

## Low back pain: development and five-year prospective application of a computerized quality-based diagnostic and treatment protocol

Weisel SW, Feffer HL, Rothman RH.  
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A standardized protocol for low back pain was developed and computerized so that it could be used as a concurrent monitoring system for large patient populations. The software incorporated a relational database management system (RDBMS) and C language, a flexible, general-purpose programming language that is fast and portable. The protocol was then applied to a uniform group of industrial patients and portable. The protocol was then applied to a uniform group of industrial patients for 5 years. The results demonstrated that a quality-based protocol could be successfully computerized and applied to a large group of patients as a concurrent monitoring system. Quality care was insured by adherence to the computerized protocol. Associated economic results showed decreases in actual number of accidents each year (from 98/year prior to the study to 42/year in the last study year), in lost work days (from 3640/year before the study to 2118/year in the last year), and in costs (savings averaged \$430,000/year). The goal of this study was to provide quality medicine; the economic benefits were a bonus. The monitoring system differed from those of the past in that it was driven by the basic medical information taken from the history, physical examination, and radiograph findings. The monitoring physicians were unbiased because they were not allowed to become involved in the patient's ongoing care. There was no rebound phenomenon (an initial drop in cases followed by a gradual return to the prestudy level); this was attributed to the constant monitoring of each case from beginning to end. These results led to the following conclusions: (a) Computerization of a standardized medical approach for low back pain is practical. (b) A computerized protocol can be employed as a concurrent monitoring system to achieve consistent care. (c) The emphasis should be on quality medicine, which, in turn, will lead to cost savings.

**KEY WORDS:** low back pain, relational database management system, protocol.

## Radiology of posterior lumbar apophyseal ring fractures: report of 13 cases

Dietemann JL, Runge M, Badoz A, Dosch JC, Beaujeux R, Bonneville JF, Wackenheim A. Neuroradiology 1988; 30:337-344

The authors report radiological findings in 13 cases of avulsion of the posterior lumbar apophyseal ring. The lesion affected young adults in 10 cases and adolescent in 3 cases. The lesion involved the inferior endplate of L4 in 11, and of L5 in 1 patient, and of L3 in 1 patient. 6 patients presented with unilateral sciatica, 3 with bilateral sciatica, and 4 with low back pain. Acute spinal trauma was evident only in 2 adolescents. Radiological recognition of the lesion was possible on plain films in 9 cases. CT demonstrates association of avulsion of the posterior vertebral apophyseal ring and herniated disc in all cases. Avulsion of the posterior apophyseal ring has to be differentiated from posterior longitudinal ligament, annulus, or herniated disc calcifica-

tions, as well as from posterior degenerative ridge osteophytes. Controversy about physiopathology of the lesion remains: weakness of the apophyseal ring during childhood and in patients with Scheuermann's disease may explain avulsion of the apophyseal ring in association with median disc herniation.

**KEY WORDS:** spine, apophyseal ring, intervertebral disc, herniation, trauma, Scheuermann's disease, computed tomography.

## Lumbar disc herniations: the predictive value of the Health Attribution Test (HAT) and the Minnesota Multiphasic Personality Inventory (MMPI)

Herron LD, Turner JA, Weiner P. J Spinal Disorders 1988; 1(1):2-8

Ninety-one patients who were treated for lumbar disc herniation with chymopapain chemonucleolysis were evaluated preoperatively by means of the Health Attribution Test (HAT) and the Minnesota Multiphasic Personality Inventory (MMPI). There were 54 good, 10 fair, and 27 poor results after chemonucleolysis. Nineteen patients subsequently underwent lumbar laminectomy and discectomy and the ultimate outcome for the entire series including these laminectomy patients was 66 good, 10 fair, and 15 poor results. The fair/poor chemonucleolysis outcome patients scored significantly lower than did the good outcome patients on the HAT Powerful Others and significantly higher on the Chance scale. Patients with fair or poor outcomes after chemonucleolysis only scored significantly higher on the Hypochondriasis, Hysteria, Psychopathic Deviate, Paranoia, and Hypomania scales in preoperative MMPI testing. Good versus fair/poor ultimate outcome patients differed significantly on preoperative MMPI Hypochondriasis, Hysteria, Psychopathic Deviate, Paranoia, Psychasthenia, Schizophrenia, Hypomania, and Social Introversion scales. These groups also differed significantly on preoperative HAT Internal and Chance scales. Further analyses found the MMPI to be a slightly better predictor of chemonucleolysis outcome and much better predictor of ultimate outcome than the HAT.

