Abstracts

Relationship of psoas width to osteoporosis

Pogrund H, Bloom RA, Weinberg H. Acta Orthop Scand 1986; 57, 208-210.

We have related the radiographic width of the psoas muscle to age, degree of osteoporosis, height, and weight, and to constitution in 234 subjects. The psoas width correlated well with age. When the subjects were grouped according to age, an association was observed between narrowing psoas width and increasing osteoporosis. Narrowing of the psoas was evident some years prior to radiographic evidence of osteoporosis.

Effect of exercise on obesity

Garrow JS. Acta Med Scand Suppl 1986; 711:67-73

The changes in fitness and body composition which accompany physical training in people of normal weight would be very valuable in the treatment of obesity. However, one of the most marked disabilities arising from obesity is a reduced exercise tolerance, so severely obese patients are unable to perform the exercise which would bring these benefits. It has been suggested that exercise may confer benefits on the obese person by reducing voluntary food intake, or by causing a prolonged elevation of metabolic rate. There is no good evidence for these claims. Obesity is best treated by a combination of dietary restriction and exercise: the more severe the obesity the more important the diet component of treatment, but exercise becomes more important with the management of mild obesity or the prevention of obesity.

KEY WORDS: obesity treatment, exercise, thermogenesis, calorimetry, body composition, appetite regulation.

Role of muscles in protecting athletes from injury

Radin EL. Acta Med Scand Suppl 1986; 711:143-7

Athletics create impact load which can be deleterious to the musculoskeletal system. These impact loads are attenuated by either deformations of materials external to the body, deformation of tissues, or tearing of tissue and fracture of bone. Muscles act to lower the bending stress on bone and to attenuate the peak dynamic loads from unprotected impulsive loads that can damage musculoskeletal tissues. Athletes should be advised to avoid impulsive loads for which they are unprepared, and to not participate in athletics when their muscles are fatigued.

KEY WORDS: bone fracture, muscle injury, fatigue, stress fracture, impact loading, shock absorption.

Osteoporosis and physical activity

Smith EL, Raab DM. Acta Med Scand Suppl 1986; 711:149-56

Bone involution poses serious health risks for aging women. Bone mass is subject to both local (mechanical) and systemic (hormonal) homeostatic control mechanisms. The local forces acting on bone are due to gravity and muscular contraction. There are several theories concerning the mechanisms of local control. When bent, bone functions as a piezoelectric crystal with calcium accumulation on the negatively charged concave surface. Microfractures that occur in response to stress greater than normal levels stimulate osteoclastic activity to remove the damaged structure. Studies of astronauts and immobilized subjects have consistently found bone atrophy. The degree of bone loss is related to the difference in levels of stress normally applied and those at bedrest in the site studied. Correspondingly, athletes have greater bone mass than the sedentary population, with the greatest hypertrophy found in the areas most stressed. Exercise intervention also promotes bone hypertrophy. Both middle-aged and elderly women increase bone mass or reduce the rate of loss in response to physical activity intervention programs.

KEY WORDS: osteoporosis, exercise, bone mass, age.

The effect of head restraints and seat belts on the incidence of neck injury in car accidents

Olney DB, Marsden AK. Injury 1986; 17:365-367

During a 5-month period a study was made of motor vehicle occupants presenting at an Accident and Emergency department following an accident. Records were made of the incidence of neck injuries in relation to the presence of head restraints and the use of seat belts. There was a slight reduction in injuries when a head restraint was fitted but this difference did not achieve statistical significance. The incidence of neck injury was not increased if a seat belt was worn. It may be that the reason for the failure of head restraints to afford the expected protection is their inappropriate design and lack of adequate adjustability.

Sacroiliac subluxations – facts, fallacies and illusions

Dulhunty JA. J Aust Chiropractors' Assoc 1985; 15:91-9

Critical evaluation of certain clinical procedures used commonly by chiropractors has been attempted. It is suggested that responsibility for establishing the reliability of certain clinical procedures associated with the sacroiliac joints, including x-rays, leg checks and palpation, has been abdicated. It is also demonstrated that the type and amount of movement in the sacroiliac joint described by those promoting these procedures cannot be substantiated scientifically. Many commonly-held concepts involving "subluxations" of the sacroiliac joints can be demonstrated to be ill-founded, unsubstantiated or over-simplified. A mechanical model is presented in an attempt to clarify and allow visualisation of the type and amount of joint mobility.

KEY WORDS: Sacroiliac joint, subluxation, biomechanics, chiropractic.

"Tennis elbow": a manual therapist's perspective

Lee DG. J Ortho Sports Phys Ther 1986; 8:134-42

Ever since the turn of this century the pathogenetic mechanism of "tennis elbow" has been a controversial issue. The following article briefly describes the varying opinions and then proposes a working

hypothesis to explain the unpredictable presentation of lateral forearm pain. The articular mechanics of the elbow joint are described in detail followed by a discussion of intrinsic and extrinsic factors pertinent to tennis elbow. The intent is to logically present a multifactorial syndrome, such as tennis elbow, from the perspective of manual therapy which incorporates a global evaluation of the clinical picture.

