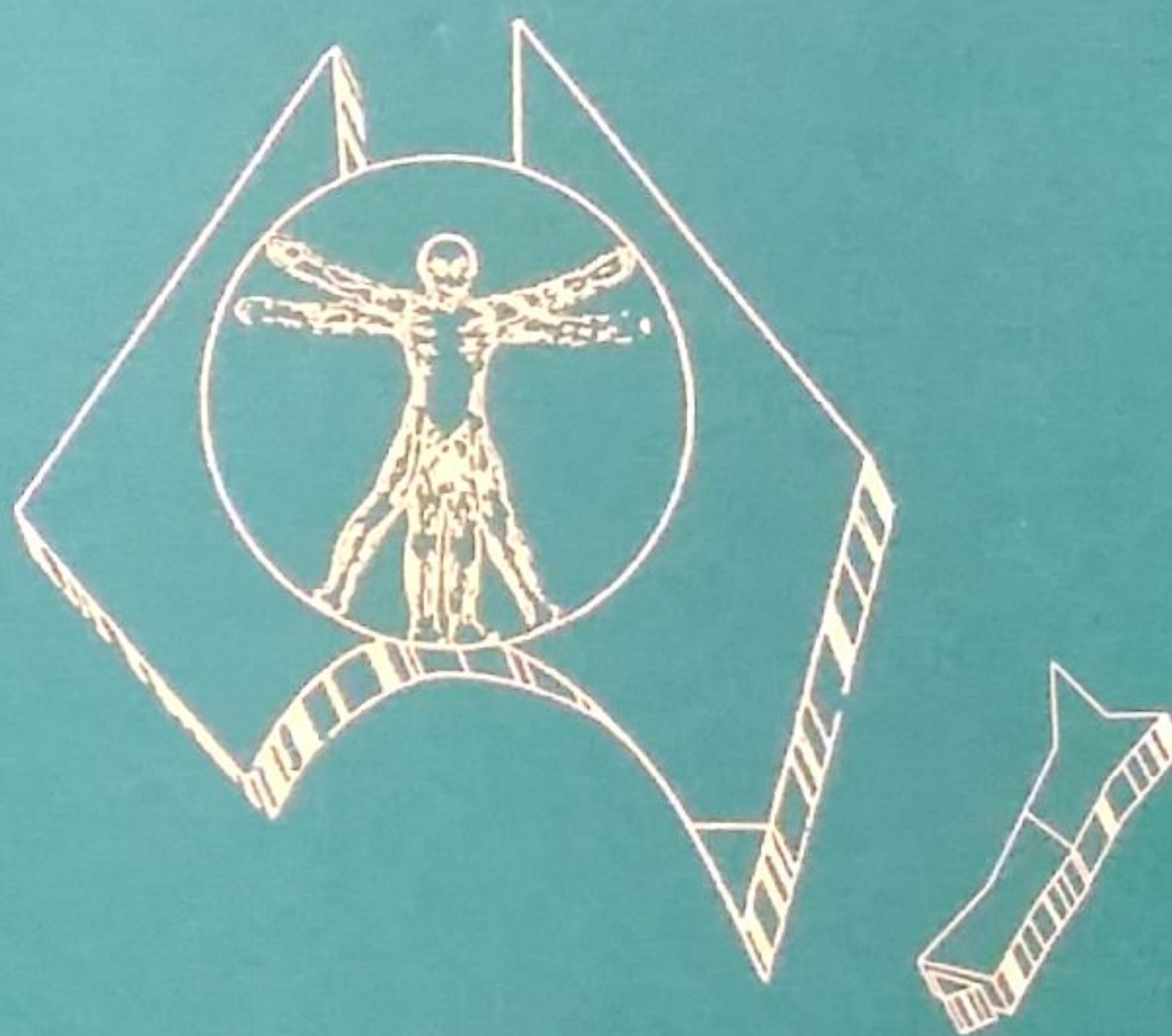


Australasian Musculoskeletal Medicine



**Risk Factors for
Lower Back Pain**

**Radiological Investigation
of Lower Back Pain**

Back Rehabilitation

Pain Conference Address

How to Write a Paper

Australasian Musculoskeletal Medicine

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The A.M.M. is produced by the Australian Association of Musculoskeletal Medicine for medical practitioners interested in the aetiology and management of musculoskeletal disorders. Opinions expressed are those of the authors and not necessarily those of the editor or the Association. Editorial comment may reflect the opinions of the editor alone. Contributions on any relevant topic are welcome for submission to the editor, Dr Ron Palmer, Suite 24 Royal Brisbane Place, 17 Bowen Bridge Road, Herston QLD 4006. Telephone (07)252 1128 or to any member of the A.A.M.M. Council. Published by Professional Secretarial Service, 57 Devona Street, Aspley QLD 4034, Printed by Snap Print, Bowen Hills, QLD 4006.

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Vice-President:

Assoc. Prof. Jim Taylor MB, ChB, DTM, PhD, FAFRM (Sci)
Australian Neuromuscular Research Institute
Sir Charles Gairdner Hospital
Nedlands, WA., 6009
Telephone (08) 346 3812

Hon. Secretary:

Dr. Wade King MB, BS, Grad Dip Mus Med
82 High Street, Taree, NSW., 2430
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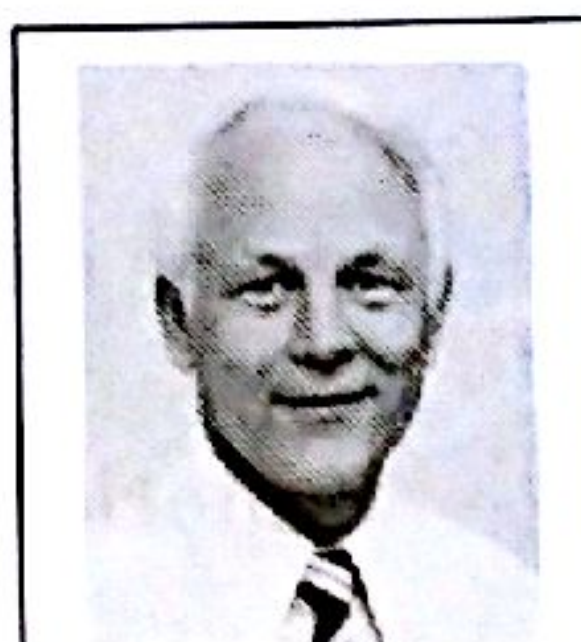
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Dr. David Vivian	Brighton, VIC	(03) 596 7211



New Zealand Association of Musculoskeletal Medicine

OFFICE BEARERS 1994 — 1995

The following members were elected to office at the annual general meeting in Christchurch on July 22nd 1994.

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Dr. Angus Johnston
126 Wade River Road, Whangaparaoa
Tel: +09 424 7912

President Elect & South Is Education Convenor:

Dr. Jim Borowczyk
79 Wilson's Road, St Martin's, Christchurch
Tel: +03 337 0991

Secretary:

Dr. John Malloy

201 Mt Eden Road, Auckland, 3
Tel: +09 631 5863 / Fax: +09 630 0146

Treasurer & North Is. Education Convenor: Dr. Mark Johnston

16 Moana Avenue, Orewa
Tel: +09 426 5437 / Fax: +09 426 5437

South Is. Associate Treasurer:

Dr. J Brownlee

256 Papanui Road, Christchurch
Tel: +03 355 7038 / Fax: +03 355 7038

Academic Co-ordinator of Diploma:

Dr. B Tait

19 Stratford Street, Fendalton, Christchurch
Tel: +03 364 0430 / Fax: +03 364 0909

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Dr. Paul Quin

437 Remuera Road, Auckland 5
Tel: +09 520 4761

COMMITTEE MEMBERS:

Dr. J Watt	Takapuna	Tel: +09 489 5059 / Fax: +09 486 4973
Dr. C Franzmeyer	Christchurch	Tel: +03 355 7080 / Fax: +03 355 7080
Dr. S Bentley	Dunedin	Tel: +03 479 8212



EDITORIAL



The diagnostic skills associated with medicine in general have always been associated with accurate history taking and a complete and thorough physical examination. This has been the very fundamental basis of our profession in bygone years and still remains the very crux of our skills today. The use of diagnostic tests has been, and must remain, useful tool at our disposal, but to resort to these for a short cut to diagnosis is fraught with extreme danger. Musculoskeletal medicine above all should involve precise history taking and pin point examination. To reproduce the patient's pain is the paramount aim. If you are unable to do this, then there has to remain some doubt as to the accuracy of your diagnosis. If you fail to achieve this, then spend some time in re-evaluating your position before launching off into treatment mode which may well be wrong. Our strength over paramedical groups is our ability to treat aetiology causes rather than resorting to treating symptomatology.

The April 1994 edition of the Bulletin had an excellent paper by David Vivian on the effectiveness of MRI in diagnosis of back related pain. This edition of Australasian Musculoskeletal Medicine has an article by Michael Yelland which carries this question of a step further, discussing the value of plain x-rays and CT scans in the assessment of low back pain. While there will no doubt be some objections from other medical groups as to the conclusions reached, it even beholds those parties to step back from the front line and question their own position and views. While there remains a fee for service there must in some instances be decisions that become based on economics rather than genuine medical investigatory requirements. This point becomes an indictment of some members of our profession to police their own actions.

There are some examples of overuse of services that defy logic. How often do you see a case of LBP where the patient has seen a number of practitioners presenting at the interview with three or more series of plain x-rays taken within the preceding year? We all know that degenerative changes are not going to alter rapidly nor are you going to be able to glean any significant new information that will effectively alter the diagnosis or treatment. Perhaps this scenario is most frequently seen in medico-legal cases where it seem to behold each examiner to repeat the original x-rays.

The cost of medical health services in this country are continuing to rise rapidly, to the point where we now are seeing the breakdown of the system. It is not the intent of this editorial to pursue any political judgement on the system that exists in this country. However, it is reasonable to point out that the over-use of many investigatory procedures are certainly adding a strain to the system that is now wilting under the load. Costs aside, the more important aspect of over-use of radiological procedures are the potential side effects to the patient. This aspect is covered in more detail in the relevant paper in this journal.

The extent to which absurd use of radiology has traveled is brought home by the following example that prompted this particular editorial. A thirty two year old male presented with a right sided neck and shoulder area pain that had some degree of somatic radiation into the upper third of the arm. The patient did not apparently have either an examination to the cervical spine nor was subjected to any testing of the rotator cuff. As related to me, the upper border of the trapezius was palpated and the patient was requested to roll his head in a circular fashion. He was the informed that he needed an MRI of the shoulder. This was duly undertaken in spite of the patient being unemployed and having to pay for this expensive procedure by borrowing money from relatives. As suspected the MRI was totally normal. The patient had a very minor cervical lesion clinically which responded to a single treatment. From this we must question the right of some individuals to have open license to order such investigations. This immediately opens a new can of worms, but it also illustrates why politicians seem to have an overwhelming desire to crush medical practice as we know it. If we are unable to police our own actions, then perhaps we will not remain as innocent as we would like to pretend.

The crucial question from any investigatory procedure is "what can we learn". To use an investigation to fob a patient off, to generate additional income, or to grope in the dark for a diagnosis does not enhance our position. While the following is a rationalisation, procedures should be used to confirm a diagnosis or to exclude other pathology. They in no way surpass the basis history and examination. It is these skills that separate our profession from all of the satellite para-medical groups. It separates mumbo-jumbo from fact. To the musculoskeletal physician it is paramount. Cyriax concluded, "Diagnosis is only a matter of applying one's anatomy."

I leave you with the following thoughts. Diagnosis depends on ...

1. Knowledge of functional anatomy
2. Accurate patient history
3. Diligent observation
4. Thorough examination

As an emerging medical specialty we come under the spotlight of our peers as well as the legislators of the land. We must continue to strive for excellence, yet at the same time demonstrate not only expertise, but also cost efficiency. We should all think seriously before resorting to the use of investigatory procedures that are non-essential or may result in potential harm to the patient.



LETTERS TO THE EDITOR

Dear Editor,

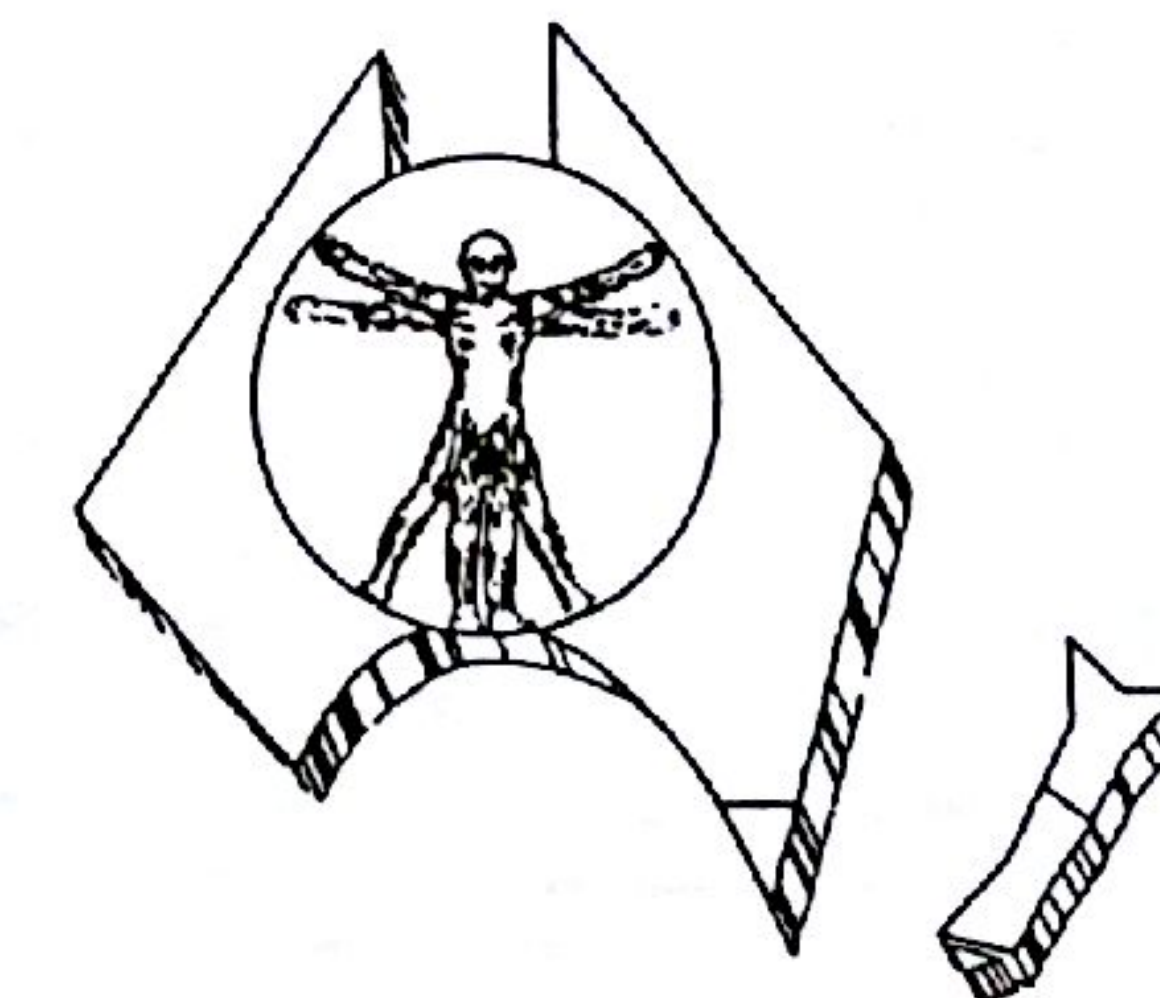
I note in the very thoughtful and useful glossary of musculoskeletal terms that Wade King and Jim Borowczyk compiled that Edwards test was not mentioned. As the introduction welcomed feedback from readers concerning such oversights, I thought I should point this out. Do you believe tests such as this, which was so important to the participants in the first diploma course at Flinders, should so readily be forgotten?

Yours faithfully
Steve Jensen

Dear Dr Jensen,

Your point is well taken. EDWARDS tests is crucial in the clinical assessment of the painful wrist. Indeed, it remains the hallmark for the establishment of a diagnosis of palmar instability. I have relayed your comments to Dr King who thanks you for your astuteness and he offers an apology to those other readers who would also have noted the omission. He also points out the essential feature is to hold the hand in ulnar deviation when carrying out the test. This oversight will be corrected by inclusion in the next upgrade of the glossary.

Editor



A WORD FROM THE PRESIDENT OF THE A.A.M.M.

The Brisbane Annual Conference was extremely successful and those who attended gained significant benefit from the various papers presented as well as renewing friendships and discussing problems of mutual interest. Following the Scientific Meeting the Annual General Meeting re-elected the executive and committee as previously. However, it is extremely important that new blood be seen at all levels to ensure viability of the Association. In the course of the year some members should feel free to offer their services, both on the committee and in the activities of the Association. Obviously many people are apprehensive about putting themselves forward. If there is any hesitancy in this, then older members should give some encouragement to newer members to become active in the affairs of the Association.

It was with great delight that one witnessed a tremendously successful workshop, established on such a grand scale. Admittedly there was some degree of apprehension when Phil Watson suggested this grand venture. However his insight, and the team that supported him, are totally justified in their bold endeavor. Never before has an educational attempt on behalf of A.A.M.M. met with such success. It is therefore important that such momentum should be continued in the future and with this in mind, the organising committee for the July conference in Canberra have made temporary bookings at Thredbo for a conference in the snow with expenses being around the mark as experienced on the Gold Coast.

With the New Year approaching can I strongly suggest that established members of the Association make the initiative to run courses, evening meetings and workshops, etc. The discipline will only flourish as more people gain skills and appreciate what the discipline has to offer in the management of people with musculoskeletal dysfunction. There is sufficient talent around to run workshops, at least of one day duration, in large country towns and preferably offer weekend duration in capital cities. We need to be about presenting ourselves as a source of authority in this area.

Finally I take this opportunity of wishing all members a fruitful New Year in the pursuit of skills and the development of expertise in the discipline.



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A WORD FROM THE PRESIDENT OF THE N.Z.A.M.S.M.

The New Zealand Association's Conference, in July this year, will include a Multi-disciplinary Workshop and Scientific Meeting on the subject of the Occupational Overuse Syndromes. Our intention in the Workshop is to focus on the problem syndromes; cases illustrative of these longstanding or recurrent conditions will be presented as in a Ground Round by one of our members and discussed by a panel which includes practitioners of Medical Acupuncture, Alexander Technique, Chiropractic, Osteopathy and Physiotherapy as well as our own discipline. Any new techniques considered worthy of attention will be demonstrated and can be practiced by the participants in small groups.

The guest speaker for the Conference will be Dr Michael Hutson, a Musculoskeletal and Sports Medicine Physician, who is the President of the British Institute of Musculoskeletal Medicine. He will also chair the Workshop to ensure an orderly outcome for what promises to be an informative and fruitful Workshop.

The Conference itself will consider the Overuse Syndromes from the perspective of aetiology and causation with the Alternative Therapists being given an opportunity to present their views. Contributions to the subject of management will be made by Occupational Therapists and Physiotherapists who practise Deep Massage and Relaxation Therapy as well as Manipulation and Muscle energy techniques. It is felt that we seldom have the opportunity to assess Alternative Therapies at first hand and the representatives of the Alternative Therapists are selected for their expertise in their particular field.

The Overuse Syndromes involve both Musculoskeletal Medicine and Sports Medicine; two disciplines which are to my mind, complementary, and today as Sport has become an Occupation for many participants, so have certain Sports injuries become Occupational Overuse injuries. Tendonitis, tenosynovitis, enthesiopathies, diffuse limb pain all require rational explanation. We treat them but we don't really know why the particular muscle has lost its previous painfree status. Here is a forum where all the views of interested Therapists will be heard.

The December issue of F.I.M.M. NEWS is of interest in that it carries reports on F.I.M.M.'s endeavours to produce a uniform teaching syllabus for all member Associations. This is an exercise that the combined Australian and New Zealand Association's Teachers subcommittee has almost completed and one can sympathise with the Europeans, given their language diversity, let alone their terminological and ideological divisions. As we appear to be further ahead in achieving a uniform syllabus, and our time-frame is shorter we should be able to assist our European colleagues in both the Terminology and the Teaching fields; and in the process make F.I.M.M. a more credible organisation as our World body. In this respect the same periodical contained a strongly worded plea from Dr. Michael Hutson, President of the British Institute of Musculoskeletal Medicine, for F.I.M.M. to adopt a higher Medico-political stance and lobby for a monospeciality of Musculoskeletal Medicine in the European Community.

This monospeciality is also one of our chief objectives and as Dr Hutson is visiting the Antipodes for the New Zealand Conference in July we must certainly assure him of our support on this issues and actively demonstrate our desire to reform F.I.M.M. from within. To have a Global body administering matters Musculoskeletal means that our Discipline has universal credibility and like it or not, despite logistical problems, it is in our best interests to be actively heard in its deliberations.

It is one of my beliefs that Australasia will be a force to be reckoned with in Musculoskeletal Medicine in the next decade and we will need a Forum at which to speak. F.I.M.M. is the logical Forum and the English Edition of the F.I.M.M. Journal must be resurrected to improve communications at the grass roots.

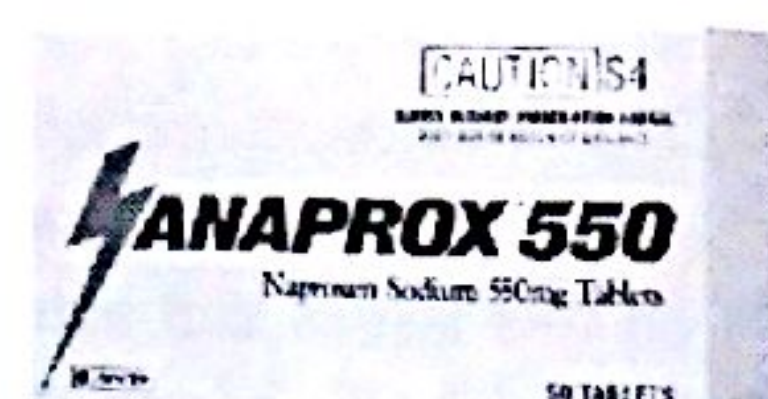
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FROM THE A.A.M.M. HON. SECRETARY'S DESK

The experience of being totally engrossed in musculoskeletal medicine for days on end will be familiar to those who are (or have been) involved in a postgraduate course. A distinct sense of purpose is engendered by living in almost monastic seclusion with a group of colleagues for a fortnight and spending the whole time discussing matters of common interest. The feeling has recently been shared by the first group to undertake the postgraduate diploma course at the University of Newcastle.

The monastic allusion was applicable to this particular group in more ways than one. To begin with, most were accommodated in the nuns' quarters at the Mater Misericordiae Hospital (it must be added in haste that the nuns were not in residence). Secondly, much of the time was devoted to consideration of the fundamental nature of things and the quality of truth. On the very first day the group established the first tenet of their creed as:

"In God we trust: all others bring data".

Acceptance of the scientific rigour implicit in this aphorism brought a radical change of attitude to what constitutes competence in clinical practice. The ability to test one's own beliefs and the management strategies based on the, and to identify those that are really worthwhile (i.e. reliable and valid), confers a power unknown by many.

The application of basic scientific principles to a consideration of the nature of truth lead to the second tenet of a rational belief system:

"Truth comes in 2 x 2 contingency tables".

