank my colleagues and friends in the EC for all of the enthusiasm and hard work that they have undertaken. Special thanks go to Jacob Patijn of the SC for his ongoing advice and help.

It is the aim of the EC to make all education in manual/musculoskeletal medicine evidence based and to work with the SC to produce a spinal course for reproducibility.

Our ultimate aim is to have a university-based Masters degree.

# Secretary-General AGM Address, 2003

## Montreux, Switzerland

*Ron Palmer, Secretary-General FIMM, September 2003, Montreux*

The past year has been an extremely busy one for me in my role as secretary-general of the FIMM. I have a number of items to report and some observations for the General Assembly. The very size and role of the FIMM is changing. Indeed, the basis of these changes will have a bearing on the future role of the secretary-general's office. All the executive officers of FIMM will also have an evolving and changing role, one which will require more devotion of time and effort. Therefore, I intend to divide this statement into two parts, one concerning what has occurred in the past year and the other about changes I see occurring in the office of secretary-general.

At the outset I would like to thank our president, Bernard Terrier, for all his help, and also my deputy, Michel Dedee. They have each given me support and have been vital in the production of the FIMM News. Any office in an organization like the FIMM has to be one of team management. With an international group of this magnitude, the singular role of the individual is far less important than the total team approach. To advance M/MSM in the international arena requires cohesion and a common direction. There remain differences in philosophy between member nations and a unified approach is required to overcome obstacles that are present or may arise, just through being associated. Simply, the way forward must be by a universal evidence-based scientific approach. In the evolving world of medicine, past dogma is justifiably dead.

### **Year achievements**

New members

New applicants

Communication with member societies

Up-dating society executive addresses

FIMM Newsletter

Distribution of FIMM research material

Swiss society back-up office

A brief summary of each of these

achievements is listed.

### **New members**

South Korea and Canada have been welcome as new FIMM member societies.

I have had good contact with their executive Board and look forward to even better inter-medical contact in the future. There is little point in having member nations if we cannot work together.

South Korea has made a proposal that will be discussed during the course of this AGM.

### **New applicants**

Japan and Bulgaria have indicated that they wish to join FIMM. It is good to see an expansion of FIMM and even better to see contact with Asia. I have had a chance to review some material from Japan and can say that their society appears well advanced in both education and science associated with M/MSM. Likewise, I have had good email communication with Bulgaria.

### **Communication with member societies**

Every effort to contact all member societies of the FIMM has been undertaken. This has not always been successful. I have tried to reach each member society and advise them of how the FIMM is trying to liaise better with members. The FIMM newsletter has been sent to most members. I have offered all member societies the chance of asking the FIMM executive for help in training their own members, have offered to advertise their society conferences, and indeed advertise any educational programs they run. The accent has been placed on the FIMM being present to help if required.

### **Updating society executive addresses**

This has been extremely difficult because of changes in positions and addresses of their executive officers. The FIMM has not been notified in most cases and tracking down the new details has been difficult. In fact, it took

me 11 months of writing, emailing, phoning, and annoying my colleagues for details. This work would not have been necessary had member society executives let me know of their election results and any changes in address contact. Yes, I am complaining, but as a parent society the FIMM cannot function adequately without these details. Remember, the FIMM is *your* society. I am only doing the job you have given me and co-operation must be reciprocal.

### **FIMM newsletter**

This year the newsletter was produced for the first time. The aim of the newsletter is to give better communication to all members and to be a format for providing information that arises from the EC and SC. It could become a vehicle for publishing scientific work that arises from the proposed Academy. We will try to advertise member society coming events completely free of charge. In addition it would be useful to list member website addresses. The FIMM newsletter is not designed to mirror image the FIMM News and should be seen as a helpful addition to what the FIMM is trying to do in regard to better communication with all member societies. You are requested to forward me any material that your society would care to have published.

### **Distribution of FIMM research material**

All members of the SC have been requested to publish in their own Society journals work that originates from the SC. Richard Ellis is doing a fine job in achieving this through the *Journal of Orthopaedic Medicine*. As secretary-general I have forwarded considerable material to some member societies. We also have continual coverage in *Australasian Musculoskeletal Medicine*. Further material is published in the FIMM newsletter. The office of secretary-general now has a significant role to play in communication, a field not previously developed to its full

potential. This role will continue to expand in the future.

