The Chiropractic Report

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Professional Notes

Back Pain – Is 'Good Medical Care' Enough?

When research and national back pain guidelines in the mid-1990s supported spinal manipulation as a first option for most patients with acute low-back pain, and spinal manipulation and exercise for those with chronic low-back pain, treatments not commonly given by medical doctors, the medical profession faced an interesting challenge in the huge field of back pain. The medical response has been:

• To acknowledge that traditional medical care, relying principally on bed rest and medication, was misguided and less effective than chiropractic care; but

• To claim that 'good medical care', replacing advice to rest with educating patients about the self-limiting nature of back pain and motivating them to keep active, is just as effective as chiropractic care – or acupuncture or physiotherapy or any other professional care – and less expensive.

A new trial by Niemistö, Lahtinen-

continued on page 4

The White Rats of Davenport

Basic Science Research Affirms the Foundations of Chiropractic

A. Introduction

TOOTH DECAY is well established before the first warning signs of pain. Marital difficulties require attention before separation or divorce.

Similarly, according to chiropractic theory and practice, vertebral subluxation may have a significant impact on health before the appearance of pain or other signs and symptoms. For example, loss of movement or stiffness in a spinal joint may lead to associated degenerative changes – changes that can be prevented or even reversed if there is timely treatment to restore movement in the joint, but that may be irreversible before warning signs of pain first appear.

Therefore, as with dental practice, chiropractic practice includes an emphasis on prevention. Patients are encouraged to have periodic check-ups to screen for mechanical changes and fixation in spinal joints and their effects – for the presence of what chiropractors traditionally term subluxation.

2. But is there evidence supporting this theory that the loss of function and fixation can lead to early osteoarthritic changes in joints, changes that later cause pain, then disability and other health problems? Today there is, and it includes:

(a) At a broad level, the many proven structural changes to joints, ligaments, discs, muscles and bones caused by rest in general. A list of these changes, taken from Liebenson[1] appears, in Figure 1. To maintain the musculoskeletal system in good health there must be weight-bearing, movement and exercise. Loss of function leads to loss of structure.

(b) More specifically, there is the evidence of many animal experiments exploring joint function and pathology. Leading research has been the work by Videman et al. in Finland in the 1980s[2]. A primary goal of their research was to see what role, if any, immobilization of joints had in the pathogenesis of osteoarthritis. Using rabbits with knee joints splinted and immobilized in extension, Videman et al. reported irreversible joint degeneration and osteoarthritic changes after only two weeks of complete immobilization.

(c) Even more specifically – and the main subject for this article – there is compelling new evidence from ongoing animal experiments by a chiropractic research team from the Palmer College of Chiropractic, Davenport, Iowa and the National University of Health Sciences, Chicago, assisted by bioengineering experts from the University of Iowa. Charles Henderson, DC PhD of Palmer and Gregory Cramer, DC PhD of National and their colleagues, in sophisticated new studies made possible by the multimillion dollar grants of public research funds now finally available for chiropractic research, are exploring spinal joint function and pathology using white rats.

Early results, first presented at a scientific meeting in Las Vegas in March and soon to be published in two papers submitted to the *Journal of Manipulative and Physiological Therapeutics (JMPT)*, demonstrate cumulative and major degenerative joint changes over a period of 16 weeks of joint immobilization, with first degenerative changes apparent from week 1. Within 12 weeks joints were completely fused and immobilized. Illustrations, reproduced in this issue of *The Chiropractic Report*, are dramatic.

These new experiments, specifically designed to test the chiropractic model of subluxation and its effects, involve immobilization of the lumbar vertebrae of white rats for varying periods of time using surgically attached metal tags.

3. We now look more closely at the evidence – firstly from at Videman et al., medical basic science researchers in

Figure 1. The Negative Effects of Immobilization

Joints
Shrinks joint capsules
Increases compressive loading
Leads to joint contracture
Increases synthesis rate of glycosaminoglycans
Increase in periarticular fibrosis
Irreversible changes after 8 weeks immobilization

Ligament
Lowers failure or yield point
Decreased thickness of collagen fibers

Disk biochemistry
Decreases oxygen
Decreases glucose
Decreases sulfate
Increases lactate concentration
Decreases proteoglycan content

Bone
Decreases bone density
Eburnation

Muscle
Decreased thickening of collagen fibers
Decreased oxidative potential
Decreased muscle mass
Decreased sarcomeres
Decreased cross-sectional area
Decreased mitochondrial content
Increased mitochondrial content
Increased connective tissue fibrosis
Type 1 muscle atrophy
Type 2 muscle atrophy
20% loss of muscle strength per week

Cardiopulmonary
Increased maximal heart rate
Decreased VO, max
Decreased plasma volume

From Liebenson C, Rehabilitation of the Spine: A Practitioner's Manual, Williams and Wilkins, 1996. The author gives references for each negative effect.