This became the group's unofficial motto. The use of 2 x 2 tables enables identification of meaningful data and recognition of data that has no useful purpose. Development of the capacity to evaluate observations provides the key to the significance of sensitivity, specificity and related indices, and to the objective determination of association and agreement. These in turn are essential elements in the understanding of cause and effect, and evaluation of clinical outcomes.

The combination of reliable knowledge and simple mathematical constructs also allows quantitative assessment of musculoskeletal function: this confers a new dimension to the understanding of patients' problems and their solutions. For example, practitioners may be required to advise a patient about performing a manoeuvre such as rising from a position of knee flexion. The practitioner who can calculate the tension developed in the extensor apparatus and compare the patient's capacity with reliable normative data will be in a far better position to advise than one who does not have that information base. In fact, it could be asked how else such advice can be given. Could it be based on some sort of intuition or simply on guesswork?

The evolution of diploma courses is changing the discipline in ways that were unforeseen even a few years ago. Each course offers slightly different perceptions and has its own characteristic approach. All, however are developing scientific knowledge and skills in what have long been uncharted areas. A new breed of musculoskeletal physicians is emerging and they will have abilities that their predecessors could hardly have imagined.



NEWS

In February, a subcommittee of the executives of the Australian Association of Musculoskeletal Medicine and the Australian College of Physical Medicine joined forces to make a written submission to the National Medical Services Group of the Workcover Corporation. The submission puts forward a case for new methods of payment for Musculoskeletal Medicine services for work-injured patients. The National Medical Services Group is considering new methods of payment for medical services and is aiming to introduce a nationally consistent system of payment for currently recognised medical services.

The submission begins by defining Musculoskeletal Medicine as it is currently practiced in Australia and outlines the specific skills that Musculoskeletal Medicine practitioners have to offer the Workcover Corporation. It argues for the cost-effectiveness of the Musculoskeletal Medicine Practitioners through their careful and comprehensive diagnostic approach, their discerning choice of investigations and the avoidance of inappropriate, protracted courses of treatment.

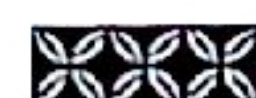
Their knowledge of a broad range of assessment and treatment modalities is emphasised. For the Workcover Corporation this makes them potentially as reviewing doctors for diagnosis and the treatment programmes of work-injured patients. It also equips them with a technical language for communication with both medical and non-medical practitioners.

A proposed system of payment for Musculoskeletal Medicine consultations suggests that rates similar to consultant physician rates would be appropriate for time and level of expertise provided. For referred patients this also recognises the time required to provide a report for the referring practitioner. Payment for therapeutic procedures not currently listed in the Medicare Benefits Schedule (eg. manipulation) has not been proposed, as it was felt that it would be more prudent to propose a consultation fee which recognises their value as an integral part of the consultation.

The proposed eligibility criteria for this system of payments are proof of any of the postgraduate qualifications in Musculoskeletal Medicine, namely a diploma or certificate in Musculoskeletal or Manual Medicine, Fellowship of the A.C.P.M. and the licentiateship of the A.A.M.M.

If the submission is successful, it is likely that eligible doctors would have to undergo processes of accreditation, quality assurance, peer review and monitoring, similar to the processes for vocational registration for general practitioners. Workcover would undoubtedly want to be reassured that they were getting value for their money.

The submission is just the first step in what may be a lengthy process of negotiation with Workcover. It is part of a wider campaign for the recognition of the valuable services that those practising Musculoskeletal Medicine in Australia have to offer health care system and the community as a whole. Updates on the negotiations with the Workcover Corporation will appear in future editions of this publication.



Congratulations to David Collinson, Ian McIntyre and Vic Wilk for successfully obtaining their Flinders Diplomas in Musculoskeletal Medicine. The number of members obtaining their higher qualifications is steadily rising and it is this momentum which keeps the political ball rolling. Those A.A.M.M. members who are currently not enrolled in a diploma course are encouraged to do so. Not only are you educating yourself, you are helping the Association.



The Twenty-fifth Annual Scientific Meeting will be held at the National Convention Centre, Canberra on 22nd-23rd July, 1995. It will be followed by a week of practical workshops, to be conducted at the Alpine Hotel Conference Centre, Thredbo, NSW from 24th-28th July. The theme will be "Scientific Management of Musculoskeletal Pain Syndromes". Noted authors in the field will be speaking at the meeting and providing workshop sessions on the practical application of current scientific knowledge in clinical musculoskeletal medicine.

Accommodation has been arranged for the conference weekend at the Capital Parkroyal Hotel, adjacent to the main venue. Participants will be transferred by coach to Thredbo for the workshops and a package deal has been negotiated for accommodation there. Members will receive details by mail in the near future.

1995 is the Association's silver jubilee year, marking twenty-five years of organised activity in musculoskeletal medicine in Australia. All members are encouraged to make the Twenty-fifth Annual Scientific Meeting and associated workshops a suitable commemoration of the occasion.



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RISK FACTORS FOR LOW BACK PAIN

DR. STEVEN JENSEN

Newport, Melbourne

Abstract

Low back pain is not a definable entity, rather a symptom with which a patient presents. This disorder is multi-factorial but there does exist some important risk factors. These risk factors are explored by reviewing a wide sample of the current world literature. As expected a previous history of back injury is high on this list, but in general, radiological abnormalities are not predictive of future LBP. Chronicity of LBP approaches 10% of the population and this alone indicates the need for ongoing research in this subject.

INTRODUCTION

There is much written about low back pain (LBP) in the medical literature. However, none of the articles surveyed in the course of this literature review offered a definition of this entity. It would appear that it is merely a symptom with many possible pathophysiological explanations. A patient presenting with "low back pain" may mean discomfort anywhere from the lower thorax to the inferior aspect of the buttocks. Most people indicate an area located around the lower aspect of the lumbar spine and/or buttocks as their source of pain, with a variety of pain referral patterns to the buttocks, groin and lower limbs. It is now generally accepted that, in developed countries, LBP represents a severe public health problem, with a high prevalence rate with substantial psychosocial and financial implications.

The 1989-90 National Health Survey conducted by the Australian Bureau of Statistics (1) found that 8.1% of the population had long term unspecified "backtrouble" (trouble that had lasted or was expected to last more than six months). This is consistent with overseas studies which have quoted 5-10% chronicity (5,9). Most studies put the point prevalence of LBP at around 12-18%, with a lifetime incidence of between 60-80% (2-5). In a review of NSW statistics for 1991-92 (6) the following estimates were made concerning LBP:

- it accounts for 1 in every 4 work injuries
- it is the greatest single cause of lost work time
- 1 occupational low back injury occurs every 5 minutes of the working day
- there is a 10-15% recurrence rate in 1 year.

- per annum it costs \$300 million in compensation payments; \$200 million in lost production and \$100 million in hospital costs. (No estimate was made for non-hospital medical and paramedical costs, nor for the legal costs, which in themselves would be considerable).
- 8-10% become chronic sufferers and consume 80% of the total cost.

Similar statistics apply to other Australian states such as Victoria (7) and developed countries (8).

It is also generally accepted that very little inroad is being made into the problem. Frymoyer has stated that the incidence of LBP has not really altered over the last 20 years. However, the incidence of chronic low back pain disability has increased dramatically at a rate disproportionate to all other health problems and that these statistics are similar throughout the industrialised world. (9,10,11). An approach to help resolve this problem would be to identify those people at risk of developing LBP with a view to modifying any factors which contribute to the risk.

Thus the purpose of this review of the literature is to ascertain what is known about the risk factors for LBP.

Personal Factors

1. Age

For the majority of LBP sufferers, the first episode has usually occurred by the fourth decade (4) with as many as a third having had their first occurrence in adolescence (12,13). The prevalence of LBP is highest in the wage-earning years. After about 65 years the prevalence decreases in men (3,5,14). It has been reported by some that the prevalence increases in females relative to males in the older age groups (3,14)

while others have failed to demonstrate this difference (15). Heliovaara (15) found that the prevalence of "sciatica" is greatest for both sexes in middle age (45-64 years) and then decreases significantly after 65 years. (see Table 1).

Table 1: Prevalences (5) of LBP syndromes by age and sex. The Mini-Finland Health Survey. (Adapted from Heliovaara (15)).

Age (years)					
Diagnosis	30-44	45-54	55-64	65-74	75-
Men					
Sciatica	3.6	8.5	7.0	4.1	1.9
Undefined LBP	6.6	14.3	19.1	17.2	15.1
Total	10.1	22.8	26.0	21.3	17.0
Women					
Sciatica	3.4	5.4	5.6	2.3	0.3
Undefined LBP	7.1	12.1	19.9	17.9	17.3
Total	10.4	17.5	25.5	20.3	17.6

2. Body Mass Index

Obesity is another factor that has long been linked to LBP. However it appears that it is only those in the highest 20% of body mass index (BMI) that seem to be at increased risk. Also, the association is strongest for females (16). Battie et al (17) found a minor association between greater BMI and future report of LBP in women which was not present for the male population they studied. BMI may be more an indicator of the risk of disability and/or severity of LBP rather than the incidence per se.

A study of 7217 Finnish men and women aged 30 years or more suggested that both extremes of the BMI (specifically, less than 20 kg/m² or greater than 35kg/m² or greater than 35 kg/m²) may lead to an increased risk of disability from low back trouble (18). This is supported by a study by Bostman (19) of 1128 patients who underwent surgery for lumbar intervertebral disc (IVD) herniation compared to a similar group from the general population. He found that the patients who underwent surgery for a disc herniation were more obese and taller, and thus had a higher BMI, than the population at large. He concluded that increased BMI had a clear association with those lumbar

IVD herniations severe enough to require surgery.

Some studies have revealed that tallness has a weak correlation with sciatica in men. (2,19). An association between LBP and height seems more spurious (17). One study revealed that the risks of LBP from heavy manual work are greater for short rather than tall men (20) and concluded that height alone should not be used to exclude people from particular occupations.

3. General Health

In a general population study of 928 men and women of working age from Copenhagen, Biering-Sorensen et al (21) looked at 135 variables in an attempt to identify all possible risk indicators for low back trouble (LBT). They concluded that persons with first time or recurrent LBT suffered poorer general health than those without LBP on the basis that they had more upper gastrointestinal tract systems and more hospitalisations from whatever cause. They also concluded that sufferers of LBT probably lived under a higher psychosocial pressure than those without. This in turn may have altered their perception of pain and discomfort in general and their ability to cope with such symptoms, leading to the findings of this study.

4. Socioeconomic status

LBP is reported more often in those from a lower socioeconomic class and of a lower educational standard. This is most likely attributable to the fact that these individuals tend to be employed in more physically demanding occupations and in those which are of a more menial nature which, in themselves, constitute an increased risk of LBP (see below & 3,22,23).

Psychosocial factors will be discussed more fully later.

OCCUPATIONAL FACTORS

1. Manual work

Manual materials handling, which by its very nature usually involves bending, lifting, twisting, pushing, pulling and/or awkward postures in varying permutations

and combinations has long been thought to be associated with an increased risk of LBP. (20,26,27,28,29,30,31,32,33,34, 5,36,37)

Kumar (28) has suggested that it is the "cumulative load" i.e. the biomechanical load and exposure time over the entire work experience, that may be particularly important in assessing the risk of back pain. He analysed every job performed by 161 institutional aides using a two dimensional static mathematical mode. The compression and shear at the thoracolumbar and lumbosacral discs were computed by the use of a biomechanical model. He found that cumulative compression and shear were significantly higher in those with LBP compared to those without ($P < 0.01$) and thus concluded that it is the cumulative increase in work load that leads to an increased risk for LBP.

Kelsey et al (38) in a study of over 300 cases compared to demographically matched controls, reported that lifting objects greater than 11.3 kg more than 25 times a day results in 3.5 times the risk for prolapsed intervertebral disc (IVD) while carrying the same weights to the same frequency increases the risk by a factor of 2.7. (Table 2). If the body was usually twisted while the lifting was done then this elevation of risk was apparent with less frequent lifting. Performing such lifts while twisting with the knees straight increases the risk of back injury by a factor of 6.1. If the lift is performed with the knees bent the risk is only increased by a factor of 2.7. (Table 3) A recent report suggests that non-occupational lifting of a similar nature significantly increases the risk of prolapsed IVD in similar manner (39). This in turn suggest that lifting technique is important. A look at the biomechanics of lifting would tend to support this view (40).

Table 2: Odds ratios for associations between average frequency of performing certain activities on the current job and prolapsed lumbar IVD. (From Kelsey et al, (38)).

Table 2:

Average Frequency	Lifting > 11.3kg	Carrying > 11.3kg
Not at all	1.0	1.0
< 5 times/day	1.2	1.0
5-25 times/day	1.3	2.1
>26 times/day	3.5	2.7
Test for trend	p=0.01	p=0.04

Table 3: Odds for prolapsed lumbar IVD associated with lifting more than 11.3 kg while twisting the body according to whether knees were generally bent or almost straight when lifting was done. (From Kelsey et al, (38))

Variable	Odds ratio
No lifting while twisting body	1.0
Lifting while twisting body: knees bent	2.7
Lifting while twisting body: knees bent	6.1

There is some evidence pointing to each individual's own lifting capability as being more important in the genesis of LBP than the absolute amount of lifting done. For example, Chaffin has been involved in several studies (41,42,43) looking at this issue and has reported that workers whose lifting capability is equal to the task requirements have 1/3 the amount of injuries as those whose strength did not match the job. It has been noted in the literature that the effect of frequent bending and twisting is difficult to evaluate separately as lifting is usually also involved.

Magora (35) found that sudden maximal efforts, especially if unexpected, played an important role in the causation of LBP. By way of explanation or this observation, he suggests that if the body is caught in a condition or posture less than optimal for the kind of effort required, then this motion may trigger sudden strain on the thoracolumbar soft tissues, thus causing LBP. Furthermore, he proposes that regular movements are less likely to cause LBP as they follow a specific pattern to which the subject has had time to become both trained and accustomed, and for which he is able to adequately prepare.

Svensson and Anderson (44) have questioned the relationship between manual materials handling and LBP. In their study of 1,760 30-64 year-old women they performed a univariate analysis and found eight work variables correlated to LBP i.e. forward bending, lifting, standing, monotony of work, dissatisfaction with the work tasks, dissatisfaction with the work environment, a higher degree of worry, and fatigue at the end of the work day. They went on to perform a covariate analysis and found that only the latter three variables, none of which are physical, remained directly associated with LBP. It is generally accepted that manual materials handling in itself is a significant risk factor for LBP. This does not belittle the importance of non-physical factors in the overall picture.

2. Work posture

Static work postures also seem to play a role in the pathogenesis of LBP. Magora (34) found that prolonged periods of both standing and sitting (> 4 hours daily) was related to a higher incidence of LBP regardless of occupation and the type or degree of physical requirements required. He also found that persons able to vary their posture by sitting or standing for brief, repeated periods had far less LBP. Awkward work postures with respect to the neck, shoulders and back have also been reported as having an association with LBP. (37)

3. Vibration exposure

There are now many reports in the literature which show a positive link between exposure to whole body vibration and the development of both LBP and spinal degeneration. The link is strongest when a static sitting posture is also involved as is the case with driving of motorised vehicles such as trucks, tractors and earth-moving equipment (46), subway trains (47), helicopters (48), fork-lifts and freight-container tractors (50), and cars (51). Even a long distance from home to work, has been found to be associated with first time report of LBP (21) suggesting a link even with normal commuting by motorised vehicles, whether for work, home or leisure activities.

As exposure to whole body vibration increases, there is a tendency toward a greater incidence of complaints of back trouble. It has been shown in human subjects (46) that muscle fibres fire sequentially under vibration, and thus are liable to fatigue, leading to increased load demands on the spine, discs, and ligaments. The bouts of heavy manual work that often immediately follow prolonged occupational exposure to vibration, as occurs in many truck drivers for example, would increase this demand even further, thus substantially increasing the risk of injury.

In their review of vibration and its affect on the spine, Pope and Hansson (46) noted the difficulty in finding a suitable animal model to investigate the role of vibration and any related pathological changes to the spine. There are also difficulties in replicating the exact conditions to which human subjects are exposed. Nonetheless, studies have thus far been conducted on rats, rabbits, guinea pigs, pigs and dogs. These animal studies have revealed that vibration exposure leads to pronounced creep and large peaks in intradiscal pressure. The pressure peaks alter disc metabolism and probably lead to degeneration. Changes in the neuropeptide levels of the dorsal root ganglia have also been found in animals exposed to whole body vibration, a finding which suggests a mechanism for pain after such exposure. Chronic exposure also leads to histological changes in the dorsal root ganglia, cartilage, muscles and bone which in turn may lead to pain in the low back region.

4. Newness to the job

Being unfamiliar with the tasks which the job requires may be an occupational risk factor, particularly if there is manual work involved. In their retrospective study of workers at a large manufacturing plant, Bigos et al (52) reported that new employees tended to have a significantly greater risk of back injury.

An investigation into nursing personnel showed the greatest risk of low back injury occurs early on in their posting to long term care units (53). Student nurses had a peak incident of first time LBP between 9 and 12 months on the job, particularly if they were working on wards they described

as "heavy"(54). Both of these studies propose a review of lifting techniques and an educational and training programme for patient handling would be beneficial in prevention of LBP incidents and in reducing their severity. These findings suggest that a lack of knowledge of some of the job safety issues and a lack of skill in the use of some of the techniques involved in various occupational tasks may be important in the genesis of work-related injury, including low back injury.

5. Job dissatisfaction

There is increasing evidence pointing to job dissatisfaction being one of the strongest predictors for the onset and recurrence of LBP in the workplace. Bigos et al (52) first noted a correlation between incidence of back injuries and poor employee appraisal rating by the employee's supervisor within 6 months of the injury in their retrospective study and, in a prospective study of the same group of manufacturing industry employees, found job dissatisfaction to be one of the most predictive individual factors for LBP (55). In a retrospective study of 38 to 64 year old women, Svensson and Andersson reached a similar conclusion (44). Magnusson et al (56) found monotony, stress and low job satisfaction to be more important than loads on the spine, or on the repetitiveness of lifting as factors of great importance in the prediction of LBP, although they assessed only loads on the L3-4 level of the spine when in clinical practice it seems that the more caudally situated segments of the lumbo-sacral spine are more commonly involved in LBP syndromes.

6. Injury on the job

It is generally held view that injury on the job leads to a delay in recovery and increases the degree and duration of disability. For example, in a retrospective study comparing 150 compensable and 150 non-compensable back injury patients matched for age, sex and type of injury, Greenough and Fraser (24) found that the incidence of reported pain, disability, psychological disturbance, unemployment, and length of time off work was greater in the compensation group. They further noted that settlement of the claim did not result in any reduction in morbidity, even

up to 5 years later. Then went on to conclude that payment of compensation delays recovery from low back injury.

However, this study did not control for the type of work performed. Leavitt (25) points out that this is a common flaw in these studies, which, in turn, makes any conclusions reached questionable. He states that return to work is at least in part contingent on the type of work performed and the exposure to any occupational risk factors. Leavitt (25) went on to compare workers injured on and off the job and subdivided them into four groups depending on the level of physical exertion required on the job, ranging from none to heavy. He concluded that injury on the job is associated with prolonged disability time regardless of the type of job performed. It should be noted, however that this study did not control for the other occupational risk factors, such as exposure to whole-body vibration and postural requirements, making it as potentially flawed as the previous investigations of which it was critical.

PHYSICAL FACTORS

1. Spinal flexibility

The role of lumbar spinal flexibility in the prediction of future low back pain has been looked into by several investigators (57, 58, 59). These studies have covered a wide range of populations and age groups and have reached similar conclusions i.e. that spinal flexibility measurements are a poor indicator of future low back trouble. Although in one paper it was found that men with hypermobile backs were more liable to contract LBP (57), further studies have not been able to substantiate this hypothesis (60). These studies (57,58,59,60) are all consistent in their finding that reduced lumbar sagittal flexibility is associated with current or previous low back injury.

2. Muscle strength

Throughout the literature a wide variety of methods for assessing trunk muscle performance have been used and a comparison of these methods i.e. isometric, isotonic and isokinetic maximal strength testing, and their clinical implications were

the subject of a review by Beimborn and Morrissey (61). Regardless of the method used for assessment, it would appear that the problem of LBP results in a change in the strengths, either absolutely or relatively, of the different trunk muscle groups. (57,58,61,62,63). This has led to this physical characteristic being investigated as to its causal relationship with back pain. Early investigations suggested that good isometric muscle strength might be protective against future LBP (57,64). More recent investigations, however, have shown that tests of lifting capacity are poor predictors of future LBP, (65,66) except perhaps for those who have already suffered with a previous episode of LBP (67). As mentioned above, it may be that a mismatch between an individual's strength and lifting capabilities, and the occupational task required, is more important in terms of LBP risk.

One explanation for this lack of predictive power for these measures may be the fact that normative data have not been adequately evaluated and published. This was the conclusion of Mandell et al who found that deconditioned normal people may exhibit similar results to low back injured people on isokinetic trunk strength and lifting strength measures (68). Another major criticism of these previously used measures of trunk muscle strength, has been the fact that they do not represent normal physiological patterns of neuromuscular activity. This in turn may explain their lack of predictability for future LBP.

In an attempt to overcome this criticism, Marras et al (69) looked at lifting in a 3-dimensional and dynamic manner. They used a triaxial electrogoniometer in an in-vivo study in a manufacturing industry setting and claim that they have been able to identify two workplace factors (i.e. load moment and lifting frequency) and three trunk motion factors (i.e. lateral trunk velocity, twisting trunk velocity and sagittal flexion angle) which contribute to a high risk of low back disorder. They go on to suggest that modification of these parameters may help to minimise the risk of occupationally-related LBP.

The fact that these dynamic factors have not been looked into in the past may

explain to some degree why previously assessed physical factors such as isometric, isotonic and isokinetic tests of lifting strength have such poor predictive value for future low back trouble.

3. Endurance

In an often quoted prospective study involving 1652 firefighters, Cady et al (64) were one of the first groups to suggest that physical fitness and conditioning are preventative of low back injuries. On the job training programmes concentrating on improving physical fitness and strength have been shown to reduce the risk of future low back injury and disability from low back injury, (70,71) and even to improve productivity (71). One potential mechanism for this observation was recently reported by Trafimow et al (72). They noted that as the quadriceps fatigue, lifting technique changes from a squat (leg) lift to more of a stoop (back) lift, thus decreasing the demand on the quadriceps muscles. This in turn may increase the peak lumbosacral for a moment during the lift thus leading to an increased risk of low back injury.

It does not necessarily follow however, that lack of physical fitness is a precursor for LBP, as was found by Battie et al in a large prospective study (73). They suggest that there must be other factors at play here. For example, people who are physically fit also tend to lead healthier lifestyles and be under less psychosocial stress than those who are less fit.

4. Leg length discrepancy

No studies could be found to confirm at what figure or range of figures does leg length inequality (LLI) become clinically significant, although 3cm seems to be a commonly quoted figure. For example, Rossvoll et al (74) report a significant reduction in LBP in 22 patients followed for up to 5 years following shortening osteotomy for LLI. In this group the mean LLI pre-operatively was 32mm and was 4.3mm at follow up.

Giles and Taylor (75,76) have described asymmetric radiological changes which occur in the lumbar spine as a result of LLI of greater than 9mm. Minor degrees of LLI such as this and any subsequent

radiological and even biomechanical changes as described elsewhere (79,80) may not correlate with symptoms.

