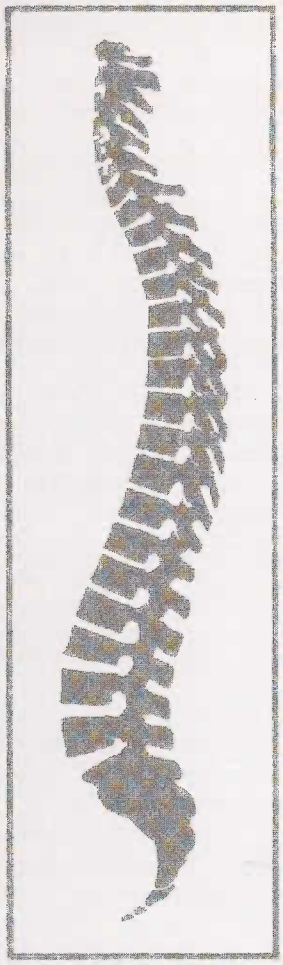

THE CHIROPRACTIC REPORT

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CHRONIC BACK PAIN – New Common Ground for Chiropractic and Medicine

A. Introduction

1. Chronic back pain — pain persisting for several months or years — is now seen as one of the major health issues confronting industrialized society. Work and life get more sedentary each year. Stress intensifies, and disability from back pain is producing remarkable statistics:

• Between 1971 and 1981 the US population rose by 12.5%, but the number of people with disabling back pain rose by 168%.[1,2] This growth of disability is greater than any other.[3]

• 85% of people will experience disabling low-back pain during their lives. Deyo reports that 6.8% of the U.S. adult population is suffering from an episode of back pain lasting more than two weeks at any given time.[4] In the U.K. episodes of incapacity per 1,000 persons per year rose dramatically from 1954/1955 (21.7 for men and 8 for women) to 1980/81 (58.2 for men and 44.7 for women). In that period days of sick certification per 1,000 rose from 506 to 1882 (about 350%) for men and 329 to 1062 (about 500%) for women.[5]

• The cost is staggering. In 1982 best estimates were $50 billion in the U.S.[6] and £1,000 million in the U.K.[7] In the 30-50 age group low-back pain is the single most expensive health care problem.[8]

• About 85% of those suffering back pain recover within three months.[1] However approximately 15% do not. They develop chronic disability, *and are responsible for approximately 85% of the cost of back pain to society*.[18]

2. What has been happening in health care in response to this grim picture? From a chiropractic perspective there are four significant developments:

i) The public and the medical profession have been learning more about chiropractic education and skills, and making much greater use of chiropractors.

• Two thorough independent surveys in the U.S. report that in 1976 to 1980 30% of Americans with an episode of back pain lasting over two weeks consulted a chiropractor.[4,9] (The first, the largest U.S. survey to date including back pain epidemiology (n.10,404 adults) gave the following breakdown for back pain patients — family physician (59%), doctor of chiropractic (31%), physical therapist (16%), doctor of osteopathy (14%)).

• A recent British survey showed that 50% of general medical practitioners in Oxfordshire had referred back pain patients for manipulation by chiropractors or osteopaths during the past year.[10]

• Recent government inquiries in other countries, such as Sweden (1987)[11] and Australia (1986),[12] have received professional survey evidence showing a high rate of acceptance and use of chiropractic services, have judged chiropractic effective and cost-effective in the management of low-back pain, and recommended government funding for chiropractic services.

ii) The medical profession has acknowledged the need for a fundamental new approach to the management of back pain, especially chronic back pain.[3,5,13,14] A prominent leader in the United States, Dr. Vert Mooney, Professor of Orthopaedic Surgery, University of Texas Southwestern, Dallas, observes:

"We have not been honest with ourselves in the past when we have supported months of passive modality 'care' that can offer no long-term benefit. We have not been fair to our patients when we have focused on pain rather than function. We, as medical clinicians, have relied only on the science available to us for the care of *structural* disorders and not for *functional deficits*. Perhaps, because nobody dies of back pain its presence in the arena of medical concern has been left relatively unnoticed. The time has come to develop rational principles of care".[25]

iii) There has been a sudden wealth of new research into the management of back pain. When the new journal 'Spine' appeared 14 years ago there were concerns it would not attract sufficient research to survive — it now has North American, European and Japanese editorial boards and is bursting at the seams. The American Back Society (which had Mooney as Course Chairman for its most recent meeting last month in Las Vegas), launched as a fledgling inter-disciplinary forum for discussion of management of back pain in 1982, has attracted huge and successful meetings.