Europe, and secondly from Henderson, Cramer, et al. chiropractic basic science researchers from the USA.

B. Rabbits and Knee Joints

4. The work of Videman and his colleagues from the Institute of Occupational Health, Helsinki, was designed to examine the relationship of joint immobilization and osteoarthritis in human beings. Animal studies, used as the starting point in much basic science research into the causes of human pathology and disease, are agreed to be excellent in this area. Equivalent human experiments would take many years to complete and inevitably would be more subjective and less valid.

In a 10 year series of studies, these Finnish researchers used rabbits, splinting and immobilizing their knee joints in an extended position. These results are reported[2]:

(a) "An early, and the most obvious, change is reduction in mobility". Initially lost mobility is "at least partially reversible". However after two weeks some range of movement is lost permanently.

(b) The level of compression between opposed areas of cartilage in the joint "increases sharply during the first week" to 200% above normal compression. It stays at that level for the following four weeks before beginning to decline.

(c) Effects related to this include:

(i) Increased blood supply to the cartilage (measurable after 1 day).

(ii) Increased formation of collagen (seen after 3 days) and glycosaminoglycan (seen after 7 days) in joint tissues.

(iii) Increased periarticular fibrosis.

(iv) Cartilage proliferation on the joint surfaces.

(v) Fibrillation (degenerative softening and formation of clefts) and atrophy of joint cartilage.

(vi) After 2 weeks of immobilization, there are first signs of eburnation in the subchondrial bone - that is exposure, wearing and hardening of bone because of extended fragmentation of the protective layers of cartilage in the joint.

"Such changes are not reversible (and) are identifiable radiologically as narrowing of the joint space, osteophyte formation and subchondral sclerosis".

(d) The loss of joint mobility and these osteoarthritic changes can be produced either by a single period of immobilization (two weeks or more) or repeated short periods of immobilization (several days each).

(i) When the knee is immobilized "the range of motion at the hip is necessarily restricted" also. Accordingly secondary loss of mobility and degeneration was measured and found by Videman et al. at the hip - including glycosaminoglycan synthesis and capsular thickening.

(e) Follow-up was equally interesting. Videman induced osteoarthritis from knee immobilization in one group of rabbits for 5 weeks, then removed the splints. Over the next 18 months some were released to "normal cage activity", others forced to take up jogging on a treadmill (3 times 5 days per week – about 2,250 meters weekly).

During this follow-up "radiographically there was no clear increase in the level of osteoarthritis" for either group of rabbits. Two points of obvious significance here are:

(i) Degeneration occurred during rest of the joint, but was largely arrested by resumption of normal activity.

(ii) Normal activity (normal lifestyle) was just as healthy for the joint as a specific exercise regime.

5. In his review of this line of research, Videman concludes that "immobilization, for whatever reason, is one of the pathogenetic factors in musculoskeletal degeneration" and that his research

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Figure 2. Schematic presenting the role of immobilization in the pathogenetic chain of osteoarthritis.
From Videman T (1987)

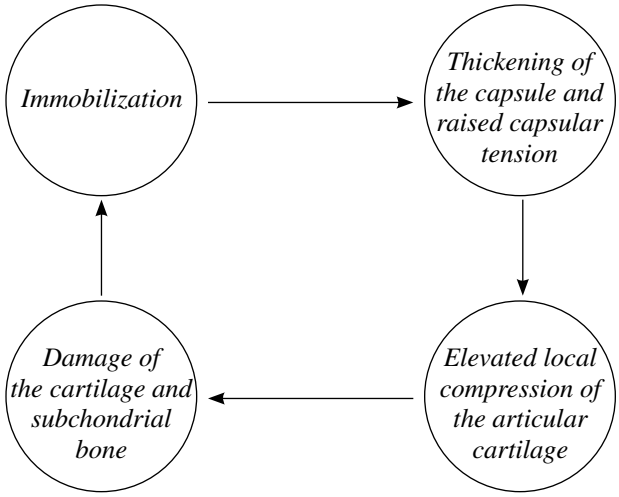
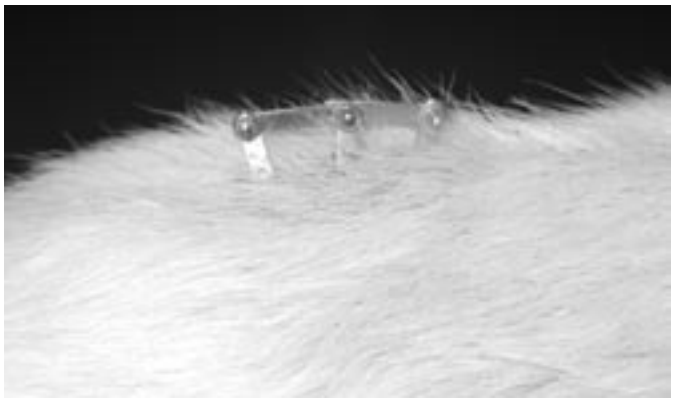