In a one year follow up to over 900 Danish men and women, Beiring-Sorensen (57) found about a 30% incidence of LLI of more than 1cm, but this did not correlate with any increased risk of LBP. Yrjonen et al (79) followed 96 patients with a history of Perthes disease for up to 47 years and found that although LLI was a common finding, LBP was not a significant problem. A similar lack of correlation between low back symptoms and LLI has been described by others (80,81,82).

PREVIOUS INJURY

Previous low back injury increases the risk of future LBP significantly as has been demonstrated by two large population studies (2,4). It would also seem that a long initial spell, onset in early life and recency of last episode further increase the risk (4,113). The risk after surgery for low back pain may be even higher (135).

RADIOLOGICAL FACTORS

1. Degenerative Changes

It would appear that the changes of spondylosis and zygapophyseal joint osteoarthritis are part of the normal ageing process as their incidence increases with age and they do not seem to have any correlation with the incidence of LBP. (40,83,84) In a study comparing plain film x-rays of symptomatic and asymptomatic spines (84), Torgeson and Dotter found that disc space narrowing increased in incidence with increasing age also, suggesting that this finding is also age related. However, this was a significantly more common finding in those with LBP symptoms than those without, further suggesting a positive link between degenerative disc disease and LBP.

More severe symptoms, particularly symptoms radiating to the lower limbs have been linked to more severe radiological changes in the lumbar spine. Frymoyer et al (85) noted that this was particularly so if these changes, such as traction spurs and

disc space narrowing, occurred at L4-5. Riihimaki et al (86) noted that moderate to severe degenerative changes were associated with sciatic pain (but not non-specific low back pain), but the types of degenerative changes provided no further information.

There has been some attempt to examine the relationship between x-ray changes and occupation. However, there seems to be conflicting reports, with some studies indicating no significant difference (86,86) while other suggest that degenerative changes are more common in those with the heaviest work background. (87)

2. Spondylosis/Spondylolisthesis

The prevalence of isthmic lumbar spondylolisthesis in the general population is of the order of 2 - 10%. (88) It is far more common in those involved in athletic pursuits which involve violent flexion and/or rotation of the lumbar spine, e.g. gymnastics, diving, cricket fast bowling, and in collision/contact sports such as football in its various codes, hockey and lacrosse (89,90,91,92). It is also related to a heavier work load and, in women, to a higher number of pregnancies (93). Other quoted predisposing factors for spondylolysis/spondylolisthesis include genetic factors and neural arch dysplasia (94) and an increased sacro-horizontal angle (95). (Fig.1)

Figure 1: Diagram of the lower lumbar spine showing:-

(i) sacro-horizontal angle - the angle between a line parallel to the upper end-plate of the sacrum and the horizontal plane, which represents the angle of inclination of the sacrum.

(ii) lumbo-sacral angle - the angle between a line parallel to the upper end-plate of the sacrum and a line parallel to the lower end-plate of the 3rd lumbar vertebrae, which is a reflection of the lower lumbar lordosis. (From Sward et al (102))

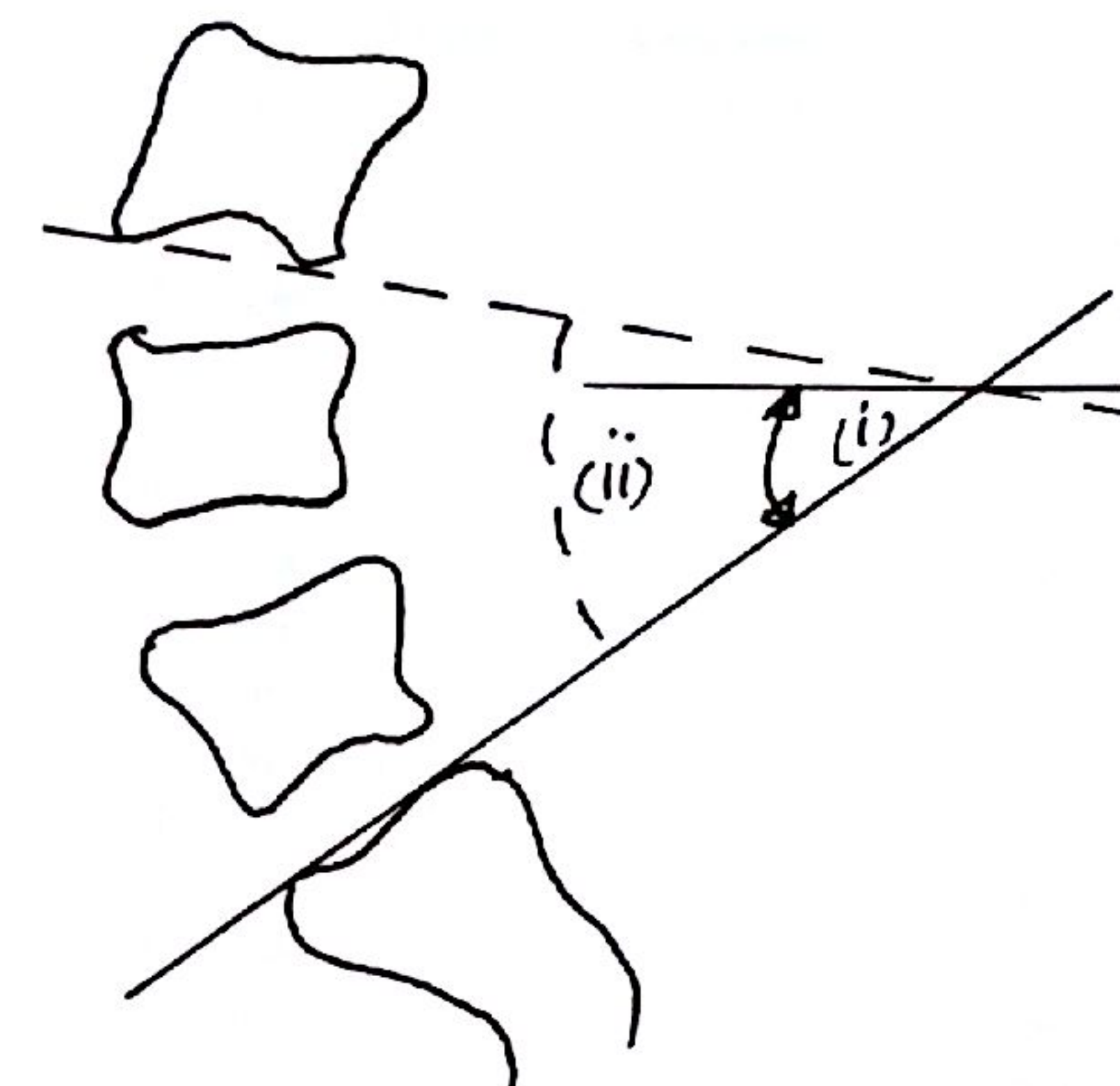


Figure 1.

Some studies suggest that spondylolysis/spondylolisthesis is more likely to be associated with LBP in adolescents and athletes (89,91). A study of symptomatic and asymptomatic spines (84) found that it occurred more frequently in those with back pain. On the other hand, an association between LBP and mild to moderate spondylolisthesis in middle-aged patients was recently reported to only exist for women and even the association was only weak (88). In a long term (>20 years) clinical and radiological follow up of spondylolysis and spondylolisthesis, Saraste (96) found that risk factors for low back symptoms were slippage of greater than 25% of vertebral width, low lumbar index in L5 spondylolysis, (the quotient between the posterior and anterior heights of the spondylolytic vertebra expressed in percentage terms), spondylolysis at L4 and early disc degeneration.

3. Transitional vertebrae

Frymoyer et al (85) found a transitional lumbar vertebra to be no more common in those with or without LBP. In those with Bertolotti's Syndrome, i.e. the combination of a transitional vertebra and LBP, Elster (97) found that when structural pathology as detected by MRI or CT scanning (e.g. spinal stenosis and disc protrusion) did occur it was almost always at the interspace above the transitional vertebra.

4. Radiographic instability

The association between radiographic lumbar instability (as determined by dynamic flexion - extension radiographs) and clinical symptoms is unclear. In a 10 year follow-up of 50 patients previously diagnosed with this condition, Sato and Kikuchi (98) found that combined posterior opening and forward translation in flexion was associated with chronic lumbar instability and debilitating LBP. However this study suggested that the functional prognosis depended primarily on narrowing of the anteroposterior diameter of the lateral recess of the spinal canal at L5 rather than the type of severity of the radiographic instability present.

5. Size of vertebral canals

Theoretically speaking, in those with smaller vertebral canals, any further encroachment on the available free space within these canals by entities such as a prolapsed IVD and/or osteophytes, would make it more likely that compression of pain sensitive structures, such as exiting nerve roots, will occur, thus leading to an increased likelihood and these changes will become symptomatic. This suspicion has been borne out by at least two published studies. (99,100).

A recently published 10-year prospective study of vertebral canal size in mining and nursing recruits found that canal size is not a predictor for back pain. (101) However, this study did report that those with small canals were more likely to visit doctors and have treatment for back pain, thus suggesting that small canal size may be a risk factor for more severe symptoms.

6. Sacral inclination

A small sacro-horizontal angle or angle of inclination of the sacrum, (Fig. 1) which in turn decreases the lumbar lordosis, was found by Sward et al to be correlated with LBP. In a study of 116 elite Swedish athletes representing four different sports i.e. wrestling, gymnastics, soccer, and tennis. (102) This finding needs clarification for the population at large, particularly as a large sacro-horizontal angle is a predisposing factor for spondylolysis/spondylolisthesis. (95)

7. Spina bifida occulta

Spina bifida occulta (SBO) has been considered to be a minor radiological abnormality with no clinical significance. However, in a recently published study (103), the incidence of posterior herniation of IVD's in patients with LBP and SBO was compared to that of patients with LBP without SBO. The results showed a statistically significant higher incidence of posterior disc herniation in those with SBO at S1. The authors conclude that SBO at S1 is not an innocent finding but may lead to instability of the base of the lumbar spine, which in turn may lead to a predisposition to posterior IVD herniation.

8. Pre-employment radiographs of the lumbar spine

In a review of risk indicators for LBP (4), Pope quotes several studies which argue against the use of pre-employment radiographic assessment of the lumbar spine on the basis of a poor predictive value for future LBP, and the risk of gonadal irradiation without future health benefit to the prospective employee. In their introduction, Beiring-Sorensen et al (87) also argue strongly against this practice, quoting several studies in support. Furthermore, Pope states that it is the combined policy of the American College of Radiology, The American Academy of Orthopaedic Surgeons and American Occupational Medical Association that this practice serves no beneficial purpose for either employee or employer and therefore should be discontinued.

Whether or not developments in the radiological assessment of the lumbar spine such as MRI and CT scanning, dynamic functional radiographs or even assessment of biomechanical entities such as the instantaneous axes of rotation will improve the predictive value remains to be investigated. However, as these techniques are associated with a significant financial cost factor, it is unlikely that they will be suitable for any more than research purposes.

LIFESTYLE FACTORS

1. Smoking

There are many studies which demonstrate a strong link between smoking and LBP,

with rising prevalence with increasing levels of smoking. (16,21,26,73, 104,105,107). However, Boshuizen et al recently reported that the association was only present in occupations that require heavy physical exertion suggesting the possible presence of confounding factors in the link detected in other studies (107). This finding implies that a conclusive association between smoking and LBP has yet to be established, despite the previously published compelling evidence for its existence. Possible mechanisms for the influence of smoking on LBP include impairment of vascular flow to the spine, the effect of inhaled toxins on disc metabolism, the increased amount of coughing in these people, and the fact that smokers generally tend to lead less healthy lifestyles and have more psychosocial problems than non-smokers (16,10,109).

2. Alcohol abuse

Several studies have shown a link between LBP and abuse of alcohol. The association is more likely due to the fact that those who do drink to excess tend to have less healthy lifestyles and suffer more psychological stress than a direct link with alcohol itself (110,111).

3. Leisure activities

Leisure sports participation has not been shown to be a significant risk factor for LBP (112) and in fact may play a protective role (64,114) particularly participation at school (113,144). In a prospective study of over 600 metal industry employees with 10 years of follow up, Leino (115) found that those involved in physical activity during leisure time were less likely to have either subjective or objective evidence of LBP. In the measurement of leisure time physical activity in this study, not only were such activities as sports, ball games and jogging included, but also other forms of physical behaviour such as walking, housework, gardening and travel to work.

Why this should be is unclear, particularly in the light of other evidence as already outlined in this review, which points to a positive correlation between physical workload and physical stress and LBP. Other lifestyle factors are probably at play

here e.g. less smoking, healthier diets, less obesity, and better mental health in those who pursue physical leisure time activities (115).

PSYCHOSOCIAL FACTORS

Psychosocial factors appear to have significant relevance in determining disability from LBP (9,10, 116,117,118,119,120). Over recent years, there has been much research into the roles of psychosocial factors in the pathogenesis of LBP. Tools used to measure these psychosocial factors include home and work activity profiles, family Apgar (an indicator of the individual's perception of family dynamics), Health Locus of Control, and the Minnesota Multiphasic Personality Inventory (MMPI), particularly scale 3 (hysteria scale) of the MMPI.

In their prospective study of employees at an aircraft manufacturing plant, Bigos et al found that a high score on scale 3 (hysteria scale) of the MMPI is a strong predictor of the report of LBP (121). By analysing further items and subscales within the MMPI scale 3 they claim that they can significantly improve the predictive effectiveness of this parameter (122). However, in a review of psychological research and chronic LBP (CLBP) Schmidt and Arntz, argue that MMPI research with CLBP only indicates a non-specific neurotic profile and does not really define a predictable CLBP personality (123).

That people who suffer LBP are under greater psychosocial pressure was suggested by a study by Beiring-Sorensen and Thompson (105) who looked at 68 medical, social and occupational variables in over 900 people drawn from the general population. This view is supported by Holmstrom et al who studied 1773 construction workers and found those with "high" stress had a significantly greater prevalence of LBP than those who reported "low" stress (124). An investigation into a professional group, in this case dentists, revealed similar findings (125).

Crauford et al (126), in a study of 80 new referrals to an out-patient clinic, found that there was a significant excess of adverse life events in those with back pain of a definite onset but of uncertain cause,

compared to those with a specific diagnosis. From these findings they concluded that stress, but not psychiatric illness, is involved in the onset of back pain. They further found that diagnosable psychiatric illness, mostly in the form of depression, usually followed the onset of pain, as did Atkinson et al (127) in their study of a pre-morbid psychiatric illness in a group of CLBP sufferers and controls. Wesley et al (128) point out that the issue is further complicated in a clinical setting as many of the neurovegetative signs of depression may also result from pain, making the differentiation between somatic and depressive signs and symptoms difficult.

Nonetheless, it appears that psychosocial stress may play a definite role in the pathogenesis of LBP, but that psychiatric illness, in particular depression, is a consequence of, rather than a causative factor in, LBP. To quote Bigos et al (121) "perhaps normally expected LBP is the final straw that breaks the already burdened camel's back".

OBSTETRIC AND GYNAECOLOGICAL FACTORS

Ostgaard et al (129) found a point prevalence of LBP in pregnancy from the 12th week until delivery of 22-28%, whereas the point prevalence in the general population is 12-18%, which suggests that LBP is much more common in pregnancy. True sciatica on the other hand was found to occur in approximately 1% of pregnant women which is similar to most population studies (129). Factors which appear to carry an increased risk of development of LBP in pregnancy include back problems before pregnancy, young age at the time of pregnancy, multiparity, backache during menstruation, and strenuous work (129,130,131).

Some biomechanically relevant factors which may link pregnancy to LBP were investigated by Ostgaard et al. (132) They investigated weight gain, abdominal circumference, sagittal and transverse abdominal diameters, the amount of lumbar lordosis, finger laxity and striae distensae in the skin of the thighs, abdomen, and breasts. Change in abdominal sagittal diameter was the primary biomechanical

risk factor found, although the correlation between this factor and LBP in pregnancy was only weak. An initially large lumbar lordosis was a risk factor, although it did not change during pregnancy. Finger laxity, which in this study was deemed to represent peripheral joint laxity in general, was important only in primiparous women, in whom the LBP group had decreased laxity.

Ostgaard and Anderson (133) found that although 37% of women still had LBP at their follow-up visit, most had recovered completely within six months. Factors that correlated with persistent post-partum LBP were presence of back pain before pregnancy, presence during pregnancy, multiple pregnancy and heavy manual work. Heavy manual work was the strongest correlate with persistent LBP at twelve months postpartum.

Svensson (131) found that up to 10% of female LBP sufferers believe that their low back trouble commenced in pregnancy. These authors also found multiparity to be a risk factor for on going LBP but suggest that this may be best explained by the fact that women with young babies perform a significant amount of lifting and bending which could contribute more to the development of LBP than any of the hormonal or altered biomechanical factors associate with pregnancy.

Svensson et al (131) also revealed a higher incidence of LBP in those females with menopausal symptoms and suggest that hormonal changes leading to post-menopausal osteoporosis may be the important factor in this group. This assumption has been refuted by Kann et al in a German study looking at x-ray changes in perimenopausal women where non-osteoporotic changes were seen as often as osteoporotic ones (134).

HEREDITARY FACTORS

There appears to be a familial aggregation for non-specific LBP syndromes, but to what degree this is due to similar environmental exposures compared to pure genetic factors is unclear. In a large study of twins, Bengtsson and Thorson (136) concluded that a relationship does exist between genetic factors and the occurrence of back pain. A definite genetic link in the

development of prolapsed IVD in the teen years is suggested by the fact that these people are more likely to have a first degree relative with a prolapsed IVD than those who develop this particular problem in their later years or than a control group (3). It is not known to what extent genetic and environmental factors contribute to this observation.

SUMMARY

The term "low back pain" merely describes a symptom, i.e. pain or discomfort experienced somewhere in the vicinity of the lower back. Although not accurately defined in the literature, it is in common usage. Some authors use the terms "low back trouble," "low back disorder," or "low back syndrome" for which they in turn do not offer a definition, but which may be more descriptive on the basis that these terms suggest a more complex symptomatology than just pain. This in turn would be in keeping with the complexity and multifactorial nature of the pathophysiology and of the risk factors involved in its development.

It would appear that the following are important risk factors in the development of LBP:-

1. Previous low back injury.
2. Exposure to whole body vibration such as that which occurs in driving motorised vehicles.
3. Manual materials handling, particularly if it involves heavy and/or frequent lifting, especially if the lift is performed with the knees straight and the body twisted.
4. Psychosocial factors such as job dissatisfaction, a high level of psychological stress, and a high score on scale 3 of the MMPI.
5. Muscle strength and endurance not sufficient to match the requirements for the individuals manual tasks.
6. Sudden unexpected physical exertion.
7. Static and awkward work postures.

8. Inexperience in a particular job or department.

9. Cigarette smoking.

Generally speaking, radiological abnormalities are not predictive of future LBP. The exception is spondylolysis and spondylolisthesis with the following features: greater than 25% slippage, occurrence at L4, low lumbar index at L5 and early disc degeneration. In particular, radiologically detected degenerative changes on their own are not predictive of future LBP, although the more severe changes are associated with more severe symptoms, particularly if they occur at L4-5. Likewise, measurement of vertebral canal size does not offer any predictive power for future LBP, but may be predictive for more severe symptoms.

Extremes of BMI may also suggest a greater risk of disability from LBP but calculation of the BMI does not convey an indication of risk of occurrence.

Minor degrees of LLI do not lead to an increased risk of LBP. At what figure LLI does become significant has not been determined, although at about 3cm there seems to be some increased risk.

Measures of spinal flexibility do not confer an increased risk, but when decreased may be indicative of current or previous low back injury.

Genetic factors may play a role but it is difficult to exclude the influence of environmental factors when trying to determine to what degree the former contribute.

Pregnancy is more of an exacerbating factor for those already at risk, but does not seem to carry an increased risk in itself. However, parenting, with its increased requirements for bending and lifting, may lead to an increased risk.

It would appear that adopting health lifestyle practices, such as leisure-time physical activity, stopping smoking, and reducing one's stress level or finding ways to cope better with that stress has benefits for the lower back, as well as for other bodily systems.

There is still much to learn about the pathogenesis of low back disorder. However, efforts can and are being made to reduce the incidence and, more importantly, the disability from this all too common public health problem. These include changes in employment practices, on the job physical and educational training programs aimed at all levels of the workforce, better education of the general public, and employer-based rehabilitation programmes. Such programmes should continue to be developed and refined as more knowledge comes to light, in an attempt to substantially reduce the personal, social, occupational and financial cost of low back disorder.

It goes without saying that further research into this subject is warranted. Specifically, what is required to ascertain the true risk factors for LBP are very long term, large scale, multicentred, prospective trials looking at a multitude of factors and then subjecting them to intensive multivariate analyses.

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A REVIEW OF THE RADIOLOGICAL INVESTIGATION OF LOW BACK PAIN IN THE PRIMARY CARE SETTING

Dr Michael Yelland
Senior Lecturer in General Practice
Department of Social & Preventive Medicine
University of Queensland

Abstract

Plain x-ray radiology and CT. scans as an initial investigatory procedure for low back pain remain in doubt for providing helpful information in the acute stage. The relationship of pain to radiological findings has not been substantiated in extensive surveys carried out world wide. Degenerative changes occur as a natural phenomena with advancing years and these changes are usually observed in radiology taken after middle age. CT. scans frequently show bulging or prolapsed discs in asymptomatic patients, again raising the question of value as a diagnostic agent except within certain guidelines. Indeed, the clinical information supplied to the radiologist can influence the type of report that is finally delivered. In the acute case, less than six week duration, there is ample evidence to suggest that radiological investigation is of limited value. Where radicular pain or specific pathology is suspected from the history, CT. scanning would seem preferable to plain film investigation as an initial diagnostic test. When ever ordering radiology one should keep in mind the cost-benefit and the radiation risk to the patient.

INTRODUCTION

Low back pain is a very common problem in adult patients, with an annual incidence of about 5% and a lifetime frequency of 60% to 90% (1,2).

Low back pain can be classified as acute (<6 weeks duration) or chronic (>6 weeks duration) (3). More than 80% of patients with acute low back pain recover sufficiently to return to work within 1 month, and by 90 days more than 90% of patients are working (4). In such a self-limiting condition the value of radiological investigation has to be questioned. Usually a thorough history and examination suffices. However, those whose pain does not respond to conservative therapies and lasts beyond this acute stage may warrant further evaluation. Investigation should be directed towards the exclusion of the more serious causes of backache which require specific therapies. These include cancer, infections, spondylo-arthropathies and fractures.

The aim should be to follow evidence-based criteria on the types of presentations where pathology is likely to occur. This is where detection of radiological abnormalities makes a significant difference to outcomes, both physical and psychological, and where the benefits of investigation outweigh the risks.

This paper will discuss the radiological investigation of low back pain in adults in the primary care setting. It will focus on the two most commonly ordered investigations, i.e. plain radiography and CT. scanning. They will be reviewed in terms of their safety, cost and their diagnostic strengths and weaknesses. Other factors influencing the use of these investigations such as patient expectations, workers' compensation and legal requirements and the consequences of missing a diagnosis will also be discussed. This will lead to a list of criteria for ordering these investigations in the primary care setting.