Reliability of a noninvasive method for measuring the lumbar curve

Hart DL, Rose SJ. J Ortho Sports Phys Ther 1986; 8:180-4

The purposes of this paper were to describe a clinically useful and noninvasive method of characterizing the shape of the lumbar spine and to evaluate the reliability and validity of this measurement technique. A flexible ruler was applied to the skin over the lumbar spines of 23 normal adults and an angle in degrees between two spinous processes (L1-S2) was calculated. Intratester test-retest reliability was good (ICC = 0.97, N = 89) for two separate measures of two spinal postures. The validity of the flexible ruler measurements was also good when compared to two different measurement techniques from a limited number of patient roentgenographs. The flexible ruler was determined to be a reliable and valid measurement technique for the shape of the lumbar spine and may prove helpful in quantifying lumbar postures and the effectiveness of clinical treatments designed to affect lumbar postures.

Back pain and trunk list

Porter RW, Miller CG. Spine 1986; 11:596-600

An association of trunk list with back pain was recorded in 100 patients, 5.6% of those attending a back pain clinic. Twice as many patients listed to the left as to the right. A total of 49 patients fulfilled the criterion of a symptomatic lumbar disc lesion, and 20 required surgical excision of the disc. The side of the list was not related to the side of the sciatica nor to the topographic position of the disc in relation to the nerve root. There is some evidence that the side of the list may be related to hand or leg dominance.

KEY WORDS: lumbar disc herniation, trunk list, location of lesion.

Low back pain: a radiographic enigma

Phillips RB, Frymoyer JW, MacPherson BV, Newburg AH. J Manipulative Physiol Ther 1986; 9:183-7

Ninety-nine anteroposterior and lateral lumbar radiographs taken of males ages 18-55 were independently analyzed by three chiropractors who assessed 56 variables, including determinations of disc space height, vertebral malalignments and subluxations, spondylosis, postural disturbances, relationships betweeen pelvis and spine, and other congenital or acquired abnormalities. The distribution of low back complaints in this study included 31% with no low back pain, 44% with previous or present mild low back pain and 24% with previous or current severe, and often disabling, low back pain. Determinations were made of interobserver reliability between the three chiropractors and a medical radiologist. Of the 56 radiographic variables assessed by the chiropractors, six demonstrated a high interobserver reliability. In general, the best reliability was for variables that were actual measurements, rather than subjective observations. Sixteen additional variables demonstrated a fair interobserver reliability. Comparison of the observations between a radiologist and the chiropractors showed correlations in their assessments of disc space height at L3-4 and L4-5; otherwise, there was poor interobserver reliability. Few of the radiographic variables were found to be reliable predictors of present or prior history of low back and leg complaints. A few variables (most notably disc space narrowing) were statistically associated with back or leg complaints ($P = 0.025$). We conclude that spinal radiographs, whether analyzed by measurements, by a radiologist or by chiropractors, have minimal value in predicting the presence or absence of low back complaints and, in particular, have no value in epidemiological studies.

KEY WORDS: low back pain, chiropractic, reliability, radiographs.

The optimum spine

Gracovetsky S, Farfan H. Spine 1986; 11:543-73

System theory is used to describe the mechanism of the lumbar spine. The role of the spine in vertebrate evolution is presented. The importance of the intervertebral joint for the survival of the species is shown to be crucial. The mechanical behavior of the joint is derived, and from this the corresponding spinal motion and muscular responses are calculated. It is shown that physiologic behavior implies that the stress at the intervertebral joints is equalized and minimized. From this simple condition, the motion of the spine in the sagittal plane is calculated. From the analysis of sagittal plane motion together with a knowledge of the energy transfer through the intervertebral joint, a new theory of locomotion is derived. This theory of locomotion differs in important respects from current theories, but nevertheless explains available experimental data. This unified theory of the function of the human spine permits the determination of the level of safe loads that can be lifted and transported. It predicts the conditions of load transfer through a joint. It proposes a new approach to the mechanism of arthritis and to the repair of fractures.

KEY WORDS: spinal mechanism, stress distribution, locomotion, lifting, compression, torsion.

Roentgenographic findings of the cervical spine in asymptomatic people

Gore DR, Sepic SB, Gardner GM. Spine 1986; 11:521-4

The purpose of this study was to determine the incidence and severity of degenerative changes seen on lateral roentgenograms in 200 asymptomatic men and women in five age groups with an age range of 20-65 years and to determine the normal values of cervical lordosis and spinal canal sagittal diameters and their relationship to degenerative changes. It was found that by age 60-65, 95% of the men and 70% of the women had at least one degenerative change on their roentgenograms. A small sagittal diameter correlated with the presence of degenerative changes

at the same disc level, and the strongest correlation was with the size of the posterior osteophytes at C5-6 (r = 0.52). Cervical lordosis measurements did not relate to degenerative changes except for subjects over age 50 with moderate or severe intervertebral narrowing. It is important to realize that although roentgenographic abnormalities represent structural changes in the spine, they do not necessarily cause symptoms.