Figure 3. White rat with tags (Spinal Attachment Units) attached to the spinous processes of L4, L5 and L6, and linked so that the vertebrae are fixed in flexion.
Courtesy of Henderson and Cramer



team's evidence "shows beyond reasonable doubt that immobilization is not only a cause of osteoarthritis but that it delays the healing process".

He illustrates his conclusions in the simple diagram seen in Figure 2.

C. White Rats and Lumbar Spine Joints

6. It is truly fitting, scientifically and historically, that the two oldest and traditionally most competitive chiropractic colleges in the world – Palmer and National – should be working as partners in developing a sophisticated new animal model to further study the fundamental principles of chiropractic. Lead investigators are Associate Professor Charles Henderson at Palmer, and Professor Gregory Cramer, Dean of Research at National, principal author of the much-admired text B*asic And Clinical Anatomy Of The Spine, Spinal Cord And ANS.*

Initial work to develop this model was funded by the Foundation for Chiropractic Education and Research (FCER). Continuing funding comes not only from FCER and other sources within the profession, but also grants of over $3 million from the US National Institutes of Health for this and related projects.

In this model the effects of experimentally induced subluxation are being investigated in a population of white rats housed at Palmer College as follows:

(a) Light metal tags (technically 'spinal attachment units') are surgically attached to the spinous processes of the lumbar vertebrae, including the three lumbar vertebrae L4 to L6 that are subsequently immobilized in some of the rats.

(b) These tags, while unconnected, cause no restriction of movement in the lumbar vertebrae during normal activities. However the tags may be connected by metal crossbars (yokes or links) causing fixation or immobilization of the joints between the linked vertebrae. Depending upon the length of the links, vertebrae can be immobilized with the spine in neutral position or flexion or extension. Figure 3 shows the back of a rat with linked tags immobilizing the L4-L6 vertebrae in flexion.

(c) The links, however, can be added or removed at any time, allowing the following subjects to be studied:

(i) The degenerative changes that take place over time in joints that are immobilized. Periods of immobilization used so far range from one week to 16 weeks.

(ii) The loss of movement in joints that have been immobilized for a given period of time.

(iii) The degree of spontaneous recovery of movement that is possible after different periods of immobilization or fixation.

(iv) All of the above matters not only with respect to the immobilized joints but also the joints adjacent to them, which, according to chiropractic theory, should be forced into increased range of motion or hypermobility.

(d) There are three kinds of control rats –those having no surgery, those having surgery but no tags affixed to their vertebrae, those having tags but never having them linked.

The model for human subluxation is not so much the time during which the vertebrae are linked and immobilized as the time afterwards when they are unlinked but stiff and with limited movement.

7. What has been discovered so far? These are the exciting results reported by Cramer and Henderson at the ACC – RAC 2004 meeting in Las Vegas on March 11-14. (For the last 9 years the principal annual research meeting for the chiropractic profession in North America has been the Research Agenda Conference, hosted by the Palmer Center for Chiropractic Research and with Dr. Bill Meeker as Program Director. Since 2001 this has been combined with the annual meeting of the Association of Chiropractic Colleges, has been sponsored and funded by the ACC and the US Federal Government (Health Resources and Services Administration, Bureau of Health Professions) and is now known as the ACC-RAC meeting).

(a) **Biomechanical Effects**. Following any period of linkage and immobilization the spinal joints are more stiff (hypomobile) when the links are removed; the longer the vertebrae are

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Back Pain – Is 'Good Medical Care' Enough?

continued from page 1

Sopanki et al. from Finland contradicts that argument. It reports that chronic low-back patients who received "good medical care" but also manipulation and exercise, did significantly better at 5 and 12 months follow-up than those patients who received "good medical care" only. Points are:

Subjects: Subjects were 204 patients with non-specific chronic low-back pain age 24-46 and with significant levels of disability (at least 16% disability on the Oswestry Questionnaire – and 29% on average). Patients with sciatica were included. This was a truly chronic population – average period with back pain was 8 years.