**KEY WORDS:** chemonucleolysis, MMPI, Health Attribution Test.

## Chemonucleolysis versus surgery in lumbar disc herniations: correlation of the results to preoperative clinical pattern and size of the herniation

Postacchini F, Lami R, Massobrio M. Spine 1987; 12(2):87-96.

A prospective study was carried out on the results of chemonucleolysis of surgery in 156 patients who had lumbar disc herniations. All patients were considered as potentially good candidates for chemonucleolysis. Seventy-two received a chymopapain injection and 84 underwent surgery. Based on a computerized tomography (CT) scan and/or myelography the herniations were distinguished as small, medium and large. Also distinguished were three types of preoperative clinical patterns, Types A, Type B and Type C, corresponding to slight, moderate, and severe nerve root compression, respectively. Follow-up evaluations were made 1 month, 3 months, and an average of 2.8 years after treatment. The patients with a small disc herniation, who underwent



chemonucleolysis, did slightly better as a group than those treated surgically. At 1 month, the proportions of satisfactory results were 75% in the chemonucleolysis group and 62% in the surgery series. At final follow-up, the proportions were 84% and 82%, respectively but the ratio of excellent-to-good results was higher in the chemonucleolysis group. In the latter, most patients with satisfactory outcomes has a Type A or Type B clinical pattern. In medium-size herniations the results of surgery were slightly better than those of chemonucleolysis. At 1 month, 55% of patients in the chemonucleolysis group had satisfactory results compared with 74% of those in the surgery series; at final follow-up the proportions were, respectively, 76% and 86%. In the chemonucleolysis group most satisfactory outcomes were found in patients with a Type A or Type B clinical pattern. The results of chemonucleolysis in patients who had large herniation were significantly inferior to those of surgery: at final follow-up the results were satisfactory in 50% of patients in the chemonucleolysis group and 89% of those in the surgery series. Chemonucleolysis appears to be the treatment of choice in most patients with small disc herniations and an effective alternative to surgery in most patients with medium-size herniations when the preoperative clinical pattern indicates a slight or moderate nerve root compression. In all large herniations and in small- or medium-size herniations causing a severe nerve root impingement, surgery should be preferred to chemonucleolysis.

**KEY WORDS:** chemonucleolysis, surgery, lumbar disc herniations, results.

### **Chiropractic residency at Lindell Hospital: a program description**

Carmichael JP. *JMPT* 1988; 11(3):177-180.

Chiropractors have been excluded from postgraduate training in medical hospitals since the time such programs were mandated following World War II. Recently, a chiropractic residency program has been established at Lindell Hospital in St. Louis, Missouri. This paper briefly describes the development of this program and the functions carried out by the chiropractic resident on the hospital environment. It then attempts to define a future direction for such residency programs.

**KEY WORDS:** chiropractic, family practice, medical staff privileges.

### **Biomechanical analysis by chiropractic radiography: Part I. A simple method of determining X-ray projectional distortion**

Zengel F, Davis B. *JMPT* 1988; 11(4):273-280.

Projectional distortion is known to produce artifactual disrelationships between the images of osseous segments on X-ray film. Apparatus and methods were developed to measure the effect of projectional distortion on a human third lumbar vertebra. The procedures for mathematical analysis of such distortion are outlined, and the results of studies to determine the accuracy of the procedure are presented.

**KEY WORDS:** chiropractic, radiography, biomechanics.

### **Clinical assessment and treatment of leg length inequalities**

Danbert RJ. *JMPT* 1988; 11(4):290-295.

