Australian Association of Musculoskeletal Medicine

Bulletin

Posture, Movement and Co-ordination

The McKenzie System

Low Back Pain: Is It The Piriformis Muscle?

Vol. 7 No. 2 September 1991

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Australian Association of Musculoskeletal Medicine

Bulletin

Vol.7 No.2 September 1991

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The A.A.M.M. Bulletin 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. Wade King, 82 High Street, Taree, NSW, 2430, telephone (065) 51 0662, or to any member of the A.A.M.M. Council.
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AUSTRALIAN ASSOCIATION OF MUSCULOSKELETAL MEDICINE
OFFICE-BEARERS 1991

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Overseas Liaison:	Marius Loeffler *(convenor)*, David Vivian

Editorial

Spinal pain patients who do not respond to treatment are always causes of concern. That concern is greater when the treatment is known to have been clearly indicated and skilfully applied, as when a decompression operation has been performed on a patient with reliable evidence of a prolapsed disc impinging on neural structures. The possibilities seem to be either that the treatment has somehow failed to achieve its purpose or that the patient is exaggerating the symptoms. In fact, a third possibility is much more likely, although it is seldom recognised.

Problems stem from the traditional practice of assigning a diagnostic label to a patient's condition, especially when the label designates a specific pathophysiological entity affecting a particular anatomic structure. Whilst such diagnostic labelling is consistent with the reductionist approach to medical education and practice, and expresses the ideal of a tissue - and lesion - specific explanation for clinical features present, it is generally incompatible with the present state of the art of spinal assessment.

Traditional clinical training imbues the practitioner with the desire for diagnostic precision. This is laudable in theory but it is simply not attainable in practice with the vast majority of patients suffering spinal pain. The quest for the cause of spinal pain is inappropriate in the present state of knowledge, as no single entity is likely to be reliably identifiable as the primary generator of the pain. The most common situation is that several structures are involved in the spinal dysfunction and associated pain generation. The question should not be which structure is the cause of the pain but rather which of the several structures implicated are making greater contributions to the problem.

Diagnoses may be designated by apparently vague terms such as "spinal pain of unknown origin" or "spinal segmental dysfunction". Semantically these imply little in the way of precise information. Nonetheless, they are often accurate statements of what can be known in particular circumstances.

This is not to say that diagnostic efforts should be abandoned or that all spinal pain should be considered "non-specific". Every pain has a specific cause (or causes) but honesty and discrimination need to be applied to the process of determining what can be known about the aetiology. Assessment must be performed with great care and due consideration given to the sensitivity and specificity of the methods employed. Every instance of musculoskeletal dysfunction should be analysed carefully for evidence of the biomechanical and biochemical disturbances which may be associated with each structure involved. The diagnosis should be expressed, not as a single lesion label, but rather as a formulation of the various elements of the problem.

Once this principle is recognised, the management of the problem becomes much more straightforward. Treatment modalities may be applied according to a logical plan based on the likely contributions of the various structures and processes involved, their (predictable) responses to different forms of treatment and the relative invasiveness of the modalities available. When the response to one form of treatment is apparent, other modalities can be used to address either the same or other aspects of the condition. The concept of "treatment failure" is outmoded by such a scheme; combinations of different treatment modalities should be employed until the outcome is acceptable in the light of the natural history and the prognosis.

The articles in this issue of the Bulletin reflect three different approaches to the assessment of patients with spinal pain. Each is based on a particular view of spinal function and dysfunction which at first sight may appear to make each method exclusive of the others. However, the differences are largely of emphasis and each of these approaches has its place, with many others, in the diagnostic armamentarium.

The challenge for the musculoskeletal physician is to appreciate as many approaches to diagnosis as possible and to reject nothing that is scientifically valid. Any methods appropriate in a particular case should be used to formulate a comprehensive diagnosis which will lead to treatment of all aspects of the patient's problem. Patients with painful musculoskeletal conditions will continue to be treated ineffectively or inadequately until these principles are more widely accepted.

A Word from the President . . .

Over the past six weeks I have seen three patients who have presented with C7 weakness. I will run through their presentations:

Case I

Ms. O.F. age 36.
On 27.3.90 this woman was involved in a car accident. The car which she was driving was hit from behind when stationary. She developed neck pain and headaches immediately after the accident and thereafter had neckache and stiffness, with some headaches. She had some gentle physiotherapy and took aspirin now and then.

She began to develop some right shoulder and arm pain shortly after the accident but her condition was stable and mild. On 3.6.91 she developed a severe attack of right-sided neck pain, describing a sensation that appeared to be like a wry neck. The head was tilted to the right and she could not rotate or bend her head to the right side. At the same time she developed a severe pain down the right arm, just beyond the elbow laterally. She also had a knife-like pain in the right anterior chest.

Her general health was otherwise good. The pain was severe.

Examination on 15.6.91 showed limited neck movement. Right rotation was 45°, left rotation 80°, side bending movements were mildly reduced and extension was to 30°. Combined right rotation, side bending and extension was restricted to the right, with minimal reproductiuon of the right arm pain. There was mild tenderness in the right cervico-thoracic region. Triceps and wrist extension power tests were to 20% of normal and some extension was mildly reduced. Sensation was normal and there was no right triceps jerk.

Plain X-rays of the cervical spine on 3.6.91 showed some neurocentral degeneration at C5/6 and C6/7 and perhaps some disc space narrowing of C6/7, although this was minimal at worst.

She was treated with Morphalgin tablets, of which she took fifty in the first week and five thereafter. Her discomfort resolved spontaneously with conservative treatment.

Review on 15.7.91 showed only minimal neckache. The neck mobility was very close to normal and the power and triceps jerk had totally recovered.

Case II
Mr R.H. age 45
This man had a history of lung cancer without secondary spread during the early 1980s and was cleared of having any further lung cancer in 1991. He had continued to see an oncologist and four weeks before he presented had been declared as having no recurrence of the lung cancer.

In February, 1991 he began to have neckache. He consulted a chiropractor and was treated with manipulation. Soon after treatment commenced he began to have left arm pain and this slowly became worse and was associated with weakness. On presentation on 4.7.91 he had quite severe neck pain, with left arm pain spreading posteriorly and into the forearm, but the pain had eased since he ceased treatment. His health was good. He was not coughing. His weight was stable and there was no night pain.

Examination showed stiffness of neck movements, with perhaps a 10° reduction in rotation to each side and no reduction in any other movements. Neurological examination showed a 20% retention of elbow extension and wrist extension. There was no triceps jerk. Neurological examination of the lower limbs was normal. He had a Horner's syndrome.

This man had a CT myelogram which showed destruction of part of C6 and C7, with compression of the C7 nerve root. A neurosurgical decompression and clearance was performed. He had recurrent lung cancer.

Case III

Mr D. S. Age 45.

This man presented on 10.7.91 with a two month history of neckache, aggravated by riding his bike and a three week history of prominent neck and left arm pain, following a protracted period of painting a ceiling. His health was otherwise good.

Examination showed a 15° reduction in left rotation, soreness in end range extension and foraminal compression to the left, i.e. combined left rotation, side bending and extension, produced some mild sensation into the left arm. Examination of the left arm showed a 20% retention of elbow extension, wrist extension and wrist flexion and no left triceps reflex.

A CT scan of the cervical spine taken on 6.7.91 showed a left C6/7 disc prolapse of mild to moderate extent, compressing the C6/7 exit foramen.

At the time of the initial consultation he had shown some improvement in symptoms, particularly after ceasing a short course of steroids.

He had been recommended to have surgical excision of the disc material. The alternative solution was for him to wait, as his symptoms had improved, because of the chance of there being a natural improvement of the weakness, and pain was no longer a significant issue.

Reviewed 3.9.91, he has now recovered completely.

Comments: Neurological deficit in the presence of disc prolapse has provided great interest over the years. If the weakness is due to a disc prolapse, I have hardly ever seen it not recover. I think Cyriax gave the best summaries of the natural history of these conditions. He suggested that arm weakness secondary to a cervical disc prolapse nearly always recovered in four months, and that weakness in the foot after a lumbar disc prolapse would recover in 12-18 months. He noted that reflexes generally recovered, except for the ankle jerk.

The only patients he considered should have an urgent operation were the ones where improvement of nerve root function was paramount in their livelihood, e.g. ballet dancer, footballer, etc.

The almost total recovery of nerve root function in the patients I have seen over the years would suggest that conservative management of weakness is highly reasonable. Disc prolapse seems to have a naturally good history, and to me it is the pain of the condition that is the indication for sending the person for investigation and surgery, providing you are happy that disc prolapse is the diagnosis. I think this is best confirmed by progressive neurological examination, rather than rushing into ordering tests, unless the symptoms warrant it.

Most peripheral nerves recover, providing they have not been cut. It would appear that if pain is bad enough, then the compression may be severe enough to cause long term damage, and in these cases pain becomes an indication for operation, rather than weakness in any case.

Those patients who have lost muscle power due to disc prolapse frequently recover. The challenge to the practitioner is to assess the likelihood of a poor outcome.

Perhaps practitioners with experiences of any nature in this area could send some comments to the Bulletin.

From the Hon. Secretary's Desk

The affairs of the Association are continuing to gain momentum and I am personally encouraged by the number of people who have expressed interest in the various areas which are occupying the attention of the association at this present time. The discussions with the Department of Health in Canberra, although proceeding slowly resulted in with appreciation of our problems and expressions of concern by the parties involved. The creation of the certificate/diploma course at Flinders University has created interest throughout the country. Finally, more and more young medical graduates are approaching the Association and the courses which we are offering, looking for something which is obviously missing in the undergraduate education program.

In respect to the discussions with the Department of Health: as most members know we have been trying to get recognition of remuneration for those people who are involved in full time musculoskeletal practice. While the Department is appreciative of our particular dilemma, at this particular time we are not making much progress. It is not much comfort to know that there are other "special interest" groups within general practice that are faced with a similar dilemma. We are pushing on - slowly but relentlessly.

On a more encouraging note, the Flinders University has approved the Certificate/Diploma Course in Musculoskeletal Medicine. The first of the units will be offered at the end of this year and an advertisement for that appears in this edition of the bulletin. It is emphasised that in the future the "user pays" system will feature in all educational programmes. Members are reminded that foreign graduates are charged of the order of $20,000 per year for a medical programme. Therefore the cost, which is totally tax deductible, of $1,500 per course is not unreasonable. This fee has been reduced from the $2,000 originally required by the university after negotiation aimed at making the course accessable to as many as possible. The adage of "cast your bread upon the waters" undoubtedly applies. Unfortunately at this stage we are limited in the number of places that we can offer and so far I am encouraged by the number of people throughout the country who have made enquiries and who have intentions of attending the first of the courses. For those wishing to attend the course billets can be arranged in Adelaide to help cut costs.

Of the other five units which constitute the Dip.Musc.Med. three will be offered during 1992 which means that it will be possible to come the postgraduate Certificate in a space of twelve months. It is possible to take each unit as an "audit" i.e. not for credit. If this is the case the cost of the unit is $1400. I will be pleased to supply more information if requested.

Finally, I am encouraged by the number of undergraduates and recent graduates who approach me regarding problems of the musculoskeletal system. There is an obvious hunger to learn more about this area and I feel we are gaining an acceptable profile, although on a small scale. I have mentioned previously the only way to forward is for positions to be created in large public hospitals where the practice of musculoskeletal medicine, apart from the rheumatological and surgical components, is available. With increasing pressure placed upon the services of the specialists there is a strong argument for local groups to lobby the powers that be in high places to gain outpatient clinics even if in the first instance they are staffed on a voluntary basis.

I look forward to seeing you in October and I encourage all members to be able to attend the Adelaide Conference especially those who are resident in the state.

AAMM NEWS

Australian Association of Musculoskeletal Medicine

Arrangements are well in hand for the Association's 21st Annual Scientific Meeting, to be held in Adelaide on 24th 25th and 26th October, 1991. The programme includes three full days of plenary sessions, supplementary breakfast and lunch meetings, and pre- and post- conference workshop courses. Full details are to be found in the Meetings, Conferences and Courses section of this Bulletin. All members should have received registration forms for the conference. Those that have not yet registered are advised to do so as soon as possible as some of the sessions in the supplementary programme have limited places and those who book late may be disappointed. Those attending the Conference are also advised to confirm their accommodation arrangements if they have not already done so; some of the hotels in Glenelg are already booked out. All indications are that this conference will be one of the best, and certainly one of the best attended, ever.

❖

The first unit of the Flinders University course for the Diploma in Musculoskeletal Medicine begins at the Flinders Medical Centre on 18th November, 1991. The commencement of the course will mark another stage in the development of the discipline as it is the first leading to a registerable qualification in musculoskeletal medicine. Full details of the course are to be found in the Meetings, Conferences and Courses section of this Bulletin. A limited number of places are still available and members interested in doing the course should contact the Course Co-ordinator, Dr. Norm Broadhurst, Department of Primary Health Care, Flinders Medical Centre, Bedford Park, S.A., 5042.

❖

Congratulations are in order for the Vice-President, who has (at last) been elevated to the academic peerage. His appointment as full Professor was confirmed recently by the Senate of the University of Newcastle. Members are advised to consult Debrett's for correct forms of address before engaging him in scientific repartee at the annual conference in Adelaide.

❖

This year's Winter Meeting went off well, with a strong contingent of hardy outdoor types gathering at the Southern Cross Ski Lodge, Mt. Buller, from 28th July to 2nd August, 1991. Snow cover was good, despite the unusually dry weather earlier in the season, and the week proceded with the usual mixture of skiing ecstacy by day and cameraderie around the log fire by night. Surely two of the greatest experiences that membership of this Association can offer are schussing down Little Buller Spur and sitting on the verandah at Koffler's in the crisp alpine sunshine after weaving down the Summit Bowl.

❖

Perth has been suggested as the venue for the 22nd Annual Scientific Meeting in 1992. Tentative dates are the second weekend in October. The Association has been committed to holding a conference in Western Australia for some years and especially since the 1989 meeting, which was planned for Perth but was aborted by the airline pilots strike. By a twist of fate, one of the long-term effects of that strike will be that eastern state members will be able to fly to Perth much more cheaply than they could have done previously. Details of the 1992 Meeting will be discussed at the forthcoming A.G.M. in Adelaide and will be notified in the next issue of the Bulletin.

❖

The day of lectures on neuroanatomy, referred pain, biomechanics, etc., given by Professor Nik Bogduk as a supplement to the 20th Annual Scientific Meeting in Melbourne in 1990 were recorded on videotape. Copies of the tapes, which contain such highlights as Nik's distinctive method for remembering dermatomes and myotomes, are available from the Association. The cost is a very moderate $50.00 for the set of two three-hour tapes. Those wishing to purchase a set should contact Dr. Max de Clifford of the Association's Education Sub-committee at 36 Heads Road, Donvale, Victoria, 3111, telephone (03) 873 1764.

❖

Following the resolution of the Extraordinary General Meeting in November, 1990, the A.A.M.M. is now an incorporated body under the terms of the N.S.W. Associations' Incorporation Act of 1984. Essentially this means that members are now protected by legal safeguards against such exigencies as the Association being sued or otherwise getting into legal or financial difficulties. There are no current circumstances known to the Council which are likely to lead to the Association's new status being tested in the courts but nonetheless all members should lie more easily in their beds because of it.