Interventions: Subjects were randomized into two groups of 102 each:

i) *The Physician consultation group*. These patients received a 25-page educational booklet on the spine, exercise, ergonomics and how to cope with low-back pain. They were motivated to keep active and "the main principle was to encourage the patients to treat themselves instead of undergoing passive treatments." They had two 60 minute consultations – one at the beginning of the trial and a second at follow-up five months later.

ii) *The Manipulative treatment group*. They received the same booklet and advice but in addition four 60 minute sessions over four weeks of manipulation (muscle-energy techniques to correct joint dysfunction) and isometric stabilizing exercises (for deep abdominal and lumbar multifidus muscles "to correct lumbopelvic rhythm") given by "an experienced manual therapist."

Outcome measures. Primary outcome measures were pain intensity (VAS) and frequency, and level of self-rated disability (Oswestry Questionnaire). Secondary outcome measures included degree of mental depression, health-related quality of life, days on sick leave and direct and indirect costs. Results of outcomes were measured at 5 and 12 months after commencement of the trial.

Results. There was improvement in both groups on all primary outcome measures, but the manipulative treatment group did significantly better than the physician consultation group in both reduction of pain intensity and reduction of disability.

(Niemistö L, Lahtinen-Suopanki T et al. (2003*) A Randomized Trial of Combined Manipulation, Stabilizing Exercises, and Physician Consultation Compared to Physician Consultation Alone for Chronic Low Back-Pain.* Spine 28(19):2185-2191.)

Bone and Joint Decade 2000-2010 Gains Momentum

www.boneandjointdecade.org

The Bone and Joint Decade 2000-2010 (BJD) is gaining serious international momentum and has major professional significance for chiropractors. Biggest chiropractic involvement to date is through the BJD Task Force on Neck Pain and Related Disorders, an international multidisciplinary task force led by Dr. Scott Haldeman as President and Dr. David Cassidy as Scientific Secretary. For details of this Task Force, which is halfway through its six year program of literature review and original research and will report in 2006, see www.nptf.ualberta.ca.

The BJD began with key medical leaders in orthopedics and rheumatology deciding to wake up the medical profession, the public and the world to:

- The size/burden of musculoskeletal disorders in all countries, specifically including spinal disorders and back pain.
- The very limited education of MDs in this area – an international task force has now been established to try to correct this problem.
- The inappropriate lack of research and research funds for musculoskeletal disorders.

Early leaders were the BJD Chair, Dr. Lars Lidgren, Professor of Orthopaedics, University Hospital, Lund, Sweden and Dr. George Ehrlich, Adjunct Professor of Rheumatology, University of Pennsylvania, Philadelphia. The BJD now has national coordinators in 88 countries, widespread support from national governments and professional and scientific organizations, and is endorsed by the United Nations, the World Health Organization (WHO) and the World Bank.

Last September the WHO's monthly journal, *The WHO Bulletin,* was devoted to the BJD. The full text is available online at www.who.int/bulletin. Key articles of interest are:

- a) The main editorial, by Lidgren. This gives a concise overview of the BJD and its goals. Quotable comments include:
- "Musculoskeletal disorders are the most common cause of severe long-term pain and physical disability"
- "Joint diseases account for more than half of all chronic conditions in persons aged 60 years and over".
- "Back pain is the second leading cause of sick leave".
- b) An article titled *Low-Back Pain* by Ehrlich. Comments from this, which will be widely read and includes references to chiropractic, are:
- "Non-specific back pain is a major problem for diagnosis and treatment".
- "Treatment for chronic back pain remains notoriously difficult . . . drug therapy is rarely of material benefit . . . often surgery is offered as an ultimately desperate last measure, but almost always it is unjustifiable and usually fails to provide permanent relief."
- People with low-back pain frequently use alternative approaches "some of which are clearly more popular and even seemingly more effective than others (e.g. chiropractic and other manipulative treatments . . .").
- "The spread of chiropractic and other manipulative treatments worldwide has won many adherents to this treatment who perceive that it works better than others . . . although meta-analysis cannot confirm the superiority of manipulative treatments . . . over other forms of therapy" and "in most instances manipulative treatments are more expensive than others (apart from surgery) and not more helpful to outcome."

• "Disc herniation and spinal canal narrowing are so common as to be shown by imaging in most of the population in their later years, and in most cases, such conditions are not responsible for the pain. They often are cited as reasons for surgery, but only rarely are operations successful in alleviating the pain definitively."

c) An article by Akesson, from Sweden, Dreinhöfer, from Germany, and Woolf, from England, titled *Improved Education in Musculoskeletal Conditions is Necessary for all Doctors*. With data on medical education in Australia, Canada, the UK, the USA, Latin America, South Africa and Asian/Pacific countries, though interestingly omitting the studies by Freedman and Bernstein in the US and Vlahos, Broadhurst et al. in Australia, showing medical interns failing basic competency examinations in musculoskeletal medicine (see *The Chiropractic Report,* September 2002*)*, they confirm that medical education has "very few hours on the musculoskeletal system, both in basic science and in clinical training" and that students graduate "without being able to make a general assessment of the musculoskeletal system."