### Swiss society back-up office

The office of secretary-general is vital for the proper functioning of the FIMM and, for that matter, any large international society. It should be apparent to all that in the event of injury or death, there would be confusion in a "hand-over" and both valuable information and time would be lost. It would be foolish to think any individual could efficiently manage any executive office alone. On this basis there has been an effort to establish a back-up office to ensure these problems do not arise. Fortunately, our president has agreed and gratefully the Swiss society has undertaken this role. All relevant material I email to Bernard Terrier and he then passes this on to the Swiss society. It is my opinion that this practice should continue in the future.

### Future development

Functional changes have already taken place in the office of the secretary-general. These changes in this role will continue. I wish to reflect on this matter as I see it as a huge developing problem in the future.

The lack of time is the prime problem. I have no idea how anyone in a full-time medical practice could possibly devote sufficient time to this job and still hold his family together and run a full-time medical position. I speak from considerable experience after one year in this office.

As you are all aware, I was involved in a serious accident that effectively halted my private practice and teaching career. These very factors have enabled me to find the time to devote to the role of secretary-general. A conservative estimate would be 15 hours a week spent on FIMM work, a little more when publishing the FIMM News and the newsletter. This does not take into account time for research work with the Scientific Committee.

I foresee a management problem with running the proposed Academy for the same basic reasons. It will be impossible to devote the time needed to function effectively. Any international society, or for that matter, any large industrial company, would have ex-

actly the same strategic problems. An example is the Australian Medical Association. It has 34,000 members, about the same size as the FIMM but without the multinational connections and the widely differing views held by those members. Here there is a full-time secretarial staff and paid officials.

I see the role of secretary-general becoming a paid full-time position. It would also incorporate managing the day-to-day functions of the Academy. These changes may take time to evolve; yet we should all be aware that it is going to happen.

Any international organization of this size cannot effectively function without proper management. Lack of time means that no individual can hold down a medical position and then devote sufficient time to the FIMM activities to allow the society to run both effectively and smoothly. This of course means there has to be a change in the financial side of the FIMM. I am aware that many would prefer to disregard these thoughts. Burying your head in the sand will not make the matter pass away. I am aware that these are matters for the FIMM executive to solve. However, I raise these points now for I personally have been faced with such problems, even though I am effectively not in practice. The role of secretary-general must continue to expand and therefore the position will become untenable if its current situation continues.

I have raised these points for you to think about. I consider it part of my elected position to bring to your attention problems that can occur. I thank the General Assembly for appointing me as secretary-general and I hope that I can continue to serve you well for the remainder of my term.

# Vale Dr John Martin Bosler

## MB BS 1953 University of Sydney

**D**r John Martin Bosler, of Tamworth, was one of the "founding fathers" of the Australian Association of Musculoskeletal Medicine, and was president of the Association from 1979 to 1983.

Many of our members will hold fond memories of him, and of his work for the Association.

Born in 1927 in Manly to parents Winifred and Wilfred Bosler, John was an active boy who joined the local Scouts Brigade at age seven, and had a lifelong association with the movement. He married Joy Gregory in 1952.

John graduated in medicine from the University of Sydney in 1953. After three years as a resident and locum, he settled in Tamworth in 1956. He was to practise there for the next 48 years, initially in general practice.

He was appointed an honorary surgeon at Tamworth Base Hospital in 1956, and honorary medical officer (surgeon) at that hospital in 1958.

In 1968, John was in a three-man practice with Drs Doug Harbison and Peter Wakeford. Two would work while the third would take it in turn to travel overseas pursuing their respective medical interests.

After four months' study under Dr James Cyriax at St Thomas's Hospital, London, that year, John returned and worked as a specialist in musculoskeletal and manipulative medicine.

He went to congresses in Salzburg, Tokyo (presiding over the 6th session), Prague, Copenhagen, Baden Baden, Rotarua, and Zurich. He was fortunate to be able to take the whole family along in 1968 and 1977. He also presented papers to numerous meetings of medical practitioners in various states of the Commonwealth of Australia.