Controversy persists regarding the significance of leg length inequality, the diagnostic approach to the use of heel lifts, and the implementation of proper orthopedic support in treatment of anatomical leg length inequalities. The purpose of this paper is to review the literature and formulate a sequential examination for a patient with leg length discrepancy, then outline a formula for the treatment of the patient.

The initial problem a practitioner faces in examining a patient with leg length inequality is to determine if a true anatomical leg deficiency exists. Through a series of measurements and pelvic assessments, an effective screening process can be accomplished before radiography (scanogram) is required. An understanding of the mechanics along the kinetic chain, anywhere from the foot to the lumbar spine, coupled with the information gained from radiographs, can provide a treatment plan detailing the size of the lift and location.

**KEY WORDS:** leg length insufficiency, chiropractic, algorithm.

### **The biomechanics of lumbar disc herniation and the effect of overload and instability**

Wilder DG, Pope MH, Frymoyer JW. *J Spinal Disorders* 1988; 1(1): 16-32.

A multipart study has been performed to provide a mechanical explanation for the epidemiologic association between sitting in static (e.g., factory or office) or vibration (e.g., car or truck driving) environments and acute herniated lumbar discs. It was shown that a 1 h exposure to sitting environments caused significant changes in the mechanical properties of the lumbar intervertebral disc. During many of the latter tests, specimens were unstable (exhibited by a sudden, large flexion and/or lateral bend rotation response to an axially applied load). This showed that a motion segment in the lumbar spine could suddenly buckle and apply a tensile impact to the posterolateral region of the disc. We also demonstrated that a combined lateral bend, flexion, and axial rotation vibration loading could cause tracking tears proceeding from the nucleus through the posterolateral region of the annulus. It suggests that a mechanism for disc herniation is mechanical changes leading to instability of the motion segment. These experiments complete the argument that lumbar disc herniation can be a direct mechanical consequence of prolonged sitting in static or vibration environments.

**KEY WORDS:** vibration, sitting, acute herniated lumbar disc, buckling, overload.

### **Back pain: treatment and prevention in a community hospital**

Morrison GEC, Roberts WL, Chase W, Young V. *Arch Phys Med Rehabil* 1988; 69:605-609.

Because back pain is widespread and costly condition that tends to recur, treatment must focus on both the amelioration of acute symptoms



and prevention over the long term. This paper reports a longitudinal evaluation of a program from a community hospital that emphasizes both these aspects. One hundred twenty patients routinely admitted to this program were randomly assigned to treatment and control groups. These groups were assessed for differences in demonstrated physical strength, mobility, body mechanics, and self-care knowledge, and in levels of self-reported exercise, anxiety, and pain. There were significant immediate gains on physical measures of fitness and in observed body mechanics; patients also reported significant gains in physical capabilities at home and in leisure activities. Self-care knowledge also improved. When assessed one year later, original gains in physical strength and mobility were being maintained, and self-reported physical capabilities also remained high. Although demonstrated knowledge of correct body mechanics declined over this period, it was still significantly greater than before the program. In light of these results, we believe that outpatient programs like the one reported here merit careful consideration in an era of concern about rising costs for primary health care.

**KEY WORDS:** back disorders, outpatient programs, prevention.

### **Quantifying the effects of spinal manipulations on gait using patients with low back pain**

Herzog W, Nigg B, Read L. *JMPT* 1988; 11(3):151-157.

The purpose for conducting this study was to investigate the effects of chiropractic treatment on the gait of a group of subjects with sacroiliac joint syndromes. The clinical results suggest that chiropractic treatments reduce pain, increase mobility of the sacroiliac joint, and restore general functional ability of the patient. Force results obtained by using a force platform during gait of the subjects showed that external forces were significantly different for gait trials executed after chiropractic treatment compared to gait trials executed before chiropractic treatment. Force results were also significantly different for gait trials executed early in the rehabilitation process compared to those executed late in the rehabilitation process.

It should now be investigated if and how these changes in external forces influence the internal forces acting on low back structures. Such an investigation may provide further insight into the mechanisms underlying low back problems.