These three are on a BJD Task Force that has developed recommendations applicable worldwide "for a curriculum with emphasis on basic skills and basic knowledge that should be mandatory for all doctors regardless of their future specialty." Their paper in the WHO Bulletin will be of particular value to chiropractors faced with a third party payor decision to use medical doctors as gatekeepers for musculoskeletal disorders. It provides compelling evidence that they do not have the training or ability.

Several national chiropractic association are already active in the BJD. Under its structure activities in each country are developed by a National Action Network. The leader in each country is not given at the BJD website, but these leaders and their email contacts may be found at www.wfc.org (click on Newsroom and scroll to the item titled BJD 2000-2010.

The Chiropractic World – Notes on Education

1. **USA – Florida State University**. In the future, March 12, 2004 may be recognized as one of the most significant dates in chiropractic history. On that day Governor Jeb Bush of Florida signed the budget that confirmed funding and approval for the first publicly funded chiropractic school in the US – at Florida State University in the state's capital, Tallahassee. This hard-fought victory will inevitably lead to future state university programs, greatly increasing public funding for chiropractic education and research and broadening the base of acceptance of the profession.

Most credit for this achievement belongs to the Florida Chiropractic Association, led on this project by Dr. Ed Williams and Dr. Dennis Jones. Development of the curriculum and faculty at FSU, which will enrol its first chiropractic students next year, is in the hands of Dr. Alan Adams.

2. **New Zealand – The 100th Graduate.** The NZ College of Chiropractic in Auckland, with Dr. Brian Kelly as President, is small but now well-established and supported by a consortium of US colleges – Palmer University, Life West and Cleveland. This year it has produced its 100th graduate. Currently most of New Zealand's 350 chiropractors are from the US or Australia – in time that will now change.

3. **Japan – Identifying and Solving the Problem**. The only accredited chiropractic school in Japan is the RMIT Japan Unit in Tokyo, affiliated with RMIT University in Melbourne, Australia, and there has never been reliable information on the estimated 30-50 unaccredited Japanese schools of widely varying standards. Such schools are possible because the practice of chiropractic remains unregulated in Japan.

In a research project sponsored by the World Federation of Chiropractic, the Association of Chiropractic College and the US National Board of Chiropractic Examiners, Dr. Toshihiro Ishii of Seirei Christopher College, is currently undertaking the first comprehensive survey of Japanese colleges. Meantime Murdoch University in Perth, Western Australia, which has Australia's third and newest chiropractic school, is the latest of several accredited colleges partnering with Japanese schools in the ongoing effort to upgrade chiropractic education in Japan, where an estimated 10,000 practitioners practice as chiropractors.

4. **Europe – Remains a Mixed Bag**. There are accredited schools in Denmark, France and the UK (two), unaccredited schools in Germany, Sweden and the UK, and active steps to commence new schools in several countries including Italy, the Netherlands, Spain and Switzerland.

5. **Latin America – Catching Up.** Seven years ago there was no formal chiropractic education in Latin America. Today there are two schools in Brazil and one in Mexico, all five-year university-based programs, affiliated with accredited chiropractic colleges in the US. Argentina and Chile stand next in line. This year approximately 75 kinesiologists from Chile (55) and Argentina (20) who have completed a postgraduate chiropractic program jointly administered by the Southern California University of Health Sciences, Los Angeles, and the Anglo-European College of Chiropractic in the UK, will graduate. This will accelerate current plans to commence five year fulltime programs in universities in both countries.

6. **WFC/ACC Education Conference – Toronto, October 13-16, 2004**. As chiropractic education expands worldwide, will graduates have a similar core curriculum and belong to the same separate and distinct chiropractic profession? Will there be a similar and identifiable chiropractic approach to patient assessment and management? These matters are already issues for the profession even where it is established.

The World Federation of Chiropractic and the Association of Chiropractic Colleges have an important meeting in Toronto this year which examines these issues in the specific field of patient examination, assessment and diagnosis. For all details, including program and registration, visit www.wfc.org (click on Events) or contact WFC Manager, Professional Relations, Dr. Eleanor White at education@wfc.org.

Figure 4.

Figure 4A and 4B shows the external surfaces of two L5 z-joint articular processes. Figure 4A is from an 8-week control animal and Figure 4B is from an 8-week fixation animal. The large white arrows in Figure 4A point to the smooth cephalad edge of the articular process showing no signs of osteophyte formation. The arrowheads in Figure 4B outline a large osteophyte.