He was appointed honorary medical officer (physical medicine) in 1970, honorary physician in physical medicine in 1974, and visiting physician in physical medicine in 1978 at Tamworth Base Hospital. In fact, he gave over 45 years of service at the Tamworth Base Hospital. He was president of the Northern District Medical Association for a time.

John was a long-standing member of

the Australian Association of Musculoskeletal Medicine (AAMM). He was chairman of the Committee for Research and Teaching for the Association from 1978 to 1983, and president of the Association for the years 1979 to 1983. He was also a member of the British Association of Manipulative Medicine, and a member of the Australian Rheumatism Association.

He was appointed specialist examiner for the Australian Government Health Service of the Commonwealth Department of Human Services and Health, and for the Commonwealth Department of Veterans' Affairs.

He was a lecturer on back pain for the Barwon Division of General Practice.

He was appointed medical referee for the *Medical Journal of Australia* in 1983, and presented papers at various international conferences relating to physical medicine and back pain.

He attended the Second Interdisciplinary World Congress on Low Back Pain in San Diego, USA, in November 1995; the annual scientific meeting of the Australian Pain Society in the Ayers Rock Resort, NT, in April 1997; the annual scientific meeting of the AAMM on Low Back Pain in General Practice in Melbourne, Victoria, in August 1997; the 12<sup>th</sup> Triennial World Congress of the International Federation of Musculoskeletal Medicine (FIMM) at Broadbeach, Queensland, in April 1998; the Third Interdisciplinary World Congress on Low Back and Pelvic Pain in Vienna, Austria, in November, 1998; and the annual scientific meeting of the Australian Pain Society in Melbourne, Victoria, in March 2000.

As well as devoting himself to his practice and the wider medical fraternity, John was heavily involved with the community of Tamworth, particularly St John's Church Tamworth, Rotary, and the Scouting Association.

John was featured in the Weekend Magazine of the local paper on Saturday, December 6, 2003, with the heading "Pioneer doctor hangs up his shingle".

John had planned to finally retire from his practice on December 12, 2003, on his seventy-sixth birthday. He



was looking forward to spending more time with his family in retirement, and especially his grandchildren, Emily and Nicholas Rose. John used to enjoy spending time at the Barrington Reserve each year with his extended family, and Christmas turn about in Sydney and Tamworth.

However, tests revealed severe coronary occlusion, necessitating major cardiac surgery in Sydney on December 5, 2003. Although the surgery was initially successful, complications led to John's sudden death on Christmas Eve 2003.

He is survived by his wife, Joy, and his children, Greg Bosler and Diana Rose, and Adrian and Lez.

He will be sadly missed by all who knew him.

**- David Roselt**

# Conference Report

## Pain in the Post-Modern Era: Keeping Pain Management Relevant

25th Annual Scientific Meeting of the Australian Pain Society, 7-10 March 2004, National Convention Centre, Canberra, ACT, Australia

This meeting over four days in sunny Canberra in early autumn was a coming together of many groups and individuals treating pain, the common foe. Rehabilitation and pain medicine specialist Geoffrey Speldewinde, the conference convener, and the organizing committee did a superb job in organizing the event. They were ably assisted by conference secretariat, DC Conferences Pty Ltd, well known to AAMM. Geoffrey is a member of AAMM and a Fellow of the AFMM. The meeting was well sponsored by many companies, including Pfizer Australia, Allergan, Elsevier Australia, and Medtronic, to name but a few. Boots Healthcare Australia was an important source of excellent coffee during the meeting.

Principal speakers included Fabrizio Benedetti, who spoke about his research into the placebo effect. C Richard Chapman, this year's Sunderland Lecturer, spoke about suffering, and the emotional dimensions of pain, and its behavioral manifestations. Thomas Graven-Nielsen spoke on muscle pain with respect to referred pain and deep tissue hyperalgesia. Lorimer Mosley, this year's Bonica Lecturer, from the Physiotherapy Department at the University of Queensland, spoke about pain and motor control.