❖

Applications for accreditation are still flowing in to the Hon. Secretary on a regular basis and the number of Licentiates continues to grow. Of those who have elected to take the multiple choice examination, about half have passed, which is quite creditable as the pass mark has been set at 80 percent. Some may consider this standard a little high but it was set at that level deliberately to reflect a minimum acceptable standard of clinical success. Those who do not pass at their first attempts are encouraged to take another test later. The Association's accreditation scheme is not designed to exclude anyone but rather to encourage as many members as possible to achieve a recognisable standard of proficiency.

❖

Former President Conrad Winer returned recently from a trip to Russia. No definite link has been confirmed between his visit and subsequent political developments in that country but members will no doubt be interested to hear more about the trip when they encounter him at the regular Sydney meetings or at the annual conference.

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Subscriptions for 1991-1992 are now due. Many members have already paid and anyone who has done so will find a receipt enclosed with this issue of the Bulletin. Any member who has not paid yet is asked to send a cheque for the current subscription of $80.00 to the Hon. Treasurer at 82 High Street, Taree, N.S.W., 2430 as soon as possible.

Videotapes of the Bogduk Lectures

See arthrology, biomechanics and the neuroanatomy of the mulculoskeletal system presented as never before! Learn the nerve supplies of every muscle in a way that allows instant, accurate recall! Find out the secrets of

The Dance of the Dermatomes and ***The Dance of the Myotomes!***

Only $50 for the set of two three-hour videotapes. Seeing is believing!

Send your cheque, made out to A.A.M.M., **now** to:
Dr. Max de Clifford, Convenor, A.A.M.M. Education Sub-committee, 36 Heads Road, Donvale, Victoria, 3111.

Meetings, Conferences and Courses

Local A.A.M.M. Meetings

In **Brisbane**, postgraduate education has continued throughout the year with bi-monthly meetings at the Q.E.II Hopsital. A wide range of subjects has been discussed. Also, a visit has been made to the Anatomy School of the University of Queensland to refresh members' knowledge of anatomy. Some interest has been expressed in commencing another practical course but no firm decision has yet been made. For details of activities planned, members should contact Dr. Geoff Harding, telephone (07) 269 1842 or Dr. Ron Palmer, telephone (07) 252 1128.

In **Melbourne**, meetings are held monthly, usually at 8p.m. on the second Tuesday of the month. In 1991 these meetings have been arranged in conjunction with sports physicians and venues have been various clinics in the inner city area. Those interested in attending are asked to contact Dr. David Vivian or Dr. Vic Wilk at the Metropolitan Spinal Clinic, 302 Malvern Road, Prahran, telephone (03) 529 1988.

In **Sydney**, meetings are held at 7.30pm on the third Monday of each month in the Department of Rehabilitation Medicine, Royal Prince Alfred Hospital. The programme usually consists of a lecture or discussion on a selected topic, followed by case presentations and a practical session of diagnostic and management techniques. The meetings are open to all interested medical practitioners. Those wishing to attend are asked to telephone (02) 550 3837 during the preceding three working days to confirm the arrangement.

In **Perth**, weekend workshops are arranged from time to time by Dr. Marius Loeffler. The next will be held at 9 a.m. on Sunday, 20th October, 1991, at the Old Bakery, Yarloop. Dr. Nils Schonstrom from Sweden and Dr. Hans Schmid from Switzerland will speak about European approaches to management of musculoskeletal problems. Members interested in attending can obtain further details by contacting Dr. Leoffler, telephone (09) 531 1658.

Regular meetings, practical sessions and courses are conducted in many other centres around Australia by state branches, local groups and individual members of the Association. These activities are mainly for the benefit of members living in a particular area and they will generally be advised by letter or by local notices of dates, times and venues. Anyone who is not receiving information about local activities, or who would like more details about what is going on, should contact one of the local organisers listed below.

In **Adelaide**, Dr. Norm Broadhurst, telephone (08) 295 1890.
In **Cairns**, Dr. Gaye Tucker, telephone (070) 53 3330.
In **Canberra**, Dr. Goff Nelson on (062) 95 6773.
In **Hobart**, Dr. Ron Heddle on (002) 34 5990.
In **Newcastle**, Prof. Nik Bogduk on (049) 68 5699.
In **Tamworth**, Dr. John Bosler on (067) 66 4733.
In **Taree**, Dr. Wade King on (065) 51 0662.
In **Toowoomba**, Dr. Jeff Phillips on (076) 38 4800.
In **Townsville**, Dr. Roger Watson on (077) 71 3084.
In **Wollongong**, Dr. Chris Minogue on (042) 83 4011.

Those who live in **other areas** and who would like to organise or participate in local meetings should contact Dr. Max de Clifford, convenor of the Education Sub-Committee, 36 Heads Road, Donvale, Victoria, 3111, telephone (03) 873 1764. He can arrange publicity, notes, visual aids and other assistance from the Association's resources.

Annual Scientific Meeting of the A.A.M.M.

Theme: ***"Cervical Spine"***

The Association's Twenty-first Annual Conference will be held at the Grand Hotel, **Glenelg** on 24th to 26th October, 1991. Pre- and post-conference meetings and courses will be held for those interested in taking part. The full programme for the conference will be as follows:

Thursday, 24th October

8.30am	Registration	
9.00am	Opening address and Conference Perspectives	
9.30am	Whiplash Injury - The Cause and The Lesion	*A/Prof J. Taylor*
10.10am	What Causes the Pain?	*Prof N. Bogduk*
10.40am	Refreshment Trade Exhibits	
11.10am	Biomechanics of the Neck	*Prof M. Allen*
11.45am	Why Don't People Get Better?	*Dr M. Awerbach*
12.15pm	Lunch	
1.30pm	3D Cervical Segmental Movement	*Dr M. Pearcy*
2.00pm	Pain Pathways of Neck and Shoulder	*Prof N. Bogduk*
2.40pm	Ophthalmological Aspects of Whiplash	*Dr R. Renton*
3.00pm	Chronic Pain	*Prof I. Pilowsky*
3.45pm	Refreshments and Trade Exhibits	
4.15pm	Annual General Meeting of the A.A.M.M.	

Friday, 25th October

9.00am	Radiology of the Neck	*Dr N. Sandu*
9.45am	Chronic Pain from Whiplash	*Dr D. Cherry*
10.30am	Refreshments and Trade Exhibits	
11.00am	Whiplash Research Projects	*Dr N. Broadhurst*
11.30am	T.M.J. - Pain and Treatment	*Dr P. Duke*
12.00pm	Sympathetic Pain - R.S.D.	*Dr J. Pfitzner*
12.30pm	Lunch	
2.00pm	Psychologists View of Chronic Pain	*Ms M. Bridson*
2.20pm	Chronic Fatigue Syndrome	*A/Prof J. Willoughby*
2.45pm	S.G.I.C. - A.C.C. Experience	*Mr R. Daniels*
3.15pm	Refreshments and Trade Exhibit	
3.40pm	Cervical Headache	*Mr D. Watson*
4.00pm	Algometry	*Dr D. Cullum*
4.20pm	Neuronal Basis of Referred Pain	*Mr D. Butler*
5.00pm	Depart for Annual Dinner on board *"Falie"*	

Saturday, 26th October

9.00am	Myofascial Pain Syndromes	*Dr W. King*
9.45am	Dry Needling Experience	*Dr N. Broadhurst*
10.00am	Cervical Injuries in Sport	*A/Prof M. Allen*
10.30am	Refreshments and Trade Exhibits	
10.50am	Surgical Intervention - When?	*Mr P. Reilly*
11.30am	Radiofrequency Denervation	*Dr D. Vivian*
12.00pm	Fibromyalgia	*Dr B. Hill*
12.30pm	Lunch	
2.00pm	Visual Disturbance in Whiplash	*Ms S. Brown*
2.35pm	Rehabilitation. What Can It Offer?	*Dr J. Durkin*
3.00pm	Research Directives	*Prof J. Taylor*
3.30pm	Refreshments and Trade Displays	
4.00pm	How to Treat the Lesion - Panel Discussion involving *L. Barnsley, M. Allen, J. Taylor and P. Reilly*	

Supplementary Programme

Breakfast and Lunch sessions are open meetings with limited numbers. Cost is $20.00 for delegates and $35.00 for itinerant participants.

Sclerosants/Prolotherapy - What is their place in chronic pain?
Breakfast Session Friday, 25th October, 1991 *A/Prof Murray Allen*

Treating the Whiplash Injury.
Lunch Session Friday, 25th October, 1991
Dr Norm Broadhurst, A/Prof Murray Allen, Dr Les Barnsley

What can we do to help chronic pain sufferers?
Breakfast Session Saturday, 26th October, 1991 *Ms Marilyn Bridson*

Cervical Research - What has it done and where is it going?
Lunch Session Saturday, 26th October, 1991
A/Prof Jim Taylor, Dr Les Barnsley

Pre - and Post Conference Courses

These courses will run from Tuesday 22nd October to Monday 28th October, 1991.

Biomechanics of the Musculoskeletal System
2 days - Tuesday 22nd October and Wednesday 23rd October, 1991. Flinders Medical Centre.
Assoc Prof Murray Allen from Simon Fraser University, B.C.

Shoulder and Upper Limb
2 days - Tuesday 22nd October and Wednesday 23rd October, 1991. Queen Elizabeth Hospital.
Prof Nik Bogduk, University of Newcastle and Dr David Vivian, Musculoskeletal Physician, Melbourne.

Cervical Spine and Shoulder Girdle
2 days - Sunday 27th October and Monday 28th October, 1991. Queen Elizabeth Hospital.
Dr Norm Broadhurst, S.V.M.P. to F.M.C. & Q.E.H.

Lower Limb-Hip, Knee, Ankle, Feet
2 days - Sunday 27th October and Monday 28th October, 1991. Queen Elizabeth Hospital.
Dr Wade King, Musculoskeletal Physician, Taree.

These courses will be of 2 days duration as indicated. Cost to be $200 for each workshop. Enquiries should be directed to either:

The Conference Secretariate
7 Brighton Road, Glenelg, 5045, telephone (08) 295 1890;
or
S.A.P.M.E.A.
Newland House, 80 Brougham Place, North Adelaide, 5006.

Sports Massage Workshop

Monday, October 14th, 1991, Victorian School of Massage, **Camberwell**, Victoria..
Conducted by Dr. Myk Hungerford (Ph.D Physical Therapy), this workshop will focus on hands-on techniques of pre- and post- event massage. Dr. Hungerford is the director of the American Insititute of Massage Therapy, California, USA, and pioneered the introduction of massage into the 1984 Olympic Games in Los Angeles. This one day workshop will deal with techniques
- to aid flexibility
- to promote speed, power and endurance
- to achieve peak performance

Cost of $100.00 includes lunch and refreshments. Cheques should be made payable to the Victorian School of Massage. For further information phone Jim Doran (Riversdale Road Physiotherapy) on (03)882 5735 or Gregory Kolt (Kolt and Haskin Physiotherapy) (03)576 0733.

M.P.A.A. Seventh Biennial Conference

November 27 - 30th , 1991, **Blue Mountains**, NSW.
A major conference is held every two years by the Manipulative Physiotherapists Association of Australia and provides a unique opportunity for physiotherapists, medical practitioners and other interested health professionals to participate in a scientific musculoskeletal programme of international standard. Key speakers at this conference will include Nik Bogduk, John Fulkerson, Vert Mooney, Lance Twomey.

For further information contact The Conference Secretariate,
AGENDA Association & Conference Management
P.O. Box 380, Spit Junction, NSW, 2088, telephone (02) 969 1400, facsimile (02) 969 2856.

Assessment & Treatment of Craniomandibular & Cranio-Cervical Dysfunctions

March 12th - 17th, 1992, Sheraton Wentworth, **Sydney**, NSW.
These courses demonstrate the inter-relationship between occlusion and posture of the TMJ, cranium, cervical spine and other body segments.
Two Day Course: Introduction to Evaluation and Treatment of Craniomandibular and Cranio-cervical Dysfunctions. March 12th and 13th, 1992.
One Day Seminar: Maxillofacial Disorders in the Developing Child. March 14th, 1992.
Three Day Course: Advanced Pathophysiology of the Craniovertebral and Temporo-mandibular Joints. March 14th - 17th, 1992.
For further information contact The Conference Secretariate;
A. Lucas, 6 Lasa Street, Cabramatta, NSW, 2166.

N.Z.A.M.M. Annual Conference

The New Zealand Association of Musculoskeletal Medicine will hold its annual conference in **Auckland** on 15th - 17th November, 1991. The programme includes sessions on structure, pathology and treatment of the intervertebral disc, new concepts in palpatory diagnosis, pelvic dysfunction, etc. with key speakers including Prof. Nik Bogduk, Dr. Karel Lewit and Mr. Gordon Dowie.

Several pre-conference workshop meetings will also be held. Programmes and registration forms may be obtained from the A.A.M.M. Hon. Secretary or by contacting The Organising Committee, N.Z.A.M.M. Conference, Postgraduate Office, Christchurch School of Medicine, P.O. Box 4345, Christchurch, New Zealand.

F.I.M.M. Tenth Triennial International Congress

The International Federation of Musculoskeletal Medicine (F.I.M.M.), the world-wide body with which the A.A.M.M. is affiliated, will be holding its tenth tri-ennial Congress in Brussells from Wednesday 16th to Saturday 19th September, 1992.

Further information is enclosed with this issue of the Bulletin. Members interested in making up a party to attend the Congress are asked to contact the Hon. Secretary to discuss possible group concessions, etc. Enquiries about the programme and other arrangements should be directed to G.B.M.M.-B.V.M.G. C/o Mme H. van Leemputten, rue Joseph Stallaert 28, B-1180 Brussels (Belgium), telephone (32)2.344.06.30, facsimile (32)2.346.1455.

XI World Congress of the International Federation of Physical Medicine and Rehabilitation (IFPMR)

"Trends in Physical Medicine"

September 14th - 18th, 1992, Kulturpalast, **Dresden**, Germany.
For further information contact the secretariat Professor Jurgen Kleditzsch, Secretary of the XI World Congress of IFPMR, Medical Academy "Carl Custav Carus", Clinic of Orthopaedics, 74, Fetscherstrasse, Dresden GDR - 8019.

Postgraduate Programme in Musculoskeletal Medicine
Flinders University, South Australia

The Departments of Orthopaedic Surgery and Primary Health Care of the Flinders University have arranged a postgraduate programme to increase the skills of medical practitioners in assessing, diagnosing and treating musculoskeletal dysfunction.

The University requires 36 units of study to be completed before the Diploma is awarded and to this end, 6 x 6 unit courses have been approved. A Certificate may be awarded after completion of 3 x 6 unit courses.

After consultation with numerous interested parties it was decided that such a programme would best serve rural and city practitioners if it were offered in intensive in-service blocks of two weeks duration as follows:

** Anatomy, Physiology and Biomechanics of the musculoskeletal system
** Clinical Skills in managing non-surgical and non-rheumatological musculoskeletal dysfunction
** Musculoskeletal dysfunction related to diseases of the vertebral skeleton
* Musculoskeletal dysfunction related to diseases of the appendicular skeleton

** N.B. These three courses are compulsory for the postgraduate certificate.

Emphasis in the Anatomy, Physiology and Biomechanics course will be on diagnosis. The Clinical Skills course deals with management and includes specific treatment modalities.