Figures 4C and 4D show the internal surfaces of two L5 z-joint cephalad articular processes. These figures demonstrate articular cartilage degeneration. Figure 4C is from a 1-week control animal and Figure 4D is from a 4-week fixation animal. Note that the control animal's hyaline articular (H) cartilage is quite smooth (Fig. 4C) while the 4-week fixation animal's articular surface has marked roughening, pitting, and remodelling (Fig. 4D). The arrows in Figure 4D point to deep pits within the z-joint articular cartilage and subchondrial bone. The remodelling is so marked in Figure 4D that the ventral portion of the articular process, in lower half of the figure, is out of the plane of focus. In addition, the subchondrial bone (S) is exposed on the dorsal portion of the articular process where the hyaline articular cartilage has eroded.

Reprinted from JMPT *with permission from Elsevier, and courtesy of Henderson and Cramer*

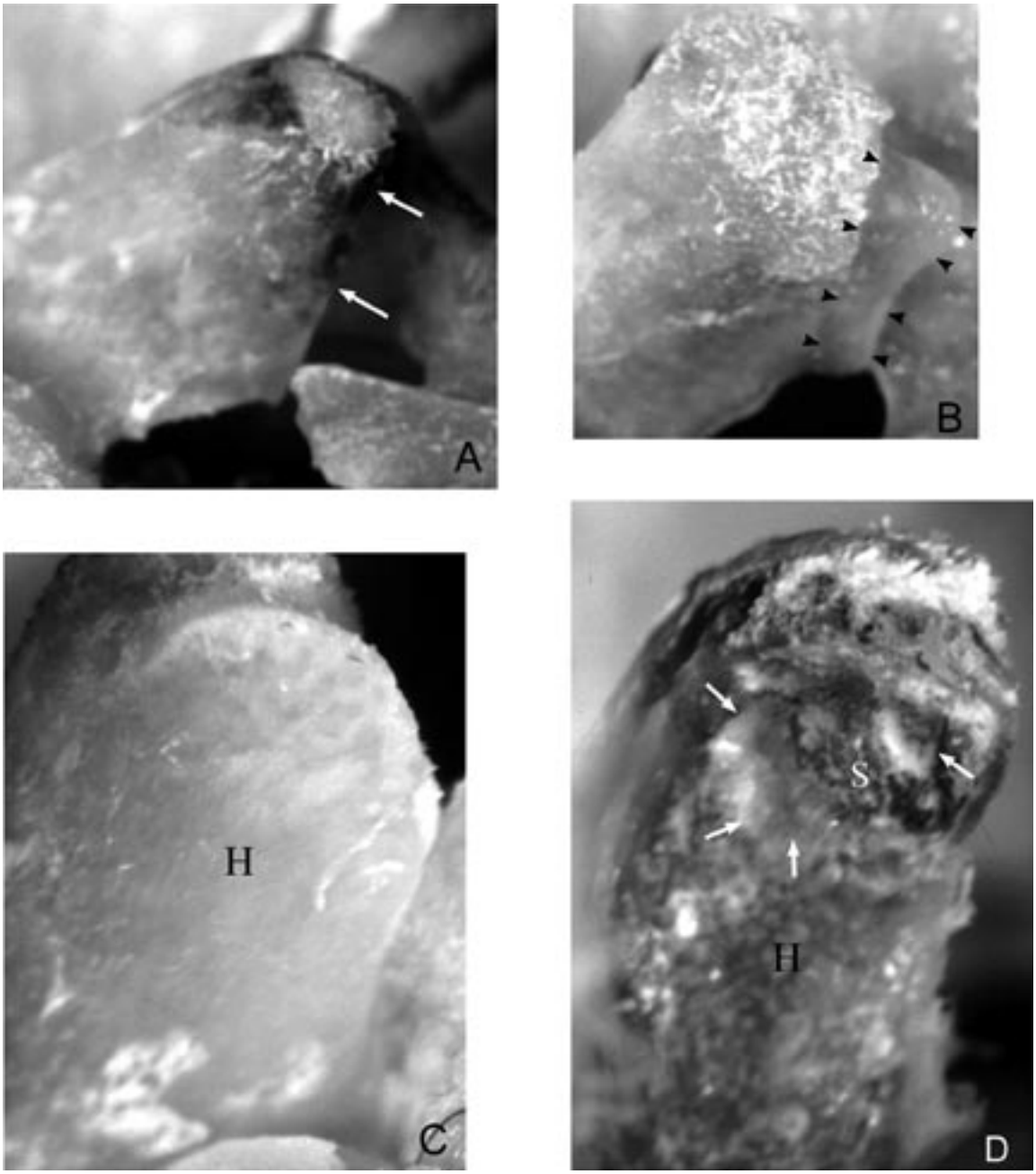