There is a large amount of new information. Paradoxically, this is revealing how little is still known by anyone about the complex anatomy and pain syndromes of the spine and associated tissues.

International Meetings

Consensus Conference on Validation of Chiropractic Methods
March 2-3. 1990.
Sea-Tac Hilton, Seattle WA.
Co-sponsored by ACA Council on Technic. Washington Chiropractic Association and Pacific Consortium for Chiropractic Research
Contact:
Washington Chiropractic Association
1420 Maple Avenue. Suite 203A
Renton. WA 98055 U.S.A.
Tel: (206) 235-4428

•

International Conference on Spinal Manipulation
May 11-12. 1990
Hyatt Regency Hotel. Washington. DC
Contact:
FCER
1701 Clarendon Blvd.
Arlington. VA 22209 U.S.A.
Tel: (703) 276-7445 Fax: (703) 276-8178

•

American Back Society: Spring Symposium
May 3-6. 1990.
Fairmont Hotel. Chicago. IL
Contact:
ABS
2647 East 14th St.. Suite 401
Oakland. CA 94601 U.S.A.
Tel: (415) 536-9929

•

World Federation of Chiropractic Assembly and First Scientific Congress
May 1-5. 1991.
Toronto. Canada.
Held in conjunction with the 1991 ABS Spring Symposium
Contact:
Secretary
World Federation of Chiropractic
3080 Yonge Street. Suite 1028
Toronto. Ontario M4M 3N1
Tel: (416) 484-9978 Fax: (416) 484-9665

iv) All these new developments are bringing medicine and chiropractic to much new common ground. Both now have the same fundamental approach to management of chronic low-back pain, neither has all the answers, and understanding of this is diminishing professional rivalries and creating satisfying opportunities for a multi-disciplinary approach.

3. In this issue we look at the chiropractic approach to chronic low-back pain, review new medical approaches including Mayer's 'functional restoration', and draw attention to some of the emerging research information.

In addition, there is a guest editorial from Dr. Theo Rudolf, who practises in a Swiss rehabilitation clinic and has dual qualifications in medicine and chiropractic.

B. Chiropractic Management

4. Those unacquainted with chiropractic sometimes carry the simplistic image of the profession as devoted solely to the practice of spinal manipulation. This is akin to seeing dentistry as filling teeth and law as conducting litigation — a fundamental element is identified, but the complete picture lost.

5. The most recent, thorough, independent study of chiropractic in North America, performed in 1978/79 by noted University of Toronto behavioral scientist Professor Oswald Hall and colleagues Kelner and Coulter, concluded:

"This study began as an effort to take a genuinely fresh look at the place of chiropractic in an expanding health care system... we have had to wrestle with both the reality and the rhetoric of chiropractic... Many of those who write... against chiropractic tend to denigrate rather than describe it, and one can often detect omissions ...and exaggeration of information.

From our study chiropractic emerges as something more than the set of techniques and the set of beliefs that form so large a part of its public image. What became clear during the research, and was far from apparent when it began, is that chiropractic has evolved a distinctive model of health care... Chiropractic therapy has undergone a substantial number of changes since 1895. For modern chiropractors, the focus of chiropractic is on the total spine, of which bone structure, muscles, and nerve structures are the component parts.

Since all three elements are so intimately connected, it would be correct to speak of current chiropractic as fundamentally concerned with the total neuromusculoskeletal system rather than just the skeletal system of the human body.