My conference started with me jetting into Canberra late Sunday on a warm Canberra morning. I went to a pre-conference workshop on neuromodulation in pain medicine, sponsored by Medtronic. This was interesting, with a lively talk by US neurosurgeon Ken Alo on his practice and approach to pain management.

He was joined in the discussion by luminaries from the Australian pain scene. Spinal cord stimulation is used to control pain mediated by the spinal cord, irrespective of origin.<sup>1</sup> It involves the introduction of electrodes into the epidural space. Neurosurgeons tend to use larger devices, implanted using an open procedure. Anaesthetists use

epidural catheters for placement. A current is delivered from an implanted stimulator that inhibits the pain perception by induction of tingling in the area where the pain is felt. There are no controlled studies to date, but a systematic review has been performed using observational data.<sup>2</sup>

The day was rounded off by the welcome reception at the National Convention Centre, then the musical soiree at a nearby hotel, where some memorable performances ensued.

A solid plenary session then concurrent sessions on Monday morning was well sustained by coffee and refreshments at the breaks, when the trade displays were vigorously supported. Networking and interaction with colleagues and acquaintances old and new was a prominent feature of the proceedings. Different practices and approaches were canvassed, and strategies advanced. Possible journal articles presented themselves. Lunch was provided on the three full days, and proved to be most convivial.

Monday concluded with a night on the Tarago Express, which featured a dinner dance with good food and wine, and much social interaction. The 1940s Railway Historical Society diesel-hauled train travelled to Tarago through the scenic Molongo Gorge. Wildlife, including birdlife and local kangaroos, were of interest, especially to overseas guests. Dessert was served on the return journey, supplemented by more deep and meaningful discussion about life in general.

The conference continued at a crackling pace on Tuesday opening with a brief history session from Chair Professor Tess Cramond introducing the Sutherland Lecture.

Musculoskeletal medicine was well represented by a topical concurrent session after lunch chaired by Jay Govind. Michael Yelland discussed his randomized controlled trial of prolotherapy and exercise for chronic low back pain published in *Spine* in Janu-

ary 2004. This is the basis of his current PhD thesis. Victor Wilk provided a stimulating discourse on real outcome measures for assessing success in treating musculoskeletal pain. Patients want pain relief, rather than to be told to accept pain. The importance of long-term follow-up was highlighted. Wade King outlined the evidence base for the management of shoulder pain, acute and chronic. There is now a substantial body of Level I and Level II evidence on the methods used in the diagnosis and treatment of shoulder pain. Systematic reviews and randomized, controlled trials have highlighted the reliability, validity, and efficacy of current practices, endorsed by the recent NHMRC guidelines: <http://www.nhmrc.gov.au/publications/synopses/cp94syn.htm>

Many currently used practices are not supported by the evidence base. There is often a clear difference between assumed utility of common practices and the results of Level I and Level II studies, with respect to both diagnosis and treatment of shoulder pain.

Other musculoskeletal pain medicine colleagues in attendance at the meeting included Geoff Speldewinde, Steve Jensen, Phillip Giles, Alex Ganora, KE Khor, Susie Lord, Tim McCarthy, John Bastian, Michael Creswick, Roger Watson, and Giresh Kanji from NZ. John Rosenthal, Raj Sundaraj, his daughter physiotherapist Shona, and Milana Votrubic were also in attendance.

The AGM business meeting filled in Wednesday afternoon after afternoon tea.

The gala dinner with three course dinner and fine wines concluded the day, and was held in the Grand Entrance Hall at the impressive National Museum of Australia from 7 pm. The Horizons, Tangled Destinies, and Eternal Galleries were open exclusively for APS Conference Delegates from 7 pm to 8 pm, after pre-dinner drinks. A musculoskeletal pain medicine table

## Conference Report

was procured and convened, and thought-provoking discussion ensued. Delegates then danced to the 10-piece Big Brass Groove into the night. A great night was had by all.

Wednesday continued in similar vein. A plenary session on peripheral and central sensitization in musculoskeletal pain by Thomas Graven-Nielsen was followed by the Bonica Lecture, and an APRA PhD scholarship presentation on the analgesic properties of alphadolone by Lara Winter from Monash University.

