ABSTRACTS OF ACC CONFERENCE PROCEEDINGS

Platform Presentations

Chiropractic Care of a Pediatric Patient With Migraine-Type Headaches and Vertebral Subluxations
A Case Report

Joel Alcantara, D.C., and **Kyle J. Pankonin**, D.C., Private Practice

OBJECTIVE

The purpose of this article is to describe the successful chiropractic care of an 11- year-old boy with vertebral subluxations concomitant with medically diagnosed "migraine-type" headaches.

CLINICAL FEATURES

The pediatric patient was brought in by his mother for chiropractic evaluation and care for chronic headaches that began at age 7 years. The headaches were described as throbbing with a frequency of at least one severe headache every 7 weeks and two to three less severe headaches every month. Previous and unsuccessful care consisted of over-the-counter medication in the form of Motrin and Ecotrin. Chiropractic examination revealed subluxation findings at the C1, C2, and T4 vertebral levels and at the sacrum.

INTERVENTION AND OUTCOME

The patient was cared for with adjustments to sites of vertebral subluxations. Within a period of 1 month consisting of five patient visits, the patient did not experience any headache. Long-term follow-up at 13 months revealed that the patient experienced only a couple of "mild" headaches during this time. At 19 months' follow-up, the patient did not experience any headaches between months 13 and 19.

CONCLUSION

This case report provides supporting evidence on the effectiveness of chiropractic care in children with headaches.

ACKNOWLEDGMENT

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Clinical Relevance and Retention of Basic Science Courseware by Practicing Chiropractors

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The curricula in chiropractic education can always be improved and should be dynamic. The intention of this study is to provide insights for potential improvements to the chiropractic education. Medical education research suggests that the basic sciences may be one area where change could be made. A thoughtful restructuring of the curriculum, reducing the number of class hours in basic sciences, dedicating those hours to more outcome-based or clinically applicable courseware, and making the remaining hours in the basic sciences more clinically relevant could better prepare future chiropractors and thus benefit the profession.

OBJECTIVE

The goal of this study was to find out what information chiropractors in the field recalled from their education in some of the basic science courses and to determine the opinions of practicing chiropractors regarding clinical relevancy of the information.

METHODS

A quiz was administered consisting of 30 questions (10 randomly selected questions from each of 3 subjects) to practicing chiropractors at continuing education seminars at the Canadian Memorial Chiropractic College (CMCC) campus. Participants remained anonymous and were asked not to indicate any personal information, and consent was thus implied with completion of the quiz. A survey instrument was developed to collect opinions on the clinical relevance of the information comprising the answers to the quiz questions. The survey used a 5-point Likert scale (1 = totally clinically irrelevant, 2 = clinically irrelevant, 3 = undecided, 4 = clinically relevant, and 5 = totally clinically relevant). For example, if one of the quiz questions was, "Which is the main flexor of the elbow joint?" the survey would ask the respondent to rate the clinical relevance of the statement, "The biceps brachii is the major flexor of the elbow joint." Survey respondents were also asked not to indicate any personal information, and implied consent by completing the survey. The target for each group was 100 completed documents. Chiropractors were asked to take the quiz relying only on their own knowledge. No outside sources were permitted to complete the quiz, and it was administered and collected at continuing education seminars conducted through CMCC. Once the quiz portion of the study was complete, the same procedure was taken at continuing education seminars with the survey portion of the study. No chiropractor was permitted to complete both the quiz and the survey.

RESULTS

Sixty-five quizzes and 43 surveys were returned completed. The overall average on the quiz was 36%, while the overall average relevancy rating was 3.1 on a 5-point scale. The average result for the biochemistry questions was 30% with an average relevancy rating of 2.7. The average result for the histology questions was 42% with an average relevancy rating of 3.3. The average result for the microbiology questions was 35% with an average relevancy rating of 3.4.

DISCUSSION

The average quiz score was 36%, with only 6 of the 30 questions scoring above 50%. This suggests that the information tested is not commonly used after the educational setting. The average ranking of clinical relevance for all of the questions was 3.1 of 5, with only 1 of 30 questions receiving a rating above 4, indicating that respondents were undecided as to the clinical significance of the information tested.

CONCLUSION

These results showed that the 65 chiropractors who participated in our study performed poorly on the questionnaire overall. Additionally, they did not rate the questions as particularly relevant to clinical practice. This supports the idea that there is superfluous information in chiropractic education, and that the basic science content could be refocused without compromising educational quality.

Chiropractic Treatment of Failed Neck Surgery Syndrome With Diversified-Type Spinal Manipulation
A Case Report

Bryan M. Bond, D.C., **Stephan R. Cooper**, D.C., Cleveland Chiropractic College, Kansas City, **Donald DeCanio**, D.C., Private Practice, and **Mark T. Pfefer**, R.N., M.S., D.C., Cleveland Chiropractic College, Kansas City

Postspinal surgery cases are seen with some frequency in chiropractic practice. Regional symptoms may be due to surgery or may be entirely unrelated to the operation. Whatever the basis for the ensuing pain, there may be a reluctance to reoperate due to the low success rates and relatively high complication rates of revision back surgery. Chiropractors may be faced with treating a patient in or around a region of previous spinal surgery. As surgery may cause altered biomechanics of the region, the choice of manipulative techniques must be altered accordingly. This article is the first to document the use of diversified-type spinal manipulation for the treatment of failed neck surgery syndrome with cervicobrachialgia in a patient with previous surgical fusion of the cervical spine.

CLINICAL FEATURES

A 28-year-old female presented to a chiropractic college clinic complaining of bilateral cervicothoracic spine pain. The pain started approximately 2.5 years prior, following a motor vehicle collision. The patient's vehicle had been rear-ended. Four hours later, the patient presented to an emergency room with vomiting and extreme fatigue. She was diagnosed with "whiplash" and released. No imaging was performed. Two days later, the patient reported difficulty ambulating, tremors and numbness in both arms, and cervical spine pain. A neurologist attributed the patient's symptoms to soft tissue injury. Approximately 1 year later the patient sought a consultation with a neurosurgeon. She was diagnosed with a C5–C6 fracture and recommended for surgery. A C5–C6 laminectomy with spinal fusion was performed. The patient reported a decrease in the cervical spine pain and left arm paresthesia, but without full recovery. Eighteen months after surgery, the patient presented for a chiropractic evaluation. She was still experiencing bilateral cervicothoracic spine pain described as a constant, dull, and aching with bilateral paresthesia in the upper trapezius and paresthesia in the left lateral arm. She rated the pain as a 4/10 on a numerical rating scale. A neck disability index (NDI) score was obtained at the time of initial chiropractic consultation. The patient scored 44%, indicating moderate disability. Range of motion of the cervicothoracic spine revealed restricted movement and localized, sharp pain in the midcervical spine. Jackson's compression test reproduced her symptoms. Neurological exam was unremarkable. A five-view cervical radiographic series was taken and provided no evidence of recent fracture, dislocation, or instability. However, cervical motion during flexion and extension was decreased. There was evidence of surgical residuals and fusion at the C5–C6 motor unit.