This system of the spine, so conceived, has been accorded very little significance in the study of anatomy... in focusing their attention on the spine in this way, chiropractors have broadened the concept contained in this word far beyond its usual meaning. As well as seeing it as the major component of the skeleton, they see it in dynamic terms, since it is integrally involved in all movement of the body".[16]

6. Health science is littered with impenetrable language. At first blush chiropractic seems to have added to the burden with the word 'neuromusculo-skeletal', which has now been in common use for some 20 years and appears not only in standards of education and practice but also now legislation regulating the practice of chiropractic.[17]

7. Though a tad unwieldy, 'neuromusculo-skeletal' is a useful term since it emphasizes an integrated functional approach to low-back pain, the vast majority of which has no visible structural lesion. It points to the traditional elements of chiropractic management which are:

- Spinal adjustment, or specific manipulation, for correction of joint dysfunction (subluxation). (Techniques generally involve high speed but small distance (amplitude), 'adjusting' the range of movement of the joint by taking it beyond the active and passive ranges through the physiological barrier — i.e. to an end range of movement that cannot be accomplished by the patient).

- Other manual and physical therapy techniques for muscle dysfunctions, such as trigger points, spasm and adaptive shortening. (It is a surprise to some to learn that chiropractors were using electrotherapy before the discipline of physical therapy or physiotherapy was first organized).

- Exercise programs for muscle rehabilitation, without which long term results cannot be achieved.

- Patient education, allowing understanding of the sources of disability and motivating the patient to prevent future problems through altered postures and lifestyle.

8. There is rather compelling logic to the principle of having patients understand more about their problems and know how to take personal control of management as far as possible. Cherkin Ph.D. and MacCornack Ph.D. recently published the results of a survey comparing patient evaluations of low-back care received from chiropractors and family physicians.[9] The results:

- Although similar proportions of patients were "very satisfied" with care for other problems provided by family physicians or chiropractors, back pain patients reported being "very satisfied" three times as often (66% v 22%) after chiropractic care.

- The study showed "large inconsistent differences between patients of family physicians and patients of chiropractors in their satisfaction with the information they received about their back problem". Chiropractic patients felt they received more information about the cause of pain, the period of recovery, and how to care for their backs themselves. Family physician patients were "significantly less likely" to feel they had adequate instruction on exercise, posture and lifting techniques.

- Although the chiropractic patients represented a more chronic sample — i.e. had a history of more episodes of back pain over a longer term — days of disability during the 8 month period between initial visit and survey date were significantly higher for family physician patients (mean 39.7, median 7) than for chiropractic patients (mean 10.8., median 0). 48% of family physician patients reported disability for more than one week, only 17% of chiropractic patients.

9. The best evidence of the effectiveness of chiropractic management of chronic low-back pain, referred to previously in greater depth in this Report (January 1987 Vol. 1 No. 1), is the work of Kirkaldy-Willis, an orthopaedic surgeon, and Cassidy, a doctor of chiropractic, at the University Hospital, Saskatoon, Canada.

Their early data, published in 1985,[18,19,20] has been confirmed by subsequent results[21] in a study that has now been continuing for 12 years. They report:

- 90% of all totally disabled, chronic low-back patients received at their hospital clinic are found, upon chiropractic examination, to have spinal joint dysfunction.

- Approximately 90% of these are returned "to full function with no restrictions for work or other activities" following a 2-3 week regime of daily chiropractic manipulation together with instruction at back school.

- Importantly, that success rate is maintained at 12 months follow-up.

- The essence of management has been to discover and correct joint dysfunction in the large percentage of patients where that

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Guest Editorial – An Integrated Approach to Management of Chronic Low-back Pain

By Theo Rudolf, DC MD

Dr. Rudolf graduated as a chiropractor from the Canadian Memorial Chiropractic College, Toronto, Canada in 1974, as a medical doctor from the University of Berne, Switzerland in 1983. Since that time he has practised in the areas of rheumatology and rehabilitation. He is currently Head Physician at the Leukerbad Clinic for Rheumatology and Rehabilitation, Switzerland.

At our Rehabilitation Clinic in Leukerbad, Switzerland we see many patients disabled for months or years by low-back pain. Their conditions have proved resistant to many individual treatment approaches, including chiropractic care.

Rational management of these patients must restore normal function to both the 'hardware' (joints) and 'software' (muscles) of the locomotor system. Correct function, whether in the sportsman[1] or chronic low-back pain patient, involves:

- Full range of motion in joints.
- Strength, endurance, and flexibility of the musculature.
- Controlling 3 other external focuses or influences — psychological input, environmental input, and reflex input. (see Fig 1).

A rehabilitation program that allows for all of these factors will have the best prospect of long-term success.