In addition to the above, two additional units must be taken to complete the requirements for the Diploma:

Independent Study - to include indepth literature survey, critical assessment of a treatment modality/ examination or procedure, etc., to be made in consultation with the course co-ordinator.

Rehabilitation Studies **or** any related unit from the offerings within the Master of Science Primary Health Care Programme.

In determining the fees for such a course cognisance must be taken of:

a. The charge for each year of an undergraduate medical course is of the order of $26,000 per year for the full-fee paying student, e.g. overseas students.
b. There is no mechanism whereby university or government funds can be put toward the costs of the course.

The fairest way is to charge $1,500 for each unit or $9,000 over a two to three year period until the Diploma is completed.

The first of the two week intensive inservice courses is planned for 18th to 30th November, 1991 at the Flinders Medical Centre, Adelaide, S.A.

Participants are expected to find their own accommodation. The Flinders University Halls of Residence may have some vacancies and efforts will be made to find billets for course participants.

Course:	Anatomy, Physiology and Biomechanics of the Musculoskeletal System.
Dates:	Monday 18th November to Saturday 30th November
Venue:	Flinders Medical Centre, South Australia
Cost:	$1,500
Limit:	12

Note that Continuing Medical Education can be claimed as a tax deduction.

Further information about course offerings can be obtained from: Dr. Norm Broadhurst, Department of Primary Health Care, Flinders Medical Centre, Bedford Park, S.A. 5042.

Posture, Movement and Co-ordination

Barry Abeshouse

26 Kambala Road, Bellevue Hill, N.S.W., 2023.

ABSTRACT

The functions of the musculoskeletal system are described as the achievement of upright posture and bipedal gait, and the performance of skilled movements. Factors governing posture and movement are considered. The initiation of gait is described as a progression from bipedal standing to standing on one leg; the cycle of gait is also discussed. Common postural abnormalities are considered from the perspective of their effects on total body function.

A method is outlined for the assessment of static and dynamic posture, with direct techniques for the examination of factors such as muscle length, strength and co-ordination. A scheme of management is suggested, based upon the problems defined by examination.

INTRODUCTION

Posture, movement and co-ordination are the fundamental components of motor function. Each is subject to many variables[1].

Traditional medical teaching describes the body as distinct parts which perform specific functions in mechanically defined ways. This approach is appropriate for local diagnostic and surgical assessment. However, assessment of motor function as it affects the body as a whole requires an appreciation of the interaction between the various parts and of the relationships between the factors which influence motor behaviour.

The performance of a skilled movement depends on the integrity of the motor and sensory systems.

Every movement pattern is unique to the individual but there are common elements which may be evaluated in the assessment of the musculoskeletal system. Many of these elements are complex and will only be unravelled by painstaking clinical examination but this is no excuse for them to be ignored.

When a problem is chronic and severe enough not to respond to simple treatment modalities, comprehensive assessment and intensive rehabilitation must be undertaken. Such a regime may prove demanding for both practitioner and patient but the long term rewards will justify the efforts required. The alternatives are either that the patient becomes compliant and attends repeatedly for ineffective treatment or that treatment is abandoned and the patient just "lives with" the problem.

Understanding the factors which determine static and dynamic posture, and the extent to which they may be evaluated by a comprehensive clinical assessment, provides the key to determining appropriate management.

POSTURE AND EQUILIBRIUM

A continuous situation of compromise exists between the requirements of balance, maintenance of a stable ocular platform, active movement, background postural maintenance, locomotion, reaction to body needs and reaction to the environment (both as it really is and as it is perceived)[2].

The musculoskeletal system acts as an integrated unit which adapts to and compensates for factors which disturb function, so that equilibrium is maintained. It is an extremely efficient system in which the conscious is allowed to focus on the interpretation of significant new information and the solution of relevant cortical problems to achieve desire, whilst subconscious postural behaviour sets the scene. Background posture is based on reflex behaviour which seems to be genetically determined but modified by developmental influences.

Background posture may exist alone but movement always has a background component. Phasic activity (fast, finely controlled motor behaviour) is always preceded and followed by postural (slow, strong background) activity.

Postural functions organise the background to phasic activity. They originate from the point of contact with earth and are projected into the phasic activity via a sophisticated interaction of body behaviour.

The muscle bulk involved in background postural behaviour is considerable. It represents 70-80% of the musculoskeletal system which in turn is 80% of the total body mass.

ENVIRONMENTAL INFLUENCES

Man exists in a relatively constant and predictable environment. It exerts forces which require resolution by the musculoskeletal system.

Constant, external and predictable forces of gravity and contact with the environment have allowed the body's anti-gravity behaviour to become almost completely automatic and subconscious. Sophisticated mechanisms, based on reflex behaviour and patterning, usually cope with environmental forces without conscious effort.

Man also has a variable component to his existence, as determined by various needs and mediated via complex motor activities. Variable forces are largely internally and motivationally derived. Finer modifications of behaviour patterns, involving conscious effort, are often required to deal with them, to extents dependent upon their effects and their relationship with the environment.

Complex behaviour has greater representation higher in the central nervous system where more sophisticated integrated mechanisms have evolved. The variable forces are those relating to intent and complex behaviour such as fine hand movement, speech and facial expression. Their representation in the cortical homunculus is extensive relative to the muscle mass, being related to the complexity of these functions and their control.

Healthy motor activity requires each of these systems to work to it's optimal capacity whilst being able to integrate and supplement the other.

POSTURAL PATTERNING AND SKILLS

Complex postural patterning is established during development (involving local, synaptic, spinal and central memory), in which basic reflexes such as the withdrawal and extension reflexes are modified to achieve consciously driven goals[1].

Extension in the lower body, lumbar spine and cervical spine allows man to achieve upright posture.

Flexion is the predominant feature in the upper body's fine active prehensile behaviour with the complimentary release of extension in the antagonists facilitating local reflex tonal control.

Complex movements are learnt and memorised at local as well as central sites and then become integrated into reflex subconscious background behaviour[2,3]. Postural patterns are established by these learnt modifications of reflex behaviour. They are largely cerebral activities utilising the available functional anatomy.

Skilled movement is the epitome of motor function and therefore any disturbance in the motor system is reflected as an effect on performance.

Speech may provide us with a model of how the upright postural mechanism operates with its fine nuances of muscular flickering as one defies gravity[4]. Speech is a uniquely human development which requires exquisite control of a whole series of finely tuned muscles and other structures in order to produce the sounds and their integration. The peripheral anatomy varies between individuals but the generation of articulate speech is largely cerebral and based upon an integrated subconscious mechanism. One could postulate equivalence of various conditions such as stuttering and dysarthria as existing in the postural system.

Because of their complexity "models of movement" allow examination to be performed on the system and abnormalities to be more easily diagnosed.

Standing on one leg is such a model. It has an initiation in overcoming inertia, movement and the maintenance of stability and balance, the achievement of the goal and the capacity to hold the position. The return to the original status is an independant movement in itself and warrants equal attention. It is not a reverse of the first movement if only in that in the first the action is against gravity and the second is with gravity. The directions may be reversed but as soon as the forces change the mechanism must also change; during development the body determines the most efficient patterns for each individual.

When fundamental background postural function is disturbed, more complex behaviour requires recruitment of other tissues and competition with other functions to achieve the aim.

As the models become more complex the capacity for interference with total function increases.

Without the integration of intentional movement and background posture, pathological compensatory patterns develop and complicate musculoskeletal activity. Such patterns decrease performance, increase the risk of both micro- and macro- trauma and interfere with healing.

DEFINITIONS

Various concepts of function are demonstrated by the following quotations.

Sherrington: "Posture is tonus". "Posture follows movement like a shadow"[5].

Brain: "Movement begins and ends in posture". "There is an intimate relationship between movement, posture and tone"[2].

Roaf: "Posture is the position the body assumes in preparation for the next movement"[6].

Janda: "Basic human posture should be derived from the principal movement pattern, namely gait. Since we stand on one leg for most of the time during walking, the stance on one leg should be considered to be the typical posture of man; the postural muscles are those which maintain this posture"[7].

Dart: "The head moves in human beings in order to extend the range of vision; to better his vision man became completely upright. Perhaps the richest comedy presented by the evolutionary process is that the creatures nature designed to have perfect posture and vision should today present a picture of bespectacled decrepitude"[8].

POSTURE AND LOCOMOTION IN PRIMATES

About four million years ago a complex series of skeletal and functional adjustments resulted in the first efficient primate biped[8].

Bipedal standing, walking and running occur in several species of primates, but with a bent knee, bent hip and almost crouched posture. Apes in captivity have been noted by Napier to stand erect by contracting the hamstring and quadriceps femoris muscles but were thus obliged to walk with completely stiff knees[9].

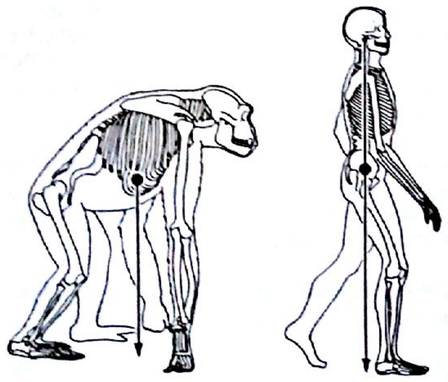


Fig. 1 *The weight-line of an anthropoid ape such as the gorilla is the oblique quadrupedal position (left) falls between the fore-limbs and the hind-limbs. In upright standing walking man, the axis of the body mass (or the 'centre of gravity') passes from the occipital condyles of the cranial base, close to the vertebral column, through the hip-joints on either side and so to the tripodial feet. Although various forms of bipedalism are encountered in Primates other than man, the peculiarly human form of bipedalism is a distinctive adaptation that was acquired early in the process of hominization. Its acquisition has been accompanied – indeed made possible – by anatomical adjustments affecting every part of the skeleton and locomotor apparatus from the cranial base to the feet.*

Posture has many learned elements and behaviour influences function. In the Lancet in 1888, a Colonel Sleeman who resided in the forests of India described six cases of "wolf children". Some had spent up to ten years with wolves after being carried off as babies. "The mode of progression... is on all fours; not, as a rule, on the hands and feet but on the knees and elbows, which are extremely calloused. They are rarely seen to stand upright, unless to look around, and they gnaw bones in the manner of a dog, holding one end between the forearms... "[10].

Erectness of the trunk, bipedal stance and gait, skilled use of body parts and speech are characteristics of human motor behaviour.

Man is the only primate able to stand erect for long periods of time (with full extension of the knee joint) and to walk with a striding gait[8].

Functional and morphometric analyses have furnished evidence that those anatomical adjustments produce a more efficient system of weight-bearing.

The concentration of the weight line has enhanced stability, improved balance and enabled man to stand upright with a minimal expenditure of energy.

To understand upright posture in man it is necessary to understand the changes required to convert the flexed upright posture and gait of apes into the fully extended stance and erect, striding gait of man.

Habitual uprightness is accompanied by special anatomic adjustments in two main parts of the body, the axial skeleton (spinal column surmounted by skull) and the pelvis and lower limbs[8].

Axial Skeleton

Greatest adaptive change has occurred in the skull and nuchal region and in the lower spine and pelvic region. The increases in functional demands to produce effective upright posture appear to be important contributing factors in the production of specific musculoskeletal complaints which afflict these areas.

In the human being the cervical, lumbar and sacral curves are more marked and the sizes of the vertebral bodies increase progressively towards the lumbar region (since each vertebra supports a greater mass than the one above it).

The spinal column curves into the thoracic cavity and the sternum is relatively close to the spine, placing the weight line in upright man much further back and nearer the vertebral column[4].

Cervical Spine and Skull

In man the centre of head mass lies only a short distance anterior to the point of pivot (i.e. the weight line lies just in front of the occipital condyles). The attaching behind the point of pivot are sufficient to maintain the poise of the human head in the upright posture. In monkeys the cranium is smaller, the jaws larger and the centre of mass is more anterior to the pivot. Six times as much power is required by the nuchal tissue of these animals[8]. In humans the lesser role of the nuchal muscles is reflected in the smaller cervical spinous processes and a dramatic reduction in the area of the base of the cranium for their attachments.

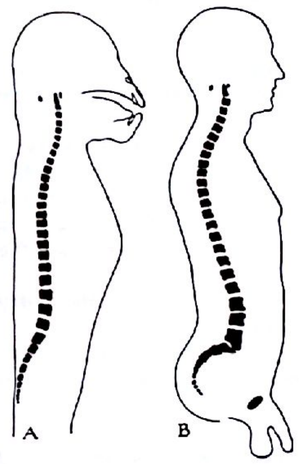


Fig.2 *Median sagittal sections through the head and trunk of a chimpanzee, A (after D.J. Cunningham, 1886) and of a man, B (after C.H. Stratz, 1905). The sections show the differences in the curvatures of the vertebral columns of ape and man, the cervical, lumbar and sacral curves being more marked in the upright human being. The sequence of vertebral body sizes from above downwards is another distinguishing feature: in upright man, the sizes increase more markedly towards the lower lumbar vertebrae, since each vertebra regularly supports a greater mass than the one above it.*

The relative sizes of the muzzle and brain between apes and man (and the smaller amount of human nuchal tissue) are intimately linked with uprightness.

Anthropologists use "head balancing" and "condylar position " indices as humanoid values in their classifications.

Poise in using the skull allows the major senses of sight, hearing and smell to be readily directed and concentrated towards objects or tasks in an extremely energy-efficient manner.

Some interesting conjectures may be made. Is human intelligence related to the filling of the cranial space created in an attempt to pivot an upright head more efficiently? The use of much of the cerebral grey matter is not understood; perhaps its main value is as "fill" or ballast. The erect posture had increased man's vulnerability with a lightened upper body and exposed soft under-belly, genitalia and nape of neck. Changes in musculature and propulsive functions affected his abilities to climb but increased his speed. Were these factors contributory to development of our higher awareness (to protect) and logical thought (to gather food)? Does this highly poised mechanism leave us prone to nuchal injury when head balancing becomes compromised as in whiplash, anterior hip flexion or short leg syndromes?

Pelvis and Lower Limbs

Pelvic adaptations have occurred in response to weight-bearing in the stationary erect posture and two legged locomotion.

The posterior bending of the shortened ilium, the backward displacement of the sacrum and the appearance of the sacral promontory and lumbar curve permitted the trunk to be held vertically whilst an adequate birth canal was maintained.

The shortening of the ilium effectively brought the auricular surface nearer and more vertical to the acetabulum, allowing the mass of the trunk to be transmitted more directly to the lower limb.

The posterior displacement of the sacro-iliac articulation allowed the continuation of an adequate birth canal whilst improving weight-bearing and transmission.

Internal architectonic remodelling, unique to man, has resulted in a prominent iliac pillar which extends from the tubercle of the iliac crest down to the posterior part of the acetabulum[11]. This helps to bear the compression exerted by the gluteus medius muscle when it tilts the pelvis during human walking and so draws the trunk over the stationary limb, enabling the contralateral limb to clear the ground (as in the Trendelenberg test).