INTERVENTION AND OUTCOME

A diagnosis of failed neck surgery syndrome with concomitant joint dysfunction and cervicobrachialgia was made. The patient underwent a course of spinal manipulative therapy, initially two to three times per week for 3 weeks, a reevaluation, and then once per week for 3 additional weeks. A total of 11 treatments of high-velocity, low-amplitude manipulation were administered over the course of 6 weeks. The patient was treated with a seated diversified lateral break maneuver administered to the upper cervical spine region. Manipulation was also performed on segmental restrictions in other spinal regions. After the fourth treatment, the paresthesia had subsided in the trapezius regions and the left upper extremity. After the seventh treatment, the patient was no longer experiencing paresthesia during waking hours. The NDI score at the end of 11 treatments was 28%, indicating mild disability.

DISCUSSION

This case demonstrates an improvement in the NDI score in a patient receiving diversified-type spinal manipulative therapy for the treatment of failed neck surgery syndrome. Further research is needed to evaluate efficacy, effectiveness, and safety of spinal manipulative therapy for the treatment of failed neck surgery syndrome.

Effect of Spinal Manipulation Speed and Force on Vertebral Movement and Neuromuscular Response

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Previous study of human subjects has quantified vertebral motion and neurophysiological responses to impulsive (150 N, 5 ms) spinal manipulative thrusts in vivo. Little is known about the effect of varying force–time profiles on vertebral motion and neuromuscular responses during spinal manipulation.

OBJECTIVE

The purpose of this study was to investigate the effects of spinal manipulative pulse duration and amplitude on vertebral displacement, vertebral acceleration, and neuromuscular responses.

METHODS

Ten adolescent Merino sheep (mean mass 46.5 kg) were examined. Following animal anesthesia, 10-g triaxial accelerometers were rigidly fixed to the L1 and L2 lumbar spinous processes. Four bipolar needle electromyography electrodes were inserted deep into the multifidus muscles adjacent to the L3 and L4 spinous processes bilaterally. A computer-controlled voice coil actuator mechanical testing apparatus equipped with a load cell was used to deliver a posterior to anterior uniform "pulse" directly to the L3 spinous process. Three mechanical pulse durations (10, 100, and 200 ms) at a constant force (~90 N) and three force levels (~60, ~90, and ~120 N) at constant pulse duration (100 ms) were examined. A single-amplitude, constant-duration pulse excitation was also applied. Five trials were performed for each intervention in a random order. Posterior to anterior force, L3 posterior to anterior displacement, vertebral accelerations, and multifidus electromyographic responses were recorded at a sampling frequency of 5000 Hz. Peak-to-peak acceleration responses and electromyographic amplitude ratios (peak-to-peak electromyographic response divided by baseline response) were computed for each trial. Positive electromyographic responses were defined as an amplitude ratio > 1.5. The effect of manipulation duration and amplitude on the posterior to anterior motion response (displacement or acceleration) was assessed using a repeated measures analysis of variance (ANOVA, $p < .05$ as significant difference).

RESULTS

The 100- and 200-ms manipulation protocols resulted in an oscillatory vertebral motion response, which damped out rapidly (after 50–75 ms). Both the 100- and 200-ms manipulation protocols resulted in significantly greater (ANOVA, $p < .001$) peak-to-peak L3 posterior to anterior displacements in comparison to the 10-ms manipulation protocol. However, the 10-ms manipulations produced substantially longer duration (75–150 ms) and significantly greater (ANOVA, $p < .05$) amplitude vertebral motion responses (posterior to anterior peak-to-peak acceleration) in the adjacent L1 and L2 vertebral segments in comparison to the longer pulse duration manipulation protocols. Vertebral acceleration responses tended to be greatest for the L2 vertebral segment, which was adjacent to the segmental contact point for mechanical excitation (L3). L3 posterior to anterior displacements and L1–L2 vertebral motion responses increased significantly (ANOVA, $p < .001$) when the L3 manipulation force was increased (maintaining a constant pulse duration of 100 ms). Positive multifidus muscle electromyography responses were observed for all manipulation protocols. The magnitude and percentage of positive electromyography responses increased with increasing manipulation force magnitude. Manipulation pulse duration did not affect the percentage of lower amplitude (1.5 × baseline) electromyography responses, but a greater percentage of higher amplitude (2.0×, 2.5× baseline) electromyography responses were observed for the 100 ms and 200 ms manipulation pulse durations. The sustained manipulation pulse protocol produced positive electromyography responses that were comparable to the uniform pulse protocols.

DISCUSSION

Increasing force amplitude applied during manipulation causes larger vertebral motions at the segmental contact point, but shorter pulse duration (faster) manipulations cause greater motions in adjacent vertebral segments. Manipulation is associated with positive neuromuscular responses that appear to be modulated by increasing force amplitude and pulse duration. These findings add to the body of knowledge investigating the mechanisms of manipulation. Further work is necessary to understand the significance of these and other physiologic and clinical outcomes.

The Effect of Y-Axis Rotation and X-Axis Translation on Radiographic Analysis of Femur Head Height and Clinical Implications

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Radiographic analysis of biomechanical dysfunction is commonly performed by chiropractors and taught in chiropractic colleges. However, use of x-ray analysis methods for biomechanical diagnoses is controversial. Line marking reliability, patient placement, repeatability of radiographic procedures, and projectional error may all lead to problems with biomechanical analysis of x-rays.

OBJECTIVE

The purpose of this study was to explore the clinical and statistical relationships between rotation and rotation with translation of a pelvis and their effect on radiographic determination of femur head height and anatomical leg-length deficiency.

METHODS

The midsection of a young male cadaver was dissected away from the upper trunk and lower extremity, from the first lumbar vertebra to midfemur. The anterior and posterior sacroiliac ligaments, the joint capsule of the acetabulofemoral joint, and the sacrospinous and sacrotuberous ligaments were left intact to disallow movement beyond normal physiological restraints. The specimen was mounted in a box housing. Two screws were also fastened into each femur head at the same anatomical location with relation to the lesser and greater trochanters. A carpenter's level was modified to measure the absolute level of the femur head screws, thereby ensuring a level relationship between the femur heads throughout the experiment. Anterior to posterior full-spine (APFS) view and anterior to posterior lumbar (APL) view radiographs were evaluated. A 14- $\times$ 17-inch film size was used. A 34- $\times$ 42-cm grid, calibrated in 1-cm^2 gridlines, was placed in the film cassette and fixed in place. The unexposed film was then taped to the grid so as to maintain a constant film-grid relationship throughout the trial. The specimen was set up initially with no rotation and no translation with the femur head screws level. Six films of each view were taken to get control values. The specimen was rotated between 4° and 22° from neutral. The femurs were rotated such that the lesser trochanters would be visible on the film. The femur head screws were then checked to ensure a level relationship. A total of 74 x-rays were taken. Femur head heights were measured from the bottom of the film and the nearest gridlines. Radiographic measurements were also made of the os coxae height and pubic symphysis deviation. The films were analyzed by the Gonstead method for the anatomical leg-length deficiency. In testing for clinical significance, the films were analyzed by the Gonstead method to determine if a heel lift would be required. An anatomical leg-length difference of greater than 6 mm was used for this determination.