Geoffrey Speldewinde then spoke eloquently on the role of reductionism in the treatment of chronic cervical spinal pain. Jay Govind followed with precision diagnosis and treatment for chronic lumbar spinal pain, further raising the profile of musculoskeletal pain medicine in this important forum with another spell-binding presentation.

Morning tea included a sub-committee meeting to discuss the future AAMM Annual Scientific Meeting planned for March 3-6, 2005, at Twin Waters, Sunshine Coast, Queensland. Chairman Nell Karpin from DC Conferences Pty Ltd officiated. Other attendees included Steve Jensen, Victor Wilk, Michael Yelland, and me.

The day was rounded out by free papers after morning tea, then lunch, followed by more interesting topical concurrent sessions, and a plenary session on the possible emerging role of cannabinoids in pain management.

Unfortunately I had to leave early during this session to get the jet for home.

But it was followed by panel discussion, awards including prizes for the best poster presentation, and plans for Sydney 2005.

It was a brilliant meeting, and I'd thoroughly recommend attending the next one.

The 26<sup>th</sup> Annual Scientific Meeting of the Australian Pain Society will be held in Sydney in August 2005. It will be held in conjunction with the International Association for the Study of Pain (IASP) 11<sup>th</sup> World Congress on Pain, August 21-26, 2005, and should be well worth attending, so mark it in your diaries, and keep the time free:

[www.iasp-pain.org/05Cong.html](http://www.iasp-pain.org/05Cong.html).

### References

1. Bogduk N, McGuirk B. Pain Research and Clinical Management, Vol. 13. *Medical Management of Acute and Chronic Low Back Pain. An Evidence-Based Approach*. Elsevier Science, 2002
2. Turner JA, Loeser JD, Bell KG. Spinal cord stimulation for chronic low back pain: a systematic literature synthesis. *Neurosurgery* 1995; 37: 1088-96.

- David Roselt

# Conference Report

## Australian Association of Musculoskeletal Medicine 33<sup>rd</sup> Annual Scientific Meeting, Sydney 27 – 30 November 2003

The 33<sup>rd</sup> Annual Scientific Meeting (ASM) of the Australian Association of Musculoskeletal Medicine (AAMM) had the theme of "A Pain in the Neck". The two-day scientific conference examined evidence-based medical research into neck pain and associated disorders. The program followed the previously popular format of morning lectures and afternoon practical "hands-on" workshops.

The results of the evaluation questionnaires of the two-day AAMM ASM reveal that the plenary sessions and workshops were rated as at least good by an overwhelming majority of attendees. The vast majority of attendees were of the opinion that at this year's ASM, we reasonably met the conference objectives, namely:

- To improve assessment of neck pain and whiplash-associated disorders
- To be able to differentiate cervicogenic headache from other forms of headache
- To gain a better understanding of how to manage complex pain problems
- To learn new injection techniques.

A major criticism of the 2002 ASM was that the time for open discussion was too limited. This issue was actively addressed in the planning of this year's ASM, and so it was pleasing for the organising committee to receive positive feedback in this regard, formalised in the written comments from some attendees in terms of "good discussion".

AAMM remains a primary-care-based organisation, in contrast to the Australasian Faculty of Musculoskeletal Medicine, which is for those who want to make musculoskeletal medicine their practising specialty, rather than just a special interest area. Based on this premise, the major goal of the ASM of the AAMM and its associated workshops over the years has been to teach and upgrade general practitioners' practical skills in musculoskeletal medicine, including physical exami-

nation, and management techniques, such as manual therapy and injection techniques.

This year's workshops covered these areas well, with a beginner's basic manual therapy workshop run by Michael Cheswick, and for the more advanced, a counter-strain workshop run by Philip Watson. Injections were well covered by a prolotherapy workshop, including use of cadavers to cover the practical aspects of this technique, run by Michael Yelland. The more theoretical aspects of interventions with injections were admirably covered by David Vivian. Rounding off the workshop aspect of the ASM program was a CBT/Indahl/Activation workshop run by Scott Masters, Robert Gassin, and Geoff Harding.