**KEY WORDS:** manipulation, sacroiliac joint syndrome, gait analysis, chiropractic.

### **Correlates of low back pain in a general population sample: a multidisciplinary perspective**

Roncarati A, McMullen W. *JMPT* 1988; 11(3):158-164.

This study identifies correlates of low back pain in a general population sample and defines a profile of subjects with low back pain. A multidisciplinary approach was employed that required surveying and physically assessing 674 subjects on 105 variables in biographical, anatomical, strength and flexibility measurement categories. No attempt was made to select subjects from specific occupational, age, athletic,

psychological and anatomical groups or subjects with specific biographical features, which may have resulted in a sample that was atypical of the general population. The results of this study based on a casual comparative ex post facto research design corroborated selected findings of previous research conducted on nongeneral population samples. These findings include relationships between low back pain and age, body type, sex, stress, smoking, selected types of physical activity, occupational and previous injuries to the neck, shoulders, back and upper legs, as well as previous episodes of low back pain. Additional correlates of low back pain that were identified and have little or controversial review in the back literature include: delayed low back pain syndrome caused by abrupt change in running frequency, Q angle, pes cavus, leg length (right and left), trunk length, genu recurvatum and multiplane strength and flexibility limitations in the hip joints.

**KEY WORDS:** low back pain, chiropractic, clinical study, leg length insufficiency.

### **Effect of lumbar posture on lifting**

Hart D, Stobbe T, Jaraiedi M. *Spine* 1987; 12(2):138-145.

Twenty laborers assumed specific lumbar spine postures and lifted a 157 N crate to three different hand heights to determine if lumbar spine flexion moments or trunk muscle activity were affected by the lifting postures. Lumbar flexion moments were lowest when the workers used the lordotic and straight back postures, while the average erector spinae muscle activity tended to be highest in the lordotic and straight back postures. The kyphotic posture regularly reduced the activity of the erector spinae to bursts of activity while lifting and caused more discomfort during the lifting tasks than any other posture. Therefore, the lumbar lordotic posture is recommended as the posture of choice while lifting, particularly when lifting from the floor level.

**KEY WORDS:** lumbar spine flexion, in vivo tests, postures.

### **Rotator cuff disruption: diagnosis with digital arthrography**

Stiles R, Resnick D, Sartoris D, Andre M. *Radiology* 1988; 168:705-7

Shoulder arthrography is a reliable technique for use in the diagnosis of tears of the rotator cuff, although delineation of the precise site and size of tears requires meticulous double-contrast technique and considerable examiner expertise. The authors initiated a prospective evaluation of digital arthrography of the glenohumeral joint in 28 patients with clinical manifestations suggesting rotator cuff tear because they believed that examination with this technique would allow more accurate definition of the precise status of the cuff. Fifteen patients had normal studies. Ten complete and three partial rotator cuff tears were demonstrated with digital technique, and the precise site of the tear was demonstrated in all of these cases. The results indicate that digital arthrography of the glenohumeral joint may have some advantages over standard arthrography in the delineation of complete and partial tears of the rotator cuff, particularly in defining the exact site of tears.



### Radiological features and diagnosis of acromegaly

Woo C. JMPT 1988; 11(3):206-13.

The most constant radiological features of acromegaly include soft tissue hyperplasia, and increased joint spacing, especially in the limbs by articular cartilage overgrowth. Overgrowth is variable in bone. Despite the closure of the epiphysis, articular endochondral overgrowth and subsequent ossification does occur at specific sites as pseudo-epiphyseal linear growth. The combined bony apposition-remodeling resorption mechanism, rather than a true osteoporosis, may involve the skull, extremities and spine. Radiological features of the spine have scarcely been reported. The clinical significance of hyperostosis of the spinous process for chronic backache, and vertebral scalloping to compensate for entrapment myelopathy and/or cauda equina syndrome or radiculopathy are overlooked. Further series of radiological assessment of the spine by noninvasive CT scans and plain radiography are recommended. The diagnosis of acromegaly is discussed from a literature review. Deep facial skin-crease testing and dorsal skin-fold assessment of the extremities are recommended as initial screens for evidence of soft tissue hyperplasia.