RESULTS

Regression analysis and ANOVA show a strong correlation between y-axis rotation and femur head height difference, and y-axis rotation and anatomical leg-length deficiency. The APFS view with no translation had the greatest average anatomical leg-length deficiency. Most interesting is the appearance of an apparent change in femur head height when none was present. Twenty-two of the 74 films would have been considered clinically significant enough that a heel lift would have been prescribed.

CONCLUSION

Femur head height deficiencies are strongly influenced by rotation of the subject and placement of the central ray. Y-axis rotation may show a femur head height difference when none actually exists or may hide an actual leg-length discrepancy. The use of an APFS view exacerbates this problem.

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Improvement in Hearing After Chiropractic Care

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The first chiropractic adjustment, given in 1895, was reported to have cured deafness. Chiropractic care has been repeatedly associated with improvement in hearing in small case reports. This study examined the effects of a single, initial chiropractic visit on hearing by documenting clinical changes of audiometry in patients after chiropractic care.

METHODS

Fifteen patients (nine male, six female) with a mean age of 54.3 (range, 34–71) participated in this study. A Welch Allyn AudioScope 3 was used to screen frequencies of 500, 1000, 2000, and 4000 Hz at fixed decibel levels. Chiropractic therapies employed were the usual and customary methods in this practice setting, and were based on clinical findings relevant to each patient. There was no treatment protocol employed that was specific to hearing. Pre- and posttreatment audiometry scores were compared using Wilcoxon's signed rank test.

RESULTS

All patients in this study showed immediate improvement in audiometric screening tests within speech frequencies. In these patients, the average score improved after treatment (right average pre = 5.7, post = 9.9, $\Delta = 4.2$; left average pre = 8.2, post = 10.2, $\Delta = 2.0$). This difference was statistically significant ($p < .02$) on both sides.

DISCUSSION

Patients presenting to this practice frequently have a mild to moderate hearing loss, most notably in the right ear and to low-frequency tones. The grouping of the total number of tones recognized after a chiropractic adjustment or improvements were surprisingly evenly distributed between the frequencies in both ears. The clinical progress documented in this report suggests chiropractic care may benefit some forms of hearing loss.

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The Value of Chiropractic Postgraduate Fellowships

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Because to the great variety in designation, consistency, and quality of available programs, there remains considerable confusion as to the actual value of postgraduate designations to chiropractors wishing to pursue them. This study explores the value of chiropractic postgraduate fellowship designations in Canada. General systems theory provides the conceptual framework for studying value as a management issue for institutions that provide postgraduate education leading to fellowships.

METHODS

This study used survey methods with a self-designed and pretested questionnaire to gather data in order to determine differences between chiropractors with and without specialty designations. Three hundred sixty-five questionnaires were mailed at random to non-Fellow chiropractors registered with the Canadian Chiropractic Association. One hundred twenty questionnaires were mailed to all the active Fellows of the College of Chiropractic Radiology, the College of Chiropractic Sciences, and the College of Chiropractic Sports Sciences with addresses in Canada.

RESULTS

Response rate was 108/120 (90.0%) for Fellows and 268/365 (73.4%) for non-Fellows (77.9% overall return rate). Fellows reported statistically significant higher gross incomes (mean differences of $25,000 CAD per year) and number of income sources. A variety of career parameters including variety, intellectual stimulation, and interprofessional interaction were significantly different

between groups. Career and lifestyle satisfaction were significantly higher for the Fellow group. Trends in career paths showed differences as well. Fellows reported significantly higher rates of pursuing university-based postgraduate education than non-Fellows. No differences were found in amount of leisure time or perceived prestige of fellowship value within the chiropractic community.

CONCLUSION

The results of this study imply that the postgraduate chiropractic fellowship designation may have significant value for the Fellow in terms of increased gross annual income, number of income sources, variety and intellectual stimulation in their careers, career satisfaction, and lifestyle satisfaction.

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Conservative Management of Groin Pain During Pregnancy
A Descriptive Case Study

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Groin pain and/or pubic pain can be a severe and disabling complication of pregnancy. Previous studies have focused on the implications of low back pain in pregnancy, with minimal reporting on pubic/groin pain. Preliminary reports suggest that many women with pubic/groin pain are ignored or receive little care. When care is provided, it is not very successful. Pelvic/groin pain cannot be explained solely by biomechanical or hormonal factors. There is likely a combination of physical and psychological factors that lead to pregnant women experiencing pain in this region. Current treatment approaches include rest, pelvic belts, and exercise. While these are applied clinically, little has been reported as their utility or success. This descriptive case study used a functional approach that combines manual therapy with stabilization exercises.

METHODS

This study reviews a case of a 32-year-old pregnant woman complaining of low back pain and groin pain after beginning her second trimester of pregnancy. Patient measures included a battery of functional and provocation tests, visual analog scales (VAS), and a Quebec Task Force Disability Scale questionnaire (QT). Tests included the pelvic pain provocation test, the forward flexion test, the long dorsal ligament test, straight leg raise, and active straight leg raise. Interventions included behavioral modifications (instructions on proper mechanics for her daily activities, soft tissue manipulation (Active Release Technique to address muscle and connective tissue restrictions) and exercise (postisometric relaxation and specific stabilization exercises).

RESULTS

After two treatment sessions the patient showed significant changes in her VAS and QT. The VAS decreased from 8 to 0 and the QT comprehensive score changed from an initial 122 to a final of 62. The recorded change for the QT is significant by means of a minimum clinically important difference. Muscle tension decreased and her activities were no longer causing any pain. After 3 months, she continued to report no pain or restriction of daily activities.

DISCUSSION

This study shows that low back pain and groin pain in pregnancy can be managed with conservative care. Groin pain is somewhat common in pregnancy with reports as high as 35%. This case shows promise for treating these women with a conservative rehabilitation approach. Further investigation is warranted to identify diagnostic classification and treatment indications.

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Heritability of Neck Pain
A Population-Based Study of 33,794 Danish Twins

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Several studies have focused on whether genes play a role in neck pain, but so far the heritability of neck pain in a population of young and middle-aged twins remains to be investigated.

OBJECTIVE

The purpose of this study was to determine the heritability of neck pain in a population-based study of twins.

METHODS

Data on lifetime prevalence of neck pain from a population-based cross-sectional survey of Danish twins was used. To assess twin similarity, the probandwise concordance rates, zygosity-specific odds ratios, and tetrachoric correlations were calculated and compared for monozygotic and dizygotic twins. Using biometrical modeling (structural equation modeling), the genetic and environmental contributions of the liability to neck pain were estimated.

RESULTS

A total of 33,794 (73%) twins answered the questions regarding neck pain. Probandwise concordance rates, zygosity-specific odds ratios, and tetrachoric correlations showed a significant genetic effect on neck pain. There was a statistically significant difference in heritability between males and females (33% vs. 51%).

CONCLUSION

Genes play a significant role in neck pain which is more pronounced in women. The genetic component accounts for about half of the liability of neck pain in women and one third in men. However, the genes become gradually less important with increasing age and diminish in the older age groups. Thus, the environmental influences dominate in the older age groups.

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Evidence-Based Health Care in Medical and Chiropractic Education
A Literature Review

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OBJECTIVE

The purpose of this article is to review educational and patient outcomes of teaching and utilizing evidence-based health care (EBHC) in medical and chiropractic education, and to discuss future directions for research.