THE RELATIONSHIP OF PAIN TO PATHOLOGY

The relationship of low back pain to radiological changes suggesting pathology has been challenged by a number of studies over the years (5-8). Perhaps the most important of these are the degenerative changes including spondylosis and osteophytes (5), disc calcification, facet joint arthrosis and subluxation, degenerative listhesis and comprehensive radiological degenerative indices (6). These show a similar incidence in patients with back pain and in asymptomatic controls. Although the findings of degeneration increase with age (7,8), pain does not increase proportionally (6).

Backache reaches its peak incidence in the middle years of life (6). Indeed it is largely a matter of perspective whether the degenerative changes seen with age are a normal process or a sign of pathology.

Several other commonly reported radiological abnormalities are generally felt to be of questionable clinical significance. These include lumbarisation and sacralisation, Schmorl's nodes, mild to moderate scoliosis and spina bifida occulta (3). However, it has recently been shown that where there is clinical evidence of posterior disc herniation, this diagnosis is more commonly confirmed on CT. scan in those with spina bifida occulta than in those without (9).

A relationship between low back pain and the findings of spondylolysis and spondylolisthesis was found in a case-control study by Torgerson and Dotter (5). They also found a significant association between single or multiple disc space narrowing and low back pain. More specific analyses of single disc space narrowing have not shown an association with low back pain (10,11), whereas multiple level disc degeneration has been linked with pain (11). A CT./discography study has shed further light on this by showing that pain response is linked with degeneration, but that this association weakens with age as the prevalence of degenerative changes increases (12).

The radiological finding of a herniated nucleus pulposus is also not a reliable predictor of pain. Wiesel et. al. (13) demonstrated this finding on CT. scanning in 20% of asymptomatic volunteers. However Wilberger and Pang (14) followed 108 patients with asymptomatic disc hernias discovered during myelography for other reasons and found that over 5 years 64% of them developed symptomatic disc disease.

ACCURACY OF PLAIN RADIOGRAPHY AND CT. SCANNING IN THE EVALUATION OF BACK PAIN

In choosing the appropriate radiological tests for back pain an understanding of the accuracy and limitations of tests is most helpful. Table 1 details the sensitivity (100% - false negative %) and specificity (100% -

false positive %) of plain radiography and CT. scanning in the evaluation of the pathological causes of back pain. It can be seen that plain radiography is reasonably sensitive and specific in the detection of malignancy. However it may miss pathology in the early stages because it requires 50% to 75% of focal bone loss in cancellous bone to be visible on the lateral view and even more loss to be visible on the AP view (15). CT. scanning is superior in the detection of malignancy, but bone scanning has the highest sensitivity at 99%. However, with a specificity of only 70%, complementary tests are usually needed after bone scanning to improve specificity (3).

A single postero-anterior film of the pelvis showing inflammatory changes in the sacroiliac joints has a 50% sensitivity for spondyloarthropathy (3). Where changes are equivocal, the addition of angled posterior and oblique films increase this figure to 80%, comparable to the sensitivity of CT. scanning (16).

Plain films are of no diagnostic value in the pre-operative evaluation of sciatica (3). Prolapse usually occurs at an early stage of the degenerative process, before radiological narrowing of the disc space occurs (6). CT. scanning is much more useful in the evaluation of sciatica, although it should be noted that the provision of clinical information to the radiologist affects the interpretation in this condition. In one study of 107 patients with sciatica who had CT.scans, herniated discs were found in 57 when no clinical information was supplied and in 66 when it was. At subsequent surgery there were 3 more false-positive diagnoses in the group with clinical information supplied than in the group without (17).

In trauma, plain films are limited in the evaluation of the posterior elements in the neural canal due to overlapping shadows (18). They underestimate the damage to bone and soft tissues, and they will not disclose spinal compromise (18,19). In a post-mortem study of 31 motor vehicle accident victims with lumbar X-rays showing no bony injuries, 35% were shown to have fractures of the lumbar facet joints on subsequent post-mortem examinations and 77% showed soft tissue facet joint injuries (20).

Table 1. Characteristics of Plain Radiography and CT. Scanning in the Evaluation of Back Pain.

Diagnostic Test	Sensitivity	Specificity
FOR MALIGNANCY		
Plain radiography	70%	90%
CT Scan	95%	80%
FOR OSTEO-MYELITIS		
Plain radiography	80-90%	70-90%
CT scan	95%	80%
FOR SPONDYLITIS		
Plain radiography (PA pelvis)	50%	90%
CT scan	80%	70%
FOR HERNIATED DISC-SCIATICA		
CT scan	72-97%	66%

PRETEST PROBABILITIES IN THE PRIMARY CARE SETTING

In a primary care population with back pain, prevalences of some mechanical causes with radiological findings include 4% with compression fractures and 3% with spondylolisthesis (21). The prevalence of patients with non-mechanical back pain in this population has been estimated at 0.66% for malignancy (22), 0.3% for ankylosing spondylitis (23) and less than 0.01% for spinal infections (24). With these low probability figures clinical methods which screen out those with very low likelihood of these conditions should be pursued before radiological investigation is contemplated. The characteristics of these clinical criteria are outlined in Table 2 (21).

In malignancy, the absence of the historical features of age 50 years or over, past diagnosis of cancer, unexplained weight loss and failure of conservative therapy act together to confidently exclude this diagnosis. Spinal infection should be suspected in those with a history of intravenous drug abuse, urinary tract infection or skin infection (21). In ankylosing spondylitis the key historical features have been shown by Gran (25) to be nocturnal pain which makes the sufferer leave the bed, pain not relieved by lying down, pain

of greater than 3 months duration and morning stiffness lasting more than half an hour. The peak incidence of herniated lumbar discs is in the 30-55 year age group (26). The presence of sciatica has a high sensitivity (95%) in the detection of these.

Table 2. Estimated accuracy of the medical history in the diagnosis of spinal diseases causing low back pain (21).

Disease to Be Detected	Medical History	Sensitivity	Specificity
Compression fracture	Age 70 years or over	22%	96%
	Trauma	30%	85%
	Corticosteroid use	6%	99.5%
Cancer	Age 50 years or over	77%	71%
	Previous history of cancer	31%	98%
	Failure to improve within a month of therapy	31%	90%
Ankylosing spondylitis	Unexplained weight loss (4.5kg in 6 months)	15%	94%
	No relief with bed rest	>90%	46%
	Duration of pain >1 month	50%	81%
Spinal osteomyelitis	Age 50 years or over or history of cancer or unexplained weight loss or failure of conservative therapy	100%	60%
	Out of bed at night because of pain	65%	79%
	Pain not relieved supine	80%	49%
Herniated disc	Pain duration 3 months or over	71%	54%
	Back pain at night	71%	53%
	Morning stiffness, 0.5 hours or more	64%	59%
Herniated disc	Intravenous drug abuse, urinary tract infection or skin infection	40%	NA
	Sciatica	95%	88%

WHAT IS AN ADEQUATE RADIOLOGICAL EXAMINATION OF THE LUMBAR SPINE?

A full series of lumbar spine plain radiographs includes anteroposterior, lateral and oblique views and a coned lateral view of the lumbosacral junction. The value of the oblique and coned lateral views has been challenged by Scavone et. al. (27) who found in a large series that these views gave additional information in only 2.4% of patients. Unilateral spondylosis was the radiological finding most often undiagnosed on AP and lateral views, and the only omissions were spondylolysis and a single congenital facet fusion.

Padley et. al. (28) have challenged the need for the AP view by showing that a single lateral view did not miss any significant pathology that was found on the conventional 3 film lumbar spine series. However, their series excluded any patients in which there was a suspicion of malignancy or infection.

Davies et. al. (29) found that radiologists performed better in the identification of metastases when viewing the AP film than the lateral film, but performed best of all when able to view both. Likewise, cases of inflammatory spondylitis were better detected on AP than lateral views. Conversely they performed better in the detection of infection with the lateral view than the AP view as the disc spaces are best seen on the lateral views. Hence reduction in the lumbar spine series to a single lateral view to reduce gonadal radiation would seem to threaten its prime purpose of detecting serious disease.

CONSEQUENCES OF A DELAY IN DIAGNOSIS

In adopting a purist's approach to minimising the number of unnecessary investigations, the consequences of a delay in diagnosis must be addressed for each diagnostic group.

With lumbar malignancies and infections a delay in diagnosis does mean a delay in specific treatment that can reduce pain and suffering. The challenge for the primary care practitioner is to remain vigilant for these conditions with their very low prevalences. In contrast, acute low back pain of mechanical origin is very prevalent in primary care. However a delay in its radiological diagnosis is of questionable significance because of its lack of influence on the choice of therapy/outcome for the different aetiologies identified and the more favourable natural history of this condition (30).

Similarly, for patients with acute sciatica, a delay in radiological confirmation of the cause is of questionable importance as most resolve with conservative therapy (31). Disc surgery and its radiological requirements should generally not be performed in those who have been symptomatic for less than 2 months. The exceptions here are progressive neurological signs and evidence of cauda equina compression, which should not be treated conservatively (31).

It is unclear under which conditions significant traumatic lesions can be missed (32). As there are no selective clinical criteria to differentiate stable from unstable fractures, radiographic evaluation of lumbosacral trauma remains indicated. Although ankylosing spondylitis is listed as a condition where radiology is indicated, the

consequences of missing this diagnosis for the first few months are not serious. Moreover, as one of the criteria for diagnosis is pain for at least three months (25), radiology during this period may not be sufficient to give a definite diagnosis.

OTHER FACTORS INFLUENCING THE USE OF RADIOLOGY

Patient and Doctor Factors

Many patients with back pain express needs for more information and information of better quality about their conditions. Where these needs are not met worse compliance with treatment and a desire for more evaluation may result (33). Patient satisfaction may well be higher when films are obtained (34) and so is likely to influence the use of radiology by general practitioners.

The emphasis that many general practitioners place on a positive radiological diagnosis is another factor promoting use. The ordering of investigations for acute mechanical low back pain can be likened to the prescribing of antibiotics for viral upper respiratory tract infections - it keeps the patients happy and it requires less effort on the doctor's part than explaining why neither approach is indicated.

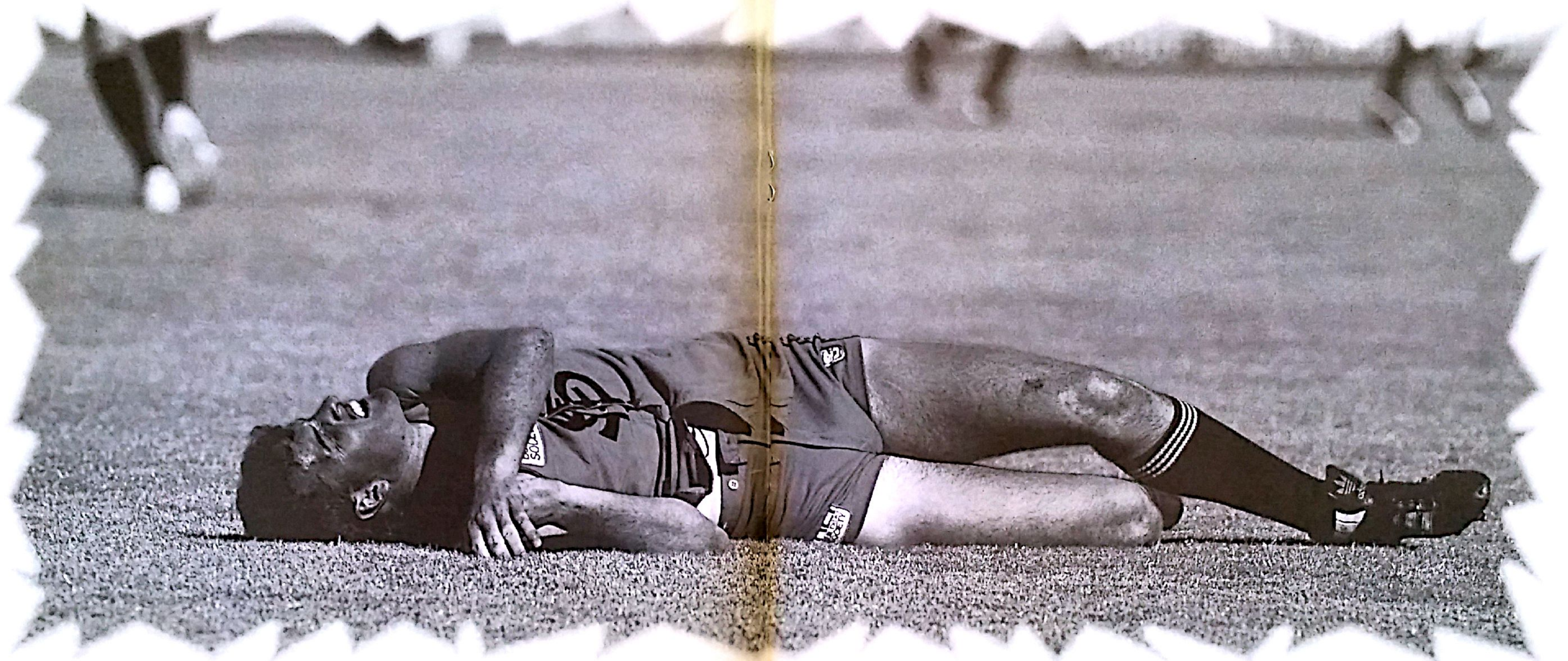
Medicolegal and Compensation Factors

Medicolegal considerations are considered to influence the ordering of lumbosacral examinations in 6% to 30% of patients (32). Factors affecting this in work-related injuries may include the requests for results of X-ray findings by the Workers' Compensation Board. Doctors may also be concerned that when their patients with work injuries are called for review by specialists working for the board that the absence of films will be regarded as a substandard assessment by the specialist. This may also be a factor in referrals for back pain unrelated to work.

In a recent set of Workcover guidelines for the management of back-injured employees, a plain X-ray is not recommended until 4-6 weeks after injury in back pain with no radicular elements with or without referred pain (35). Further radiological investigation in the primary care setting is not recommended. A plain X-ray and CT. scan is suggested at the onset for the evaluation of back pain with leg pain and abnormal

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unilateral neurological signs. Similar investigations are recommended in the absence of neurological signs only if 'psychosocial factors' are not dominant.

Cost-benefit

The cost of lumbosacral spine films to the community is of considerable importance when contemplating their use. In 1985 an estimated 9 million lumbosacral spine films were performed in the USA at a cost of US\$825 million (32). Ten percent of all orthopaedic radiographs taken are of the lumbar region (6) and in the evaluation of acute low back pain, films are ordered in 18% to 39% of cases (34).

Liang and Komaroff (24) have attempted to estimate the cost-benefit of plain films in primary care patients with acute low back pain. They based their estimates on a 0.2% probability of serious disease not detected by history and examination and benefiting from specific treatment. They compared a roentgenogram strategy for all patients at the first visit with a selective roentgenogram strategy at the first visit where films were taken at 4 and 8 week follow-up visits if symptoms had not improved. The theoretical benefit of the roentgenogram strategy was an average reduction of 0.04 days of suffering per patient at ten times the cost and a tenfold greater radiation exposure. They concluded that the risk and cost of the earlier diagnosis of the small percentage of occult serious disease was not warranted.

Radiation Exposure

Although modern radiographic equipment and techniques endeavour to minimise radiation exposure, the current levels of radiation in lumbar spinal radiography still call for serious consideration of the risk-benefit ratio to the patient. The total body radiation dose from an average lumbar spine series of 3.4 films has been calculated at 3.8 mGy, with an associated marrow dose of 2.2 mGy and an ovarian dose of 6.4 mGy (36). This compares with a recommended effective annual dose limit for the general public of 1 mGy and an average natural background dose of 1-2 mGy. While the risk of low level irradiation is difficult to assess, it has been estimated that 1 million lumbar spine films may result in an excess of approximately 10 deaths from malignant neoplasms (37).

The published data on radiation dose from CT scanning of the lumbar spine varies considerably. It is dependent on the size and habitus of the individual patient and to a considerable degree on the type of scanner being used. The approximate total body dose would be 55-70 mGy (36). Most of the latest scanners incorporate more efficient detectors allowing for a reduction in radiation dose for no loss in image quality.

The radiation 'costs' of CT scanning are difficult to compare with conventional films because of the different manner in which the radiation is delivered. The internal body tissue dose in CT is a greater proportion of the skin dose (40-70%) than is the case with films (approximately 10%) (38).

GUIDELINES FOR RADIOLOGICAL INVESTIGATION IN THE PRIMARY CARE SETTING

The decision to investigate low back pain radiologically should be guided by the same primary considerations guiding the investigation of other medical problems, namely:

- Will this investigation influence the treatment?
- What is the probability that significant findings will be present based on clinical judgement and the accuracy of the investigation?
- What are the consequences of a delay in diagnosis at this visit?

Secondary, but nonetheless important considerations include:

- Patient reassurance about the absence of serious disease.
- Medicolegal and compensation factors.
- An assessment of the costs, risks and benefits of investigation.

To satisfy the primary considerations above, the indications for investigation of acute low back pain at the first primary care visit based on the evidence presented in this paper are as follows:

- Significant trauma.
- History of cancer.
- Unexplained weight loss (4.5 kg in <6 months).

- Associated fever.
- Drug or alcohol abuse or corticosteroid use.
- Symptoms and signs of cauda equina compression.

Investigations should be ordered after 4-8 weeks if there is no improvement or a deterioration despite adequate conservative treatment. This acts as a safety net in detecting the very small number of serious cases not screened out by the above guidelines (24). Age over 50 years has been suggested as an indication for radiology at the first visit in emergency departments (32) but in the general practice setting the 4 to 8 safety net guideline would seem adequate.

If there are features of a spondyloarthropathy, investigation is indicated after 3 months of pain. Pelvic films with postero-anterior, angled posterior and oblique views should be the initial radiological investigation here.

The Workcover guidelines (35) for the investigation of acute sciatica with neurological signs do not seem to be driven by their influence on treatment. A large proportion of patients with this condition improve without surgery or do no better with surgery (39) and so could well be left without investigation for the first 4-8 weeks. Investigation should be reserved for those who fail to improve by this time and/or are being assessed for surgery.

Regarding the secondary considerations, investigation principally aimed at reassuring patients about the absence of serious disease should not be a substitute for a good history, examination and discussion of the diagnostic probabilities.

Taking this further and using radiological examinations to make a diagnosis should be approached with a healthy degree of scepticism. Not only may this fail to contribute to the solution of the clinical problem, it may actually serve to obscure it. Unless there is a good correlation between the clinical features and the radiological findings, the latter should not be used as a label for the cause of the pain.

As with the pressure to reassure patients, medicolegal and compensation factors may at times override sound clinical judgement on the ordering of radiological examinations.

These should be tempered by consideration of the cost and risks of such examinations.

All the above considerations apply in the radiological investigation of chronic low back pain if it has not already been investigated at the first visit. However, the value of repeat plain films is questionable as it has been shown that 64% of these demonstrate no interval change and another 32% follow some expected healing or degenerative process (40).

CHOOSING THE APPROPRIATE RADIOLOGICAL INVESTIGATION

The choice of a radiological investigation is not only influenced by the multitude of factors discussed thus far, but also by the prevalence of the suspected condition in the particular primary care setting.

Kelen et al. (32) have made recommendations about the choice of radiological investigations in the emergency room setting. They advocate conventional films first in patients with mechanical pain who are over 50 years of age or have failed to improve by 4-8 weeks. They are also a reasonable choice in the general practice setting.

They express a preference for CT scanning over conventional films for the following presentations:

- Significant trauma.
- Non-mechanical pain where there is a history of cancer, infection, fever and where no specific pathology is suspected.
- Root syndromes where conservative therapy has failed or where cauda equina compression is suspected.

With the low frequency of these conditions in the general practice setting, the need for CT scanning should rarely arise.

In significant trauma plain films are limited in the detection of damage to the neural canal and the posterior elements of the vertebrae (18,20). CT scanning does not require the patient to be moved and is superior in the detection of bony and soft tissue trauma (38). At less significant levels of trauma usually seen in general practice and where osteoporotic crush fractures are suspected plain films would seem to be a more cost-effective choice.

CT scanning is more sensitive in the detection of spinal malignancy and infection (3), but bone scanning is more sensitive still and should be considered as the initial investigation where these diagnoses are a real concern.

In the general practice setting where the pretest probabilities of these conditions is very low, plain films with close clinical follow-up offers a safe and more cost-effective alternative.

In spondyloarthropathy CT scanning and a pelvic series of plain films offer similar sensitivities (3), the cheaper alternative being plain films.

Plain films are of virtually no diagnostic value in the pre-operative evaluation of sciatica (3). Here CT scanning without contrast may be slightly inferior to myelography (41), except with far lateral disc herniations where it is more sensitive (38). If referral for surgery is contemplated, investigations should be left to the surgeon as the CT scan may have to be repeated with contrast to ascertain the exact site of pathology.

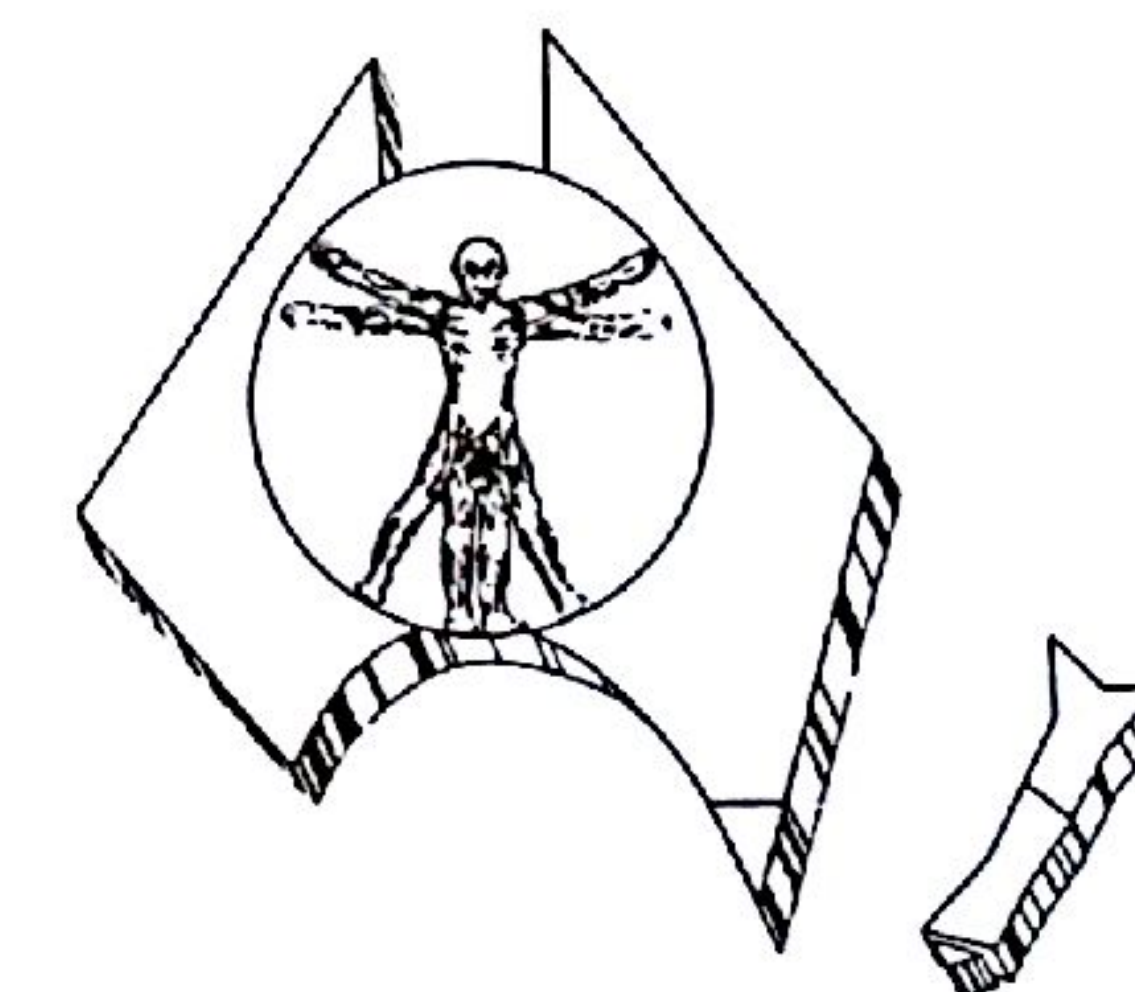
CONCLUSION

The decision about whether to investigate low back pain in the primary care setting is a complex one influenced by many of the factors discussed in this paper. The purpose of this paper has been to provide the reader with the information required to make an informed decision which will reduce the number of missed and incorrect diagnoses from radiological investigations. At the same time it should keep radiation exposures and costs to acceptable levels.