Muscular Adaptions

Muscular adaption (especially in those muscles which cross the hip joint) has played an important role in erect posture and bipedal gait.

The gluteus maximus is a most powerful extensor of the hip joint, extremely important in the production and maintenance of upright posture. In man it has enlarged as its attachment on the posterior part of the iliac blade has broadened and moved backwards. Its extensor function is relatively less developed in

apes and the abductors, especially the gluteus medius, are relatively more important[12,13]. Normal quiet walking draws little upon its great power potential but it comes fully into play for walking up stairs, slopes, standing from sitting or squatting, etc.

Muscle reserves have permitted the development of body techniques in well-postured, poised and skilled movements.

Thus, if normal standing and walking is compromised the implications for total motor capacity are significant.

The hamstring muscles have converted to producers of fast movement in man as a result of the reversal of proportions of moment (ischium) and lever (the mobile femur) arms. In man the ischium has truncated and the femur has lengthened. The long, fairly straight femur provides more efficient weight transmission and man alone is capable of habitually extending his knee and locking it in this position.

The Foot

The foot has evolved from a grasping organ in apes to a weight-bearing and locomotor prop in man. A new secondary load line has evolved along the fifth digital ray so that the weight is distributed through a tripod comprising the heel, the hallux and the small toe.

Neurological Adaptions

Development within the nervous system has led to the capacity to further control body movement.

In the peripheral nervous system thick fast fibres usually connect remote areas, while thin slow fibres connect neighbouring areas. Hence messages arrive at near and far muscles at about the same time. This is part of the secret of the eye-head-neck-hand-foot co-ordination which is basic to the attainment of human skills.

To the cerebellum travel two great sets of sensory inputs, vestibular and proprioceptive. The subtlety of the proprioceptive messages determines the precise muscle tone and flickering contractions necessary to maintain erect posture and relaxed bipedal walking.

Balance combined with the anatomical changes in the lower limb have given man the capacity to totter, thus providing a stable pelvic platform from which to produce phasic activity which is controlled and enhanced by the poised senses in the skull.

FACTORS GOVERNING POSTURE AND MOVEMENT

There are four major factors to assess in the examination of posture and movement;

1. Tissue length
2. Tissue strength
3. Co-ordination
4. Nociceptive stimuli - their presence or absence.

Tissue Length and Strength

In functional terms these factors determine the capacity to develop power (Power = Force X Distance), generate mechanical advantage and maintain stability. Neurological mechanisms control these functions.

Mechanoreceptors involved with control of posture are found in the joint capsules, ligaments and skin. Three types of mechanorecptors have been described, one slowly adapting and responsible for static posture, a second rapidly adapting and responsible for the initiation of movements and a third very slowly adapting and having inhibitory effects on reflex pathways. Nociceptors also have a role in the control of posture and movement[14].

Co-ordination

Co-ordination is the ability to control a movement accurately.

It is primarily guided by sensation and depends upon the integrity of the senstory pathways, especially those which end in the postcentral convolution.

Feedback, and feedforward (from the receptors and vestibular mechanism) integrate the roles of agonists, antagonists and synergists whilst maintaining orientation of the head and body to provide a stable ocular platform.

This most complex integration of nervous activities is presided over by the cerebellum and limbic system and occurs at a subconscious level automating tone and movement patterns.

During management, balancing techniques may effectively be used to facilitate the sub-conscious automation of postural correction.

The toes and foot provide the essential sensory input relating to contact with earth and are the source of the stimuli to basic reflex behaviour. When the forefoot is inactive and the major relationship with earth is through the back of the foot the situation in terms of sensory input becomes analogous to trying to control function in the upper body with sensory

Muscles of the lower body and extremity with

predominantly postural function: (tend to shorten)	**predominantly phasic function:** (tend to weaken)
Erector trunci	Erectus abdominus
Quadratus lumborum	Obliquus abdominus
Tensor faciae latae	
Iliopsoas	Gluteus maximus
Rectus femoris	Vastus medialis
Piriformis	
Pectineus	
Adductor of hip	Gluteus medius, minimus
Hamstrings	
Triceps surae	
Tibialis posterior	Tibialis anterior
	Peroneus brevis,longus

(Schmid,1980)

input from the thenar and hypothenar eminences of the hand only. Management of complex postural problems must include attention to the contribution made by the toes and feet.

Nociceptive stimuli

Pain and protective responses are important considerations in disturbances within the musculoskeletal system.

Protective responses may result before sensation or pain thresholds are reached[3]. Their causes may be real or perceived but these are equally important and must be managed appropriately. Actual pathology may produce protective responses without the perception of pain, as can perceived pain or the fear of impending injury[15]. Such responses affect function locally and generally.

MUSCLE TYPES

Developmental influences are found in different muscle types which in turn have been influenced by man's behavioural needs.

Virtually all muscles have two fibre types.

The *red fibres* have a larger amount of myoglobin(for local oxygen storage) and mitochondria where aerobic metabolism takes place. These fibres are non fatiguable as no lactate is produced. They develop less strength than the other fibre type and are the fibres used in preference for anti-gravity postural functions.

The *white fibres* (with less myoglobin and fewer mitochondria) are used where greater strength is required but they fatigue because they accumulate lactate (which may be a factor in trigger point activity)[16].

The proportion of red to white fibres is determined by genetic factors[3].

Adaptive factors were demonstrated by Denny-Brown to be significant in birds, where the migrating birds' pectoral muscles are postural whilst the short distance flyers are phasic[17].

Human muscular development has in all probability similarly been influenced by man's behavioural needs.

When a sedentary person regularly increases his rhythmic, isotonic activity, some of the white fibres improve their ability to use oxygen without producing as much lactate. Thus results in improved aerobic activity[6].

"SHORT" MUSCLES.

Patients with musculoskeletal problems often have short muscles. These are muscles which have become shorter than normal, even at rest. There is no spontaneous E.M.G. activity and therefore they do not involve increased activity in the nervous system or active muscle contraction.

Shortening most commonly occurs in the postural muscles involved in standing on one leg. These are mainly large, long, powerful muscles which, when shortened, have a significant effect on pelvic tilt and spinal curvature.

The effects of shortening are that the range of joint movements are limited, resulting in poor mechanics, the antagonists are inhibited and weaken,

and upper body substitution of postural function is required to be performed by tissues which are weaker and adapted to different functions.

Shortening is treatable by muscle facilitation (post isometric relaxation) techniques.

The same effects on postural function occur with contractures.

CONTRACTURE

Definitions of contracture vary according to usage.

Physiologists use the term to mean a reflex condition often provoked by pain.

Pathologists and surgeons refer to a fibrotic change in muscles and connective tissues associated with injury or lack of use[19].

GAIT

It has generally been accepted that the basic movement patterns are represented by locomotion for the lower body and prehension for the upper body. This corresponds exactly to morphological as well as physiological findings.

Gait can be considered as the principal movement pattern[19]. It has determined our basic postural behaviour. Eighty five percent of the time in gait is spent on one leg and subsequently the postural muscles are those muscles involved in standing and co-ordinating movement on one leg[20].

Ideally, walking commences from the standing position by unlocking the knees, raising the leg and transferring weight forward as in standing on one leg. The knee extends first, then the hip concomitantly with the ankle, foot, arches and toes. The weight is constantly loaded over the hip (load bearing hinge) through the straight leg (lever) and over the foot which effectively becomes a moving, springing, shock-absorbing fulcrum.

The supporting leg extends at the hip, knee, ankle and toes. The knee remains slightly flexed (unlocked) even in mid-stance. As the body moves forward the reflex tone supports the weight from the ankle across onto the arches, through the metatarsal heads and onto the toes which extend as the ankle extends. As the weight is unloaded the limb returns to flexion springing the already flexing knee forward recommencing the cycle.

The raised leg flexes as the weight moves forward on the supporting leg. It anticipates its supporting role and the knee straightens to full extension as the heel hits.

The lengthening effect of the leg, by the extension of the ankle, allows the pelvis to maintain a constant height as the hip's extension allows the body to remain upright. Any restriction on extension of the hip forces weight-bearing and extension into the spine. This extension capacity is limited and the total foot activity is inhibited anteriorly.

Propulsion is the result of contraction of the extensors through the straight leg lever. The flexors' role is to position the leg and lengthen and stabilise the extensors. The pelvis should remain almost horizontal without tilt, with a slight side-to-side sway (more in women) resulting in accompanying changes to the spinal curves. The thoracolumbar junction remains above the sacrum. The head moves very little. The arms swing symetrically, the movement coming from the shoulder. The scapulae are fixed from below with the upper fixators of the shoulder girdle relaxed. The centre of gravity should shift minimally from side to side or up and down. The respiration remains diaphragmatic[21].

The force generated in the first step is weak as the initial length of the extensors of the leg and hip is less than with the second step. Instability and compensatory activity may be more obvious with this first step.

COMMON POSTURAL FAULTS

Janda has described common postural syndromes which often exist together; the Proximal (or upper) Crossed Syndrome and the Pelvic Crossed Syndrome[7,22].

They are summarized in the following diagram.

Substitution (with hypertrophy, possible strain, trigger point activity) occurs for:

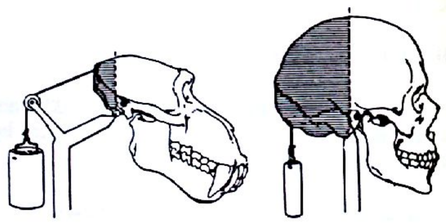


Fig. 3 Skulls of baboon (left) and man (right). The suspended weights illustrate the difference in muscular bulk and strength required to hold the head on the vertebral column in such a position that the eyes would hve been able to look straight to the front. In each Instance the hatched part of the cranium is the proportion that lies behind the point of pivot on the spinal column. The tapering support shows the orientation of the spinal column and the position of its articulation with the cranium. Diagram by Th. Mollison, 1932.

weak glutei medii by the tensor and quadrati lumborum

weak abdominals by the iliopsoas in hip flexion

weak glutei maximi by the erector spinae and the hamstrings

weak lower fixators of the scapulae by the upper fixators

Anterior pelvic tilt with increased lumbar lordosis is the resultant standing posture from the lower imbalance.

Round forward drawn shoulders with hyperlordosis of the upper cervical spine is the result of the upper imbalance.

Diaphragmatic respiration is inhibited and replaced by an upper respiratory pattern.

Stratification of the muscle groups affects the surface anatomy and profiles[15].

With these syndromes come various effects on movement.

Fixed hip flexion dictates that the extension so fundamental to normal erect posture and propulsion must be substituted by extension in the lumbar spine and cervical spine. The gait is shortened by this lack of extension inhibiting the complementary behaviour of the forefoot.

Tight hamstrings and triceps surae (gastocnemius and soleus) will prevent the knee extending to provide maximal height and strength in the supporting leg, whilst further contributing to a shortened stride by necessitating an earlier heel contact. The disuse atrophy of the muscles of the foot, together with weakening of the tibialis anterior, results in a flattening and pronation of the arches.

Shortening of the piriformi externally rotate the foot exaggerating the pronation and setting the scene for forefoot abnormalities (bunions, hammer toes,etc.).

With a weak inactive forefoot and the fixed hip flexion deformity the most stable effective transfer of body weight is posteriorly through the lateral heel. Inactivation of the forefoot causes major proprioceptive and mechanoreceptive function to be lost, resulting in the further decrease of extension reflexes, instability and decrease in co-ordination.

When the centre of mass is moved posteriorly over the heel and a weak, inactive forefoot is combined with tight postural and weak phasic musculature, normal movement integration is lost and reflex responses are inhibited resulting in inefficient compensatory upper body movements. This has three major effects. Tissue not adapted to postural function is forced to substitute for the lower body postural activity resulting in hypertrophy, changes in statics, trigger point activity, injury, recurrent strain, blockage, etc. This need to fill the basic postural demands competes with the prehensile activity demands of the upper body with resultant effects on function. With function elevated to the upper body, stability is further disturbed with the raised centre of gravity making more demands on upper body correction[15,22].

EXAMINATION OF POSTURE

The examination of posture for practical purposes can be achieved by observing and eliciting physical signs in the following order: standing, standing on one leg, walking (i.e. progressing from the static neutral position of standing to the most common active posturing of gait), sitting, lying prone, supporting upper body, lying on one side, lying supine and laying over the end of the couch[8].

Abnormalities exhibited reflect existing pathology and the alteration of factors that influence movement.

Standing (examining static function)

Under ideal mechanical and physiological conditions the erect standing position is so well balanced that little or no muscular activity is necessary to maintain it.

Inspection may be assisted by a plumb line, scales, Moir grid, fluid level or photographs.

Ideally, the patient looks healthy, moves easily and comfortably into a standing position. There is good muscle bulk and no genetic abnormalities. The patient is symmetrical and balanced with normal spinal contours.

The body weight falls evenly and the line of gravity passes

just behind the ear,
through the shoulder joint,
slightly posterior to the axis of the hip,
slightly anterior to the axis of the knee and
through the lateral maleolus.

The arches support the weight equally.

No abnormal motor activity is observed (standing on one leg may be habitual and should be discriminated from pathological weight distribution).

The ankle joints should be stable without muscle play as demonstrated by tendon activity,

The legs should be equally straight, but not braced.