METHODS

Literature search identified 190 EBHC studies and 21 of these were reviewed and categorized into the following areas: educational and patient outcomes after EBHC medical training, and educational outcomes of EBHC chiropractic training.

RESULTS

Improved knowledge, skills, and attitudes after EBHC medical education were demonstrated in single studies and systematic reviews. Six controlled trials showed improved patient outcomes after EBHC medical education. Limited evidence from three single studies of EBHC chiropractic training indicated improved self-assessed educational outcomes.

CONCLUSION

EBHC developed from practical need in addressing clinical uncertainty and evolves through continuous integration of new research. Early evidence demonstrated improved educational and patient outcomes after EBHC medical education. Rigorous studies of EBHC training on patient outcomes are needed in chiropractic education.

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Static Vertebral Position Alters Lumbar Paraspinal Muscle Spindle Sensitivity

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Vertebral motion segment dysfunction and its correction are widely considered etiologic components of idiopathic low back pain and therapeutic components of spinal manipulation, respectively. Studies in leg muscles of humans and cats indicate that the length history of a muscle affects the resting discharge and sensitivity of its muscle spindles. For example, changing the static position of the ankle joint by holding the ankle in a position that shortens the calf muscles evokes proprioceptive errors in foot repositioning. While the exact nature of the chiropractic subluxation is not known, it might involve alterations in proprioceptive signaling from paraspinal muscle spindles secondary to static motion segment position.

OBJECTIVE

The aim of the current study was to investigate how the duration of static vertebral position affects sensory feedback from paraspinal muscle spindles. The working hypothesis was that as the duration of static vertebra position

increases, the lumbar paraspinal muscle spindle sensitivity increases.

METHODS

Muscle spindle sensitivity to a reference vertebral position (static test) and to vertebral movement from that reference position (dynamic test) was determined after having held (conditioned) the vertebra in one of three positions: either a reference position or a position that shortened or lengthened the paraspinal muscles. The duration of the conditioned position (i.e., the held position) varied between 0 and 8 s.

RESULTS

Seventeen muscle spindle afferents were classified as primary spindles and 13 were classified as secondary spindles. All were located in either the lumbar multifidus or longissimus muscles. During the static test, conditioning that loaded the primary muscle spindles decreased their resting discharge by 20.5 ± 2.3 Hz compared with conditioning at the reference position. Secondary muscle spindle discharge decreased by -9.4 ± 1.3 Hz. On the other hand, holding vertebrae such that the primary spindles were shortened did not affect the discharge of the primary muscle spindles, but increased the discharge of the secondary muscle spindles by approximately 5 Hz when compared with conditioning at the reference position. During the dynamic test, loading conditioning decreased the discharge of primary muscle spindles by 5–10 Hz compared with hold reference conditioning. The secondary muscle spindles were only slightly affected ($\sim$2 Hz). As conditioning duration increased, the magnitude of the decrease in discharge increased for the primary muscle spindles. Conditioning in a shortened postion did not appear to affect the discharge of either primary or secondary muscle spindles.

DISCUSSION

Because muscle spindles increase their static firing rate by $\sim$4 Hz per millimeter change in muscle length, the change in sensitivity magnitude indicates that reporting of paraspinal muscle length may be inaccurate by 1–5 mm. These results show that paraspinal muscle spindle input during identical postures and movement can provide the central nervous system with different information depending on the historical presence of small vertebral displacements that previously unloaded multifidus and longissimus muscle spindles. To the extent that the subluxation has a vertebral positioning component, it may contribute to abnormal sensory input from paraspinal muscle spindles.

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The Effects of Active Release Technique on Hamstring Flexibility
A Pilot Study

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The hamstring muscle group is commonly injured in athletic environments. This high incidence of injury has been attributed to a lack of flexibility in the hamstrings. A number of techniques for increasing flexibility in the hamstring group have been investigated including static stretching, proprioceptive neuromuscular facilitation, heat, and massage. Active Release Technique (ART) is a soft tissue intervention that proposes that releasing the adherence of muscular adhesions provides functional improvement sufficient to improving performance. ART has generated interest in sport and rehabilitative medicine for its effectiveness in treating soft tissue disorders. Preliminary investigations suggest that ART used in combination with joint mobilization or manipulation can successfully treat soft tissue injuries. There is a lack of experimental data concerning the effectiveness of ART in improving muscular flexibility.

OBJECTIVE

The hypothesis of this pilot study was that treatment with ART would significantly increase hamstring flexibility in a group of asymptomatic male participants using the sit-and-reach test as the outcome variable.

METHODS

Twenty physically active male participants (mean age 24) with no current or previous history of lower extremity injury were tested. The sit-and-reach test was used to determine hamstring flexibility. ART was performed on the origins and

insertions of the hamstrings as well as the dorsal sacral ligament. Participants were immediately retested using the sit-and-reach test. Mean values were calculated and a *t* test was performed comparing the two sets of data.

RESULTS

There was a significant difference between the pre-ART and post-ART test data (mean pre-ART = 35.5 cm; mean post-ART = 48.3 cm; $p = .0015$). All 20 participants increased their sit-and-reach score following the application of ART.

DISCUSSION

ART improved hamstring flexibility in each of the 20 healthy male participants. The expectation was that ART would improve the sit-and-reach scores of subjects. However, not all of the subjects were expected to improve. This was a preliminary investigation and cannot be used for drawing definite conclusions. Because the participants were all young healthy males, the results are not necessarily generalizable to other populations. The measurement for the post-ART group was taken immediately following the intervention and does not provide long-term effect analysis. The application of ART should be examined on a symptomatic population whose flexibility measures lower than normal. This would give data as to the possible benefit of ART in treating conditions associated with decreased hamstring flexibility. Future research should investigate ART's effects on hamstring-related conditions, such as patellofemoral disorders and postsurgical cases, that would be likely to have flexibility deficits.

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Improving Preventive Health Services Training in Chiropractic Colleges
A Pilot Impact Evaluation of the Introduction of a Model Public Health Curriculum

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Recent efforts have been made by chiropractic researchers, educators, and interested stakeholders from the public health community to update the public health curriculum provided by chiropractic colleges to include a greater focus on health promotion and disease prevention. This updated curriculum was aimed at increasing the provision of clinical preventive services by field practitioners.

OBJECTIVE

The purpose of this study was to investigate the impact of the dissemination of the model public curriculum at one U.S. chiropractic college on chiropractic interns during their outpatient clinical internship.

DESIGN AND SETTING

A retrospective pilot study was performed to evaluate the frequency of nine patient clinical preventive health recommendations made by interns, during their clinical training. The frequency of recommendations by interns completing their public health coursework after dissemination of the model curriculum was compared with those completing their coursework during the time frame immediately proceeding dissemination. A standardized data abstraction tool was developed to collect data from clinic charts that would establish a patient's need for any one of nine preventive health services which could be provided by chiropractic interns.