KEY WORDS: acromegaly, radiology, spine, hyperostosis, osteoporosis, diagnosis.

### Cervical spondylitic myelopathies: surgical treatment

Carol MP, Ducker TB. J Spinal Disorders 1988; 1(1):59-65.

The surgical approach to the treatment of cervical spondylitic myelopathy has been a major controversy, both clinically and in the literature. We present here the results of a retrospective analysis of 206 patients treated by the authors over a 7-year period by either a posterior or anterior approach. Our results suggest that if the procedure is tailored to the cause as well as extent of the problem, similarly good results can be obtained by either surgical approach.

KEY WORDS: myelopathy, laminectomy, discectomy, fusion.

### Lumbar instability: a dynamic approach by traction - compression radiography

Friberg O. Spine 1987; 12(2):119-129.

Translatory segmental instability was provoked by successive axial traction and compression of the lumbar spine in 117 patients with a known spondyl- or retro-olisthetic displacement. Lateral spot radiography showed an anteroposterior translatory movement of 5 mm or more in 25 of 45 patients with lytic spondylolisthesis of L5, in all of 7 patients with degenerative spondylolisthesis of L4, and in 37 of 65 patients with a retro-olisthetic displacement of L3, L4, or L5. In cases of spondyl- and retro-olisthetic instability the upper vertebra moved posteriorly during traction and anteriorly during compression. Severity of low-back pain (LBP) symptoms did not show any correlation with the degree of the maximal displacement but correlated significantly with the amount of instability both in the case of spondyl- and retro-

olisthesis. Traction - compression radiography proved a simple and practical method to diagnose and measure translatory segmental instability even when conventional flexion - extension load failed to provoke any abnormal movement (e.g., in the case of spondylolisthesis).

KEY WORDS: low back pain, segmental instability, spondylolysis, spondylolisthesis, retro-olisthesis.

### Design and evaluation of a back injury prevention program within a geriatric hospital

Wood DJ. Spine 1987; 12(2):77-82.

Two phases of a back injury prevention program were studied using 2035 accident reports filed between 1979 and 1984. Phase 1, Personnel Program, was designed to decrease the duration of wage-loss claims by increasing the effectiveness of the existing procedures used to process these claims. This program significantly lowered the proportion of high-hour claims ( $P < .05$ ) and significantly reversed a trend of increasing accident rates ( $P < .05$ ). Phase 2, Back Program, was designed to lower the incidence of back injuries through a feedback-oriented education program. The Back Program itself could not demonstrate a significant reduction in back injuries primarily due to the powerful and confounding effect of the Personnel Program. The combination of the Personnel Program and Back Program significantly lowered back injuries for nurses when compared with a similar group of injuries that occurred at geriatric hospitals ( $P < .001$ ). The large effect of the Personnel Program and the small effect of the Back Program have design implications for any injury prevention program.

KEY WORDS: back injury, prevention, prospective study.

### Electromyographic and skin resistance responses to osteopathic manipulative treatment for low-back pain

Ellestad S, Nagle R, Boesler S, Kilmore M. JAOA 1988; 88(8):991-7.

Previous studies have demonstrated that patients with low-back pain have increases in absolute electromyographic (EMG) activity levels in the lumbar paraspinal muscles during motion. In the present study, EMG, skin resistance, and supine lumbar lordosis measurements in patients with low-back somatic dysfunction were evaluated. The 40 subjects in the study ranged in age from 22 to 36 years. Twenty had low-back pain and 20 were pain-free (controls). In each group, 10 subjects were assigned randomly to receive osteopathic manipulative treatment (OMT), which consisted of high-velocity, low-amplitude techniques for the entire axial skeleton and pelvis. The OMT subjects had measurements taken before and after treatment, while the control group was measured before and after a period of rest. All subjects were re-evaluated seven days later. There were significant decreases in EMG activity during motion and in skin resistance levels in the low-back pain treatment group, as well as a significant decrease in EMG levels in the control OMT group. No significant differences were found in the low-back pain and control nontreatment groups.