The lecture program was also well received. The topics were diverse and interesting – from presentation of the NHMRC guidelines for acute cervical pain, in Nik Bogduk's inimitable and entertaining style, to the revolutionary surgical technique of cervical disc replacement surgery, presented by Lali Sekhon. For my own part, it is always a bonus to come away with a few pearls to use on return to my clinical practice. Les Barnsley's presentation of acromioclavicular and sternoclavicular joint pain referral patterns proximally to the neck fitted this bill perfectly.

Backing onto our ASM, on November 30, was a multidisciplinary symposium on whiplash and associated disorders (WAD), organised primarily by the Australian Physiotherapy Association, with the organising committee also comprising a representative from AAMM, and also the Chiropractic and Osteopathic Council of Australia, and the Faculty of Rehabilitation Physicians. Our ASM attendees were strongly encouraged to attend this seminar as well, and 68 did so.

Personally, I found the plenary sessions of this program interesting and sound. Nik Bogduk presented his very compelling research pertaining to cervical zygapophysial joint pain diagno-

sis and treatment with radiofrequency medial branch neurotomy, which AAMM members are all familiar with. Gwen Jull is another familiar name to all those who follow the research in this area. Her presentation suggested that those with WAD and abnormal pain processing can be detected early, and require a different therapeutic regimen from those without abnormal pain processing, confirming my own clinical impression. Philip Bolton's work on basic physiology and the probable involvement of the afferent input from muscle spindles to explain some of the WAD symptoms, such as headache, dizziness, ataxia, and visual disturbance, was stimulating. For me personally, it was an honour to introduce Jim Taylor and his work on the pathology of whiplash, a presentation worth travelling across the continent for, if you have not heard it before. Speaking personally again, I found the breakout sessions to be a little disappointing in their scientific content and rigour, and in their presentation.

AAMM is committed to continuing to provide training in musculoskeletal medicine skills at its future ASMs, but is also very keen to utilize its teaching resources to run workshops at other times, through the divisions of general practice. In the past, a major barrier to this goal has proven to be just getting our foot in the door of the GP divisions. When we have managed to do so the feedback from such ventures has been very positive. So this is an invitation to all AAMM members to influence their own GP divisions to secure a slot on their educational timetable for musculoskeletal up-skilling.

- Dr Steve Jensen

# Red Flag Clinical Indicators

The Red Flag Checklist summarizes historical features that are the best guide to the possible presence of a “red flag” condition (serious cause, for example, fracture, cancer, infection) in a patient presenting with acute low back pain. It can be adapted and should be incorporated in the medical record.

“Red flag” conditions are fortunately rare, and best suspected on the basis of history or examination. Minor trauma is not a risk factor for fracture unless osteoporosis is present. This is very rare under the age of 50 years, and the evidence base suggests patients presenting with osteoporotic fractures from minor trauma are usually much older. Corticosteroid use increases the risk

of osteoporosis presenting at an earlier age.

The pre-test probability of a general practice patient presenting with acute low back pain due to cancer is 0.7%. Infection is the cause in less than 0.01%.<sup>1</sup>

A positive response does not confirm the presence of a “red flag” condition, but serves to alert the practitioner to its possible presence. It means more attention should be focused on history and examination for this feature.

If all items are checked and responses negative, the possibility of a “red flag” cause for the pain is extremely unlikely. Further investigation is not indicated.

However, it is important to be vigilant, and the checklist can be revisited at each review, and recorded for medico-legal purposes.

For chronic low back pain, associated features are of utmost importance in detecting “red flag” conditions. The Red Flag Checklist serves just as well for chronic low back pain as it does for acute low back pain. Nil responses to all items again allow the practitioner and the patient to be reassured that a serious condition is extremely unlikely to be the cause of the pain.

1. Bogduk N, McGuirk B. Pain Research and Clinical Management, Vol. 13. *Medical Management of Acute and Chronic Low Back Pain. An Evidence-Based Approach*. Elsevier Science, 2002.