RESULTS

Of the 408 charts examined (204 each from treatment and comparison groups) on a random sample of patients presenting for care in the college outpatient clinic, there

were only four documented instances (1.0%) of recommendations for any of the nine preventive health service categories. Two recommendations occurred in the precurriculum change period. One event involved the student intern sending the patient out for blood cholesterol testing. Follow-up for this one event was documented in the chart. The second recommendation was for a cervical cancer screening in which a pap smear was recommended. There was no evidence of follow-up for this event documented in the chart. The two recommendations that occurred in the postcurriculum change period were for blood pressure screening. There was no documentation in the chart for either of these two patients which reflected whether or not they had followed up with the initial recommendation.

DISCUSSION

The results of this pilot study indicate that there has been no observable impact on intern behaviors toward educating patients in preventive health services since the dissemination of the model public health curriculum at one of the chiropractic colleges in the United States. The sampling of every fifth clinic patient chart achieved a representative and demographically comparable cohort of clinic patients in the pre- and postcurriculum change groups. The impact of this reform in public health education may have been limited by its minimal focus on clinical preventive services and by a focus on didactic rather than a clinically relevant learning exposure.

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e-Health in Chiropractic
Changes in the Chiropractor–Patient Relationship

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The Internet is increasingly becoming a first choice for health-related information. More than 93 million Americans have searched online for health and medical topics, with 7 million searching every single day. The Internet is changing the way people learn about health and illness, creating potential for improved health outcomes and behaviors. Chiropractors must take advantage of this unique opportunity to create, support, reference, and promote awareness of quality electronic sources of health information. Despite awareness of the potential impact of new information technologies, little empirical research has been conducted on how chiropractors and their patients use the Internet.

OBJECTIVE

The objective of this study was to determine the use of the Internet for obtaining health information, describe the type of information sought, and determine the experience and attitudes of Internet use by chiropractors and their patients.

METHODS

Survey instruments were developed, field tested, and administered to 50 chiropractors and 500 chiropractic patients. Survey responses were entered into a database and analyzed using SPSS software. Frequency distributions and means were calculated for each item.

RESULTS

Over 90% of chiropractors reported using the Internet in various ways to find medical information, including literature searches, accessing on-line journals, general searches for medical information, and searching for patient-specific information. Ten percent reported using the Internet daily to find medical information, 26% several times a week, 25% weekly, 21% monthly, and 18% rarely. Over two-thirds considered Internet health information to be usually (30%) or sometimes (40%) reliable. Chiropractors estimated that <10% of their patients accessed the Internet within the last month for health information. The mean patient age was 43.2 years, 86% were female, and 46% had completed at least 4 years of college. A majority of chiropractic patients (72.4%) reported having Internet access. Twenty-two percent of those using the Internet for health information reported using it at least once a week, while 42% used the Internet at least monthly. Sixty-six percent indicated that they searched for information about diet and nutrition, 51% investigated complications or side effects of drugs, and 55% sought information on chronic diseases and conditions. Interestingly, 45% searched the Internet for second opinions regarding medical conditions and 24% reported purchasing natural or complementary remedies from a Web site. Many patients would like to be able to interact with their doctor online, with 42% desiring the ability to make appointments online, 56% wanting to receive a report of findings, and 74% wanting to be able to purchase products from their doctor's Web site.

DISCUSSION

The Internet has brought an irreversible change to the doctor–patient relationship. Several U.S. and European surveys of the last 2 years show that more than three-fourths of respondents agree with the statement that people should take responsibility for their health and not rely on doctors to such a great extent. With this transfer of responsibility comes a need for knowledge. Consumers' demand for information is fueling an explosion in health-related Web sites. Considering the importance of patient education and industry-wide marketing campaigns, the Internet has become a valuable tool that cannot be ignored. This study suggests that chiropractors need to begin to recognize the extent of Internet use by patients for health information.

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Development of Technology for Video-Enhanced Demonstration of Chiropractic Manipulation Loads

Maruti R. Gudavalli, Ph.D., Palmer Center for Chiropractic Research

Chiropractors perform manipulations of the spine to improve the function of the human spine. Chiropractors deliver forces by means of hand contacts on the patient during adjustments. These are complex three-dimensional forces and are delivered to create forces and moments at the joint of interest. Investigators have used a variety of methods to measure the loads delivered during manipulations. Recently, researchers have been focusing on the measurement of three-dimensional forces and moments at the thrusting hand. These studies are limited to measuring the forces and moments at the thrusting hand contact or using one force plate and inverse dynamics. This information is used for research as well as for teaching and training purposes. Currently there has not been reported any high-technology development integrating the force measurements along with video of the manipulations. Development of such a tool should provide better feedback for training doctors of chiropractic.

OBJECTIVE

The objective of this article is to report on the development of a computer-based system for the simultaneous measurements of three-dimensional forces during lumbar side posture manipulation synchronized with video recording to get immediate feedback.

METHODS

The authors developed two specially instrumented tables with three-dimensional force plates (Bertec force plate model 4060-NC, Bertec Corporation, Columbus, OH) and small, three-dimensional force transducers (model Mini-45, ATI-Industrial Automation, Greensboro, SC) to quantify the loads delivered during chiropractic manipulations. One of the tables was a flexion-distraction table used to deliver low-velocity, variable-amplitude manipulations/mobilizations. The second table was custom built to be used to deliver high-velocity thrusts to the lumbar and thoracic regions of the spine. Both of these tables were instrumented with two force plates to measure three-dimensional loads (forces and moments). In addition, three hand transducers were used to measure the three-dimensional loads at various contact points between the doctor and the patient. All these force measurement devices were connected to an industrial-grade rack-mounted computer along with analog-to-digital converters. Two video cameras (Sony model 102 digital video camera, Sony Corporation) were connected to the same computer using a firewire video capture card to record the videos into the computer along with load measurements. Motion Monitor software (Innovative Sports Training Inc., Chicago, IL) was used to simultaneously measure and record. The software allows changing the data collection sampling rate. The sampling rates chosen were 100 samples per second for low-velocity, variable-amplitude manipulations and 1000 samples per second for high-velocity, low-amplitude thrusts. The system developed allows the immediate graphic display of the three-dimensional loads (forces and moments) along with video playback of the manipulation. A cursor travels along the force graph while the video of the manipulation is played back. This provides immediate feedback on how the chiropractor is delivering the manipulations. The forces and moments at various contacts have been measured simultaneously during flexion-distraction mobilizations and thoracic and side posture lumbar spine high-velocity adjustments, along with video recordings of these procedures.

DISCUSSION

This article describes the development of technology and a tool for doing research in training the doctors of chiropractic in delivering quantitatively controlled spinal manipulations. This technology may significantly impact the future of the training of chiropractors. This technology could also be useful in quantifying the treatments delivered during clinical trials.

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Chiropractor Contact and Patient-Table Support Loads During Lumbar Side Posture Adjustment

Maruti R. Gudavalli, Ph.D., and **Robert M. Rowell**, D.C., Palmer Center for Chiropractic Research

Low back pain patients commonly seek chiropractic care. More than 90% of chiropractors use side posture manipulation for the treatment of low back pain. Chiropractors deliver forces by means of hand contacts on the patient during adjustments. These are complex three-dimensional forces and are delivered to create forces and moments at the joint of interest to create joint movement. Investigators have used a variety of methods to measure the loads delivered during manipulations. Recently, researchers have focused on the measurement of three-dimensional forces and moments at the thrusting hand. These studies are limited to measuring the forces and moments at the thrusting hand contact or using one force plate and inverse dynamics.