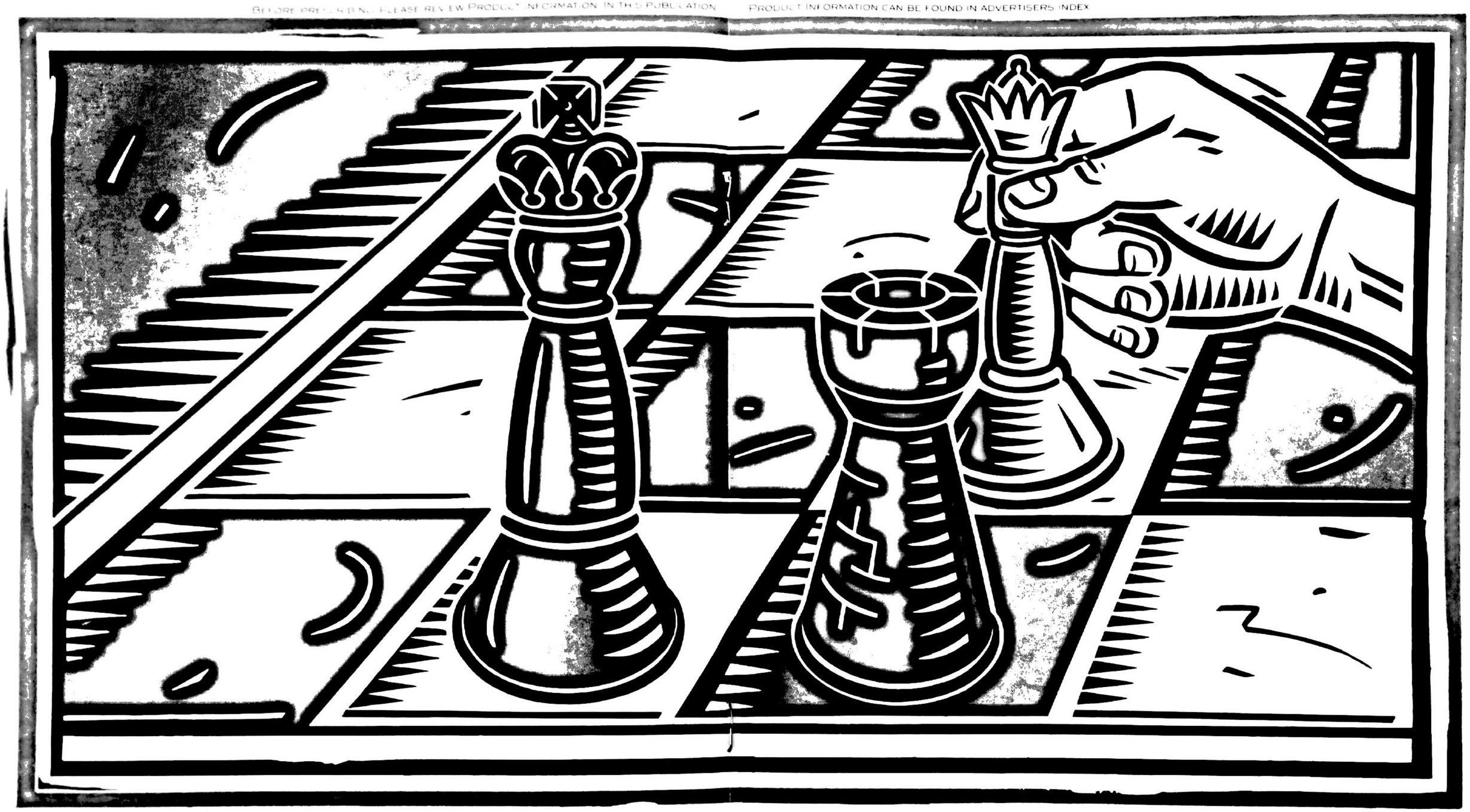
The patellae should not be displaced or moving.

The knees should not be bent.

The quadriceps and hamstrings should be in balance.

The hips should be straight.

The pelvis should be level.



ARTHRITIS PATIENT RESCUES QUEEN FROM CASTLE!

Voltaren®
(diclofenac sodium)

RELIEVES ARTHRITIC PAIN.

Curves of the profile should be normal and even.

Body creases should be even as should muscle bulk and balance between agonists and antagonists.

Shoulders and scapulae should be level but not raised or rotated; they should be equidistant from the spine.

The shoulders should not be internally rotated.

The head should be straight.

Respiration should be diaphragmatic.

Trophic changes of abnormal weight bearing and movement should be absent.

This posture is not often seen. Most patients reveal a static representation of pathology, its cause and effects, demonstrated in that particular position which is theoretically the least stressful[21].

Standing On One Leg

(a static representation of the commencement of gait).

At least 85% of the gait cycle is spent in this position. The practitioner should observe the movement in attaining the position, the initiation of the movement, the counterbalance of the whole body, the strength and stability in attaining and maintaining it, the play around and the strength of the supporting ankle. It is the static representation of some of the elements of propulsion. If movement is adapted from basic reflex behaviour it is not unreasonable to see the situation of standing on one leg as essentially a withdrawal reflex on one side and an extension reflex on the other modified by balance.

This contralateral integration of the flexion and extension reflexes is fundamental in the production of normal gait. Abnormalities noted at this first stage of gait are present during the full gait cycle.

In correct posture on one leg (where the opposite knee is raised forward and flexed to 90 degrees) the following points are noted. All joints of the supporting leg are in line with gravity. The centre of mass, compared with that of the stance on two legs, moves forward to the second and third metacarpal head. The pelvis should remain horizontal. The spinal curvature should be almost unchanged. The stabilisers of the hip, in particular the gluteus medius, should contract. When the supported leg is fully raised the flexion may be noted to be complete in that the toes curl (or at least start to), the arch increases, the foot externally rotates and the ankle flexes. This occurs normally in the toddler but is less often seen in the older patient. The supporting hip should extend slightly with the hamstrings and glutei contracting, transferring the weight forward and laterally through an extended knee over a stable arch and onto weight-bearing toes.

Dejerine's sign was described in 1901. The iliac crest on the opposite side to the supporting leg rises if the hip abductors (gluteus medius,gluteus minimus and tensor facia lata) are weak on that side. This is associated with a lateral shift as the patient centralises his weight above the supporting leg. The shift and the associated instability of the supporting ankle are the most obvious aspects of the sign when the patient is being observed from the rear. This (according to Lewit) is more common than Trendelenburg's sign, the lowering of the unsupported iliac crest[15,22].

EXAMINATION FOR POSTURAL FAULTS

Weakness of Hip Extension

E.M.G. studies have demonstrated that the prime movers of the hip in extension are the hamstrings, followed closely by gluteus maximus and erector spinae.

With the patient prone the strength and order of contraction is most readily determined by palpating the hamstrings and gluteus maximus with one hand and the erector spinae with the other as the patient lifts his straight leg.

Weakness of Fixators of the Scapulae

The lower part of the trapezius is weak if the inferior scapular angle fails to move caudomedially when the patient is told to pull the shoulder down. It moves medially like a hook and protrudes like an alar scapula.

The serratus anterior as well as the lower trapezius is noted to be weak when supporting the weight on the arms produces an alar scapula.

Weakness of Hip Abduction

With the patient lying on the side the strength of the tensor facia lata, gluteus medius and gluteus minimus can be determined by palpation as hip abduction is performed. Both groups of muscles should contract and if there is outward rotation and hip flexion, the gluteus medius is contracting too little and too late.

Weakness of Rectus Abdominus or Deep Neck Flexors

In the supine position the patient is asked to tilt the head as if to read (chin to chest without anterior movement). Patients with weak deep neck flexors can only maintain this position for a few seconds (normal 30+ secs).

With the patient's legs straight the examiner puts his hand under the heels and tells the patient to press into his hands while curling up, head first. The pressure of the heels ceases as soon as the hip flexors start substituting for the recti abdomini.

ACTIVE (requires active participation, therapist independent once learnt) (self responsible and powerful)		PASSIVE (subject is passive, therapist dependent)	
Continuous	**Intermittent**	**Peripheral**	**Central**
Alexander technique	1.antigravity exercises t'ai chi ch'uan, yoga 2.sensory awareness bioenergetics Feldenkrais technique psychophysical re-education gestalt posture therapy 3.muscle "lengthening" exercises orthotherapy Kung fu Karate 4.respiratory techniques chi kung/ne kung	acupuncture-accupressure shiatsu polarisation trigger point therapy neural point therapy neural therapie rolfing (structural integration) psychoperistaltic massage connective tissue massage	osteopathy other spinal manipulation methods

Tightness of Muscles

With the patient still supine the length of the triceps surae can be assessed and then the hamstrings tested with a straight leg raise. Leg length is conveniently assessed at this stage.

The hip flexors (iliopsoas, rectus femoris and tensor facia lata) may be assessed in the position for Mennell's test, with the patient at the end of the couch[7]. The hip adductors also may be specifically tested from this position.

With the patient sitting the slump test may be modified by having the patient first fix the pelvis to give a more accurate assessment of the erector spinae.

MANAGEMENT

The first step in management is appreciation of the symptomatology as the result of multifactorial dysfunction. All aspects must be addressed in a systematic way.

Education

The patient must be educated and instructed in all aspects of his postural problems and encouraged to take control of the condition (to become the therapist). The problems must be "de-mystified" and a healthy body image established;the patient is not a cripple condemned to "taking it easy" or having repeated manipulations but a person with definable, correctable problems which initially may need intensive therapy, then ongoing self maintenance with occasional professional help.

All exercises must be carefully and meticulously taught and the patient followed up to ensure they are being performed correctly.

Elimination of Nociceptive Stimuli

This involves specific forms of treatment, including mobilisation, manipulation of joints/segments, medical, surgical and psychological modalities, and consideration of mechanical and environmental strategies, as appropriate to the particular patient's circumstances.

Normalisation of Muscle Power

The patient may be assisted, by the use of exercises to lengthen tight muscles (especially around the hips), to strengthen (especially the feet, tibialis anterior and gluteus medius) and to increase aerobic activity.

Correct metabolism and nutrition should also be addressed, especially when diabetes mellitus, gout or hypothyroidism are present.

Normalisation of Co-ordination

Postural sensory, labyrinthine, vestibular and central co-ordinating mechanisms may require attention. Feldenkrais (functional integration), Janda (sensory motor stimulation) and other exercises may prove useful. All patients should be instructed in efficient movement patterns.

Lifestyle Modification

The patient should be encouraged to increase physical activities generally and be "permitted" to play regular sport. Sport should be given a priority and the maintenance stretching exercises be incorporated into warm-up and warm-down activity.

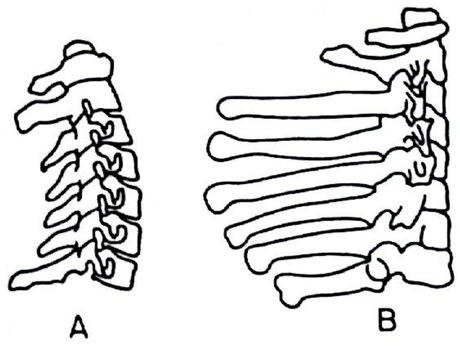


Fig. 4 The spinous processes of the cervical vertebrae in man (A) and gorilla (B). Note the large size of the processes in the ape, in keeping with the marked development of the muchal muscles; in man, the well-balanced head is supported y small nuchal muscles attached to the reduced spinous processes shown above (re-drawn after Campbell 1974).

Benefits of sport include relaxation, positive self image and general health improvement.

Other aspects of lifestyle modification may involve changes to the patient's work environment and methods, activities of daily living, etc.

Techniques Used for Restoring Postural Homeostasis

These techniques may prove to be of benefit in particular cases. They have as their common thread an effect on the postural "system", albeit through the mechanisms already discussed. The "credibility" of any one will depend upon cultural conditioning and similar factors.

With so many independent claims from different countries and cultures concerning the effects of these posture changing techniques on health in its wider sense, serious consideration perhaps ought to be given to the possibility that a definite relationship does exist between postural (physical) homeostasis, physiological homeostasis and psychological homeostasis. The various techniques are listed in Table 2.

CONCLUSION

Complete examination of the musculoskeletal system requires consideration of all the forces and mechanisms involved in the motor behaviour of the body.

Definite syndromes of postural muscle abnormality are common. They disturb total body function and cause inefficiency and/or pain.

Lewit concluded that "by far the most frequent cause of pain is disturbed function . . .. The most important cause of blockage is overstrain due to faulty movement patterns or body statics"[15].

Authors of articles on management of problems in the musculoskeletal system often spend one line on a reference to "correct posture and mechanics". In practice, this aspect may take the majority of management time and effort, and is fundamental to the achievement of long term results.

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The McKenzie System

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ABSTRACT

The McKenzie system is a comprehensive plan for the diagnosis and management of non-specific pain of spinal origin. Although it was devised by a noted manual therapist, Robin McKenzie, the system favours non-manual methods of treatment, including patient education, postural training and exercises.

This paper outlines the historical perspective in which the method developed and the differences from other schools. McKenzie's three main diagnostic categories, Postural Syndrome, Derangement Syndrome and Dysfunction Syndrome, are explained and the Patho-physiological model on which they are based is set out in detail. A description is given of the McKennzie method of management, which emphasises the resolution of symptoms and the promotion of the patient's independence.

INTRODUCTION

Patients with spinal pain are readily treated when the cause is known but in many cases the pain cannot be attributed to a specific cause. When the pain is non-specific (i.e. of uncertain aetiology) treatment guidelines tend to be somewhat confused. The practitioner must choose from a wide range of modalities, including rest, heat, exercise, massage, ultrasound, TENS, acupuncture, anti-inflammatory medications, podiatric orthotics, ergonomic evaluation, hydrotherapy, psychological counselling, traction, autotraction, mobilisation, manipulation, steroid injection, spinal nerve block and various surgical procedures.

Many have tried to make a meaningful system out of this jumble of remedies. Those who have formulated relatively complete systems include, Cyriax[1,2], Stoddard[3], Kaltenborn[4], Maitland[5], Kenna and Murtagh[6], and many others. Robin McKenzie is a New Zealand manual therapist who has developed a unique approach to the management of non-specific spinal pain.

How do new systems of treatment arise? What are the characteristics of a worthwhile new system? The following criteria are suggested.

1. A new system must embrace the valuable parts of all that has gone before, i.e. it must bear out the lessons of history.
2. It must be different in some substantial way from all previous systems. Otherwise there would be no reason for its existence.
3. It must provide a rational patho-physiological model which accords with current concepts of anatomy, biomechanics and radiology.
4. It must make sense at a fundamental anthropo-biological level and accord with current knowledge of epidemiology.
5. It must be effective.

The system devised by McKenzie involves rather a complicated method of assessment, in which emphasis is placed on a detailed history and the examination of the spinal movements. Patients are then assigned to a diagnostic category. Treatment may involve rest, postural training, ergonomic advice, exercises (which may be altered from day to day) and occasionally, manual techniques (which are usually of low grade). Many patients receive a combination of these methods.

Pain modulating treatments such as pharmacological agents, heat, ultrasound, acupuncture and TENS are seen as palliations unlikely to effect the natural history of the condition. Surgery is often recommended very early rather than late, if the clinical findings suggest that the patient will not respond to conservative measures.

McKenzie's four books and many published articles attempt to explain how this actually all works[7,8,9,10,11,12,13,14,15,16,17]. The subject is rather long and involved. For introductory purposes, the McKenzie system will be considered in terms of the five evaluative criteria.

HISTORICAL PERSPECTIVE

The diagnostic history and physical examination required by the McKenzie method are consistent with the rigorous standards expected in the best orthopaedic surgery units. The only unusual feature is the additional interest in the effect of repeating spinal movements in a standardised fashion and the effect this has on the patient's symptoms.

The actual manual techniques which are used by McKenzie are almost all copies of techniques previously described by others including Stoddard[3], Cyriax[1,2] and Maitland[5]. In fact, McKenzie stresses that the vertebrae can really only be pushed in a limited number of directions by the application of external force. The real difference between schools lies in the rationale for the application of force, its timing and associated treatments.

The genesis of McKenzie's concepts of "derangement" and "dyfunction" (vide infra) can be found in the work of Cyriax. McKenzie however has taken these concepts to far greater lengths and has developed very different principles of treatment.

Like Cyriax, McKenzie came to the view that the disc is an important primary source of pain. Most of Cyriax's classic descriptions of the disorders of the shoulder, hip and sacroiliac joint remain valid in the McKenzie model.

The postural control techniques of McKenzie are far more elaborate than the usual standards of physiotherapy and are even strangely reminiscent, at times, of the Alexander technique[18].

A variety of pillows and lumbar supports are commonly used in accordance with current ergonomic theory.

DIFFERENCES FROM OTHER SCHOOLS.

McKenzie's system is revolutionary in the following ways.

In contrast to many other systems which involve manual therapy, McKenzie's system tackles the fundamental questions "Why should therapy be manual?" and "Could other methods be more effective?" In fact, McKenzie claims that about 70% of patients (at a primary care level) recover more effectively without any manual therapy. He believes that the remainder get better more quickly with quite low grades of manual force. Practitioners of other systems often do not address these questions at all but simply assume that all patients referred to them require some form of manual force.