Joint Function

Anyone who has the requisite training, skill and experience in practice knows that specific spinal manipulation is a very efficient method of treatment of joint dysfunction. Mobilization and manipulative techniques form a central part of our clinic's rehabilitation program in Switzerland.

In recent years there is much research evidence [2,3,4,5] supporting this clinical judgement. Specific manipulation is now generally the treatment of choice for functional problems of the 'hardware'. In some cases there is an important role for a pelvic belt, and a relatively small number of cases require orthopaedic correction.

Muscle Function

Tonic and phasic muscles

There are essentially two types of muscle fibre:

a) Long-acting, aerobic, 'slow-twitch' fibres. These respond to training below maximum effort, but with many repetitions.

b) Short-acting anaerobic, 'fast-twitch' fibres. These respond to training at maximum effort, but over a short time and with few repetitions.

Every muscle in the human body contains both types of fibres. However some muscle groups are comprised predominantly of slow-twitch fibres, some mainly fast-twitch. We speak of:

a) *Tonic muscles* — those with more slow-twitch fibres. Examples are the sacrospinalis (in the lumbar and cervical regions), the quadratus lumborum, the piriformis, the iliopsoas and the hamstring muscles.

b) *Phasic muscles* — mainly fast-twitch fibres. Examples are the sacrospinalis in the mid-back, the abdominals, and the gluteal muscles.

The delicate balance between tonic and phasic musculature in establishing normal function is easily disturbed, and effective muscle rehabilitation must recognize the need to restore balance.

The 3 pillars of function

Flexibility

Tonic muscle may be short (tight) restricting spinal range of motion. Is this secondary to joint dysfunction? If so primary treatment will be adjustment or manipulation of the joint. Is this solely a muscle problem? If so, is it spasm (treated by post-isometric relaxation or other relaxation technique) or adaptive shortening (requiring stretching techniques or mobilizing exercises). Treatment approach is directed by questions such as these.

Figure 1

Strength

There may be remarkable relief from chronic pain following manipulation to correct spinal dysfunction, and following stretching to relieve short tonic muscle.

However this satisfying result may be short-lived if, following long-term pain and disuse, there are now deconditioned (weak) muscle groups contributing to the problem. These must be strengthened through a structured exercise program.[6] For this purpose we are using a basic sequence exercise apparatus. For everyday purposes in a chiropractic clinic simple broadly quantitative tests of strength in major muscle groups as proposed by Imrie MD and Barbuto DC in 'The Back Power Program'[7] are quite adequate. The crucial point is to make the patient realize that it is his/her duty to provide this element of recovery — through regular compliance with appropriate exercises as prescribed by the chiropractor or other member of the rehabilitation team.

In recent years new devices providing truly objective measurement of strength of trunk musculature have been described in the literature.[8] These devices are either:

a) Isokinetic — where speed of muscle contraction is kept constant.

b) Isoinertial — where weight or resistance remains constant.

In our clinic we are using an isokinetic system, mainly to provide one more objective measure of improvement of muscle function for research purposes. We hope to establish a standard program for strength training of trunk and pelvic musculature in chronic low-back patients.

Endurance

This is the third pillar vital to restoration of muscle balance, and concerns slow-twitch fibres which respond to training involving many repetitions. Cardiovascular conditioning is important. In our clinic, besides specific exercises, we use group gymnastics, swimming with fins, mountain biking and cross country skiing. For good motivation you must move beyond private home based exercises.

External Focuses

Two sources of external influence on locomotor function are the physical environment (e.g. work postures, other aspects of lifestyle that produce biomechanical strain) and psychological states. Both are addressed by back school, a growing part of integrated rehabilitation programs during the 1980s.[9] At our clinic the school is conducted by an occupational therapist, and goes beyond anatomy and exercise to an intensive education in ergonomics — the relationship between man and work and efficient function, bearing in mind mechanical, physiological and psychological principles.

The third external focus comprises reflex mechanisms within the nervous system — and often unsuspected yet powerful influence on balance in the locomotor system. These mechanisms may be altered by external reflex therapy, including transcutaneous electrical nerve stimulation (TENS) and manipulation.

Conclusion

Our experience is that an integrated program as described produces sound long-term results with chronic low-back pain patients.