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BACK REHABILITATION

L.T. TWOMEY

Curtin University of Technology, Western Australia

Abstract

Chronic low back pain is one of the most common disorders in western societies. Precise etiology is often difficult to elicit, but there is overwhelming evidence that inactivity is deleterious while active physical rehabilitation does result in rapid recovery. Restoration of function is associated with pain reduction. There are now methods of measuring both physical and behavioral function. In rehabilitation centres, patients are measured prior to programmes being activated and at the conclusion of those programmes. These programmes are designed toward preparing each individual for their return to the workplace. Work hardening is the overall theme. By increasing the participant's strength, endurance and cardiovascular fitness there is a concomitant reduction in the level of pain. These findings even apply to herniated lumbar discs.

1. INTRODUCTION

The current epidemic of low back pain and spinal dysfunction in western society, with its consequent huge costs to the individual and to the communities concerned, has demanded concentrated attention in recent years. It is suggested that contemporary health science is currently unable to contain the ever increasing costs of treatment (1) and is failing to provide this definitive answers to this multifaceted problem. However, closer analysis investigation reveals that in some areas there have been significant recent advances in our ability to rehabilitate those with chronic back pain (2,3).

Few people escape back problems and associated pain during their lives and all vertebral columns show changes with age which make them potentially less able to cope with the variety of physical stress of daily life. It is considered that 80 per cent of adults in Western industrialised societies suffer low back pain during their lifetime. In terms of work loss and treatment costs, back pain is the single most expensive musculoskeletal ailment in western society (4,1,5). At any time, about 40 per cent of any large gathering will indicate that they currently have low back pain, while as many as 60 per cent of the population will have experienced some degree of low back pain in the past year (6).

In the absence of a complete knowledge of the pathogenesis of back pain, and the inadequacy of some diagnostic procedures, many of the diagnostic labels attached to patients are uncertain and treatment is often

empirical (2,5). However, recent biological and epidemiological studies continue to fill in the gaps in our knowledge of normal spinal structure and function and of the patterns of age changes and related pathology in the spine (4). Low back pain and low back dysfunction or disability need to be carefully distinguished (1). While both may reflect pathology and structural change, soft tissue or biochemical pathology are not readily diagnosed by current investigative methods and the assessment of pain and dysfunction still rests primarily on the individual's subjective history. This is influenced by the patient's beliefs and attitudes (7), and the subjective report of the severity of back pain may reflect a host of other influences. These influences include concepts as diverse as the patient's learned response to pain, the patient's interpretation of the meaning of their back pain, and patient avoidance behavior associated with unpleasant aspects of the patient's lifestyle or occupation.

2. EXERCISE AND BACK PAIN

It is not the purpose here to consider the treatment of acute low back pain. There are many treatment methodologies which appear to be effective and the reader is referred to Grieve (8) and to Corrigan and Maitland (9) for excellent descriptions of many of these physical treatment methods. The present paper considers the treatment of chronic low back pain as it is this disorder which is most prevalent in western societies and has been the focus of considerable research effort.

In recent years, it has become clear that physical activity is beneficial and necessary to patients with back pain; active

rehabilitation not only restores function, but is also strongly associated with a reduction in pain (1,3,4,7,10-12). There is NO evidence that prolonged rest, or the avoidance of exercise/activity brings about a reduction in chronic back pain; indeed the evidence supports the view that except for a short period after injury, rest has no effect on the natural history of back pain. A number of studies suggest that prolonged inactivity accentuates the problem and may increase the severity of the pain (12,13). In spite of this evidence, bed rest, analgesics, the prescription of corsets and the avoidance of physical activity are still the most commonly prescribed forms of medical treatment (1).

There is no doubt that prolonged bed rest and inactivity brings about profound deleterious changes to the musculoskeletal system (14,15). There is a decline in physical fitness, a marked reduction in muscle strength, a reduction in joint range and flexibility and a decline in bone mass in those individuals whose activity levels are severely curtailed (14,16,17). All parts of the musculoskeletal system demand constant use throughout life and event into extreme old age to maintain their strength and efficiency. In the spine, the health of joints is largely dependent on repeated low stress movements. The intervertebral discs and the articular cartilage of the facet joints are dependent on the "stirring effect" of movement for the maintenance of adequate fluid transfer and nutrition in their a vascular cartilage (15,18). A habitual reduction in activity levels is inevitably associated with a decline in a person's ability to react appropriately to changes in the environment. A return to physical work, after a period of bed rest for chronic back pain, exposes an individual to risk of further back injury, since the individual's state of musculoskeletal fitness is much lower than it was when the back pain initially caused the person to stop work. Such individuals are weaker, less mobile and fatigue more rapidly than before they stopped work and it is little wonder they often suffer an early recurrence of their back pain problem on return to work (3,12). Much of the lost productivity in industry, resulting from work absence due to back pain, relates to the physical changes directly resulting from bed rest and inactivity (19).

3. PHYSICAL REHABILITATION

In recent years, an improved understanding of the relationship between back health and activity and of the deleterious effects of prolonged disuse, has resulted in a new approach to treatment in many centres (1,3,12). This approach concentrates initially on the need to gain a comprehensive "baseline" measure of back function and fitness and pain levels. Patients are then fitted into a programme of intensive physical therapy appropriate to their physical status. This will often include a behavior medication programme, aimed at rapid functional restoration and a return to work as soon as possible. The success of such programmes can be measured by marked improvements in physical capacity and function and particularly by the ability to return to the workplace. Improvement during the course of the programme should not be judged solely by the patients' subjective self-reports on their pain levels, since this is often modified substantially by legal, psychological, financial and social factors (20). It is important to note that at the conclusion of such programmes of intensive physical reconditioning a significant reduction in subjective pain measures are consistently reported (1,20,21). As a general rule, people who are physically fit recover faster from any musculoskeletal ailment (22).

The recent advances in the intensive physical rehabilitation of patients of all ages with chronic back pain have developed principally from the treatment of young athletes with sports injuries (3,22). It has been known for some years that athletes with severe musculoskeletal damage (including back injury) respond very well to intensive programmes of physical treatment (22).

4. MEASUREMENT

Measurements of spinal performance have proved difficult to devise and slow to gain acceptance because of the complexity of the vertebral column, which consists of a multitude of small joints, covered by large fleshy muscles with overlapping attachments, allowing complex multiplanar movements (23). However, it is now possible to measure many aspects of the movement behavior and mechanical capacity of the vertebral column

by non-invasive technologies which have been verified in laboratory and clinical trials (4,3,24). These measurements include:

4.1 Measures of Physical Function:

4.1.1 Ranges of lumbar movements, using instruments such as the lumbar spondylometer and rotameter.

4.1.2 Isokinetic trunk strength, utilising isokinetic dynamometers such as Cybex, Kin Com and Isostation B200 (3,21,24).

4.1.3 Measures of muscle endurance for trunk extensor and flexor muscles (21,25).

4.1.4 Measures of cardiovascular fitness and efficiency using standardised fitness tests.

4.1.5 Static and dynamic lifting using fixed loads or dynamometry (3,11,21).

4.1.6 Measures of functional capacity. These are usually especially constructed for each subject and reflect the working conditions to which it is expected they will return (2,12).

4.1.7 Dynamic obstacle course. A timed test stimulating activities of daily living, and requiring the person to complete the series of tasks in many different positions (3).

4.2 Measures of Behavioral Function:

The behavioral self-report measures available are many and different clinics use many combinations of them. They include such tests as:

Oswestry low-back pain/disability questionnaire;

Visual pain analogue scale; Quantitative pain drawing; Minnesota Multiphasic Personality Inventory;

Middlesex Hospital Questionnaire.

Patients are measured prior to and at the conclusion of the intensive physical treatment programmes and at regular intervals during the programme. In addition, every aspect of their physical work activity is carefully monitored to assess

ongoing performance levels. Regular follow up assessment is done at six weeks, three, nine and twelve months intervals after the conclusion of the programmes.

5. PHYSICAL TRAINING AND WORK HARDENING

After the initial measurement and full medical diagnosis and assessment, patients begin a programme of intensive physical therapy and work conditioning for 8 to 10 hours a day over 3 or 4 weeks (3,12). Each programme is carefully tailored to meet the particular requirements of the entering individuals, and is closely monitored by appropriately trained staff. The patient's working day consists of a well constructed mix of weight training, aerobic and fitness work, functional activity, relaxation and stress training, work hardening, educational instruction and where appropriate, behavior modification. All programmes emphasise active participation, encourage the individuals to continue to persist at their tasks irrespective of their back pain levels and demand a progressive increase in work output as the programme proceeds. Cardiovascular fitness is always included as a central element, since it plays a most important role in back injury and in prevention (26,27).

There is always an accompanying back education component which teaches the patients about the structure, function and pathology of the vertebral column. This segment needs to allow considerable opportunity for dialogue between educator and patients and seeks to ensure that each patient develops a proper understanding of his or her particular back problem and its management. Thus, the educational component should include both group and individual counselling. This is usually done by a clinical psychologist who may be using behavior modification, relaxation and pain management techniques.

The whole thrust of these programmes is directed toward preparing each individual for return to work. Thus, specific programmes of work hardening need to be constructed and implemented. The aim is to return the individual to the previous occupation

wherever possible. At times, either the workplace requires modification or the patient requires retraining for a modified or different occupation. In these circumstances, the physical and occupational therapists should work in close harmony with the rehabilitation counsellor and representatives of the patient's workplace.

Patients from occupations requiring heavy and/or repetitive lifting procedures are not precluded from such programmes. All programmes include substantial lift-training components. Recent research clearly indicates that most individuals can be trained to manage heavy, repetitive lifting tasks, using well-proven and long known weight training techniques (28). Thus, the initial assessment procedure determines the type and duration of lifting activity which any individual will need to perform at work and trains that person specifically for that task. If, for example, the job requires the lifting of 10kg legs of ham from a freezer and placing them on a shelf then the individual is trained to a level so that they may adequately perform that particular task. The physical therapist ensures that the training initially uses low loads and low repetitions. Progressively, the size of the loads and the numbers of repetitions are increased until a satisfactory standard is reached. These methods will generally ensure that the patient's strength and endurance capacities are progressively and rapidly increased.

Other work activities can be measured and appropriate training is provided in the same way as for lifting. The whole process of fitness for a specific occupation forms a most important part of the total rehabilitation process and is the goal to which the physical programme is directed. This requires a close investigation of the worksite by the rehabilitation team, a proper assessment of the physical/mental requirements of the task and the subsequent development of a training programme aimed at developing those skills in the injured worker. It must involve dialogue with management, and often leads to changes in the workplace so as to provide an ergonomically safer and more efficient worksite. Thus the heights of benches, tables and chairs may need modification and often the ergonomist/therapist is able to provide

information on alternative techniques or facilities which might be used to help the worker perform the tasks more appropriately and safely. Where repetition of physical activity is a central part of the occupation, the employees and employers are educated as to the length and nature of pauses which are necessary throughout the working day to avoid fatigue and prevent musculoskeletal problems. It is important that pause activities and exercises be taught to the employee as an essential part of a job. The close co-operation of the employer is central to the success of this approach. Just as much as the employees need to be fit for the tasks which the job prescribes, employers need to understand the physical difficulties of particular tasks appreciate and the need for some alternative activity at appropriate times throughout the working day.

Similarly, a strong association has been shown between poor physical work skills, low levels of strength and endurance and the incidence of occupational back pain and dysfunction (29,12). By increasing the participant's strength, endurance and cardiovascular fitness, together with improving the specific handling skills necessary for a particular occupation, there is usually a concomitant reduction in the level of back pain reported (29,26). This provides a cogent argument for ensuring that physical rehabilitation programmes are especially tailored to suit the work skills and requirements of particular individuals. While there are many physical exercises and activities which can be done in common within a large group, there is no doubt that specific "work hardening" is an essential part of any programme (12).

6. RETURN TO WORK

In Mayer's (3) classic study of objective assessment and intensive physical treatment at the PRIDE establishment in Dallas Texas, 84 per cent of his study group (n=62) returned to work and continued in work for 12 months after the conclusion of the programme. This compared very favorably with a return to work of 55 per cent for his control group, and only 20 per cent for those who dropped out of his initial cohort. Mayer's control group consisted of 38 patients, each with a similar history of

chronic back pain, who were eligible for entry into the programme, but where there was prolonged delay or refusal by their insurance companies to authorise participation. Continuing data for the Pride Clinic show that the initial population is continuing in employment for some years after the completion of their initial treatment/education programme.

However, the figures indicating an 84 per cent return to work are higher than those obtained at most other clinics. In West Australia, data from a clinic (21) with a similar philosophy, demonstrates a 55 per cent return to work, with that group still retained in employment at the end of 12 months, whereas a matched control group showed only a five per cent return to the workforce within the same period.

A recent retrospective cohort study by Saal and Saal (30) considered the functional outcome of an aggressive physical rehabilitation programme in 64 patients with herniated lumbar discs. The underlying premise of the treatment was that patients should be involved in active rather than passive therapy. The study showed that 90% of the patients has a good or an excellent outcome based on measurement criteria and there was 92% return to work. Four of the 6 patients who required surgery were found to have spinal stenosis. The study demonstrates that some patients with herniated lumbar discs can be successfully treated by intensive physical therapy and that surgery should be reserved for those patients in whom function has not been improved by aggressive physical rehabilitation (30).

SUMMARY

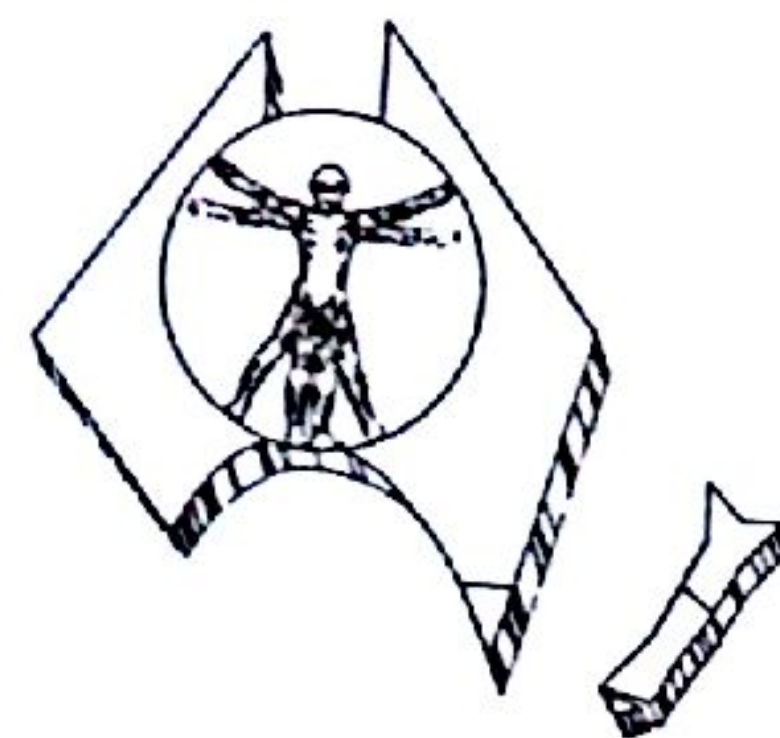
A review of recent current literature reveals that patients with chronic low back pain react better to active rather than to passive treatment regimes. Indeed, the existing information demonstrates that rest, which is currently the most popularly prescribed treatment, often exacerbates rather than improves the condition of those with low back pain. Deyo et al (31) have shown that two days of bed rest after an episode of acute back pain is sufficient and that further bed rest causes a significant decline in a patient's functional capacity. They believe that if a

policy of no more than two days of bed rest was universally applied that there would be significant benefits for a community. These would be realised in terms of reduction in the indirect costs associated with low back pain for patients and employees and that absenteeism would be substantially reduced.

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PAIN CONFERENCE ADDRESS

Christopher J Legoe QC

The following address was delivered by Justice Legoe to the Pain Conference held at Flinders Medical Centre on 17th September 1994. This address has been un-edited and contains some legal 'jargon'. The contents present an insight of what the "Bench" seeks from medical practitioners when determining medico-legal claims where pain is a salient feature. It beholds all of us to understand the difficulties faced by non medical personnel in coming to terms with our own medical 'jargon'. There are many grey areas contained within the parameters of pain aetiology management and it is obviously often difficult for the court to be able to arrive at simple decisions. It is our responsibility to supply comprehensive medico-legal reports to the court that are precise, written clearly and contain the relevant facts.

WHAT SALIENT ASPECTS OF A GENUINE PLAINTIFF'S CASE HAVE TO BE DELINEATED?

When turning my mind to this topic I am reminded of Peter Mere Latham's words in Book II of his *Collected Works*:

"It would be a great thing to understand PAIN in all its meanings."

I shall try to do this by discussing some aspects of pain claims that have been indicated to me during my sixteen years as a practising Supreme Court Judge. In order to crystallise these it is necessary to formulate a few basic legal principles.

I. What Does the Genuine Plaintiff Have to Prove?

The law has undergone some changes and a degree of refinement over the last 20 to 25 years. The reported decision in the various Australian State Supreme Courts and the High Court fill bookcases. The current thinking of barristers in presenting the plaintiff's case in 1970 is vastly different to the present day assessments. In 1970 some States, for example New South Wales and Victoria, retained the lay jury system to assess claims. South Australia abolished civil juries in the 1920s. Judges in this State have perhaps the longest record of assessments by Judges alone.

As the number of judicially reasoned awards increased since the other States have abolished civil juries in damage assessments so the legal literature has exploded.

For the purpose of this talk I enumerate a few basis propositions.

1. The plaintiff must prove his or her claim on the balance of probabilities. Judges pose various approaches to this standard of proof - "is it more likely than not that this plaintiff has suffered, and (if alleged) continues to suffer, the pain and suffering he or she claims, etc." In other words the plaintiff must first prove his/ or her genuineness.
2. Consequent upon 1. above it is axiomatic that the Judge determines the existence of pain in fact **subjectively**. Appeal courts often emphasise the importance of specific subjective findings of fact - for example; is the plaintiff credible? Are the witnesses (for both plaintiff and defendant) reliable and credible? Does the trial judge believe him or her sufficiently to prove the complaints of pain? Is the plaintiff's story consistent? How does the story (at the time the plaintiff is in the witness box) sit with what the doctors were told when the plaintiff was examined? Judges should give written reasons for so many of these matters as they consider are relevant.
3. In 1987-1988 the Supreme Court completely recast the Rules of Court. Among the substantial procedural changes made to the Rules were a block of rules prescribing the matters which must be pleaded by a plaintiff seeking damages or other remedies for injury.

Pain has been recognised by the courts as a compensable injury. But the new Rules have placed a strict requirement on plaintiffs to particularise the pain. Is it purely physical sited at a fracture or flesh wound? Or is it partly physical and partly mental - related stress. I shall refer to these aspects of pain later in other contexts. The plaintiff who fails to particularise the claim will be prevented by the operation of the rules from leading evidence on that topic or aspect of pain and suffering.

4. Today there is a sophisticated pre trial procedure whereby conciliation procedures are adopted by officers of the court, namely Masters, who require all medical reports to be mutually disclosed between the parties. This disclosure is now obligatory upon all parties. Sanctions are imposed by way of orders prohibiting the party guilty of the neglect to disclose relevant reports or manifest delay in disclosing the report(s) from leading evidence or going into proof of the injury(ies) referred to in the non-disclosed reports. There have been a number of recent decisions in the Supreme Court on these topics. These pre-trial procedures are centre around the so-called "compulsory conference" resided over by a Master of the Court. If the claim is not settled or compromised then the Master certifies that all relevant medical reports have been disclosed and the matter is otherwise ready for trial. It is of vital importance that medical reports contain details of all the known and apparent disabilities. In the context of this conference the site, the extent of and duration of the plaintiff's "pain and suffering", should be specified (to use the terminology of the case law on this topic) which should be set out in the medical reports.
5. Depending upon the state of the Cause Lists in the Supreme and District Court the hearing usually takes place between three months and nine months from the time when a master has certified the case is ready for trial.
6. Any developments (improvement or deterioration) during the period after the Case has been set down for hearing and the actual hearing have to be recorded and disclosed to the parties in the further medical reports. These must be expeditiously reported and disclosed. Sometimes in the case of subsequent medical complications the trial date has to be postponed to allow time for proper medical treatment (operations etc) and assessment. Each case differs and the courts have the ultimate prerogative to dictate the terms and conditions upon which the case is to be adjourned. This may create some difficulties for the forensic expert preparing the report. The main point to bear in mind is that all reports should be given on the basis that the facts and opinions will have to be substantiated by evidence if the claim proceeds to trial.
7. The Judge hearing the claim will determine it by finding:
 - (a) has the plaintiff established on the balance of probability a legal claim - for example if a claim in negligence (the commonest type of injury claim) did the defendant owe the plaintiff a **duty of care** - this is a mixed question of fact and law to be determined by the Judge;
 - (b) has the defendant been shown by the plaintiff to be responsible for any breach of that duty - in other words was the defendant's negligent conduct **causative**. The judge can only find such a breach of duty on legal liability on the facts proved in evidence of the case;
 - (c) was that conduct which the Judge has found to be causative of the breach also **causative of the injury** (for the purpose of this conference - pain). This issue is where the medical examination and opinion will be essential to the plaintiff's claim and to the relevant scrutiny of the defence counsel's cross examination.

Perhaps I should at this stage emphasise that medical and scientific opinion is a **matter of fact**. The Judge must assess the expert opinion in the light of all the evidence - both that of

the plaintiff and defendant and their witnesses, and finally in reasons for judgment make a finding as to which opinion(s) that Judge accepts and applies and which are rejected;

- (d) the judge will then make an "assessment" of the injuries and consequential damage which are recoverable in law and in fact by that plaintiff. In the earlier decisions the Judge usually made an overall assessment and arrived at one final overall figure as the damages to be awarded to that plaintiff.

But that has now changed, a number of decisions in the High Court of Australia have marked these changes. The landmark decision of *Arthur Robinson (Grafton) Pty Ltd v Carter* (1968) 122 CLR 649 raised the issue as to whether the trial court erred in allocating to conventional heads of damage specific amounts and then simply adding those amounts up and awarding the total sum to the successful plaintiff. Problems which have arisen by this process are (a) the need for a trial Judge sitting alone to allocate specific sums to each of the different heads; and (b) the danger of overlap if specific sums allocated to different heads are merely added up to reach the global sum awarded. These problems continue to appear in assessments particularly where pain is a component of the injury(ies) and medical opinions differ as to the origin of the pain, the site of the pain and the genuineness of the pain. It was succinctly put by Windeyer J in *Teubner v Humble* (1963) 108 CLR 491, @ 505 -

"The conventional headings, economic loss, deprivation of amenities, and pain and suffering, provide a convenient reminder of matters that ought not to be forgotten. But it is not always appropriate to consider them as if they were distinct items in a balance sheet; for one may overlap and impinge upon another."