McKenzie puts forward the view that all manual treatments are specialised forms of forces that a patient can (to some degree) apply to his own spine as an exercise. Maitland "P-A's" for example are seen as mechanically analogous to extension exercises. Whenever possible, an exercise is chosen in preference to a manual treatment, to encourage patient independence.

McKenzie elaborates the idea that postural stress alone can be a cause of a spinal pain syndrome and that in some cases there actually may be no pathology. The simplest way to demonstrate this concept is to bend a finger back in a firm fashion. As simple as this concept seems with fingers, many practitioners seem to have neglected the possibility that a similar phenomenon may occur with spines. McKenzie describes certain groups of patients for whom this type of phenomenon is the sole reason for their presentation. Obviously these patients do not require manual therapy but rather the identification and removal of the causative postural stress. McKenzie calls this clinical syndrome "Postural Syndrome". These patients are commonly subjected to many unsuccessful manual procedures in other schools of treatment.

McKenzie divides the remaining non-specific spinal pain cases into two further groups, the "Derangement Syndrome" and the "Dysfunction Syndrome". This clinical distinction is the fundamental feature of McKenzie's system.

Details of definition and differentiation of the two syndromes from each other and from "Postural Syndrome" form a very complex subject, elaborated in McKenzie's many publications.

In general the distinction is made on the basis of a very detailed history, including features of diurnal variation of pain, and detailed examination with particular reference to response to repetition of spinal movements. It is a curious fact that palpatory findings are of little use in differentiating the syndromes. Beginners should be forewarned that accurate recognition of the syndromes takes time and practice and many mistakes will be made at first. However, with experience the identification of the characteristic features becomes easy.

The management of the three syndromes is very different in concept and application. Patient education, postural control and exercises are important modalities in all three syndromes although the application and rationale differs in each case. Generally, manual therapy is only of value in derangement syndrome (and then only sometimes). The prognosis of each of the three groups is very different.

If a practitioner is not dividing his patients into the three syndromes he is not actually "doing the McKenzie system". Therapists trained in different schools may not appreciate or recognise the vital distinctions between the three groups and may inadvertently treat them all in much the same way.

Patient independence is the goal of the McKenzie therapist at all times. Many other systems seem to foster considerable dependence.

PATHO-PHYSIOLOGICAL MODEL

Whatever causes "non-specific" spinal pain must, by definition, be not demonstrable by current diagnostic methods. This means that it must have so far escaped recognition by clinical radiological and pathological procedures. McKenzie has proposed not one but three likely culprits. He has proceeded to identify each of his proposed mechanisms with its resulting clinical syndrome. All three models fulfil the criteria of undetectability by current investigative procedures.

Postural stress. There is something in the process of medical education which seems to make such a simple concept difficult to accept.

In these cases, the clinical syndrome results from postural loading of normal tissues. The patho-physiology involves no pathology as such.

In the clinical setting a patient will complain that he has a "bad back" when he sits for a long time. Commonly the doctor will order X-rays and these may show some change or other. If so, this will often be taken to represent the cause of the patient's pain. He may be labelled as having "arthritis" and commenced on anti inflammatory medication.

It takes a little bit of lateral thinking to consider looking at the way the patient sits and to see if altering the manner of sitting will help the patient's problem.

McKenzie has identified many similar situations in which neck and low back pain are related to sitting, standing or lying posture.

The minor disc prolapse. The major disc prolapse is a well known demonstrable cause of spinal pain. It is one of the "specific" causes. McKenzie noted that very commonly these patients had a history of many minor intermittent episodes of pain prior to their major prolapse. These episodes were often described as feeling similar but less severe than the major episode.

McKenzie came to the view that the minor episodes of back pain may in fact have been minor versions of the process of disc prolapse. The basic defect would be traumatic damage to the anulus fibrosis. The nuclear material would then tend to migrate into an anular 'fissure' and provoke severe pain. The protrusion would tend to fluctuate according to accepted principles of disc hydrodynamics. For example, the protrusion would travel posteriorly when the spine was held in loaded flexion, as demonstrated in the laboratory by Hutton (Graded Disc Prolapse)[19].

Reduction of a protrusion would occur with exercises and static posturing. Following reduction of a protrusion, healing of the anulus would tend to occur. Flexible healing would be best achieved under conditions of continuing joint movement.

Hukins[20] explains the viscoelastic nature of the disc. He suggests that serious mechanical problems may occur before structural change is obvious. Such mechanical problems would tend to recover spontaneously when the causative stress was removed.

The concept of minor disc protrusion is the model used to explain the clinical features of patients with a derangement syndrome.

The various derangement syndromes are quite easily recognised in clinical practice as conditions in which, the pain rapidly alters in location or severity with spinal exercises. McKenzie has described seven main types of derangement for both the cervical and lumbar spine and they are well described in his books[7,8]. Improvement in a patient's condition is signalled by centralisation of the pain[21,22] which in the model would represent reduction of the disc contents away from the traumatised area.

The short structure. The "dysfunction syndrome" patients do not seem to behave at all like those with derangements but rather have end-range pain which is not altered in any way by repetition of movement. The model which McKenzie invokes for these patients is the concept of the short structure.

There is an excellent analogy with the contractures of a limb following paralysis. Contractures limit movement of a joint and are painful at end range. At an anatomical level there may be shortening of many anatomical structures.

In the spine this type of changewould tend to occur after a period of prolonged spinal immobility which might be due to trauma (including derangement), surgery or very prolonged poor postural habit. The treatment concept developed for these "dysfunction syndromes" is based on concepts of continuous passive motion. As a clinical remedy this involves frequent stretching of the painful structure.

In clinical practice acutely damaged ligaments and muscles also behave in this "dysfunctional" way, with end range pain (unless the ligament is the disc anulus when derangement features would supervene). The management of acute dysfunctions is rather different from more chronic ones; in general a period of rest is required before exercises are introduced.

The short structures of the dysfunction syndromes are obviously very difficult to demonstrate by any static anatomic or radiological test. X-rays certainly reveal loss of end range movement but not the structures responsible.

In everyday practice, almost all patients with "non-specific" spinal pain behave as either "derangements", "dysfunctions" or "postural syndromes". The syndromes are usually quite easy to distinguish and experienced McKenzie exponents rarely differ on their analysis." To the uninitiated, however, the distinction may not be so obvious.

All three mechanisms of pain genesis are largely independent but it is not uncommon for a patient to have two or even three mechanisms operative at the same time all requiring different treatment programmes. Such situations obviously require a great deal of skill and experience to resolve.

Patients who cannot be classified into one of the three syndromes usually have a specific cause for their pain and sometimes pain from outside the spine.

FUNDAMENTAL BIOLOGICAL ASPECTS

It is not unreasonable to ask why so many human beings have "bad backs". In biological terms we should not have such an obvious disadvantage unless something has changed recently.

The change from the lifestyle of the hunter-gatherer to that of civilisation brought with it a dramatic increase in the time spent in sitting. One result of this would be to increase stress on the posterior anulus, increasing the propensity for derangement syndromes. Primitive man would have had much less reason to sit: no car, no desk job, no T.V. ... in fact, no chairs. McKenzie believes that modern lifestyles provide many explanations for the frequency of back pain in our society.

EFFECTIVENESS

Simple as it seems, this criterion is actually the hardest to prove, for any method of treatment.

There are several studies demonstrating the superiority of McKenzie's system over other methods[23,24,25]. However, really this is just the beginning. It may take many years to prove things which in practice look obvious and much more research work is needed.

Many therapists who reject the system genuinely believe that it does not work. This most commonly occurs in the early stages of involvement with the McKenzie approach, before the concepts are fully understood. Many initial failures are due to an incorrect diagnosis.

DISCUSSION

McKenzie has accumulated facets of knowledge from diverse sources and pieced them together into a cohesive system. He has included his own original discoveries. The most important of these is the clinical distinction between "derangement" and "dysfunction". This led to others of special importance including the centralisation phenomenon, the lateral shift correction techniques, the clinical recognition of the adherent nerve root, the anterior derangement, etc.[13,14]. In fact, the list of individual contributions includes the very minutiae of treatment of each derangement. It is difficult to realise the complexity of thought involved until the system is well learned. It then becomes obvious how original the approach is.

Certainly, in practice, the McKenzie system is radically different from all other systems of back care. Intending practitioners would be well advised to allot at least half an hour for new patients and to be prepared for a very tired voice by the end of the day. They will also require a continuing influx of new patients, as most will tend to conduct their own treatment after three or four visits.

Generally, the McKenzie system can be learnt to a reasonable degree of competence over a six to twelve month period, with several four day courses, and frequent reference to books (and patients). The complexity of the system is something of a drawback but it is very difficult to see how it could be simplified further. It is probably, in fact, the only system to date to grasp the true complexity of the subject. Great perseverance is required on the part of the novice.

One common area of misunderstanding arises from the failure of the McKenzie textbooks to explain how to distinguish the predominant "non-specific" from the less common "specific" causes of pain such as spondylolisthesis, the zygapophysial joint syndromes, sacroiliac syndromes, hip syndromes, shoulder syndromes, injured muscles, spinal stenosis, inflammatory syndromes, fractures, malignancies and psychiatric conditions. These are assumed to be recognisable by the doctor with basic undergraduate knowledge. Generally, McKenzie courses assume quite a large amount of such basic knowledge but specific topics are very fully revised, especially in the more advanced courses.

One particular area of difficulty should be noted. The McKenzie system will not cure malingerers or people with nonorganic pain. Commonly such patients will not fit any diagnostic category and everything will make them dramatically worse, including the examination! It is quite uncommon to encounter either of these difficulties outside of the compensation context. The paper of Waddell[26] provides many useful clues to the diagnosis of these difficult patients.

When discussing the McKenzie method it is also worth remembering the very different demography of different clinical settings. Spinal stenosis, for example, may be very commonly seen by some practitioners who may rarely ever see a simple derangement syndrome. Every practitioner has some degree of bias in his view of the total picture of spinal disorders.

One interesting feature of the McKenzie approach is the considerable de-emphasis of the possibility of body wall pain being referred from the thoracic spine as a common phenomenon. This sets McKenzie apart from many other authors[1,6,27,28,29]. Certainly if these syndromes do exist, and they may well to some extent, they should be particularly well handled by McKenzie's system. To date the system has had very little exposure in general practice, where these types of syndromes could be expected to occur most frequently.

It is interesting to compare the complexity of McKenzie's pathological models with other systems. Maitland makes a virtue of having no model but recommends manual therapy to every patient, to see if it will help. Many chiropractors have the model of a "chiropractic lesion" which explains everything and excludes nothing; fortunately it always responds to manipulation. The osteopaths have a primary disorder of the facet joints which usually responds well to manual techniques but transforms itself into a disc prolapse if the condition deteriorates.

It could well be that the success of the McKenzie system is due to McKenzie having adopted models which turn out to be more or less accurate representations of the pathological processes at work.

It is very difficult to find weaknesses in the McKenzie system, although many have certainly tried. Its great strengths are that it actually does work and that patients rapidly become independent .

Interested physiotherapists and doctors are eligible to enter McKenzie courses, which are now run world wide. These courses are highly recommended to anyone dealing with non-specific pain of spinal origin. It is vital to actually see the method demonstrated on patients.

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McKenzie's Mechanical Diagnosis and Therapy: Fact and Fiction

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INTRODUCTION

As a teaching faculty member of the McKenzie Institute in Australia, the author has become aware that there are a number of common misconceptions about Robin McKenzie's approach to the diagnosis and treatment of spinal conditions. A broad manual therapy perspective, based on her own training which has included not only McKenzie's approach but also the methods of Cyriax, Kaltenborn, Janda and Maitland, allows a balanced view of the issues which seem to be misunderstood. Each of these misconceptions will be discussed so that practitioners can make an informed decision when considering whether or not to learn or use the McKenzie approach.

COMMON MISCONCEPTIONS

The common misconceptions are as follows:

1. It consists of extension exercises only.
2. It is only self-treatment; i.e. no "hands-on" treatment is used.
3. It is effective only for acute and sub-acute conditions.
4. It works in the lumbar spine but is not effective in the thoracic or cervical spine.
5. It is too simplistic.

Extension Exercises Only

This idea has probably developed because lumbar extension has been shown to be a very effective force for reducing or abolishing the symptoms of a large number of lumbar conditions. Also, when McKenzie initially took his ideas and methods of treatment overseas, the flexion principle was very deeply entrenched as the correct way to treat all painful conditions arising from the lumbar spine. The idea of using extension as a testing and treatment manoeuvre was considered so radical (and dangerous!) that McKenzie had to push the 'extension theory' very hard to overcome prejudices. Thus his name became synonymous with 'extension'.

In reality, any direction or combination of directions that achieve the desired effect are used. Persistent unilateral pain will often not reduce or centralise unless extension is used in combination with 'side gliding'. More and more combined techniques are being explored by experienced McKenzie practitioners and many are demonstrated and used in the educational courses.

Self Treatment Only : No Manual Therapy

The McKenzie method utilizes a progression of mechanical forces that begin with the patient's own positions and movements (self-generated forces) and proceed to manual therapy (therapist generated forces) when required. While a considerable number (up to 70%) of patients can learn to control their symptoms completely by their own efforts, about 30% of cases usually require some degree of therapist assistance to achieve a good result. Basically, once a certain degree of force is no longer achieving the desired result, progressive force is added (which can mean therapist techniques) until the desired effect is achieved or until the direction chosen is proved to be no longer applicable. The McKenzie approach places manual therapy in a different perspective to that of other primarily "hands-on" methods: the therapist's techniques are seldom "curative" in themselves but are utilized to enable the patient's own efforts to become the primary treatment measures.

While certain therapist techniques are unique to the McKenzie approach (e.g. correction of the lateral shift), any manual therapy technique from any of the various methods can be used, as long as the correct effect is being achieved.

For Acute and Subacute Conditions Only

This misconception is probably the most entrenched because McKenzie's original observations and methods were developed with this group of patients. Anyone who has witnessed the dramatic improvement that can occur with the acute disc derangement patient using McKenzie's approach will have no doubt about its efficacy in these cases. These examples will stand out in a therapist's mind when he or she thinks of the McKenzie method. Over the past five years the author has used the assessment and treatment concepts in many chronic cases (symptoms of one to fifteen years duration) and has found it just as applicable for chronic complaints as for acute ones. The main difference is that the response to the method is slower in chronic problems as a general rule. Most chronic pain patients feel that they have little to no control over their symptoms (hence the tendency for reliance on others to provide relief). As one of the basic tenets of the McKenzie approach is teaching the patient to become self-reliant, this method has tremendous potential to help chronic sufferers gain some control over their daily symptoms. Many experienced McKenzie practitioners in other countries have been using the method with chronic patients and clinical studies with this difficult group are currently being run and prepared for publication.