Muscle conditioning, balancing various individual capacities, is important. Back education, giving patients the knowledge necessary for their own participation and recovery, is important. But, both with in-patients and out-patients, I consider skilled manipulative therapy to be very important too. It is valuable for functional restoration of joints or 'hardware', for its impact on related muscle or 'software' problems, and as a specific source of reflex therapy.

Sound rehabilitative care should incorporate all essential elements of our program. However failure by any of us to get our patients fully involved in their recovery means that long-term success is replaced by repeated short-term cycles of success and failure.

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occurs, and then engage all patients in back school so they can assist their own recovery through better understanding of the problem and appropriate exercise and other rehabilitation.

C. New Medical Approaches

Back School

10. This has been the first alternative method developed within medicine, initially in Scandinavia[22] but now worldwide. The aim is to help patients take responsibility for their own problems, through education and exercise given over several extended group classes. Instructors are nurses, occupational therapists or other allied health professionals.

11. The Swedish Backschool protocol is:

Session 1. Anatomy and biomechanics of the spine and common causes of low-back pain are taught. Relaxation techniques are demonstrated and practised. Exercises (aimed primarily at strengthening abdominal muscles) and lifting techniques to strengthen the quadriceps and other muscle groups are taught, with patients advised to continue these exercises on a regular daily basis.

Session 2. Wider introduction to ergonomics (the study of man, movement, and efficient design of workplace and other environments) with the aim of avoiding pain in different positions demonstrated and practised. Standing, sitting, lying, walking and lifting are all discussed with special regard to postural strain.

Session 3. Putting into practice methods already taught for carrying out functional activities with minimal strain on the spinal structures.

There is evidence that such a back school, alone or as an adjunct to other treatment, is effective and cost-effective.[23,24,25] However it must be done well and, as it relies on patient motivation and compliance, works better with chronic than sub-acute patients. Berwick et al, from Harvard, have recently reported no clinical effect from back school given over one 4-hour session, even where there is follow up encouragement by telephone and correspondence.[26]

Pain Clinics

12. Particularly in the United States, where greater resources have been available for health care, the recognition that chronic back pain and disability have physical, emotional, and social factors has led to the development of multi-disciplinary pain centres. These have offered broad diagnostic facilities, together with medical, physical therapy, clinical psychology, psychiatric and sometimes chiropractic services.

There are now over 2,000 pain centres in the U.S. but, in general, their results have been disappointing.[27,28,29]

Functional Restoration

13. This is the name of a new aggressive and comprehensive management approach in the U.S. first developed by Dr. Tom Mayer, Professor of Orthopaedic Surgery, University of Texas Southwestern, Dallas. It draws on the experience of pain centres and back school, but has its real foundation in sports medicine. Principles of integrated management that were working with top athletes in bringing faster return to competition were applied by Mayer to chronic low-back pain patients and, in work first reported in 1985,[30] Mayer demonstrated that 87% of his program graduates were working two years later compared with only 41% in a comparison group.

14. Mayer's program and results have recently been duplicated by Hazard MD, Fennick Ph.D. et al in a New England back clinic.[1] The essential elements of the functional restoration approach appear in that study:

a) Criteria for entry were:

- At least 4 months continuous disability from work because of back pain. (Average was in fact 19 months).
- No evident pathology warranting surgical intervention.
- No evidence of psychosis or severe personality disorder.

b) Program content was:

- 1½ days of physical, psychological and occupational tests to provide an initial Quantitative Functional Evaluation (QFE).
- 3 weeks of 53 hours of intensive management including:

5½ hours daily of physical and occupational therapy exercises.

Daily back school with instruction on anatomy, medications, compensation law, surgery and theoretical basis of treatment program.

Psychological treatment, including a stress management program monitored by bio-feedback, training in assertiveness, rational emotive therapy, and pain crisis management.

Counselling — by means of individual, group and family meetings.