<b>Name:</b>			<b>MRN</b>			<b>Low Back Pain</b>		
<b>DOB</b>								
<i>Presence of</i>			<i>Cardiovascular</i>			<i>Endocrine</i>		
Trauma	Y	N	Risk factors?	Y	N	Corticosteroids?	Y	N
Night Sweats	Y	N	<i>Respiratory</i>			<i>Musculoskeletal</i>		
Recent Surgery	Y	N	Cough?	Y	N	Pain elsewhere?	Y	N
Catheterization	Y	N	<i>Urinary</i>			<i>Neurological</i>		
Venipuncture	Y	N	Hematuria?	Y	N	Symptoms/signs	Y	N
Occupational exposure	Y	N	Retention?	Y	N	<i>Skin</i>		
Hobby exposure	Y	N	Stream problems?	Y	N	Infections?	Y	N
Sporting exposure	Y	N	<i>Reproductive</i>			Rashes?	Y	N
(Overseas) travel	Y	N	Menstrual problems?	Y	N	<i>G/T</i>		
Illicit drug use	Y	N	<i>Haemopoietic</i>			Diarrhoea?	Y	N
Weight loss	Y	N	Problems?	Y	N			
History of Cancer	Y	N						
<i>Comments</i>						<i>Signature:</i>		
						<i>Date:</i>		

Fig. 1. A checklist for “red flag” clinical indicators, suitable for inclusion in medical records used in general practice, developed by Professor Nikolai Bogduk for the Australian National Musculoskeletal Medicine Initiative

# Educational Activities

## MASTERS, DIPLOMA, AND CERTIFICATE COURSES IN MUSCULOSKELTAL MEDICINE

### FLINDERS UNIVERSITY DIPLOMA/CERTIFICATE IN MUSCULOSKELETAL MEDICINE

DATE	TITLE/KEY RESOURCE PERSON	VENUE	PROVIDER	CONTACT	CME POINTS
1 <sup>st</sup> Semester 2003	MSME 704 Pain, MSME 708 Clinical Therapeutics	Fortnightly teleconferences on Tuesdays	University of Otago	V. McGroggan Tel. +64 3 364 1086 Fax +64 3 364 0909 Email: <i>veronica.mcgroggan@chmeds.ac.nz</i> or Geoff Harding Tel. +61-7-32695522 Fax +61-7-32696407 Email: <i>geoffharding@uq.net.au</i> website: <i>www.chmeds.ac.nz/go/dept-orthop</i>	Mixture of points
2 <sup>nd</sup> Semester 2004	MSMX 701 Part 2 - Clinical Diagnosis	To be announced	As above	As above	Mixture of points including small group points
24/7/04 – 30/10/04	MSMX 707 Musculoskeletal rehabilitation	Fortnightly teleconferences on Thursdays	As above	As above	Mixture of points
24/7/04 –	MSME 710 Recreational & sports injuries	Fortnightly teleconferences on Thursdays	As above	As above	Mixture of points
24/7/04 – 30/10/04	MSMX 705 Regional disorders - Spine MSMX 706 Regional disorders - Limbs	Fortnightly teleconferences on Thursdays	As above	As above	Mixture of points

### UNIVERSITY OF NEWCASTLE MASTERS IN PAIN MEDICINE

DATE	TITLE/KEY RESOURCE PERSON	VENUE	PROVIDER	CONTACT	CME POINTS
2004 New enrolments for 2005 from 10/04	Masters in Pain Medicine	Internet	University of Newcastle	Louise McPherson Email: <i>Louise.McPherson@newcastle.edu.au</i> -admin. liaison officer	N/A