OBJECTIVE

The objective of this article is to report on the three-dimensional forces at the thrusting and stabilizing hands, and the support reaction forces at the pelvis and rib cage during lumbar side posture manipulation.

METHODS

This study was reviewed and approved by the Institutional Review Board of Palmer College of Chiropractic/Palmer Center for Chiropractic Research. We developed a specially instrumented table with two force plates and small three-dimensional force transducers. Five participants were recruited from the employees of the institution with ages ranging from 18 to 53 years old. They were informed of the study and signed an Institutional Review Board approved consent form. The patients were placed in side-lying posture and a chiropractor delivered adjustments to their lumbar spines. The transducer was placed between the doctor's hand and the patient with the x-axis directed inferiorly, parallel to the spine. The y-axis was directed right laterally, and the z-axis was directed anteriorly. The load-time histories were recorded at a sampling rate of 1000 Hz using Motion Monitor software and a desktop computer connected to the force transducer. Force-time histories were plotted. Mathcad software was used to analyze the data in terms of preloads, peak loads, and the duration of the thrusts. Maximum loads at the thrusting hand, stabilizing hand, pelvic support reactions, and the rib cage support reactions were calculated.

RESULTS

The loads at the thrusting hands reached as high as 96 N in Fx, 64 N in Fy, and 382 N in Fz. The maximum stabilizing hand loads were 9 N in Fx, 50 N in Fy, and 160 N in Fz. Support loads reached as high as 166 N in Fx, 286 N in Fy, and 727 N in Fz at the pelvic support. At the rib cage support, forces reached maximums of 222 N in Fx, 151 N in Fy, and 660 N in Fz. Moment loads reached as high as 4 Nm at the hand contacts and 120 Nm at the support force plates. Rates of loading were as high as 1800 N/s. The shear forces and moment loads were smaller than the transmitted loads in the lumbar spine using the inverse dynamics approach and force plate measurements.

DISCUSSION

This preliminary study shows that there are shear forces and moments applied at the doctor's hand–patient interface and at the rib cage and the pelvic support locations during side posture manipulation. These measurements are important in understanding the effects at the spinal joints that are being treated. This is the first report of the loads at the doctor–patient and patient–table interfaces.

ACKNOWLEDGMENTS

We would like to acknowledge Josh Myers for his assistance in data reduction, and the subject patients for their participation.

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Production of Radiographic Lumbar Pseudoscoliosis From Lateral Thoracic Cage Translation Posture (Trunk List)

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Clinically, trunk list posture is common, particularly in patients with lumbar scoliosis. It is unknown what projected Cobb angles might be associated with trunk list posture.

OBJECTIVE

The purpose of this study was to determine the magnitude of Cobb angles on anterior to posterior lumbar radiographs during lateral postural translations (trunk list) of the thoracic cage.

METHODS

The anterior to posterior radiographs of 17 normal volunteers in neutral and in left and right lateral translations of the thoracic cage were digitized in a computer laboratory. Vertebral body corners of T12 to L5 were digitized on the 51 anterior to posterior lumbar radiographs. Coupled motions were calculated. Cobb angles were calculated from perpendiculars constructed along the superior end plate of T12 and the inferior end plate of L5 and the superior end plate of L1 and the inferior end plate of L5. Risser-Ferguson angles were calculated between T12 and L5.

RESULTS

Using the horizontal displacement of T12 from S1, subjects could translate an average of 53.2 mm to the left and 52.1 mm to the right. The average digitized Cobb angle produced for the 34 translated postures was 15°. Angles ranged from 2.6° to 27.0°. Risser-Ferguson angles averaged 10° between T12 and L5.

DISCUSSION

During lateral translation of the thorax (trunk list), coupled lumbar lateral flexion resulted in the appearance of a pseudoscoliosis on anterior to posterior radiographs. For this trunk list posture, Cobb angles are considerable (15°) and differentiating true structural scoliosis from this pseudoscoliosis would be clinically important. The small coupled axial rotation in trunk list is in contrast to the considerable degree of axial rotation observed in structural idiopathic scoliosis.

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The Doctor–Patient–Observer Clinical Exercise (DPO-CEX) Early Evaluation of a Proposed Teaching Model

Dennis M. J. Homack, D.C., C.C.S.P., New York Chiropractic College

Much has been written on strategies and the effectiveness of OSCE (Objective Structured Clinical Examination) and mini-CEX (Clinical Evaluation Exercise) style examinations. A project was undertaken to investigate more effective methods of critically assessing and training chiropractic students for clinical responsibility. The approach taken here is to utilize student observers to critically analyze student doctor–patient interactions.

OBJECTIVE

The goal was to evaluate the usability of a recently developed method of training and evaluation of 6th-trimester chiropractic students. The key goals for measure include the ability to perform the exercise as designed, the perceived value of the exercise to the students, and the comfort level of the students.

METHODS

A modified mini-CEX format, which I have called the DPO-CEX (Doctor–Patient–Observer Clinical Exercise), differs from other approaches in the participation and responsibilities of a student observer, who must evaluate the student doctor through all phases of an interaction. For the pilot trials, cases were prepared based on a sample of those that will be integrated into a future laboratory course. The participants included 65 student volunteers from a 6th-trimester class of over 120 students. Two instructors from diagnosis courses and two clinicians assisted with the trials. Once the groups were established, the patients were instructed not to provide any hints or clues to the doctors as they worked through each case. The doctors were instructed to perform each activity as though they were in a clinical setting, working with a real patient. The observers were provided with a checklist form that included specific criteria for each of the 25 cases and the individual exam procedures by which the doctors were to be evaluated. The observers were to provide feedback after the encounter. A 33-question survey was distributed at the completion of each of the two trials. The data collected were entered into a Microsoft Excel Spreadsheet and analyzed with SPSS.

RESULTS

Each 2-hour trial resulted in the completion of seven cases, with each taking about 10–15 minutes. The results indicated that in general, students felt comfortable in the three roles. When asked about fairness of the observer's judgment, 100% of the patients, 96% of the doctors, and 82% of the observers felt they provided a fair assessment. When asked if the doctor's performance was a true reflection of the doctor's ability, 68% of both patients and observers responded in agreement, with 74% of doctors agreeing. The remainder of items in the instrument asked about the satisfaction, educational value, stressfulness of the process, willingness to participate again in the future, and how they felt about a class based on these types of interactions. Nearly 100% agreed with positive responses to these issues.

DISCUSSION

Student response to this event was very positive overall. Student comments reflected a high level of interest in having this style of interaction in classes, even earlier than 6th trimester. Dividing classes into groups of three allows faculty to focus on directing analytical and observational skills of the observers. It is hoped that student observers would then internalize their observations and critical analysis.

CONCLUSION

The strategy of the DPO-CEX format encounter for evaluating and training students can be a very effective means of delivering new clinical situations when training students. While it is not recommended for use as a one-time, high-stakes method of evaluation, this method is useful in teaching student observers to sharpen their observational and clinical skills while providing student doctors an opportunity for a higher level of quality peer feedback.