Not Suitable for Cervical or Thoracic Spine

The concept of using the patient's own positions and movements to treat cervical and thoracic conditions has evolved very successfully over the past ten years. It used to be taught that disc injury was quite rare in these regions of the vertebral column. However, recent anatomical and biomechanical studies have clearly demonstrated the frequency of symptomatic intervertebral disc pathology. McKenzie's textbook "The Cervical and Thoracic Spine - Mechanical Diagnosis and Treatment" has finally been published and is available for purchase in Australia now. This comprehensive text (320 pages) should be a great help in clarifying the McKenzie method of assessment and treatment in these regions of the spine. The McKenzie approach can be very effective in the management of cervical and thoracic conditions.

The McKenzie philosophy is a very comprehensive approach that deals with the immediate symptoms and (more importantly) the long term effects, of stresses placed on the vertebral column. While simple unidirectional forces are assessed for their effectiveness initially, multi-directional forces (both by the patient and by the therapist) are often needed for more complex problems. It should be borne in mind that a therapeutic philosophy does not have to be tremendously complicated to be successful.

It is hoped that these comments have helped to clarify some of the common misconceptions that are encountered by instructors and clinicians using the McKenzie method of assessment and treatment. Following is a list of published papers that have compared the McKenzie method with other forms of therapy. Many more trials are nearing completion and awaiting publication in reputable medical or health care journals.

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Low Back Pain: Is It The Piriformis Muscle?

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ABSTRACT

Chronic low back pain frequently presents as a dilemma in diagnosis. When no pathology is demonstrated in the lumbar spine attention should be directed to structures in the pelvis as a potential cause for the patient's symptoms.

Twenty four patients were diagnosed as having piriformis muscle syndrome by the use of three tests which were able to reproduce the patient's pain, viz:

- ***Gluteal palpation just lateral to the sciatic notch.***
- ***Resisted external rotation of the flexed hip.***
- ***Resisted abduction of the hip when adducted and flexed.***

All patients were satisfactorily treated using post-isometric relaxation exercises.

INTRODUCTION

It is not uncommon in General Practice for the practitioner to be faced with patients who complain of low back pain, which does not resolve with rest and conservative Physiotherapy treatment. These patients are frequently referred to either an Orthopaedic Surgeon or a Neurosurgeon who return a verdict of soft tissue injury which should resolve in time. Unfortunately, a significant number of these patients do not get better and resort to treatment from alternative health care providers.

The author has been confronted with such a problem on numerous occasions and in an attempt to help the genuinely distressed patient, he began to examine possible causes of low back pain which were not related to the lumbar spinal column or the sacroiliac joint. A structured investigation of the piriformis muscle has been undertaken.

The concept of a piriformis muscle syndrome has been widely held since it was first reported by Yeoman[1] in 1928. This syndrome is not universally accepted by standard texts on Orthopaedics, Neurosurgery or Rheumatology. However, there are several texts, written by medical graduates involved in manual therapy, which devote space to this syndrome. The authors of these texts vary in their methods used to assess a patient with low back pain in whom the pathology may be in the piriformis muscle[2,3,4,5].

ANATOMY

The piriformis muscle arises from the anterior surface of the sacrum between the second and fourth lateral masses as well as the sacro-tuberous ligament with some attachment to the capsule of the sacro-iliac joint. The muscle mass passes through the sciatic notch to insert into the upper border of the greater trochanter. It is innervated by branches of the sacral-plexus with the main innervation being that of S1. The action of this muscle is to externally rotate the extended leg and to abduct the flexed thigh. It has a minor role of supplying stability to the hip joint. In 10 - 12% of people the piriformis muscle is pierced by the sciatic nerve[6].

Obturator internus is the other muscle which is attributed to having a similar function to that of piriformis, namely lateral rotation and abduction. Table 1 lists the other muscles which are regarded as weak, external rotators of the hip.

AIM

The purpose of this project was to determine the reliability of several tests in reproducing a patient's pain. These patients had not responded to conservative measures and for which no definitive diagnosis had been made prior to the diagnosis as having this syndrome.

Another aim was to test the efficacy of the post isometric relaxation exercises as a treatment for this condition.

LITERATURE REVIEW

Thiele[7] reported thirty one cases of piriformis muscle spasm which were diagnosed by palpation per rectum and a positive Frieberg sign (inward rotation of the fully extended thigh). These patients experienced pain in the superior gluteal region or down the back of the thigh. He further noted that many patients complaining of buttock pain reported that the pain was relieved after defecation. Per rectal examination revealed a tightness of the piriformis and effective relief was obtained from four to six massages, each lasting two to three minutes on alternate days.

Table 1

MUSCLE	ORIGIN	INSERTION	NERVE SUPPLY
Piriformis	Sacrum	Greater Trochanter	L5 **S1** S2
Obturator Internus	Obturator foramen & membrane	Tronchanteric fossa	L5 **S1**
Gluteus Maximus	Ilium, sacrum & Sacrotuberous ligament	Iliotibial tract & gluteal tuberosity on femur	L5 **S1**S2
Obturator externus	Outer surface of foramen & membrane	Trochanteric fossa	L3 **L4**
Quadratus femoris	Ischial tuberosity	Quadratus tubercle on femur	L4 L5 **S1**
Superior Gemelli	Ischial spine	Merges with Ob. int. tendon	L5 **S1**
Inferior Gemelli	Ischial tuberosity	Merges with Ob. Int. tendon.	L4 **L5**

Pace and Nagel[8] found that of seven hundred and fifty cases from a specialised back clinic, forty five could be related to the source of pain being in the piriformis muscle. These authors also found that the presentation of the piriformis muscle was more frequent in females than in males in the ratio of 6:1.

Hallin[9] listed the following as being commonly seen in patients which he considered to have pathology in the piriformis muscle:

- Pain was more commonly felt in the upper buttock area.
- Pain was usually worse after prolonged sitting and then rising from the sitting position.
- Radiation of the pain was variable.
- Straight leg raising test was positive.
- Sciatic pain was usually evoked when the leg was high in the arc.
- Most often pain was confined to the buttock or radiated to the knee, but in a few cases the patients complained of pain and/or numbness in the foot.

A short leg was considered by Hallin to be the cause of the pain. He suggested that the stress in the piriformis muscle was brought about as the hip goes from external to internal rotation during the stance phase of gait. A review of the literature and as well as a study of his paper reveals very little to support this hypothesis as a contributing factor to the aetiology of piriformis muscle pain.

Steiner[10] claims that symptoms of a prolapsing disc and a tight piriformis muscle can frequently be concurrent discorders. Failure to detect and treat the piriformis pathology may result in persistent discomfort even when the disc has been removed. He therefore referred to the piriformis muscle as "failed laminectomy syndrome". In order to separate the idea of sciatica as being due to nerve root entrapment, Steiner considered that the term sciatic neuritis would be more appropriate term if it was secondary to injury in the piriformis muscle.

Radiological proof of the involvement of the piriformis muscle as being a cause of low back pain was attempted by Karl et al[11]. In this study they delineated the hyperemic area of the piriformis muscle using scintographic techniques. This study, in only one patient, outlined the muscle borders very nicely. This was the first successful attempt at trying to establish this syndrome radiographically. The diagnosis is usually made on clinical grounds.

Refractory pain in the piriformis muscle has been effectively treated by incision of the insertion of the tendon of the greater trochanter[13]. These authors claim that the two patients had instant relief of symptoms with no long term complications in motor function.

A private communication from Dr Roger Davis of Colorado Springs, Colorado, revealed that a diagnosis of piriformis muscle pain in two hundred and fifteen patients was supported by eliciting pain using resisted techniques with the flexed adducted hip. These tests consisted of abducting as well as externally rotating. He then injected under fluoroscopic conditions, a small volume of bupivocaine into the area of greatest tenderness with significant relief of symptoms. A series of stretching exercises were then employed with the abolition of pain.

METHOD

a) Diagnosis

The author, who has a special interest in musculoskeletal pain, sees many patients with low back pain of extended duration. Those patients who presented with deep seated low back pain usually pointed to an area in the upper gluteal region over the area of the sciatic notch.

Table II

Symptoms suggesting Piriformis Dysfunction

Deep seated buttock pain

Pain on sitting

Pain on walking

Difficulty in climbing stairs

Difficulty in walking up an incline

Pain may be constant

Dyspareunia

A list of symptoms, seen in Table II, were commonly mentioned by these patients most of whom were female.

Those patients who complained of gluteal pain and manifested most of the symptoms in Table II were subject to the five tests as shown in Figs. 1 - 4.

If the diagnosis was not clinically definite, infiltration of the piriformis muscle with 5 mls of 1% lignocaine was used to dull the pain. The provocative tests were again applied and marked diminution of pain was found in cases of piriformis muscle syndrome.

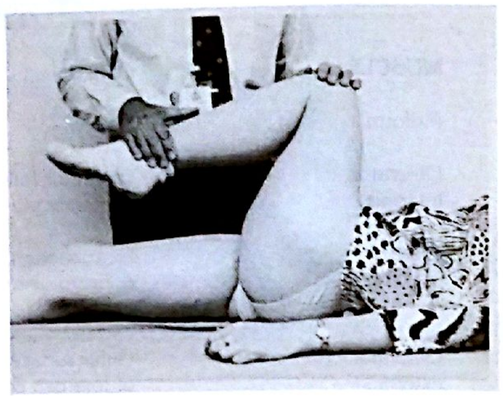

Fig. 1 *Palpation of the piriformis muscle for pain. The thumbs are over the lateral border of the sacrum and the right index finger is over the insertion of the greater trochanter. Pain can be elicited by palpation with the free index finger.*

Fig. 2 *Resisted abduction with the hip adducted and flexed reproduces pain in the external rotators. The patient points to the area over the buttock when this pain is reproduced.*

b) Treatment

For the purpose of this study the author used the post isometric stretching technique as described by Lewit[2] with a modified version which was described by Luypers[12].

The principle of this technique is for the muscle to be fascilitated, relaxed and then stretched. The patient

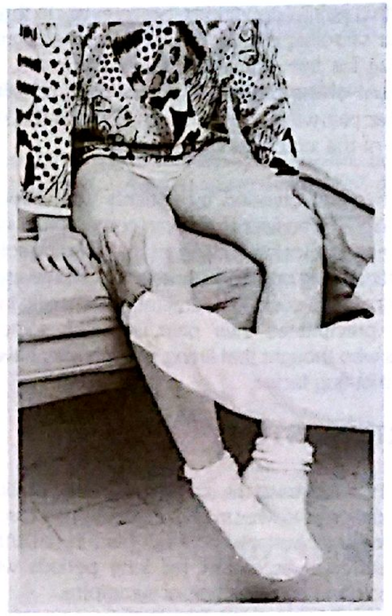

Fig.3 *Resisted rotation with the hip and knee flexed reproduces the patient's pain in the region of the external rotators. The patient can feel the muscles contract.*

breathes in, holds the resisted movement as shown in Figs. II and III for seven seconds. the patient then breathes out, relaxes for five seconds before the muscle is stretched for ten seconds. The pain is usually worse on the initial stretch but becomes less painful after three to four stretches. This procedure is carried out four to five

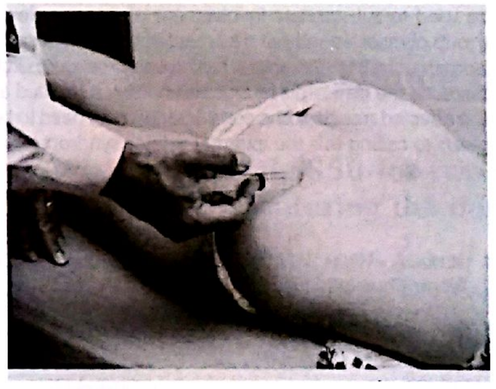

Fig.IV *Resisted adduction with the heels together. A method described by Lewitt which was not helpful in reproducing pain.*

times two or three times a day until the pain has gone, which takes no more than five to seven days. Initially the therapist does the treatment once the diagnosis has been made; however, the patient and/or spouse can be easily instructed in self physiotherapy. A follow up visit two days after the initial diagnosis was arranged to assess the technique and to note progress.

For those patients who had difficulty in doing the internal stretch as shown in Fig. 3 a modified technique as developed in New Zealand[12] was taught. The patient is instructed in both hand positions to determine which technique is most comfortable and effective for the patient.

c) Follow up:

Follow up telephone calls were made to all participants after six months from initial diagnosis. The patients were asked two questions:

(i) Were the exercises helpful?

(ii) If there was a recurrence how long did they take to correct the discomfort?

RESULTS

After the first ten patients were examined using the five screening tests it become apparent that the tests in the Figs. 1 - 3 were the most reliable in reproducing the patient's pain whereas the tests in Figs. 4 failed to be as definitive. Therefore these two tests were abandoned and reliance was placed on tests demonstrated in Figs. 1 - 3 to reproduce the patient's pain and so to make the diagnosis of piriformis muscle syndrome. It is probable that the two tests which were eliminated did not put the muscle sufficiently on the stretch for the test to be effective.

This means that the triad of deep palpation of the gluteal area over the area of the sciatic notch, resisted abduction of the adducted flexed hip as well as resisted external rotation with the hip flexed, was used as the diagnostic criteria for the piriformis muscle syndrome.

The patient profile for the twenty four patients diagnosed was as follows:

- Age range 16 - 55 years.
- Sex 3 male 21 female
- Side of pain 16 right 8 left
- Duration of pain 3 months to 9 years

All patients indicated significant improvement after one week of treatment using the post isometric stretching technique.

The follow up telephone interviews revealed that all participants considered that the exercises were the treatment of choice. This can be interpreted as being

significantly worthwhile and very cost effective. Seven patients had suffered a mild recurrence of symptoms. However they found that repeating the stretching exercises for a short time corrected their recurrence of symptoms.

A pleasing outcome of this study is the number of patients who had been suffering from low back pain for extended periods and who suddenly found an explanation as well as an effective cure for their dilemma.

DISCUSSION

It must be acknowledged that very few tests used in musculoskeletal medicine are specific for a particular joint, muscle, ligament or capsule. Whenever a joint is moved or an area palpated several anatomical structures can be involved i.e. any structure or tissue which has nociceptors. In the palpation of the gluteal area the gluteus muscles as well as the external rotators are capable of being sites of pain. In addition, the hip capsule together with the associated pelvic ligaments can be painful and reproduce pain on palpation.

Resisted external rotation as shown in Fig. 3 involves all the external rotators but is a test which comes closest to being specific. Because the piriformis muscle is the largest of the external rotators, it would make a major contribution to the dysfunction of this group of muscles. Hence the concept of the piriformis muscle syndrome.

The patients in this study had a good range of movement of the lumbar spine without pain. The usual movements of sidebending, extension and flexion were complete and did not produce the type of pain with which the patients presented. Palpation over the iliolumbar ligaments as well as over the lower interspinous ligaments were often noted to be tender but did not reproduce the patient's symptoms. Patients frequently expressed surprise at having very tender spots which they had not recognised previously.

Active and passive hip movements were painfree, but testing the sacroiliac joints was sometimes confusing as the two painful conditions can co-exist. In this study tests for sacroiliac dysfunction[14] were not as significant as those for the piriformis muscle syndrome. After treatment of the piriformis muscle pain, retesting for sacroiliac pain was negative indicating the interdependent nature of the structures of the pelvis.