The same judge elsewhere described the injury assessment process as "an arbitrary determination, not a necessary conclusion from ascertained fact;" *Bresatz v Prizibilla* (1962) 108 CLR 541 @ 543

II. The Role of the Medical Practitioner

"Pleasure is oft a visitant; but pain clings cruelly to us."

I wonder if we all agree with these words of John Keats in Book I of *Endymion* line 906. This is an age of specialisation, particularly in the medical profession and to an increasing extent in the legal profession. Vital to the judicial assessment of damages for pain and suffering is the medical evidence submitted by the parties. Judges have no training in medical science. It is often suggested that the experience gained by barristers before going on to the bench is either misleading or out of date. Medical research is a boom business particularly over the last two or three decades.

What goes through the Judge's mind that enables him or her to assess conflicting medical opinion? One is reminded once again of Latham's words:

"People in general have no notion to the sort and amount of evidence often needed to prove the simplest fact." (supra)

I have touched on this to some extent above in my outline of what a genuine plaintiff has to prove.

From the Judge's point of view it is worth nothing that the judicial oath obliges the Judge to preserve impartiality and a proper balance on the issues raised by the parties in the particular claim. Pain features in many of the cases that remain unsettled and go to court. The amount of material that a Judge reads prior to the hearing is limited. Because the Rules require the parties to file written consents to compromise the case the Judge cannot and must not search through the court file which is in court in the hands of the Associate. The parties are obliged to file a set of

"copy documents" for the use of the trial Judge. The copy documents contain the pleadings (Claim and Defence etc) and the Master's Certificate of "readiness for trial" but not the medical reports disclosed by the parties nor other interlocutory proceedings such as interrogatories administered by the defendant seeking answers from the plaintiff as to specific aspects of the alleged injury such as pain and suffering. Sometimes the barristers agree that the medical reports can be handed to the Judge once the case has started. Such reports are usually tendered on the basis that the reports contain the evidence that the medical witness could give if called. Where the claim is contested and other particular aspects of the injury are disputed, and more especially where there is a conflict of medical opinion, for example is the pain genuine or is it permanent or intermittent etc, the medical reports are only shown to the Judge beforehand on condition that the party tendering the report undertakes to call the medical expert who gave that report.

All of this means that the Judge knows very little about the pain history, the degree of pain, the site of the pain etc, until the plaintiff gives evidence, and the supporting medical evidence is called. Speaking for myself what went through my mind was a long checklist which the parties respectively should answer by evidence from the lay key witnesses and medical experts. Our system of justice is the so called Adversary system. Under that system it is not the Judge who descends into the arena and stirs by asking searching questions of the witnesses. In France by way of contrast where the Inquisitorial System of Justice prevails the Judge takes an active part in the examination of the witnesses. Under our common law system appeal courts have interfered with awards after a trial where the transcript discloses the Judge has questioned a witness at length and more so when the Judge has hassled a plaintiff or other important witness by a barrage of questions. I hasten to add such appeals have been rare and I believe very rare in recent times.

The Judge's function is indeed to listen, to understand, to condense and finally to apply a conclusion from the evidence to the relevant facts of the claim. Normally I adopted a practice of only interfering when I thought counsel and the medical practitioner expert were at cross purposes or not on the same wave length. It is important to engage the confidence of the medical expert and sometimes an odd question on a related topic or put in a different manner will help to elucidate the opinion. We all differ in our ability to explain the techniques of our profession in simple terms which are comprehensible to another who is not a member of that profession.

Frequently medical experts appear puzzled, frustrated and even annoyed when lawyers indulge in long worded discussions about the admissibility of evidence. Likewise, it is sometimes difficult for a Judge untrained in medical science to digest, comprehend and apply complicated theories and terminology on subjects such as psychosomatic functions etc.

The medical expert who comes to court with a clear brief from the party who is calling that witness as to the evidence on pain to be given will be a welcome breath of fresh air to the judicial task to assess the disability. The Medico-Legal Society embarked on this co-operative scheme many years ago when I was a young practitioner. I am unaware of the work done by that organisation today. But it seems to me that the pre-trial procedures introduced in 1987 have greatly assisted in the collective understandings of the two professions in this regard. Perhaps there is still work to be done in this field.

III. The Role of the Defence

"who, doomed to go in company with pain
And fear, and bloodshed, miserable train!
Turns his necessity to glorious gain"
Williams Wordsworth - Character of a Happy Warrior (1806)

Counsel for the Defence are duty bound to protect the purse of those who pay damages assessed for pain and suffering whether it be an insurer or an individual. The adversary system leans heavily on the skill of the lawyer to request necessary examinations and consultations of the plaintiff's alleged pain and to engage where necessary all proper inquiries and investigations of the observable symptoms prior to the preliminary conference and if the claim is not settled up to the trial.

The first task of defence counsel is to break down so far as permissible within instructions the strength of the plaintiff's case. This involves putting positively to the plaintiff and the plaintiff's medical witnesses the evidence casting doubt on the complaints of pain at any given relevant period. Conflicting medical opinions should be directly confronted in cross examination. As a Judge one of the most confusing aspects of a trial is where cross examination laboriously repeats the positive complaints of the plaintiff. This can be frustrating for the medical practitioner. But I have found that Judges usually intervene to speed up any such unnecessary consumption of time and expense and direct counsel to the real issues in the cause.

It is imperative for the defence to delineate the areas of dispute so that the witnesses both lay and expert have the opportunity to testify on those matters. Often these areas of dispute dissolve after effective cross examination or defence experts have given their evidence. Sometimes the judicial assessment turns on the degree of expertise and experience of the medical expert. But in other cases the evidence as to pain or not is evenly balanced. The court then has the difficult task of producing a reasoned judgement upon the whole of the evidence. This will ultimately be determined by applying the approach I have briefly outlined above - see I.

IV. Percentage Disabilities

A. Non-Economic Loss - Pain and Suffering

The Workers' Compensation legislation introduced the concept of percentage disabilities many decades ago. The common law courts have flirted with these concepts in damage assessments. Generally speaking such attempts by the contending parties have not found such concepts fitting into the jig-saw puzzles of Judges' damage assessments in claims for pain and suffering.

However on 8th February 1987 section 35a(1) of the South Australian Wrongs Act came into operation. That section made radical changes to courts' damage assessments for pain and suffering. Up to that date the assessment was "an amount which was fair and reasonable." The assessment was divided into past and future loss for the purpose of fixing interest on judgement for past non-economic loss. By definition in section 35(6) after 1987 non economic loss, as lawyers classified this head, was defined as:

"(a) pain and suffering; (b) loss of amenities of life; (c) loss of expectation of life; (d) disfigurement."

The section provides a threshold to be satisfied by the plaintiff before any damages can be awarded. The threshold is

- (a) there must be significant impairment by injury to the plaintiff's ability to lead a normal life for a period of at least seven days; or
- (b) the injured person has reasonably incurred medical expenses of at least a certain prescribed minimum amount. Once having satisfied the threshold the court must then assess the non-economic loss by assigning a numerical value on a scale running from 0 to 60 (the greater the severity of the non-economic loss, the higher the number) - section 35a (1) (b) (i). When the court has fixed a number to the total loss (both past and future) of the plaintiff's total non-economic loss then the section 35a (1) (b) (ii) prescribes that the damages shall "then be calculated by multiplying the prescribed amount by the number".

Certain observations need to be made about these changes to the law relating to assessments of damages for pain and suffering:-

1. The statutory formula to be applied by the court is "subjective in nature" see *Packer v Cameron* (1989-90) 54 SASR 246 @ 257 per Duggan J.
2. The court should first determine the severity of the non-economic loss in accordance with well established principles - *Percario v Kordyze* (1990) 54 SASR 259 @ 260 per King C J.
3. Then the court compares the severity of loss, so determined, "with the most serious and the least serious non-economic loss which anyone may suffer" - *ibid* per King C J.
4. The figure thus arrived at is somewhat arbitrary "because every award depends upon its own facts and it is not impossible that the worst case has not even come before a court ..." per Millhouse J in *Jenkins v Maddeford* (unreported, Supreme Court of SA, White, Millhouse and Olsson JJ, 10th April 1990) at page 2 of His Honour's Reasons - quoted by me in *Percario v Kordyze* *supra* at p.264. White J at pages 10-11 of his Reasons in *Jenkins* *supra* described the amount as "no more than a token amount relative to the suffering of others" see my reasons in *Percario* at pages 264-265.

The medical expert is now often called upon to express a percentage disability for the purpose of assisting the court in arriving at the degree of severity of the plaintiff's non-economic loss. However courts have generally regarded these percentages as of limited practical use in either assessing the degree of severity of the injury and certainly when comparing such severity with the most serious case that could theoretically come before the courts.

B. Multiple Accidents

Often courts are faced with the difficult task of assessing damages for injuries suffered in a subsequent accident. The plaintiff suffers accident A in year 1 for which compensation has been paid either by agreement or after a court assessment, and then suffers accident B in year 2, and accident C in year 4 and so on. The plaintiff's injuries in accident B and C may be both pain related. The court is often faced with the task of allocating a percentage of the injury caused by accident B and find how much greater injury was caused to that plaintiff by the different defendant responsible for accident C. In these cases the medical evidence may be the only reliable indication of the extent of the injury caused by the two separate acts giving rise to the claims.

This type of issue does require the medical expert to carefully record the plaintiff's case history in order to arrive at a percentage disability in respect of each separate claim.

V. Psychiatric Damage

I should conclude with a brief footnote on the complex and difficult situation that arises when the plaintiff claims that pain is not physically sited at some wound or fracture but is a form of neurosis of what Judges and lawyers have classified possibly quite inaccurately as "nervous shock". In *Jaensch v Coffey* (1984) 54 ALR 417 the High Court held that where the defendant owed a duty of care (a question of fact) to the plaintiff then in the circumstances of that case the defendant was liable to the plaintiff in respect of the psychiatric injury which she sustained. As Brennan J pointed out in that case one hundred years ago psychiatric illness, without more, was not a form of harm or damage for which damages for negligence could in those days have been recovered; see page 424 lines 38-40:

Recently a Judge in Australia said:

"Undoubtedly the last word has not yet been written on the scope of liability with respect to (psychiatric) injury and new factual situations coupled with new technology will cause appellate judges to review the limits of liability for such injury from time to time."

These remarks go to highlight the importance of this conference directed to a better understanding of the grey areas of Pain Litigation. The courts are increasingly dependent on the expertise of the medical profession especially in the field of your learned studied today. I would like to see a greater understanding of the respective problems that our two professions have in this area. Surely it is not just a problem of definition but more one where our professions understand the difficulties that we each have in ascertaining the relevant facts.



Voltaren®



Urinary Cross-Linked N-telopeptides (NTx) of Bone Collagen

Urinary Cross-Linked N-telopeptides (NTx) are used as a marker in the investigation and monitoring of osteoporosis and other metabolic bone disease. NTx is reported to be more sensitive and specific for bone loss than other markers including hydroxyproline, pyridinoline (pyridinium, PYD) and deoxypyridinoline (DPYD).

NTx is a fragment of Type 1 bone collagen which incorporates the DPYD moiety. The specificity of the test appears to lie in its exclusively endogenous source (it is not absorbed from the diet as such) and in its relative specificity for bone (i.e. its minor contribution from collagen degradation from skin, tendon, etc.).

It is reported to be elevated in conditions associated with increased bone resorption. These include post-menopausal and nutritional osteoporosis, Paget's Disease, many malignancies, inflammatory disease and steroid therapy. Clearly, to use this test effectively in the monitoring of any one of these conditions, it may be necessary to exclude other conditions which may compound the effect.

The desirable sample is the unpreserved 24 hour urine collection on which to perform the hydroxyproline analysis. However, a random urine sample is acceptable. The Laboratory will perform NTx on assay requests for NTx, PYD, DPYD, Desmosine or "Bone Resorption Markers".

Currently, NTx related assays attract no Medicare rebate.

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Bone metabolism is a dynamic balance of dissolution and formation. Disease results when the balance is lost. Tests which have been or are currently offered to investigate this balance include:

Bone Loss

NTx
DPYD
PYD
Hydroxyproline
Tartrate - Resistant Acid Phosphatase
Desmosine

Bone Formation

Alkaline Phosphatase (bone isoenzyme)
Osteocalcin (Bone Gla Protein, BGP)
Procollagen Type 1 Carboxy - terminal extension peptide (PICP)

This information is courtesy of Queensland Medical Laboratories

HOW TO WRITE A PAPER AND HOW NOT TO WRITE A PAPER

Adrian E. Flatt, M.D., F.R.C.S.

Editorial Comment

The following paper was handed to participants of the Flinders Diploma Course by the head of the Department of Orthopedic Surgery, Dick Southwood. This journal has now pirated the paper written by Dr. Adrian Flatt. I, like many others to whom this paper was presented, are eternally grateful to Dr. Flatt. I have been unable to contact him to seek permission to publish, but I am certain he will not mind. This paper is a classic and unfortunately so very true. The average correction time for the average submission to this journal exceeds eight hours. Please read and digest the following and thereby help yourselves pass exams and make the life of some unsuspecting editor just a little less stressful. Thank you Adrian.

Why are so many of the manuscripts editors get so awful?

The problems are well summed up by that accomplished novelist Michael Chrichton who earned his M.D. degree at Harvard, but never practiced. He has chastised us in an article "Obfuscation in Medical Writing!"(1.) His complaints are many; poor flow of ideas, verbiage, redundancy, repetition, wrong words, poor syntax, excessive abstraction, unnecessary complexity, excessive compression and unnecessary qualification. He also complains that in medical writing the voices are passive, verbs are transitive, modifiers are abstract and qualifying clauses abound. He makes a good point that the general tone is one of extreme timidity, going far beyond sensible caution. In summary, it is probably fair to say he thinks medical writing stinks.

The major faults of current scientific writing are:

1. The automatic use of the passive voice and impersonal style; most editors are tired of the false modesty of the passive voice and the horrified avoidance of the words "I" and "me".
2. The padding of sentences whereby timid, inexperienced writers thinking that their sentences do not have sufficient impact, add a second and sometimes a third thought to the first before nailing a period in place.
3. The use of pompous words by naive authors who, by trying to impress the readers, reach for the impressive word and achieve the exact opposite (2).

When considering a manuscript an editor asks, "Why did he start?", when reading the Introduction. "What did he do?", in the Methods section. "What did he find?", among the Results. And, "What does it mean?", in the Discussion.

A good paper is one that has a definite structure, makes its point and shuts up.

A good paper uses nouns and verbs, not adjectives and adverbs.

A good paper has a crisp scientific structure and each individual section does what it is supposed to do and no more.

Use short words in sentences which should be short. The longer they are, the more likely it is that the beginning can be amputated and that deadwood can be found in the middle, "appears to be suggestive of the possibility that" — has used seven unnecessary words to say "suggests"(3). Of course, authors need to present the facts, but there is no need to repeat what everyone already knows, nor to labour every point six times, repeat it in a table, illustrate it in a figure, show it in a histogram and then say it twice more in the summary (4).

HOW TO CONSTRUCT A PAPER

Before you start, promise yourself whatever you write will be interesting to your readers. Lois de Baakey feels that many medical articles have the literary individuality of a weather report, conforming to a common mold in which different data are simply inserted. Certainly, a good way to prepare a

scientific paper is to ask yourself Bradford Hill's five questions— What did you do? How did you do it? Why did you do it? What did you find? What does it mean? (5).

After all, this is what the editor will ask of your paper. The usual format for reporting the answer to these questions is the IMRAD structure; *Introduction, Materials and Methods, Results and Discussion*. It allows the busy reader to decide from the Title whether the subject is important to him, from the Results whether the data is new, and from the Discussion whether to read the whole paper.

THE ABSTRACT

The most important part of the paper, because although it is written last, it is looked at first by virtually all readers. An *abstract* is a self-contained document which is the bridge between the title and the full article. The Title should announce the topic and the Abstract succinctly develop it (6). An *Abstract* should not be a mere recital of the contents, full of such expressions as "is discussed" and "is described." It is *not* a summary. It should be a concentration of the essential qualities of the paper. There are five absolute requirements (7).

1. It must be understandable without reference to the paper.
2. It must set forth, in specific terms, all the major points of the paper.
3. It should be one paragraph of not more than 100 words.
4. It should preserve the form of the paper in miniature.
5. It must only contain material covered in the paper.

An Example

"The distal radius is a common site for giant cell tumors. Treatment of these lesions may involve thorough curettage of the tumor and packing the cavity with polymethylmethacrylate cement. This is a report of a case of spontaneous rupture of the extensor pollicis longus tendon following such a procedure. It was treated successfully with tendon transfer of the extensor indicis proprius to the extensor pollicis longus. Proposed mechanisms for the pathophysiology of the rupture are discussed."

This original version used 76 words. By rewording it, the same message can be given in 59 words.

"This is a report of a case of rupture of the extensor pollicis longus tendon following treating a giant cell tumor of the distal radius by packing the cavity with polymethylmethacrylate cement. The lack of extension was treated successfully with tendon transfer of the extensor indicis proprius to the extensor pollicis longus. The pathophysiology of the rupture is discussed."

The final version below uses only 47 words - note that the first eight words have been eliminated. There is not need to say the obvious - that it is a case report.

"An extensor pollicis longus tendon ruptured after a giant cell tumor of the distal radius was excised and the cavity packed with polymethylmethacrylate cement. Thumb extension was restored by transferring the extensor indicis proprius tendon to the extensor pollicis longus. The pathophysiology of the rupture is discussed."

THE TITLE

Equally hard to devise is the Title; an accurate Title of a few words but much substance requires considerable verbal ingenuity and discipline. A Title needs clarity, brevity, and specificity. There are few good Titles around - and an awful lot of bad ones. Some are ambiguous - "Joint Study of Orthopedic Problems". Some are grammatically incorrect, "Toxoplasmosis in Humans Derived From Cats". Some are illogical, "Survival after Drowning", and some are simply pompous, "Osseous Manifestations of Elbow Stress Associated with Sports Activities" (8).

THE BODY OF THE PAPER

The success of the body of the paper depends on the choice of words and their grammatical arrangement. There are eight parts of speech; nouns, verbs, adjectives, adverbs, pronouns, prepositions, interjections and conjunctions. If the nouns and verbs are selected carefully, there is less need for adjectives and adverbs - "Lurched" rather than "had a unsteady gait"(2). These individual components of a sentence all have their proper place and responsibility in communication. There are basic rules which should have been taught to you in school. When followed, they make reading a manuscript a delight. There is not much delight around nowadays.

THE USE OF ABUSE OF WORDS

To help in the choice of words there are two essential tools - a dictionary and a thesaurus. I believe 'Steadman's Dictionary' has the right approach. A dictionary, if it is to be a useful guide to a living language, must spell, pronounce, and define words as they are used - not wistfully as they should have been. The best known thesaurus was written by a physician Peter Mark Roget, who obtained his M.D. from Edinburgh in 1798 and retired from practice at age 61 in 1840. By 1805 he had completed a classified catalogue of words which was the converse of an ordinary dictionary; not with the words arranged in alphabetical order, but according to the idea which they expressed (9). Use his book. It will help you avoid dull, repetitious writing.

*Thesaurus, Latin, Treasure.

THE CLICHÉ

Clichés are not all bad; occasionally they have a use. It is the echoing that turns a phrase into a cliché. They come in many forms. Aphorisms (life is short, art is long). Biblical quotations, (physician heal thyself), Mythology, (Herculean task). Foreign phrases, (in extremis), Figures of speech, (at death's door), Paradoxes, (operation success, patient died). Epithets, (mad scientist). Pat phrases, (major breakthrough). Vogue expressions, (multifactorial etiology). Slang, (brittle diabetic), and empty inanities, (all in all) (10).

Examples that I plucked out are: A valuable addition to our therapeutic armamentarium; aggressive surgical attack; as can readily be seen; beyond the scope of this paper; decision making process; it goes without saying; uneventful recovery; vast majority; warrants further investigation; state of the art; renders inoperable; surgical intervention; multidisciplinary approach; stimulating concepts, etc., etc. People tend to build clichés on other unnecessary nouns - as in, "on a professional basis", instead of "professionally" - "over a 12 day period" instead of "for 12 days"(11).

EUPHEMISMS

Euphemisms are longer and less precise than the words or terms they replace — Desk, *individual work station*. Garbage collector, *solid waste ecologist* (3). They are often used as a way of getting around saying something unpleasant. The phenomenon of death has become encrusted with euphemisms (12). I even got a manuscript in which some animals were not sacrificed - a pejorative word anyway, but were "euthanized". Similar genteel hedging sometimes represents academic cowardice, "it may be reasonable to suggest that necrotic effects may possibly be due to involvement of some toxin-like substance". Be forthright, write "necrosis may be due to toxins"(13).

WORDS; MISUSE OF

Doctor Philip Eibel has collected a number of examples of the factual misuse of words. "The patient was medicated four times daily." Medicate means to impregnate or charge; as in medicated soap. I doubt very much the patient's entire nature is radically changed four times a day. However, the soap is permanently changed. The patient was symptomatic - how can he be? Symptomatic is characteristic or indicative of. The patient had marked pain. What was the pain marked with or by whom was it marked? He had *severe* pain. Ambulate is often wrongly used as a transitive verb. The

Oxford English Dictionary gives only four examples of its use and then only as an intransitive verb - there are *no* transitive verb examples (14).

Equally abhorrent is the use of five or six words to express something that can be conveyed by one word. "In view of the fact that" - "since". "In the opinion of the author" - "I believe" - "In the majority of cases" - "usually". "Serves the function of being" - "is" (3).

WORDS - UNSKILLFUL POSITIONING

Another common error is the unskillful positioning of words. Position is crucial to conveying the message clearly. The way you arrange the words may mean the difference between "Writing that *only* a mentor could praise - or writing that a mentor could *only* praise (15). The misplaced modifier can cause ambiguity, mis-statement, or inadvertent humour. "Being moribund, the doctor could do nothing for the patient." "The patient was referred to a psychiatrist with a severe emotional problem." "The patient was carefully followed by doctor and nurse."

THE INFINITIVE

The infinitive seems to be in constant trouble, "To split or not to split", that is the question. Eighteenth and Nineteenth century grammarians for one reason or another frowned on it - and most grammar teachers have been frowning ever since. The natural position for a modifier is before the word it modifies. Thus the natural position for an adverb modifying an infinitive should be just ahead of the infinitive and just after the "to" (12). I believe that to deliberately split an infinitive is no sin.

ADVERBS

The placement of adverbs also causes a lot of problems. Writers blinded by the split infinitive obsession seem determined not to split anything but hairs. More often than not, the proper and natural place for an adverb is between the parts of a compound verb (12). Ambiguity can be cause. "Three plans for removing sutures gradually were proposed by the staff." Better to say, "The staff proposed three plans for gradually removing sutures."