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Occupational Injuries to Practicing Chiropractors in New York State

Dennis M. J. Homack, D.C., C.C.S.P., New York Chiropractic College

The primary treatment delivered by most chiropractors is often very physical in nature and tends to be performed in awkward postures repeatedly throughout each workday. Few scientific data have been collected to date on the injuries that are incurred by the practitioner in delivering this therapy.

OBJECTIVE

The aim of this study is to use a survey to investigate what types of occupational injuries are prevalent in the chiropractic profession, what specific activities increase occupational risk factors for the chiropractic practitioner, and what other factors influence the occupational injury risk to the practitioner.

METHODS

A comprehensive online survey was constructed and accessed via the Internet. The first three sections of the survey relate to anatomical regions of the body; neck and back, upper extremity, and lower extremity. The final section collected demographic information. The survey was dynamic in the sense that a topic would expand according to responses to specific questions. It also allowed the respondent to report

on other regions and incidences of injury or discomfort if there were multiple occurrences or several injuries. The demographic section collected data on geographic region, educational preparation and experience, practice style, and physical descriptions and body habitus. All respondents were directed to complete this section. The instrument was posted on an Internet web server located at Cornell University, Ithaca, NY. Participation was requested from a representative sample of 1167 chiropractors licensed to practice in New York State. Analysis was conducted using a statistical software package for social sciences (SPSS version 12 for Windows) and Microsoft Excel.

RESULTS

The total number of correctly completed surveys from practicing doctors of chiropractic was 69/1167. Of these respondents, 47/69 (68%) were male and 22/69 (32%) were female, with ages ranging 24 to 65 ($M = 41$, $SD = 10$). Anatomical structures most at risk of being injured were the low back, the shoulder, and the wrist. The most frequently reported type of injury is muscular strain, followed by ligamentous sprain. Patient handling and delivering side posture adjustive procedures were identified as the activities most frequently resulting in injuries.

DISCUSSION

It appears that not unlike all other health care professionals, patient handling is a significant risk for occupational injuries to chiropractors. It also appears that the added stresses incurred by the manual means used by chiropractors most often to treat their patients contribute significantly to the type and severity of these injuries. Preliminary analysis of the amount of time lost from work and other influences that occupational injuries have on chiropractic practices suggests reluctance by doctors of chiropractic to take time off and a propensity to work through injuries. Comparing data obtained from the United States Bureau of Labor Statistics, chiropractors responding to the survey have demonstrated a significantly increased likelihood of upper extremity injuries, particularly of the shoulder and wrist as well as low back pain and injury. It is recommended that future studies look at specific techniques and methods of treatment to identify specific elements that may cause unneeded injury risk.

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An Examination of Musculoskeletal Cognitive Competency in Chiropractic Interns

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Musculoskeletal conditions are a major source of pain and disability worldwide, representing a common reason for patients to seek medical care. Despite the prevalence of musculoskeletal conditions in primary care, serious concerns have been raised about the competency of medical doctors' education and training in musculoskeletal medicine. Using a validated Basic Competency Examination (BCE), three studies have shown that the vast majority of medical graduates tested failed the examination. After medical doctors, chiropractors represent the second largest source of office-based care, with approximately 90% of patients presenting with musculoskeletal conditions. Consequently, chiropractic graduates should possess a basic level of musculoskeletal competence in order to meet the needs of their future patients.

OBJECTIVE

The purpose of this study was to assess the cognitive (knowledge) competency of final-year chiropractic interns in musculoskeletal medicine using the BCE.

METHODS

The BCE, a 25-item short-answer examination consists of questions representing a cross section of musculoskeletal topics from primary care. Although validated for medicine, the BCE has not been validated for chiropractic use. Face and content validity were tested using 20 faculty members from an accredited chiropractic institution whose comments and issues were assessed and categorized by two authors. Disagreements were solved by a third author. Criterion validity for the BCE was assessed by five other faculty members with Fellowship credentials (experts in chiropractic musculoskeletal conditions). To assess the cognitive competency of chiropractic interns, the BCE was administered to final-year chiropractic students at an accredited chiropractic institution over 2 consecutive days. Interns with prior knowledge of the BCE or its published studies were excluded. The BCE was administered under examination conditions, using proctors and within a designated clinic facility. Examinations were collected by the proctors upon completion and were graded for both the expert criterion panel and chiropractic interns using the previously published marking scheme.

RESULTS

Although the 20-member panel did not raise any major face validity (format, readability, understanding, or filling out the BCE) concerns, five of the BCE questions (items 1, 4, 5, 14, 22) were deemed not relevant to chiropractic practice. Consequently, two analyses were performed; one with the traditional 25-question BCE and another with the revised 20-question BCE. The mean score for chiropractic interns was 73.2% (range, 50–93%), while the expert panel scored 85.4% (range, 83–100%). For the revised BCE, chiropractic interns achieved a mean score of 80.8% (range, 52.5–100%), while the expert panel scored an 88.5% mean score (range, 86–100%). Two previous studies had established a different passing grade for medical graduates. The results of this study showed that 4th-year chiropractic students scored considerably better for the highest passing standard compared to the published results for medical graduates (>73%: 51.5% for chiropractic interns vs. 18% for medical graduates). All criterion panel members scored above the 73% passing grade.

DISCUSSION

The results of this study show that the majority of 4th-year chiropractic interns demonstrated a basic knowledge competency in musculoskeletal medicine as tested by the BCE. In comparison to both passing grades (>73% and >70%), chiropractic interns performed considerably better than medical graduates. In addition, all of the chiropractic experts achieved very high scores, confirming their status as experts in musculoskeletal medicine. Notwithstanding these results, the content validity panel identified concerns with five BCE questions (relevance to chiropractic practice and acceptable answers). In particular, there are no questions on neck pain and headache, and only two relevant questions about the low back. In contrast, there are nine questions on displaced fractures, dislocations, and septic infections.

CONCLUSION

In contradistinction to published studies of medical graduates, the majority of chiropractic interns were able to pass the validated BCE for musculoskeletal medicine even though its focus is primary medical care. Future work should address validity issues related to the BCE and chiropractic.

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Effect of Acupuncture on Carpal Tunnel Syndrome With fMRI Assessment of Cortical Somatotopy

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Carpal tunnel syndrome (CTS) is the most common entrapment neuropathy and is exceeded only by low back pain as a cause of employee absenteeism. The standard initial treatment for CTS is conservative. Acupuncture is a safe, cost-effective, nonpharmacological treatment for acute and chronic pain of nociceptive or neuropathic origin. Clinical evidence of its efficacy has been reported for neuropathic pain. Acupuncture employs antinociceptive neural controls activated by the stimulation of mechanoreceptors and may alter cortical somatopy. This novel pilot project will evaluate the clinical effectiveness of manual and electroacupuncture (EA) and its impact on S-1 finger somatotopy in CTS using fMRI.