- At 3 weeks a second QFE. (A central feature is use of new sophisticated equipment that allows objective measurement of isokinetic trunk muscle strength — providing patients and researchers with hard evidence of improvement).
- 3 further weeks of the program, but reduced to two days a week.
- Follow up QFEs at 6-12 weeks and 12 months.

c) Results were:

- After 3 weeks patients in the trial group showed significant improvements in self-assessed pain, disability, depression, and objective physical capacity.
- At one year 81% of program graduates (n.65) were back at work, only 29% of patients (n.17) in the comparison group. (These were not truly random patients — they were those denied enrolment in the program by their insurance carrier).
- The researchers conclude that "functional restoration with behavioral support is an effective treatment for chronic disabling low-back pain".

(For a full description of this approach to management of chronic patients see Mayer and Gatchel's 1988 text 'Functional Restoration for Spinal Disorders: The Sports Medicine Approach'.[14])

15. On one hand these results are impressive, given the huge cost of continuing disability. (See para 1). On the other hand, could not many of these patients have returned to work with more specific and cost-effective management of their problems? It is noted:

a) Kirkaldy-Willis and Cassidy report higher success rates in the large sub-group of patients found by chiropractic examination to have specific joint dysfunction. Medical training does not provide the necessary skills for measurement of individual joint dysfunction. As Mayer and Gatchel observe:

"We are as yet too unsophisticated to detect discrete intersegmental abberations, and we must rely on measurements of function across several contiguous segments. On the one hand, this is as crude as measuring the function of a leg, rather than of the hip, knee or ankle separately; on the other, it is a step forward from having no functional capacity assessment capacity whatsoever".

Rudolf DC, MD (see guest editorial) suggests that Mayer's results would be significantly improved with the addition of chiropractic skills.[31]

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b) The functional restoration approach relies on sophisticated facilities and equipment. In addition Hazard et al report a basic program cost for treatment in their trial of $3,000, cost with accommodation of $7,500 (in 1986). There were additional costs for prior and subsequent professional services and medication. This, of course, is very expensive compared with the more specific interventions in the Kirkaldy-Willis and Cassidy research and chiropractic practice generally.

c) A final point of interest from the Hazard study is that when patients were asked to identify what was important to their return to work, they emphasized psycho-social factors rather than physical or muscular strength, and follow up testing showed that subjective views of improvement and normal function continued even when new physical capacity developed in the program diminished with time.[7]

D. Current Research Developments

Muscles

Muscle dysfunction is related to back pain

16. This common sense proposition is now proven, and Roy MS et al[32] review the research showing:

- Paraspinal muscle weakness is linked to increased likelihood of low-back pain; and
- Patients with low-back pain have muscle weakness and dysfunction.

Objective measurement

17. With the above relationships established, and increased trunk muscle strength and endurance thus important aspects of rehabilitation, there has been a broad new drive in health science to establish techniques and equipment to measure isolated muscle functions — e.g. the strength of trunk musculature in a specific plane, and while under 3 different types of contraction:

- Isometric — where the length of the muscle remains constant.
- Isokinetic — where the speed of the contraction is kept constant; and
- Isotonic — where the resistance or weight remains constant.

Thus Mayer MD et al,[33] looking at paraspinal muscle strength 3 months after back surgery (discectomy and fusion) and using a Cybex isokinetic sagittal trunk strength tester at 3 chosen speeds for muscle contraction, can now tell us:

- While cross-sectional area of muscle was not much reduced (i.e. physical appearance was similar) post-operative trunk strength was 50% below normal. ('Normal' established by a comparison group without low-back pain).
- Greatest loss of muscle strength was in the extensors (erector spinae), followed by the flexors (rectus abdominus/psoas), with least change in rotators (obliques).

(While overall cross-sectional area of muscle was not much reduced, CT scan revealed that muscle density was — again principally in the extensors, then flexors, then rotators).

18. Mayer and Gatchel describe much of the measuring equipment now available on the U.S. market.[14] It is expensive, the data is time consuming to obtain, and at present there is a distinct risk, they say, of being "swamped by an onslaught of meaningless numbers". No general agreement on devices and protocols will be obtained for several years yet. This equipment, as Rudolf mentions in his editorial, is more important in research than practice — where the important point is appreciation of the need for muscle conditioning by both clinicians and patients.