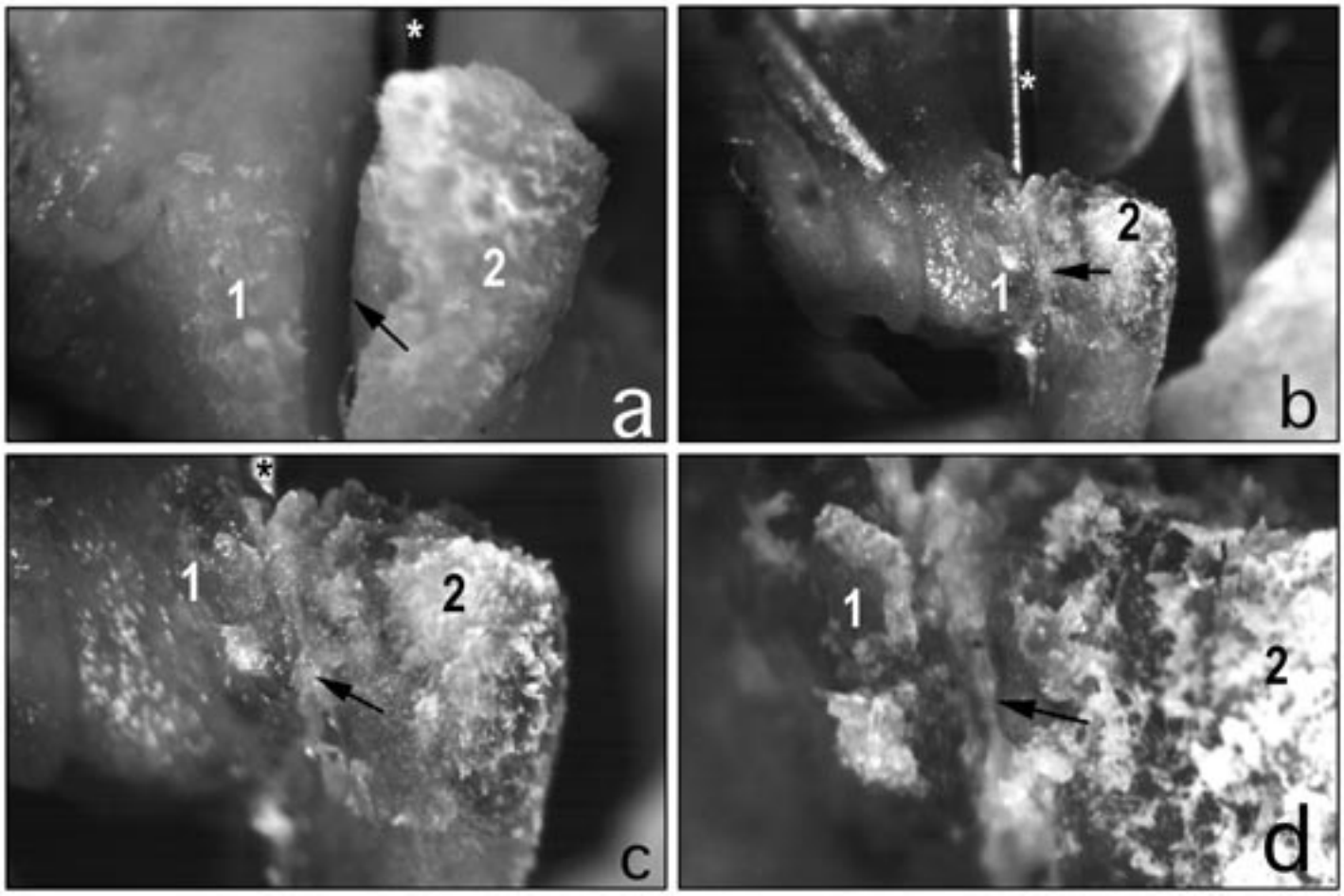


Figure 5.

Figure 5a shows a control z-joint that, after the joint capsule was removed, was easily gapped by passing a small probe (*) approximately ¼ of the way into the joint. The black arrow points to the opened joint space. The numbers 1 and 2 mark the caudad and cephalad articular processes respectively.

Figure 5b, c and d presents progressively larger magnifications of a z-joint from a rat that had been experimentally fixed for 12-weeks. The joint did not gap despite the inserted probe (*) being passed completely through the joint (joint capsule was removed). The black arrow points to intra-articular adhesions preventing gapping of the joint. The numbers 1 and 2 mark the caudad and cephalad articular processes respectively.

Courtesy of Henderson and Cramer



linked the more hypomobile the joints become; and after several weeks, confirms Dr. Henderson, "after the links are removed the stiff joints continue to get stiffer."