KEY WORDS: cervical spine, degenerative changes, lordosis, roentgenograms, normal subjects, age.

Age changes in lumbar zygapophyseal joints: observations on structure and function

Taylor JR, Twomey LT. Spine 1986; 11:739-49

Transverse sections of zygapophyseal joints from 61 human, postmortem, lumbar spines of individuals ranging in age from fetal life to 84 years, were used for a study of age changes in relation to biomechanical function. The articular cartilage and subchrondral bone of the anterior, coronally oriented third of the joint show changes that are likely to be related to loading of this part of the joint in flexion. The posterior, sagittally oriented two-thirds of the joint shows different age changes, which may reflect shearing forces, imparted to the articular cartilage through the fibrous capsule, from insertion of some fibers of multifidus into the fibrous capsule. The subchondral bone plate, which thickens into a wedge shape with growth to maturity, probably in response to loading stress in flexion, retains this shape into old age despite the bone loss associated with osteoporosis.

KEY WORDS: age changes, lumbar spine, zygapophyseal joints, articular cartilage, subchondral bone.

The multifidis muscle in patients with lumbar disc herniation: a histochemical and morphometric analysis of intraoperative biopsies

Mattila M, Hurme M, Alaranta H, et al. Spine 1986; 11:732-38

Structural changes in the multifidus muscle were analyzed in 41 patients operated on for herniated intervertebral disc. Twelve cadavers

served as controls. The two main findings follow: 1) Both in the patients and in the controls the Type 2 muscle fibers were markedly and selectively smaller than the Type 1 fibers, which were of normal size for striated muscles, and 2) the internal structure of Type 1 fibers showed so-called core-targetoid and/or moth-eaten change. Group atrophy or fiber-type grouping (indicators of denervation and reinnervation) were observed only in a few patients. The selective small size of the Type 2 fibers may indicate atrophy due to relative inactivity of the multifidus muscle both in the patients and in the controls, ie, it does not need to be related to the herniated disc. Definite proof for denervation of the multifidus muscle was not observed, but neither the possibility be excluded. The cause of the core-targetoid and/or moth-eaten changes cannot yet be determined with certainty, because these changes are not specific for any single entity but may be due, for example, to denervation, ischemia, or altered use of the muscles because of pain. In any case, because the changes were significantly more common in the patients than in the controls, they signal for a pathologic condition, the character of which remains to be elucidated.

KEY WORDS: lumbar disc herniation, muscle biopsy, vertebral muscle, low-back pain.

The relationship of degeneration of the intervertebral disc to mechanical loading conditions on lumbar vertebrae

Kurowski P, Kubo A. Spine 1986; 11:726-31

Degeneration of lumbar intervertebral discs is typical for the aging process and contributes to common low-back problems. It is likely to influence vertebrae by changing the mechanical interaction within each motion segment. This study focuses on the influence of disc degeneration on the mechanism of load transmission through the lumbar vertebral body. Effective stresses, ways of load transmission and failure modes of vertebral body were examined in cases of healthy and degenerated discs. The stress analysis was performed using the Finite Element Method. For healthy discs, the highest effective stresses were found in the centre of bony end-plates. For degenerated discs, they were found in the lateral aspects of the end-plates, in the cortical wall, and also in the vertebral body rims. However, regardless of the disc condition, the highest effective stresses do not occupy the whole thickness of the end-plate and/or the cortical wall, but are concentrated near the spongy core. Ways of load transmission through the lumbar vertebral body and modes of eventual damage to it are also strongly influenced by the disc condition.

KEY WORDS: disc degeneration, model stress analysis, stresses in vertebrae.

Discitis following chemonucleolysis: an experimental study

Fraser RD, Osti OL, Vernon-Roberts B. Spine 1986; 11:679-87

Although infection following intradiscal injections has been recognized as a distinct entity, discitis following chemonucleolysis has been often attributed to a chemical reaction from chymopapain. In the first part of this study the effect of chymopapain and Conray 280 on a wide range of bacteria was measured *in vitro*. Chymopapain was found to have a bactericidal effect on all bacteria tested, which was more pronounced with gram positive organisms, whereas Conray 280 showed very little if any antibacterial effect after 48 hours. The aim of the second part of the study was to test the hypothesis that discitis following intradiscal chymopapain injection is due to infection and not to a chemical reaction. Multiple level lumbar intradiscal injections were carried out in eight mature sheep. Sixteen discs in four sheep were injected with a mixture of reconstituted chymopapain and a *Staphylococcus epidermidis* suspension. Sixteen discs in another four sheep were injected with reconstituted chymopapain only. All sheep were sacrificed at 6 weeks and the discs and end-plates were examined radiologically, and by histopathology and nuclear material was cultured for bacteria. None of the controls showed any evidence of discitis, whereas all sheep injected with bacteria had typical radiologic and histopathologic changes of discitis. However, in most cases in which end-plate lesions were well established there was no evidence of bacteria at sacrifice. These findings support the opinion that discitis following intradiscal injection is always due to infection introduced by the needle tip.

KEY WORDS: chemonucleolysis, discitis, experimental, sheep.