PREPOSITIONS

Another obsession perpetuated by teachers of English is "*Thou shalt not end a sentence with a preposition.*" Fear of transgression constructs sentences that are incomprehensible on even the third and fourth reading. "People worth listening to" is better than "People to whom it is worthwhile to listen" (16). E.B. White wrote a classic letter in which he said, "I want to tell how to end a sentence with five prepositions." "A father of a little boy goes upstairs after supper to read to his son, but he brings the wrong book. The boy says, "What did you bring that book that I don't want to read *to out of up for?*"

PUNCTUATIONS

Policing all the words we write are punctuation marks. These are the traffic signs and signals placed along the reader's road. They tell him when to slow down and when to stop; and sometimes they warn him of the nature of the road ahead. Traffic engineers do not always agree on what signs should be used or where they should be placed and neither do writers, editors or little old school teachers employed by Journals. Much of punctuation is arbitrary (12).

THE GOOD PAPER

The English language can be used to conceal thought just as readily as it can convey a Crystal clear message. Many find it difficult to use but most people can learn to write well if they want to (or...if they *so want*. Some would teach this clumsy rigidity, but it *reads* badly).

If you have enjoyed reading a scientific paper, go back and read it again. Ask yourself why it gave you pleasure. The chances are you will find that correctly chosen words are arranged in each sentence so that their relationship to one another is clear and their message is readily understood (17). Unfortunately scientists, by and large, tend to be suspicious of lively attractive writing in their own subject (15). However, those who publish do have the responsibility to present their data in an interesting way (18).

Scientific writing is a craft, *not* an art. It does not take special inspiration; just like surgery, it takes practice, attention to detail and technique and more practice. Sit down and do it regularly. It is a frustrating experience for the beginner (19). Somerset Maugham wrote in his memoirs, "Summing up", that in his writing he strove for simplicity and lucidity - and he was trained as a physician; proof that we can write with distinction (2).

You can not teach someone to write. You can teach them to write better. In fact, good teachers may guide and impel, but really educated people are all self-educated, having read, marked, learned and invariably digested many books. Many have actually become educated without filmstrips and thus learned to write good English along the way (20). Vigorous writing is concise. It avoids unusual words. It uses as few words and as short words as possible. It uses short sentences - a help to quick understanding. Good writing is like a good watch, there should be no extra parts and every part in there should be doing some useful work (21).

Some papers have only a limited message, perhaps they make only one important point. If so, wrapping it in many words may obscure its recognition. A brief report makes much more impact. A well-written paper is concise and direct. It is the simple declarative sentence that communicates best (17). Limit sentences to single units of thought; but make sure it reports clear thinking (2).

REVISION

When you have written a paper, do not regard it as your perfect newborn baby, many are born with congenital defects. Put it away in a drawer. Leave it several weeks and then read it. You will find it wordy and windy. George Orwell pointed out that it is easier - even quicker, once you have the habit - to say, "In my opinion it is not an unjustifiable assumption that", than to say, "I think". Quarrel with the need for every paragraph, every sentence, every word. Remember Lord Chesterfield who wrote, "My dear son, pray excuse this long letter, but today I have no time to write a short one". Practice the 3 R's of revision; reduction, rearranging and rewording.

Every physician should write every word he intends for publication so that any third year medical student can understand it (22). The 8th grade teacher was right when she said, "It is not enough to write so you may be understood. -You must write so you cannot be misunderstood."

When you think your revision is crystal clear, put it away for another two weeks; your child is not yet perfect. The next time you read it, you will find more areas to be pruned and clarified. And so it goes, one should never be completely satisfied with a piece of writing.

Let me end by quoting a short paragraph which I regard as the epitome of good precise medical writing that cannot be misunderstood.

"They say man has succeeded where the animals fail because of the clever use of his hands, yet when compared to the hands, the sphincter ani is far superior. If you place into your cupped hands a mixture of fluid, solid and gas and then through an opening at the bottom try to let only the gas escape, you will fail. Yet the sphincter ani can do it. The sphincter apparently can differentiate between solid, fluid and gas. It apparently can tell whether its owner is alone or with someone, whether standing up or sitting down, whether its owner has his pants on or off. No other muscle in the body is such a protector of the dignity of man, yet so ready to come to his relief. A muscle like this is worth protecting." (23)

A WARNING

PLAGIARISM

The word, plagiarise, is derived from the Latin word, plaga, the net used by gladiators.

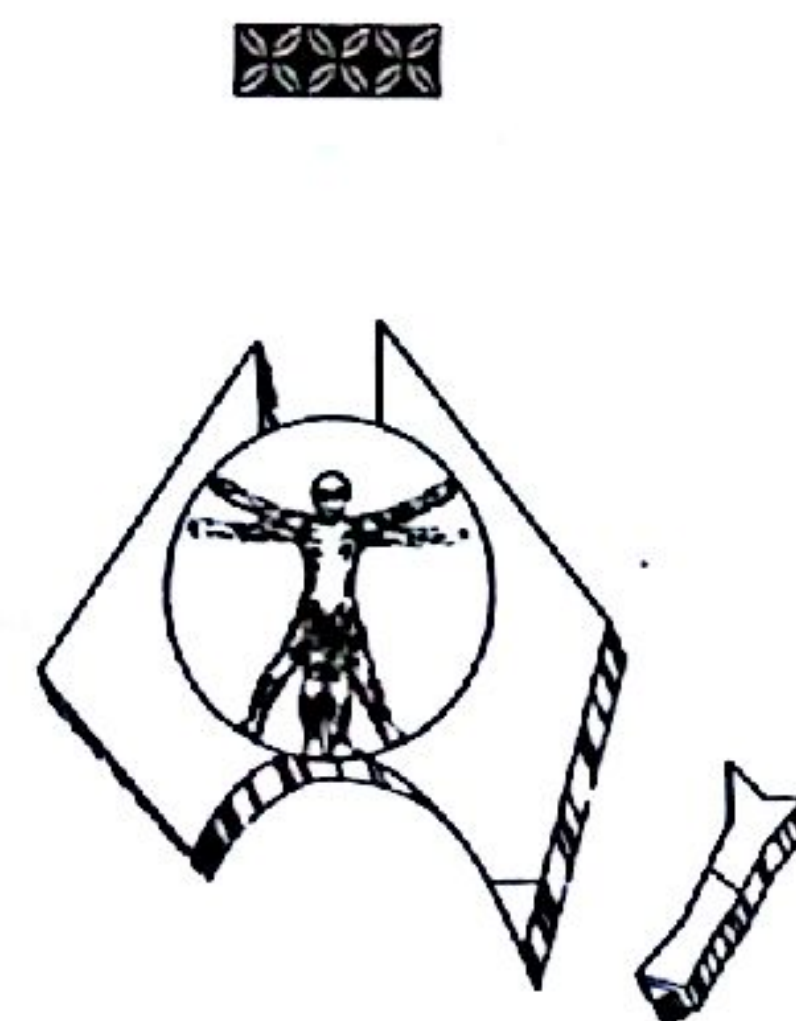
Much of this essay is not original to me. The very Reverend Dean W.R. Inge expressed it well when he said, "What is originality? - Undetected plagiarism". This kidnapping of other's written work is acceptable - indeed it is flattering to the author - provided due acknowledgment is given.

Director quotations have been referenced, you will find it helpful to read the whole paper. I have also listed some appropriate books which I have enjoyed reading - and which you would enjoy and profit from if you are serious about trying to improve your scientific writing

I can't copyright this, and I wouldn't want to, but don't you plagiarise it!!

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OVERSEAS CONFERENCES

1. London - The British Institute of Musculoskeletal Medicine Annual General Meeting

Date: 21-21 April 1995

Our British counterpart runs on similar lines as our own with valued speakers but as yet we have no further information as to the programme. Further information may be obtained from:

Dr Peter Skew
Hon. Secretary
27 Green Land
Northwood,
MIDDLESEX HA6 SPX
UNITED KINGDOM

2. Austria - FIMM, 11th Congress of the FIMM

Date: 26 - 29 April 1995

At this stage a global programme has been suggested but no further topics have been clearly delineated. Further information may be obtained by writing to:

Professor Dr H Tilscher
C/- Austropa Interconvention Centre
PO Box 30a 1043
VIENNA, AUSTRIA

3. Christchurch - Spine in Action 1996

Date: 21-25 January 1996

Venue: Town Hall, Christchurch, New Zealand

This conference involves the International Society for the Study of Lumbar Spine together with the new Australasian Faculty of Musculoskeletal Medicine. Many authorities of musculoskeletal medicine throughout the world will be gathering and will include, Professor Anderson, Illinios, Professor Deyo, University of Washington in Seattle, Dr Jiri Dvorak from Switzerland, Professor Malcolm Jayson, University of Manchester, Professor Alf Nachemson, Sweden, Professor Jeurgen Kramer from St Joseph Hospital Bochum in Germany, Professor Panjabi, from Yale University Medical Centre, and Professor Norton Hadler, University of North Carolina. Further information can be obtained from:

Dr Barrie Tait
Dept of Orthopaedic Surgery and Musculoskeletal Medicine
Christchurch School of Medicine
PO Box 4345
CHRISTCHURCH, NEW ZEALAND

CASE STUDIES

Mr B.G. Aged 43 years

History

This 43 year old shop keeper ran several businesses in a rural area. When he was away on one of his business trips he believes that he developed back pain after sleeping on a friend's pull down sofa bed for several nights. He recalls that the sofa bed was designed in such a way that a steel bar passed just below his shoulders and another bar bit into his legs just below the level of the knees. These two uncomfortable parts of the bed caused him to have restless nights and he puts the onset of his pain down to this.

Mr B.G. had no previous back pain prior to the onset of what he described as painful muscles in both hip and buttock areas bilaterally. This occurred within a few days of him returning home from his business trip. In the first instance he was awakened with this pain which lasted 30-40 minutes and then subsided, but left him with residual pain in the right buttock.

He visited a chiropractor and had numerous manipulations for what he was told was a herniated lumbosacral disc. This did not relieve his pain so he then visited a physiotherapist several times for stretching, ultrasound and interferential. It was nearly ten weeks from the onset of his pain that he managed to see his local doctor who has a special interest in musculoskeletal problems. After the consultation and examination it was established that the patient had two sources of pain. One was in the right buttock area and the other was at the level of the greater trochanter. When the patient's pain was quite severe in the buttock there was some radiation of his pain down the outer aspect of the right thigh to the knee. By this time the patient was requiring the use of a walking stick to minimise his pain which became particularly intense after sitting for a long period and then attempting to move. He was unable to drive his car, an automatic, because there was too much pain generated when he had to apply the foot brake. Activities of daily living were greatly

hampered and he could not sit in one position for more than 10 minutes.

Examination

At the time of the first visit to the rural doctor the man presented weighing 105 kgs and was 174 cms tall which gave him a body mass index of 34.6 (N = 21-25). He walked with an antalgic gait and when he stood erect there was loss of the lumbar lordosis. Flexion was possible to mid thighs. Extension was nearly 20 degrees with pain at end of range while side bending was not possible to the left without considerable amount of pain but side bending to the right was possible to the popliteal crease with pain at the end of range. Slump testing was negative and his straight leg raise was 85 degrees without pain while the sacroiliac joints did not indicate any pathology. There was no neurological deficit and palpation of the spinous processes, PSIS and iliac crests did not reproduce his pain. However he was markedly tender over the area of insertion of the gluteus medius and external rotators of the hip on the right greater trochanter. Rectal examination produced exquisite pain on palpation of the right sacrospinous-sacrotuberous ligaments.

Assessment

Diagnosis was made of a strain in the sacrospinous-sacrotuberous ligaments along with an enthesopathy of either the gluteus medius or external rotator tendons. Because it was not possible to test these without exacerbating the pain arising from the sacrospinous sacrotuberous ligaments, it was difficult to know which of the muscles was producing the pain.

Treatment

In the first instance the pain arising from the pelvic ligaments was injected with 10 mls of 0.5% lignocaine with the abolition of his buttock pain but there remained the pain over the region of the right greater trochanter. This pain was treated initially with stretching and when reviewed a week later this area was also infiltrated with 5 mls of 0.5% lignocaine with further diminution of his discomfort.

When reviewed a week later he indicated that his pain was now only 2 on a visual analogue scale whereas previously it was 10. He was still walking with a walking stick and an obvious antalgic gait, but he had returned to his business and was able to work a full day. There was some discomfort at the end of this period, mostly from sitting or driving his motor vehicle.

Further injections of bupivocaine into the sacrospinous sacrotuberous ligaments as well as the insertion of the muscles around the greater trochanter was undertaken.

Testing of the enthesopathy now revealed no weakness or pain on resisted right leg abduction, but there was both tenderness over the area of the piriformis muscle together with pain reproduction on resisted external rotation for which he was given specific piriformis stretching exercises.

Progress

After having had a working diagnosis and a management plan outlined, this patient was making good progress. Within eight weeks of being assessed by his rural GP he was almost pain free. He was encouraged to continue with exercises and lose weight.

Lessons to be learnt

1. Sometimes the patient presents with a description of what they think the origin of the pain was. It could be that sleeping in awkward positions has put added stress on the pelvic structure in a person so markedly overweight. The matter of resting on the iron bars in the position described is not likely to be the direct cause of his problem.
2. As always it is important to make a diagnosis to initiating treatment.
3. The pain over the greater trochanter may have several sources and the passage of time may be necessary before the true pathology is manifest.

CASE STUDY

Mrs J. J. Aged 50 years

History

The patient works as a cosmetic consultant for a large public store. She works part time in this position and is married with two adult children.

An injury to her right axilla occurred when she had to reach down into a 45 cm deep jar which was resting on the counter. This required the patient to stand on her tip toes and press the right axilla over the top of the container. At the end of the day when she repeatedly had to perform this task because of a particular promotion, she complained of pain in the right low thoracic and cervicothoracic regions. Initially she thought little of this and considered that there had been a slight pulling of muscles. Later she sought help from the local doctor who then arranged physiotherapy which consisted of stretching, heat and ultrasound.

There was some initial improvement, but then her condition plateaued out to the extent that she felt mid thoracic pain and discomfort in the right axilla with any type of stretching activity involving the right shoulder girdle. This meant that she could not perform the usual activities of daily living and she was becoming agitated because gardening and other physical pursuits were not possible.

This all began in June 1994 and by mid September she returned to her LMO who referred her for acupuncture. She had 12 treatments for this and thought that there was some slight improvement, but she still could not garden or exercise as freely as she would like due to the constant discomfort in the area of the medial border of the scapula and the axilla on the right. She continued to work her full quota of hours, but returned home each day in considerable discomfort. Rest improved this situation and work made it worse although she continued her usual sales activity. On presentation, she described her pain as about 25% of the original level.

No diagnosis had been made as to what the cause of the pain was. Plain x-rays of her shoulder girdle were within normal limits.

Examination

At the time of the first consultation to a musculoskeletal clinic in late October, she presented as a well proportioned lady who stood with good posture but pointed to the medial lower edge of the scapula as being painful together with tenderness in the anterior part of the right axilla. All cervical movements were within normal limits and did not reproduce any of the patient's pain. There was no neurological deficit and her shoulder movements in flexion, abduction and extension were normal but there was pain toward the end of range in respect to the right shoulder movements. This pain was readily elicited by palpation along the upper border of pectoralis major. Pressing on these two areas significantly reproduced the patient's symptoms as did palpation over the right supraspinatus muscle although there was no evidence of rotator cuff syndrome. There was tenderness to palpation over the erector spinae muscles at the cervicothoracic junction on the right.

Assessment and Treatment

It is reasonable to suppose that the type of activity this patient was engaged in actually pulled the latissimus dorsi and possibly the supraspinatus muscles causing significant damage together with some sort of compression of the pectoralis major as it forms part of the anterior axillary fold. The fact that no diagnosis had been made and no treatment aimed specifically at the tender areas could explain the reason why this patient did not get appropriate relief from the treatment she received.

Voltaren
RELIEVES ARTHRITIC PAIN.

In the first instance the patient was requested to undertake post isometric stretching exercises which entails stretching the muscles as indicated above, five times, two to three times a day. If when at work she feels the presence of her discomfort, further stretching can be done.

She was referred back to the physiotherapist for appropriate stretching of these muscles together with ultrasound on a weekly basis.

Progress

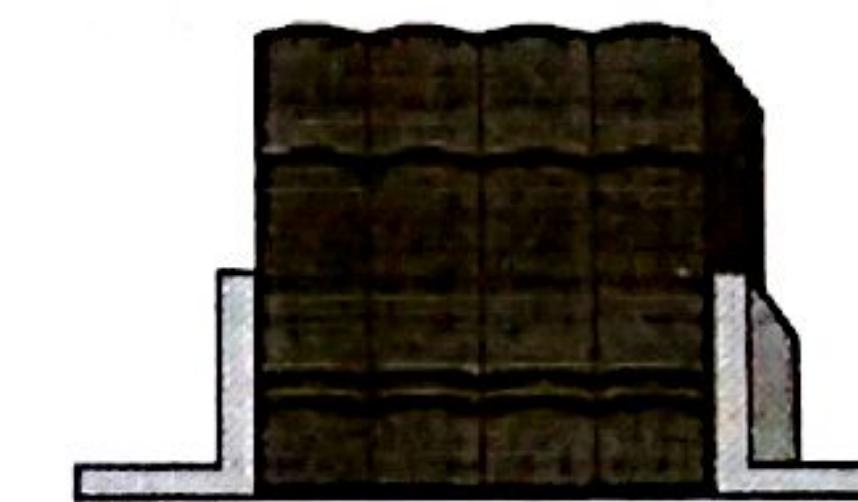
When reviewed a few weeks later she reported that she could now work without discomfort in her thoracic and axilla areas. She did get the onset of some minor muscle ache with certain household activities. When the muscles were palpated at the review session, they were still tender especially at the cervicothoracic level. These tender areas were treated with dry needling and the patient encouraged to continue daily stretching. When reviewed just before Christmas she was coping with the Christmas rush in the store with little discomfort and found that she got good relief from the exercises she was given.

Lessons to be learnt

1. Take a careful history of how the injury occurred and relate this closely to the anatomy and biomechanics of the injury.
2. Reproduce the patient's pain and give specific instructions for treatments of the particular tissues involved.
3. Encourage the patient to be aware that they are responsible for their own health and therefore should avoid situations which exacerbate their pain and should readily adopt an exercise programme to minimise their discomfort.



BOOK REVIEW



Musculoskeletal & Sports Injuries

Authors: Brian Corrigan and G.D. Maitland

Published by: Butterworth Heinemann 1994 — 232 pages

This new book is an updated section of their other publication — "Practical Orthopaedic Medicine" (First published 1983).

In editing the section on peripheral joints from their earlier publication, the authors have updated all the reference material whilst maintaining their special interest in Sports Medicine. There is therefore no section involving the spine.

The emphasis is on treating acute injuries. As such, an organic basis can usually be assumed. Diagnostic systems for examining the affected region are well laid out and clinical features, with appropriate investigations of the recognised conditions, adequately described. Management for each condition is tabulated, for easy reference, with a special emphasis (reflecting the authors' experience), in physical methods of therapy - i.e. manipulation.

Musculoskeletal pain is dealt with swiftly and abruptly. (Pages 1-3).

So abrupt that even myofascial pain doesn't get a mention. Likewise, cortisone is the only needling method advocated.

However, although the cover is quite appealing, the layout inside is in the format of the previous publication, with some poor quality reproductions of the radiological slides. The title itself is misleading. There is more to musculoskeletal medicine than this book describes, even allowing for the absence of spinal disorders. Modern musculoskeletal medicine now incorporates an understanding of not only organic pathology, acute and chronic, but also the recent advances in neuroendocrine, neuropharmacologic, neuromuscular and neuropsychiatric features of musculoskeletal disorders. The emphasis on the organic musculoskeletal injury may reinforce the older concept of orthopaedic medicine. The neglect by the authors, to mention the myofascial pain phenomenon in their treatments, is surely an unfortunate omission. Or does it reflect their bias?

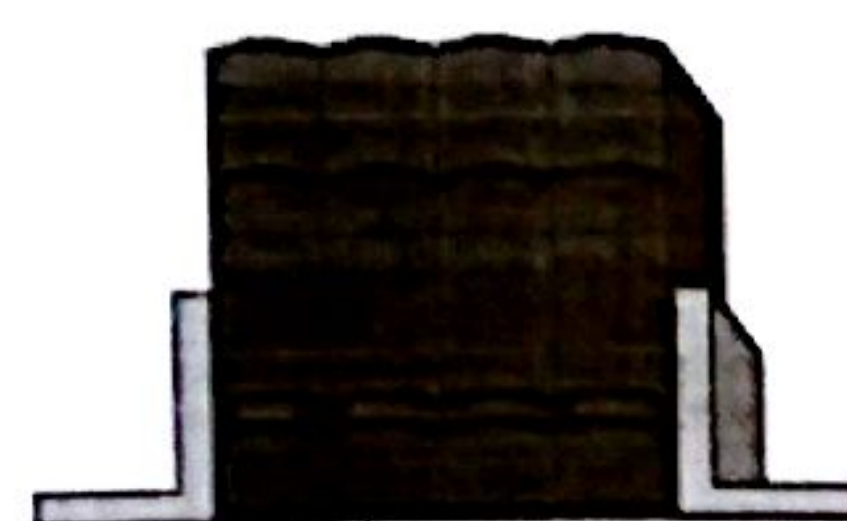
I am sure that Sports Physicians, too, will find this book wanting in several areas of sports injuries - e.g. the physiological changes that occur with strenuous activity etc. This book can be recommended to students to musculoskeletal medicine, and to those who have special interest in Sports Medicine. It would also appeal to General Practitioners and Physiotherapists. However, other books on musculoskeletal medicine will be needed to address the deficiencies. Those doctors whose practice is predominantly musculoskeletal medicine would find this book of less value.

R.R.P \$65.00

Philip Watson



BOOK REVIEW



Classification of Chronic Pain, Descriptions of Chronic Pain Syndromes and Definitions of Pain Terms — Second Edition 1994.

Authors: Taskforce on Taxonomy of IASP

Editors: Harold Merskey and Nikolai Bogduk

Reader, I urge you to finish this book review; understand its significance, buy it and use it!

Since the first edition came out in 1986, a 21 - member task force on Taxonomy, from the International Association for the Study of Pain, have worked hard to further clarify Chronic Pain Syndromes. This team has been headed by Dr. H. Merskey and Prof. N. Bogduk - the editors. The book sets out definitions of terms used to describe pain, where it occurs, the essential and acceptable features of the diagnosis, and a code system.

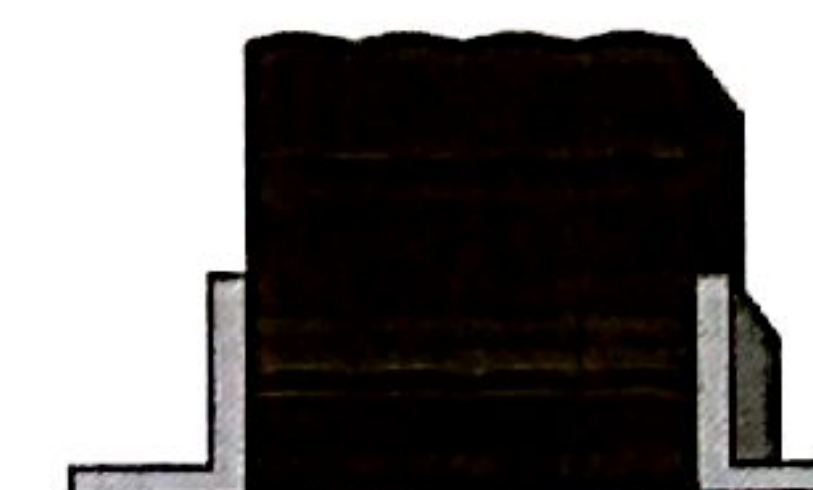
Each syndrome is treated with the same excellent and informative format, including definition, site, system, clinical features, diagnostic features, associated symptoms and signs, aggravating and relieving features, relief, aetiology, laboratory findings, diagnostic criteria, IASP code and references. This system is easily readable and better than any textbook.