Furthermore, as postulated in chiropractic theory, the joints adjacent to those that are immobilized compensate with increased motion, becoming hypermobile.

(b) **Degenerative Effects**. As in the earlier experimental work by Videman et al., joint or articular surface degeneration begins within one week of fixation, with early osteophyte formation visible after one week. Figure 4 illustrates cartilage degeneration in a lumbar facet joint (also called a zygapophyseal or z-joint) after four weeks of fixation, and compares this with a control animal with no fixation and normal healthy joint cartilage.

Figure 5 illustrates advanced z-joint degeneration from a rat experimentally fixated for 12 weeks. The joint is now completely fused and immobile, unable to be moved by a metal probe passed right through the joint.

(c) **Spontaneous Ability to Restore Joint Motion and Reverse Degenerative Changes.** The research indicates that there is a window of opportunity within the first four weeks. "If an animal has fixation for four weeks and is then unfixed for several weeks, there is a trend towards improvement", says Dr. Cramer. Bone changes come after joint surface deterioration and, "if early bone changes have just begun, it is still possible to reverse degenerative change."

8. All of the above findings offer exciting support for chiropractic theory. But is the timeframe for degeneration similar for human spinal joints? This is not clear. There are two possibilities. On one hand it may be, on the other hand if degeneration is linked to overall aging it may not be.

Rats walk on four legs. Is there a different relationship between spinal joint fixation, biomechanical effects and degeneration for quadrupeds than for bipeds? It is likely that the answer is yes. It is known, for example, that biped rats develop disc herniations while quadruped rats do not, and Dr. Henderson explains that "the degenerative changes in biped

rats are much closer to the changes found in humans than those seen in quadruped rats."

For this reason the current phase of the research includes repeating all the above-mentioned quadruped rats studies with bipedal rats. (Readers will be comforted to know that rats, which formerly had forelegs surgically removed in bipedal studies, can now be rendered bipedal through behavioral techniques – this is the approach being used).

9. If joint hypomobility in these white rats produces the kind of joint degenerative changes chiropractors have thought happen in humans, can timely and appropriate treatment reverse these changes and their biomechanical and physiological effects on health? This multiyear project has the goal of answering that question also, using two treatment approaches:

(a) Low-velocity, variable-amplitude, flexion/distraction treatment assisted by a rat-sized, motorized, flexion/distraction table. This has already been developed with funding from National and Dr. James Cox, the founder of Cox Flexion/Distraction Tables.

(b) High-velocity, low-amplitude treatment.

The force localizer to be used in these experiments has recently been built by the Faculty of Bioengineering at the University of Iowa. The miniature flexion/distraction table was first developed, however, to provide reliable measurement of ranges of joint motion in this research project, which is achieved as follows:

(i) The metal tags that protrude like fingers from the vertebrae have infrared markers.

(ii) When the links between the tags are removed the anesthetized rat is placed on the motorized flexion/distraction table which moves through various degrees of flexion or extension.

An 'Optotrak System', comprising an infrared camera and monitors, demonstrates the range and speed of movement of the tags/vertebrae to within a tenth of a millimetre.

"With a consistent and very repeatable set of measurements", says Dr. Henderson, "we have demonstrated hypomobility (in the previously fixed joints) with adjacent areas of hypermobility."

D. Conclusion

10. We must await publication of the papers submitted to JMPT – the first due for publication in this month's issue – for more complete details of this new animal experiment model and the results of the early investigations. These investigations, and therefore this article, have focused on the biomechanical and degenerative effects of restricted joint movement.

Ultimately, however, the researchers plan to use their subluxation model and population of rats to investigate many biological (e.g. production of neuropeptides, spinal cord degeneration) and behavioral aspects of chiropractic theory. Their basic science studies offer a line of research that is vital and impressive, but also slow and unglamorous – it will require a generation of work.

Fortunately, both Henderson and Cramer, two of the brightest young basic science researchers in the profession, are in mid-career – we will have them, the white rats of Davenport, and a new level of investigation of subluxation theory with us for many years to come.

11. What can clinicians take from all of this? Fundamental messages are that loss of movement in a joint soon leads to significant degeneration, that this may happen prior to experience of pain or other symptoms, and that timely restoration of movement to the joint prevents and may even repair degenerative changes. It can now be said that there is strong evidence from animal experiments on these matters.

This evidence, in turn supports in principle the value of preventive chiropractic care directed at assessing and correcting joint subluxation/dysfunction and its effects on the neuromusculoskeletal system and health prior to the development of pain and other symptoms. Here, as in so many other areas of health, it is wiser to focus on the cause of the problem rather than the symptoms. TCR

Acknowledgements

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