A frequent question by patients was "how did it happen?" The answer to this can come from a study of the biomechanics in which an internal twisting action on an extended leg could be a possibility. However, some of the patients could not remember a specific incident which precipitated their pain, although some were nurses who thought that lifting patients may have been a contributing factor.

FURTHER STUDY

This study must be considered as a preliminary investigation as to what might be satisfactory in providing a diagnosis of buttock/low back pain in patients who have suffered discomfort for long periods with no diagnosis and no resolution of symptoms.

Conclusive proof of the involvement of the piriformis muscle as the sole cause of pain is still lacking. EMG studies as well as the use of transducers to measure the pressure or hyperemia in muscles may prove to be worthwhile. Investigations similar to those involving the compartment syndromes of the lower limb may prove to be useful.

SUMMARY

It would seem reasonable to assume that patients presenting with low back or buttock pain may have involvement of the external rotators with special reference to the piriformis muscle. There are three tests which can be used to substantiate involvement of this muscle or group of muscles and self treatment in the form of post-isometric stretching exercises has proven to be successful. Because the piriformis muscle has not been isolated as the affected muscle some consideration may need to be given to calling this the external rotator syndrome.

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Case Studies

Case No. 1

J.D., a 56 year-old truck driver, was experiencing left-sided low neck pain, present for several months and getting progressively worse. It had reached the stage in which he had to hold his arm abducted with the elbow flexed and rotated to obtain relief. In this position he had minimal discomfort. He sought medical attention only because he was a semi-trailer driver and found it difficult changing gears with his left hand. He was a smoker of 30 cigarettes a day and a mild imbiber of alcoholic beverages.

His initial presentation was to a large public hospital where he went in some desperation because of increasing pain. He was referred to the musculoskeletal clinic where the above history was taken and the following examination results were recorded:

A pleasant, middle-aged gent who was in some considerable discomfort and held his head tilted slightly to the right with the left shoulder elevated. Flexion of the neck was limited with reproduction of pain which radiated down the C6 distribution of his left arm. Extension reproduced the same symptoms only less so, side-bending to the left produced severe pain and side-bending to the right was less comfortable. Rotation to the left also produced severe pain but rotation to the right again was less painful. He had decreased power in elbow flexion and supination with some lesser decrease in pronation but elbow extension was normal as was the power of the shoulder girdle and hand grip. He had high paraesthesia of the C6 dermatome on the right. Compression testing was positive and traction did nothing for his pain. There was no evidence of a Horner's Syndrome on the left.

An initial diagnosis of a C6 nerve root entrapment was made and bearing in mind that this man was a smoker with the slow onset of increasing pain, a chest X-ray was arranged. This revealed a large radio-opaque mass in the apex of the upper lobe of the left lung. C.T. myelogram indicated an eroding lesion affected the C6 and C7 nerve roots.

Palliative treatment involving pain relief and radiotherapy were commenced.

Lessons to be learnt:

1. The slow, insidious, progressive onset of significant neuromuscular deficit may herald sinister pathology.
2. Musculoskeletal pain is usually inflammatory or mechanical in origin. Mechanical pain can usually be alleviated by adopting appropriate postures. In the event that this cannot be done, thought must be given to malignancy.
3. Beware the person who is rather hardy, does not like to see doctors and will only attend when driven by desperation.

◆◆◆

Case No. 2

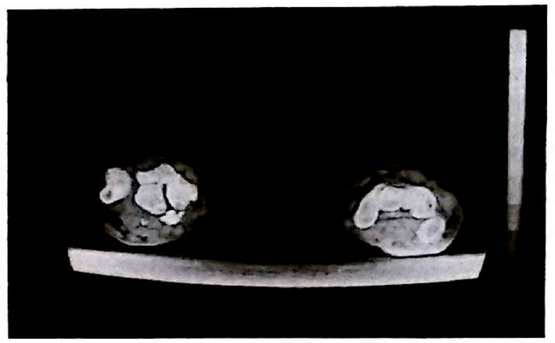
Approximately eight weeks prior to presenting to a musculoskeletal physician a sixty four year-old housewife experienced an insidious onset of right wrist pain. There was no history of trauma to the wrist in the immediate or distant past. At first there was not actual pain but rather a dull discomfort produced by flexion or extension of the wrist joint. All other movements of the wrist did not evoke pain and there was no discomfort when the arm was at rest. Sleep patterns were not disturbed. The patient claimed that at this stage there was no swelling or redness. After about a month the ache had progressed to a low threshold pain on movement of the wrist joint and she felt that there was some limitation in the range of movements, largely due to pain. At this point she decided to seek advice from her family G.P.

Her G.P. diagnosed tendonitis. She was referred for physiotherapy and was treated with cold compresses, ultra-sound and (later) laser therapy. The pain steadily became worse. At this stage no N.S.A.I.D.s had been prescribed. She continued home therapy by applying ice packs twice daily.

Following her failure to respond she again returned to her G.P. and was in turn referred to an acupuncturist. She still had not been prescribed any anti-inflammatory treatment nor had any investigations been carried out. She received four sessions of acupuncture and by then the condition had become significantly worse. Redness had now developed over the flexor aspect of the wrist and the pain was severe.

On return to the G.P. she was told that there was infection present as the ventral surface of the wrist was now bright red with some redness extending several inches up the forearm. She was prescribed erythromycin capsules and arrangements were made for her to see an orthopaedic surgeon but this appointment was for six weeks later. By now the pain had become so severe that she could no longer stand it.

The musculoskeletal physician saw her the next day. The wrist was swollen, red and even movement of fingers produced severe pain. She had no increase in temperature and there were no lymph nodes palpable in the axilla. X-rays taken at the surgery showed what appeared to be a dense amophous focus of calcification lying on the palmar aspect of the distal radius, extending distally to lie immediately anterior to the intercarpal joint between the scaphoid and lunate (Fig. 1). It was felt that she required urgent decompression and an immediate appointment was arrranged with an orthopaedic surgeon.



The surgeon ordered a C.T. scan of the wrist and this suggested that the calcification lay in the line of the tendon of flexor pollicis longus. A small focus of calcification was also located more medially in the line of the flexor digitorum profundus tendons (Fig. 2). The radiological report stated that the findings were consistent with "calcific tendonitis involving the tendons of flexor pollicis longus and flexor digitorum profundus".

In view of her extreme pain she was admitted and operated on the same day. At operation the calcification was found to be within the structure of the joint capsule. There was no involvement of the tendons or other soft tissues. On awakening from the anaesthetic she was virtually pain free. She was discharged the next morning from hospital.

Points of interest:

Neither the musculoskeletal physician nor the orthopaedic surgeon had ever seen intra-capsular calcification at the wrist joint. This case was interesting for the actual diagnosis and serves to illustrate the need for appropriate examination and investigation. It also illustrates that there are quite rare conditions which need to remain on the check list of possibilities even when the diagnosis seems simple. Efficient treatment can only take place after accurate diagnosis and in this case the patient could have been saved considerable pain, inconvenience and cost had standard procedures been followed.

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BOOK REVIEW

Peripheral Manipulation
by G. D. Maitland

Third Edition
Published by Butterworth-Heinneman Australia, Sydney, 1991.

The esteem in which Geoffrey Maitland is held for his great contribution to musculoskeletal medicine and manual therapy over many years assures widespread interest in a new edition of one of his books. ***Peripheral Manipulation*** was something of a landmark in the literature when it was first published in 1970. Twenty-one years later, the third edition contains a substantial revision of the text and brings the work fully up to date with the inclusion of facts and concepts resulting from recent research.

Medical readers will note changes in emphasis which reflect developments in the practice of physiotherapy in Australia. The second edition, published in 1977, contained only a few pages on subjective patient assessment and placed its main emphases on objective assessment and treatment. The latest edition has a greatly expanded section on general aspects of history-taking, preceded by a whole chapter devoted to "Communication and the Person". As well, sections on subjective assessment have been added to the chapters dealing with the different regions of the body. These changes reflect the tendency for physiotherapists to regard themselves as primary practitioners and the trend away from providing treatment on medical referral only. Whatever the philosophic connotations of these developments, the book is more balanced by the increased emphasis on subjective assessment and physiotherapists will undoubtedly find the information on history-taking useful.

The physical examination and treatment techniques developed by Maitland are presented in the third edition even more clearly than previously. Included with the book are montages of serial photographs designed to be viewed in a sweeping manner so that the movements involved in the techniques can be appreciated more fully. It is a novel method of presentation of such a practical subject and certainly adds an extra dimension to assist the reader's understanding. The photographic charts would have particular value as memory aids for those who have seen the techniques performed in practical demonstrations.

An interesting addition to the treatment methods described is the development of the concept of joint compression as a treatment manoeuvre. Many will find this idea new and some will be challenged by it. Analysis of the techniques which employ compression, and the rationale provided for each, invites the conclusion that once again Maitland has produced a range of innovative techniques which will expand the armamentarium of manipulative therapy considerably.

The appendix on movement diagram theory has been redrafted so as to clarify what is a difficult technical concept. Forty-seven diagrams are included in this section in the third edition, which compares very favourably with the seventeen diagrams used to illustrate the same principles in the second edition. The extra examples make this essentially visual subject much more readily understood.

The third edition concludes with a list of references which provides a useful bibliography of the subject. Interestingly, videotaped teaching material is included with the more usual text book and journal article references.

Maitland's work on both spinal and peripheral structures deserves the attention of all practitioners with interests in musculoskeletal medicine and manipulative therapy. The third edition of *Peripheral Manipulation* will be required reading for those with serious commitments to these disciplines.

322pp. Price $60.00

PRODUCT REVIEW

Vapocoolant Spray

Eagle Pharmaceuticals Pty. Ltd.

Vapocoolant spray has been an important adjunct to the treatment of musculoskeletal conditions for fifty years. In 1941 Kraus described the use of the vapocoolant effect in an article published in the *Journal of the American Medical Association*. Travell and her co-workers subsequently developed the technique of "spray and stretch", which became a standard modality for the treatment of various types of muscle dysfunction, particularly myofascial pain syndromes. Initially ethyl chloroide was used to produce the vapocoolant effect but it has the major disadvantage of being explosive in mixtures with air; it is also relatively expensive. About twenty years ago chlorinated fluorocarbons were introduced as substitutes for ethyl chloride and the resultant improvements in safety and economy led to a great increase in the use of vapocoolant therapy. "Spray and stretch" was described as the treatment of choice in the major textbook *Myofascial Pain and Dysfunction: The Trigger Point Manual* written by Travell and Simons and published in 1983. Since then, vapocoolant spray has been a standard item in the treatment rooms of musculoskeletal physicians and others involved in the management of muscular problems. Knowledge of the vapocoolant effect and its utility spread well outside the medical profession and by the mid-1980's no self-respecting football coach or other serious sporting trainer would attend a match without at least one can of vapocoolant spray.

Problems arose in the late 1980's with increasing awareness of the environmental effects of some gases. As concern grew for the earth's ozone layer, chlorinated fluorocarbons were identified among the factors responsible for its depletion. In fact, an article in the *Archives of Physical Medicine and Rehabilitation* in 1988 went so far as to question whether physioatrists were to blame for the missing ozone. Vapocoolant sprays containing chlorinated fluorocarbons were withdrawn from production shortly afterwards. No substitute appeared and for a time it seemed as though vapocoolant therapy was to be relegated to history.

Recently an Australian company has introduced a new product which overcomes the deficiency. The vapocoolant spray manufactured by Eagle Pharmaceuticals is made entirely of hydrocarbons. It contains none of the offending chlorinated fluorocarbons and has no adverse environmental effects. The volatility of the spray makes it an excellent vapocoolant for medical use and in practice it has proved highly effective for "spray and stretch" treatment. The spray is supplied in a 300 gm aerosol can fitted with a jet especially designed for accurate spraying of body areas. Four or five sweeps in the long axis of the muscle from a distance of 10 cm provide adequate coverage for most structures. The readily defined edge of the spray pattern minimises the need for overlapping and enhances the safety, efficiency and economy of the procedure. The spray is delivered evenly to the skin surface and little practice is required to produce a satisfactory vapocoolant effect.

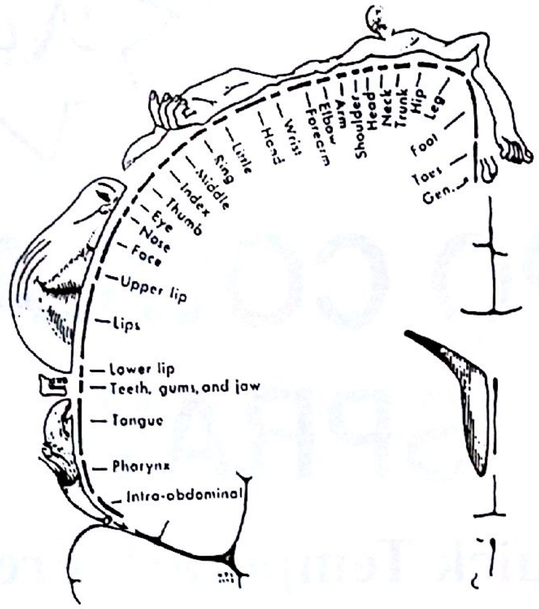
Apart from vapocoolant therapy for muscular conditions, the spray can be used to provide temporary surface analgesia to reduce the discomfort of injections. Doctors in general practice would also find the temporary freezing effect useful for a host of other minor procedures.

All in all, this product fulfills all the requirements for a vapocoolant spray for medical use and is particularly well designed for the treatment of musculoskeletal conditions. The return of a vapocoolant spray to the market will be welcomed by many and no doubt it will find its way into the treatment rooms of musculoskeletal physicians and physiotherapists all over Australia as soon as its availability becomes generally known.

Supplies can be obtained through practitioners' usual medical supply companies and any enquiries could be directed to the manufacturers, Eagle Pharmaceuticals Pty. Ltd., 26 Winchcombe Place, Castle Hill, N.S.W. 2154.

Accreditation Assignment

Members are invited to study the homunculus below and to answer the questions which follow:



1. Is this a sensory or a motor homunculus? Justify your answer without reference to the genitalia.

2. Describe an activity which involves all parts of this homunculus simultaneously. Could this activity be performed without assistance?

3. What is the relevance of this diagram to the concepts of:
   a) the sensate focus?
   b) the gate-control theory of pain modulation?
   c) continuous passive motion?
   d) sympathetic reflex dystrophy?

4. How is the region of the brain represented by this homunculus affected by:
   a) the McKenzie method of treatment?
   b) vapocoolant therapy?
   c) piriformis muscle stretching?
   d) radiofrequency denervation?

5. What is the relationship between a homunculus and an incubus? Does such a relationship challenge current bioethical standards?

Completed assignments should be forwarded to Dr. Gary Hopkins, convenor of the Associations Accreditation Sub-Committee, or handed to him at the 21st Annual Scientific Meeting in Adelaide. Ten accreditation points will be awarded for correct responses of approximately one thousand words. Alternatively, members may wish to submit responses of more than three thousand words as accreditation theses and the best of these will be published in the Bulletin.

ADVERTISERS' INDEX

There is space on this list for many other companies with interests in the field of musculoskeletal medicine. The Bulletin welcomes advertisements for any products or services considered worthy of members' attention. Advertising managers are invited to contact the editor.