Role of the abdominals

19. Here is an example of the burgeoning new research concerning the relative biomechanical functions of different muscle groups. It is generally held that the abdominal muscles assist the stability of the lumbar spine by tensing the thoracolumbar fascia and raising intraabdominal pressure. A recent experiment by Tesh Ph.D. et al[34] from Scotland using cadavers, indicates:

a) For sagittal (forward-backward) movement both mechanisms have an equal role in stability, though fascial tension is more locally important, increased intraabdominal pressure of more diffuse and general importance. However total stabilizing force of both mechanisms is less than previously thought — "they are by no means the only or most important factor in maintaining extension and stability in the lumbar spine".

b) In contrast, the middle layer of the fascia has a more important role than previously thought in assuring stability in the coronal (side-bending) plane — providing 40% of support for the lumbar spine in extreme lateral bending.

During heavy lifting the paraspinal muscles are fully engaged and unable to correct lateral and torsional movements. Much of the necessary correction comes from the abdominals via the fascia.

Stretching for flexibility

20. Training for muscle strength and endurance, whether by chronic back pain patient or the athlete, requires due attention to stretching to prevent injury and promote flexibility. Muscle stretching falls into 3 basic categories:

a) Ballistic (active) stretching — characterized by movement, usually with spring or bounce.

b) Static (passive) stretching — maintaining the body in a desired stretch position for a period of time.

c) Proprioceptive neuromuscular facilitation (PNF) — relaxation and stretching achieved in response to prior isometric contraction. The target muscle is relaxed and passively stretched, its antagonist muscle contracted. All are valuable. Current research suggests static stretching is the safest and therefore the method of first choice.[35]

Neural adaptation

21. Muscle strength depends not only on the condition of the involved muscles, but also the ability of the nervous system to activate them. Sale Ph.D.[36] a sports scientist, has recently reviewed the evidence that strength training can cause adaptive changes in the nervous system allowing:

- Fuller activation of prime movement muscles.
- Better coordinated activation of muscles supporting the prime movers.
- A greater net force.

Enoka Ph.D., another sports scientist, describes a central role for the nervous system in development of strength and observes "it is probable that increase in strength can be achieved without morphological change in muscle, but not without neural adaptation".[37]

22. Some of the evidence of neural adaptation comes from 'cross-training' studies. Here, for example, the right arm is trained for increased muscle bulk and strength, and EMG recordings reveal increased strength in the untrained left arm — the result of enhanced performance of the central nervous system or 'central neural adaptation'. This translates into increased skill and coordination.

23. Rutherford,[38] using a conventional leg extension exercise for the quadriceps with a study group over 12 weeks, has demonstrated a 200% increase in quadriceps weight-lifting ability with only an 11% increase in maximum isometric force or strength. Part of the 200% increase derives from increased strength of other muscles involved in leg extension — which include back, abdominal, shoulder girdle, and even arm muscles. But much, he suggests, comes from neural adaptation

giving improved activation and coordination to these various 'fixator' muscles.

24. What are the consequences of this for rehabilitation programs? Rutherford asks whether it is right to concentrate on conventional exercises to strengthen individual muscles. "It may be more advantageous to identify particular functional deficits and then repeatedly practise these with or without added resistance". There are no controlled trials comparing the relative benefit of the two approaches.

Conclusion

25. As the 1990s commence chiropractic, medicine and basic scientists have developed considerable common ground concerning management of chronic back pain.

Much remains unclear, and it is likely that medicine's new general emphasis on improved function will be refined to incorporate assessment of individual joint dysfunction as the training and manual skills of chiropractors become better understood. However there is agreement upon these principles traditional to chiropractic education and practice:

a) Emphasis should be on early return to function — of joints and muscles, and activities of daily living — rather than rest and pain management.

b) Maintenance of function of joints and other soft tissues "is a powerful homeostatic mechanism", to quote the words of Mayer MD.[39] Beneficial effects include promotion of bone and muscle strength, promotion of connective tissue tensile strength, improved disc and cartilage nutrition and increased systemic endorphen levels. Immobilization, by contrast, produces many detrimental effects including first irreversible osteoarthritic changes within two weeks.[40] (For fuller discussions see The Chiropractic Report, January 1989 (Vol. 3 No.3).)

c) Patients disabled by chronic back pain should have integrated management that addresses various physical and psychosocial aspects of their problems, and combines practitioner-based treatment with patient education and active participation in recovery.

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