## Educational Activities

### OTHER MUSCULOSKELETAL MEDICINE EDUCATIONAL ACTIVITIES

DATE	TITLE/KEY RESOURCE PERSON	VENUE	PROVIDER	CONTACT	CME POINTS
8/5/04 9am - 1pm	Explain pain - Dr Lorimer Mosely	Physiotherapy Department, Royal Brisbane and Women's Hospital	Physiotherapy Department, Royal Brisbane and Women's Hospital	Maree Raymer Ph: 07 3636 8547 Email: <i>Maree_Raymer@health.qld.gov.au</i>	N/A
25-26/6/04	International Congress of Manual Medicine	Moscow, Russia	Ministry of Health Russian Federation, Russian League of Manual Medicine Professionals & Russian Center of Manual Medicine	Organisers: Russian Federation, 119571 Moscow, Vernadsky prospect, 121  Dr Sergei V Nikonov Mob: (095) 8 903 593 4496 Fax: (095) 434 3101 Email: <i>sitel@cmt-moscow.com</i> or <i>nikonov@cmt-moscow.com</i>	N/A
31/7/04 - 1/8/04	Advanced Prolotherapy Workshop	Sydney	Margi Taylor	Margi Taylor Ph/fax 08 8338 3778 Email: <i>taylorme@healthon-net.com</i> URL: Prolotherapy for doctors <i>www.drmtaylor.com.au</i>	N/A
6-7/8/04	Basic prolotherapy workshop	Sydney			
17-19/9/04	Basic prolotherapy workshop	Adelaide			
6-7/8/04 Melbourne	Pain is pain, suffering is optional: helping people manage pain and discomfort	Rydges Riverwalk Melbourne	CPM Training and Counselling	CPM Training and Counselling PO Box 188, Heidelberg 3084 Ph: 1800 100 292 Fax: 03 9479 1762 Email: <i>bevans@cpm-services.org</i> URL: <i>www.cpm-services.org</i>	
9-10/8/04 Brisbane		Wanganui Gardens Brisbane			
13-14/8/04 Sydney		The Epping Club Sydney			
15-18/9/04	14th Triennial FIMM World Congr. Manual/ Musculoskeletal Med. & Pain: Evidence & New Challenges	Bratislava, Slovakia	Slovak Medical Association of Myoskeletal Medicine & FIMM	Sona Kozakova Fax +421 2 554 24015 or +421 2 554 15287 Email: <i>kozakova@sfs.sk</i> Website: <i>www.FIMM2004.sk</i>	N/A
7-9/10/04	Australian Conference of Science and Medicine in Sport	Alice Springs	Sports Medicine Australia	Rainer Wilton Sports Medicine Australia PO Box 237, Dickson, ACT 2602; Ph: 02 6230 4650 Fax: 02 6230 5908 Email: <i>sma.conf@sma.org.au</i> ; URL: <i>www.sma.org.au/ACSMS/2004/about/</i>	
29-31/10/04	AAMM Annual Scientific Meeting	Adelaide	AAMM	A/Prof Norm Broadhurst Ph: +61 8 8295 1890 Fax: + 61 8 8295 6808 Email: <i>norm.broadhurst@flinders.edu.au</i>	TBA

## Educational Activities

DATE	TITLE/KEY RESOURCE PERSON	VENUE	PROVIDER	CONTACT	CME POINTS
10-13/11/04	Interdisciplinary World Congress on Lumbo-Pelvic Pain	Melbourne Exhibition Convention Centre		Craig Bosworth Ph: +61 3 9534 3943 Email: <a href="mailto:acadie@opsmc.com.au">acadie@opsmc.com.au</a> ; Website: <a href="http://www.worldcongresslbp.org">www.worldcongresslbp.org</a>	
3-6/3/05	AAMM Annual Scientific Meeting - Pain in the Elderly	Sunshine Coast Queensland	AAMM	Nell Karpin DC Conferences PO Box 571, Crows Nest NSW 1585 Ph: 02 9954 4400 Fax: 02 9954 0666	
21-26/8/05	11th World Congress on Pain	Sydney Convention Centre, Darling Harbour	International Association for the Study of Pain	IASP Secretariat 909 NE, 43rd St, Suite 306 Seattle, WA 98105-6020 USA Ph: +1 206 547 6409 Fax: +1 206 547 1703 Email: <a href="mailto:iaspdesk@juno.com">iaspdesk@juno.com</a> URL: <a href="http://www.iasp-pain.com">www.iasp-pain.com</a>	N/A
27-28/8/05	International Conference on Orofacial Pain and Temporomandibular Disorders	Sydney Convention Centre, Darling Harbour		DC Conferences PO Box 571, Crows Nest NSW 1585 Ph: 02 9954 4400 Fax: 02 9954 0666	N/A