Several sections have been revised in this edition and the authors admit myofascial pain syndromes have proven to be somewhat difficult. The quagmire relating to "RSD" has been clarified by the concept of the Complex Regional Pain Syndromes Types I (RSD), and Types II (Causalgia). Readers will be pleased with the diagnostic criteria reflecting the reality of clinical presentations in these syndromes, seen more frequently than the literal meaning of "RSD". The section on spinal and root pain has adopted the system originally proposed by Prof. Bogduk, with the aim of improving reliability and validity of diagnosis. The IASP Classifications are needed as pain sometimes can only be described on the basis of duration, site, pattern, etc. In contrast, ICD - 10 Classification is by causal agent, and then classified to include some of the pain syndromes. Likewise, the IHS (International Headache Society) classification was found wanting. There is however, a cross-walk between the IASP and IHS systems. The committee has been careful in not including a classification of "chronic pain syndrome" in the list, as it is an undefined term, with pejorative connotations.

The coding system is interesting, and once understood, it is "worth a thousand words". The first of the five-figure code relates to the region involved, the second figure, - the system: the third figure - temporal characteristics of pain: pain of occurrence: the fourth figure - patient's statement of intensity: times since onset of pain and, the last figure, aetiology. A sixth alphabetical letter is used for subdivisions if needed. It is timely that this book review should coincide with important changes within musculoskeletal medicine - namely founding of the Australasian Faculty of Musculoskeletal Medicine and the important changes to the Australasian Musculoskeletal Medicine Journal.

All readers of this Journal, that is, members of the Faculty or Associations, must discipline themselves to use the definitions of terms, adhere to the Classifications and ideally, use the code wherever possible. This should be apparent in the clinical notes, correspondence, referral letters, hospital discharge letters and medico-legal reports. The recommendations in the Classification,

BOOK REVIEW



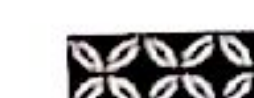
clear the way for specialist and general practitioner to diagnose chronic pain syndromes and certainly has the potential to lessen medico-legal wrangles. (Note, Justice Legoe's article - Ed.)

Our discipline now has a unique opportunity to lead our medical colleagues by insisting on the IASP Classifications and Definitions being used. For those undertaking research, it is essential that an international agreement on Definitions of Terms be agreed upon. For this, the IASP can be congratulated.

This book should be one that sits on all practitioners' desk. It should be essential reading for those studying for higher degrees in musculoskeletal medicine. A quote in the introduction - "You are not obliged to complete the work, but neither are you free to desist from it" (Rabbi Tarphon, Talmud, Avot, 2: 21.), is as much applicable to us as clinicians meeting the challenge of patients with chronic pain, as it is to the contributors of this publication.

R.R.P. \$20.00 (US)

Philip Watson



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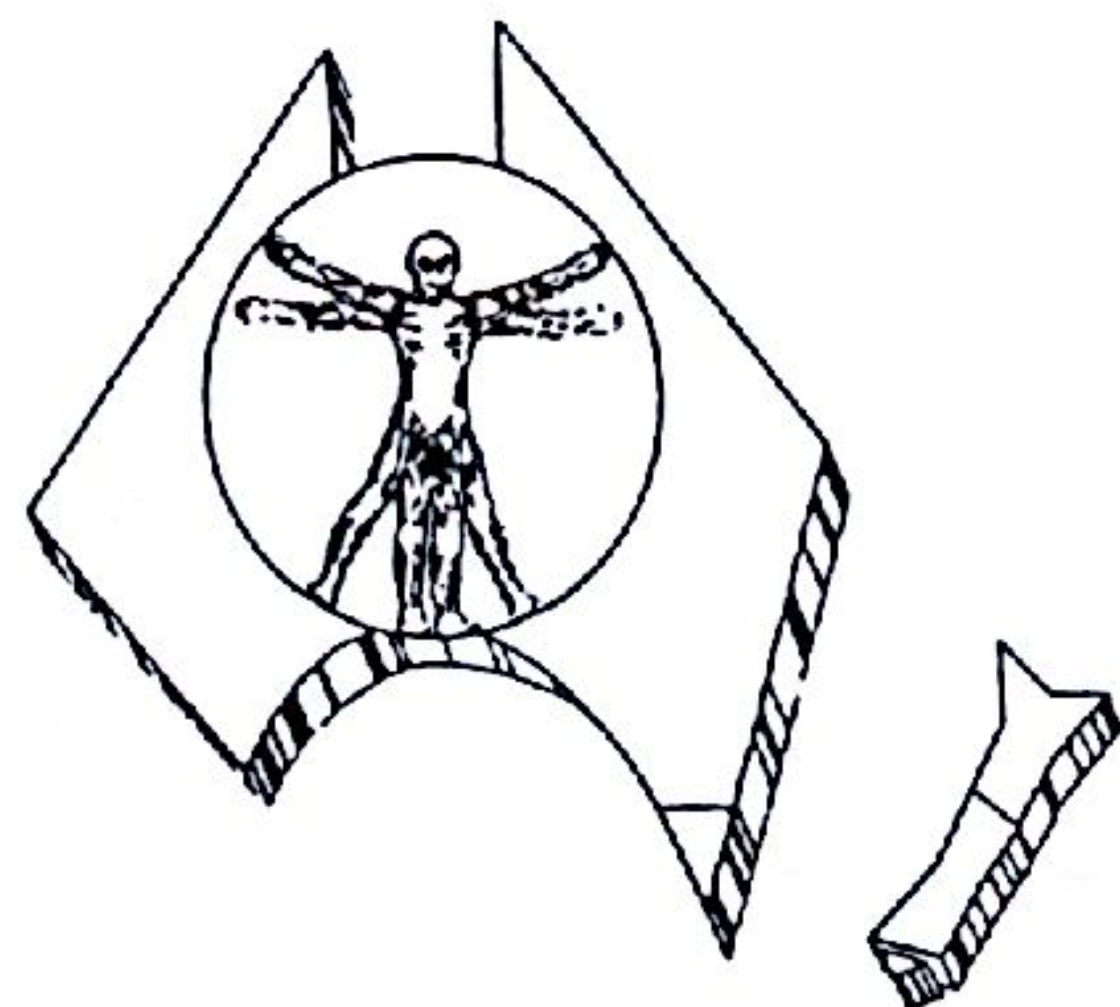
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ANAPROX 550 (naproxen sodium) A NON-STEROIDAL ANTI-INFLAMMATORY AGENT DEVELOPED BY SYNTEX RESEARCH.

DESCRIPTION The chemical name is the sodium salt of (+)-6-methoxy- α -methyl-2-naphthaleneacetic acid. It is a propionic acid derivative related to the arylacetic acid class of drugs. It is unrelated to salicylates and the corticosteroid hormones. Naproxen sodium is an odourless, white to off-white crystalline substance. It is soluble in water. It is available as a capsule-shaped, blue film-coated tablet containing 550mg of naproxen sodium engraved with the words "SYN-TEX" on one side and "ANAPROX 550" on the other side and as an oval, bi-convex blue film-coated tablet containing 275mg of naproxen sodium engraved with the words "SYNTEX" on one side and "ANAPROX 275" on the other side. **PHARMACOLOGY** ANAPROX dissociates into naproxen anion and sodium in vivo at physiological pH. ANAPROX has been shown to have anti-inflammatory properties when tested in classical animal test systems. In addition, it has analgesic and antipyretic actions. It exhibits its anti-inflammatory effect even in adrenalectomised animals, indicating that its action is not mediated through the pituitary axis. The exact mechanism of its anti-inflammatory action is not known. In man, ANAPROX is completely absorbed from the gastro-intestinal tract after oral administration. Peak plasma levels following each dose are attained within two hours with equilibrium normally achieved after four-five doses. It has a mean biological half-life of approximately 14 hours. At therapeutic levels ANAPROX is approximately 99.9% albumin bound. It has a relatively small volume of distribution (10.09 ± 0.03 litres per kg) which corresponds to about 10% of the body weight in humans. Extensive plasma protein binding apparently acts to restrict the drug largely to the plasma compartment. Human metabolism of the naproxen anion determined by analysis of the urinary radioactivity following a 100mg IV dose was found to be relatively simple. The parent structure was altered only by removal of the 6-methoxy group to form 6-demethyl-naproxen and by conjugation of the acid function. 70% of the ingested dose was eliminated either as unchanged naproxen, 10%, or as conjugated naproxen, 60% (40% naproxen glucuronide and 20% unknown conjugate). Some 28% of the dose underwent 6-demethylation. As a consequence 5% of the dose appeared in the urine as demethylated naproxen, and 22% as conjugates of demethylated naproxen. The acute toxicity of 6-demethyl-naproxen given by different routes to rats and mice was found to be considerably lower than that of naproxen. In subacute studies, the toxicity of the metabolite in all cases was found to be significantly lower than that of naproxen. Only very preliminary pharmacological assay of this metabolite has been carried out and it would appear to be very much less active than the parent compound. The plasma level curves of naproxen sodium would be expected to increase proportionally with doses up to 550mg b.i.d. Larger doses would result in a much less than proportional increase due to accelerated renal clearance of disproportionately increased amounts of non-protein bound drug. However, whether this effect increases or decreases the toxicity of ANAPROX has not been established. **INDICATIONS** ANAPROX is indicated as an analgesic in acute migraine attacks, for the treatment of rheumatoid arthritis, osteoarthritis, ankylosing spondylitis and for the relief of acute and/or chronic pain states in which there is an inflammatory component. **CONTRAINDICATIONS** Patients who are hypersensitive to naproxen or naproxen sodium or in whom acetylsalicylic acid or other non-steroidal anti-inflammatory agents induce allergic manifestations eg asthma, rhinitis and urticaria. Patients with either a history of, or active, peptic or gastrointestinal ulceration or chronic dyspepsia. Active gastrointestinal bleeding. Children under 5 years of age. **PRECAUTIONS** ANAPROX should not be used concomitantly with NAPROSYN (naproxen) or NAPROGESIC/SYNFLEX (naproxen sodium) since they all circulate in the plasma as the naproxen ion. In patients with active peptic ulcer or active inflammatory disease of the gastro-intestinal tract and active rheumatoid arthritis, an attempt might be made to treat the arthritis with a non-ulcerogenic drug such as gold. As with other non-steroidal anti-inflammatory drugs, ANAPROX should not be given to patients with active peptic ulcer. Patients prone to gastrointestinal tract irritation or with a history of peptic ulcer or diverticulosis should be closely supervised. Serious gastrointestinal adverse reactions can occur at any time in patients taking non-steroidal anti-inflammatory drugs. The cumulative incidence of serious gastrointestinal adverse reactions, including gross bleeding and perforation, increases approximately linearly with duration of use of naproxen (or other non-steroidal anti-inflammatory drugs) therapy. As with other non-steroidal anti-inflammatory drugs, there is probably a higher risk of adverse reactions with use of higher doses of these drugs. Patients with initial haemoglobin values of 10 grams or less who are to receive long-term therapy should have haemoglobin values determined frequently. Patients on some anti-coagulants should be watched for an increase in prothrombin time and patients on other drugs such as hydantoin, sulphonamides, sulphonylureas or methotrexate should be observed for increased effect or toxicity. A 550mg tablet of ANAPROX contains approximately 50mg of sodium. This should be considered in patients whose overall intake of sodium must be markedly restricted. Peripheral oedema has been observed in some patients although sodium retention has not been reported. For this reason, the drug should be used with caution in patients with fluid retention, hypertension or heart failure. anti-inflammatory, anti-pyretic and analgesic effects of naproxen sodium may mask the usual signs or symptoms of infection. Naproxen sodium therapy should be discontinued for at least 72 hours before testing adrenal function. As with other non-steroidal anti-inflammatory drugs borderline elevations of

one or more liver tests may occur in up to 15% of patients. These abnormalities may progress, may remain essentially unchanged, or may be transient with continued therapy. The SGPT (ALT) test is probably the most sensitive indicator of liver dysfunction. Meaningful (three times the upper limit of normal) elevations of SGPT or SGOT (AST) occurred in controlled clinical trials in less than 1% of patients. A patient with symptoms and/or signs suggesting liver dysfunction, or in whom an abnormal liver test has occurred, should be evaluated for evidence of the development of more severe hepatic reaction while on therapy with this drug. Severe hepatic reactions, including jaundice and cases of fatal hepatitis, have been reported with this drug as with other non-steroidal anti-inflammatory drugs. Although such reactions are rare, if abnormal liver tests persist or worsen, if clinical signs and symptoms consistent with liver disease develop, or if systemic manifestations occur (e.g. eosinophilia, rash, etc.), this drug should be discontinued. Adverse ophthalmological effects have been observed with non-steroidal anti-inflammatory agents; accordingly, patients who develop visual disturbances during treatment with ANAPROX should have an ophthalmological examination. (See ADR under "SPECIAL SENSES") **Use in Patients With Impaired Renal Function** In chronic studies in laboratory animals naproxen sodium has caused nephritis. Glomerular nephritis, interstitial nephritis and nephrotic syndrome have been reported rarely in humans. Naproxen sodium should therefore be used with great caution in patients with significantly impaired renal function and the monitoring of serum creatinine and/or creatinine clearance is advised in these patients. ANAPROX should not be given to patients with creatinine clearance less than 20mL/minute because accumulation of naproxen metabolites has been seen in such patients. Certain patients, specifically those where renal blood flow is compromised, such as extracellular volume depletion, cirrhosis of the liver, sodium restriction, congestive heart failure, and pre-existing renal disease should have renal function assessed before and during naproxen sodium therapy. Some elderly patients in whom impaired renal function may be expected, as well as, patients using diuretics could fall within this category. A reduction in daily dosage should be considered to avoid the possibility of excessive accumulation of naproxen metabolites in these patients. **Use in the Elderly** Studies to date have not identified any subset of patients not at risk of developing peptic ulcer and bleeding. However, elderly and debilitated patients are more prone to gastrointestinal ulceration than others. Most of the fatal gastrointestinal events associated with non-steroidal anti-inflammatory drugs have occurred in this patient population. One study indicates that although total plasma concentration of naproxen is unchanged, the unbound plasma fraction of naproxen is increased in the elderly. The lowest effective dose is recommended in elderly patients. **Use in Patients with Impaired Liver Function** Chronic alcoholic liver disease and probably also other forms of cirrhosis reduce the total plasma concentration of naproxen but the plasma concentration of unbound naproxen is increased. The implication of this finding for naproxen sodium dosing is unknown. In patients with impaired hepatic function, the lowest effective dose is recommended. **Use in Pregnancy** PREGNANCY CATEGORISATION C Non-steroidal anti-inflammatory drugs inhibit prostaglandin synthesis and, when given during the latter part of pregnancy, may cause closure of the foetal ductus arteriosus, prolong labour and delay birth. Continuous treatment with non-steroidal anti-inflammatory drugs during the last month of pregnancy should only be given on sound indications. During the last few days before expected birth, agents with an inhibitory effect on prostaglandin synthesis should be avoided. ANAPROX should, therefore, only be administered during pregnancy if the benefit justifies the potential risk. **Use in Lactating Mothers** The drug has been found in the milk of lactating mothers at a concentration approximately 1% of that found in plasma. As the effect of the drug in the newborn is not known, the use of ANAPROX in lactating mothers is not recommended. **Use in Children** Naproxen sodium administration to children under 5 years of age is contraindicated since safety in this age group has not been established. NAPROSYN (naproxen) Suspension 25mg/mL is an appropriate formulation for use in children 5 years and over. (Please refer to the NAPROSYN Product Information). **Significant Interactions with Drugs and Laboratory Tests** (i) Naproxen sodium may interact with other albumin bound drugs, for example, warfarin or bishydroxycoumarin may be displaced and induce excessively prolonged prothrombin times. Similarly, patients receiving hydantoin, sulphonamides, sulphonylureas or methotrexate should be observed for increased effect or toxicity. (ii) It decreases platelet aggregation and prolongs bleeding time. This effect should be kept in mind when bleeding times are determined. Patients who have coagulation disorders or are receiving drug therapy that interferes with haemostasis should be carefully observed if naproxen sodium is administered. Patients on full anticoagulation therapy (e.g., heparin or dicoumarol derivatives) may be at increased risk of bleeding if given naproxen sodium concurrently. Thus, the benefits should be weighed against these risks. (iii) Probenecid significantly prolongs the half-life of the drug (from 14 to 37 hours). This is associated with a decrease in conjugated metabolites and an increase in 6-demethyl naproxen. (iv) The natriuretic effect of furosemide has been reported to be inhibited by some drugs in this class. (v) Inhibition of renal lithium clearance leading to increases in plasma lithium concentrations has been reported. (vi) Urinary 17-ketogenic steroids may be spuriously increased due to a reaction between naproxen sodium (and/or its metabolites) and m-dinitrobenzene (used in this assay). 17-hydroxycorticosteroid measurements (Porter/Silber test) do not appear to be altered. (vii) It may interfere with some urinary assays for 5-hydroxy-indoleacetic acid. (viii) Naproxen sodium and other non-steroidal anti-inflammatory drugs can reduce the antihypertensive effect of propranolol and other beta blockers. (ix) In vitro studies have shown that naproxen may inter-

fere with the metabolism of zidovudine, resulting in higher zidovudine plasma levels. Therefore, consideration should be given to reducing zidovudine doses to avoid the potential of increased side effects associated with increased zidovudine plasma levels. (x) As with other non-steroidal anti-inflammatory drugs, naproxen may increase the risk of renal impairment associated with the use of ACE (angiotensin I-converting enzyme) inhibitors. **Special Precautions** If steroid dosage is reduced or eliminated during ANAPROX therapy, the steroid dosage should be reduced slowly and the patients must be observed closely for any evidence of adverse effects, including adrenal insufficiency and exacerbation of symptoms of rheumatoid arthritis. **ADVERSE REACTIONS** Adverse reactions reported in controlled clinical trials in 960 patients treated for rheumatoid arthritis or osteoarthritis are listed below. In general, these reactions were reported two to 10 times more frequently than they were in studies in the 962 patients treated for mild to moderate pain. **Incidence greater than 1%** Gastrointestinal: The most frequent complaints reported related to the gastrointestinal tract. They were constipation, heartburn, abdominal pain, nausea, dyspepsia, diarrhoea, stomatitis. **Central Nervous System** Headache, dizziness, drowsiness, lightheadedness, vertigo. **Dermatologic** Itching (pruritus), skin eruptions, ecchymoses, sweating, purpura. **Special Senses** Tinnitus, hearing disturbances, visual disturbances. **Cardiovascular** Oedema, dyspnoea, palpitations. **General** Thirst. **Incidence less than 1%** PROBABLE CAUSAL RELATIONSHIP: The following adverse reactions were reported less frequently than 1% during controlled clinical trials and through voluntary reports since marketing. The probability of a causal relationship exists between the drug and these adverse reactions. **Gastrointestinal** Abnormal liver function tests, gastrointestinal bleeding, haematemesis, jaundice, melena, peptic ulceration with bleeding and/or perforation, non-peptic gastrointestinal ulceration, vomiting, ulcerative stomatitis, colitis, fatal hepatitis. **Renal** Glomerular nephritis, haematuria, interstitial nephritis, nephrotic syndrome, renal disease, renal papillary necrosis, renal failure. **Haematologic** Eosinophilia, granulocytopenia, leukopenia, thrombocytopenia. **Central Nervous System** Depression, dream abnormalities, inability to concentrate, insomnia, malaise, myalgia, muscle weakness, aseptic meningitis. **Dermatologic** Porphyria cutanea tarda, alopecia, skin rashes, epidermal necrolysis, erythema multiforme, Stevens-Johnson syndrome, photosensitivity reactions including rare cases in which skin is resembling porphyria cutanea tarda or epidermolysis bullosa. **Special Senses** Hearing impairment. **Cardiovascular** Vasculitis, congestive heart failure. **General** Anaphylactoid reactions, menstrual disorders, pyrexia (chills and fever), eosinophilic pneumonitis. **CAUSAL RELATIONSHIP UNKNOWN** Other reactions have been reported in circumstances in which a causal relationship could not be established. However, in these rarely reported events, the possibility cannot be excluded. Therefore these observations are being listed to serve as alerting information to the physicians. **Haematologic** Agranulocytosis, aplastic anaemia, haemolytic anaemia. **Central Nervous System** Cognitive dysfunction, convulsions. **Dermatologic** Urticaria, *Mouth and Throat* A few severe cases of sore throat have been observed. **General** Angioneurotic oedema, hyperglycaemia, hypoglycaemia, hyperkalaemia. **DOSEAGE AND ADMINISTRATION** **Acute Migraine Headache** The dose is 825mg at the first symptom of an impending headache. An additional 275mg to 550mg dose can be given throughout the day, if necessary, but not before an hour after the initial dose. The total daily dose should not exceed 1375mg. **Acute Pain States with an Inflammatory Component** For the relief of acute pain states in which there is an inflammatory component, the dose is 550mg initially followed by 275mg every six to eight hours as required. The total daily dose should not exceed 1375mg. **Rheumatoid Arthritis, Osteoarthritis, Ankylosing Spondylitis and Chronic Pain States with an Inflammatory Component** The dosage range of naproxen sodium is 550mg to 1,100mg daily in two divided doses. The starting dose should not be less than 550mg daily and may be varied stepwise within this range 550mg to 1,100mg daily maintaining twice daily administration for long-term maintenance, depending on the needs of the patient. **OVERDOSAGE** Significant overdosage of the drug may be characterised by drowsiness, epigastric pain, indigestion, nausea or vomiting. A few patients have experienced seizures, but it is not clear if these were related to naproxen or not. It is not known what dose of naproxen sodium would be life threatening. Should a patient ingest a large number of ANAPROX tablets accidentally or purposefully, the stomach may be emptied and usual supportive measures employed. Animal studies indicate that the prompt administration of activated charcoal would tend to reduce markedly the absorption of the drug. Haemodialysis does not decrease the plasma concentration of naproxen because of the high degree of its protein binding. **PRESENTATION** ANAPROX is supplied as a 550mg capsule-shaped, blue film-coated tablet engraved with the words "SYNTEX" on one side and "ANAPROX 550" on the other side and as a 275mg oval, bi-convex, blue film-coated tablet engraved with the words "SYNTEX" on one side and "ANAPROX 275" on the other side. "ANAPROX 550" is available in packs of 5, 10 and 50 tablets. "ANAPROX 275" is available in packs of 5, 10 and 50 tablets. **PHARMACEUTICAL PRECAUTIONS** ANAPROX 550mg and 275mg Tablets: Protect from light, store below 30°C, shelf-life four years. **PBS Restricted:** 50 tablets + 3 repeats. **Unrestricted:** 10 tablets. **SYNTEX AUSTRALIA, LIMITED** 275 ALFRED STREET NORTH, NORTH SYDNEY NSW 2060 **TGA Approval Date:** 5 March, 1993 **Safety Related Changes:** 21 June, 1993 © Registered Trademark **S&N SYMAN 1709**