METHODS

This study was reviewed and approved by the Institutional Review Board of Massachusetts General Hospital. Patients with a diagnosis of mild to moderate carpal tunnel syndrome were recruited ($n = 6$). Inclusion criteria were based on both physical exam (Phalen's, Tinel's sign, grip strength, two-point discrimination, Boston CTS Questionnaire), and nerve conduction findings (median nerve sensory latency and velocity). Exam and conduction tests were administered prior to treatment and after 2 and 5 weeks of acupuncture. Subjects were scanned with fMRI before and after acupuncture treatment. Control subjects were also administered physical exam and nerve conduction tests, and were scanned and rescanned 5 weeks apart ($n = 8$). Manual acupuncture was performed over 5 weeks for CTS patients (3X/week for 3 weeks and 2X/week for 2 weeks). A standardized acupuncture protocol was utilized. Every subject was treated with unilateral TW-5, PC-7, 2 Hz EA, low intensity. Symptoms determined the choice for three of the six points: HT-3, PC-3, SI-4, LI-5, LI-10, LU-5. The needles were 38-gauge (0.18 mm), 30 mm in length. Even motion needle technique was used. Block design fMRI involved three runs per digit to stimulate digits 2, 3, and 5 with 100 Hz electrostimulation. BOLD

fMRI was completed on a Siemens Allegra 3T equipped with head coil (TR/TE = 3000/30 ms, 38 sagittal slices, 3.13 × 3.13 × 3.6 mm). A 3D MPRAGE T1-weighted structural data set was collected prior to functional imaging. Single-subject data were processed with FSL version 3.1 and visualized with SUMA. Functional activity was superimposed on Freesurfer (MGH) reconstructed and inflated individual brain surfaces. Group data were created with use of spherical space standard mesh creation and a fixed-effects 3D ANOVA (SUMA/AFNI). Threshold was set to 0.0005 and clustered at 3 × voxel size.

RESULTS

Improvement was demonstrated in both subjective (Boston CTS Questionnaire) and objective (sensory latency differences) outcome measures. The mean neuropathic symptom severity for CTS as measured by the Boston CTS questionnaire showed gradual improvement at 2 weeks ($p < .05$) and 5 weeks ($p < .001$) into acupuncture treatment. The mean differences in median-ulnar sensory latency were significantly different between CTS patients and controls ($p < .001$). After 5 weeks of acupuncture, improvement was noted by a significant reduction in latency difference for fingers 2 ($p < .05$) and 3 ($p < .01$). Finger separation (2, 3, and 5) in the hand area of the postcentral gyrus was controversial but was achieved for most subjects. Group averaged maps demonstrated differences between normal adults and CTS patients. Differences appeared less pronounced after 5 weeks of acupuncture treatment.

CONCLUSION

The feasibility of exploring somatosensory dysfunction with fMRI was supported. CTS may contribute to pathologic alteration of finger somatotopy in S-1. Acupuncture may be an effective modality for managing CTS and more studies are warranted.

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Quality-of-Life Changes in a Disadvantaged, Underserved Chiropractic Patient Population
A Retrospective Case Series Report

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The health of homeless individuals is characterized by high rates of morbidity, mortality, and very poor quality of life, and has been the subject of an increasing number of studies. Despite the increasing interest in the health and quality of life in homeless populations, a Mantis literature search revealed no studies have been published assessing the impact of chiropractic care on the health and quality of life of homeless individuals. The health status and quality of life of the women's shelter residents is generally quite poor. Although their chief complaints generally fall under back pain categories, they suffer from a multiplicity of other conditions. Adult-onset diabetes, hypertension, and chronic obstructive pulmonary disease are prevalent among shelter residents. Chiropractic student interns from Life University were intimately involved in the development of the Ellis Street Shelter. After receiving donations of paint and other materials, the interns painted the interior of the shelter and assisted in other renovations. Working with local businesses, the interns also obtained food, clothing, toiletries, and furniture for shelter residents.

OBJECTIVE

The purpose of this descriptive case series report is to assess whether chiropractic care provided by student interns at the outreach shelter clinic helped to improve the quality of life of patients from the women's shelter.

METHODS

This study was reviewed and approved by the Institutional Review Board of the Life University College of Chiropractic. Case records from the Ellis Street Women's Shelter were reviewed and 10 case records that contained preintervention and postintervention SF-36 scores were included. Because the population of the women's shelter is extremely transient, many of the shelter's residents are not under systematic care for the 4 weeks required to complete postintervention SF-36 health surveys. The patients in the cases studied received

chiropractic care administered by chiropractic interns for a period of at least 4 weeks. The care included complete case histories, physical examinations, chiropractic evaluations, lifestyle and nutritional counseling, and a series of chiropractic adjustments. Some of the patients had also attended spinal exercise classes taught by student interns. This retrospective case series report utilizes preintervention and postintervention scores on the SF-36 health survey as the primary form of assessment. Preintervention and postintervention SF-36 scores were compared using paired two-tailed *t* tests with Microsoft Excel.

RESULTS

SF-36 mean scores of patients from the shelter increased in each of the scales and summary scores. Patients involved in this study experienced double-digit mean score improvements in four of the eight SF-36 scales as follows: 11 bodily pain, 15 general health, 22 vitality ($p = .02$) and 13 role emotional.

DISCUSSION

The results of this study must be interpreted with caution because of the small sample size. The gain of 22 points in vitality is unusually large and quite promising, representing a significant improvement. That being said, the postintervention score of 47 on this scale is still 14 points below the population norm of 61.1.

CONCLUSION

It appears that chiropractic care holds promise and merits further investigation as one means of enhancing the quality of life in the homeless population studied in this case series report.

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Chiropractic Spinal Manipulation for Low Back Pain of Pregnancy
A Retrospective Case Series

Anthony J. Lisi, D.C., University of Bridgeport College of Chiropractic and Palmer Center for Chiropractic Research

Low back pain is a common complaint in pregnancy. Chiropractors commonly manage patients with low back pain, and commonly use high-velocity, low-amplitude spinal manipulation. Despite this, remarkably little outcomes evidence exists regarding chiropractic treatment, with or without high-velocity, low-amplitude spinal manipulation, for pregnancy-related low back pain.

OBJECTIVE

The purpose of this report is to characterize the results of a group of patients with pregnancy-related low back pain who underwent chiropractic treatment including high-velocity, low-amplitude spinal manipulation.

METHODS

This study was a retrospective case series. Information was gathered from patient records of all patients presenting to a private practice in a 12-month period with complaints of low back pain during pregnancy. Charts were reviewed and subjected to specific inclusion criteria. Data were extracted from the charts and tabulated. All subjects were treated by the same clinician. Active treatment consisted of reassurance and education, advice on body mechanics, and exercise instruction. Passive treatments were manual myofascial release, manual joint mobilization, and manual high-velocity, low-amplitude spinal manipulation. Clinically important improvement was considered to be a decrease of 2 or more points on a 10-point pain scale.

RESULTS

Seventeen cases were included. Among the 17 cases, the average patient age was 32 (range, 21–42) years, and gestational age 24 (range, 15–38) weeks. The average onset of pain was at 21 (range, 13–34) gestational weeks and low back pain duration was 22 (range, 3–90) days on average. The average low back pain intensity at presentation was rated 5.9 (range, 2–10) on the pain scale. The overall group average

pain scale score decreased from 5.9 (range, 2–10) at initial presentation to 1.5 (range, 0–5) at termination of care. When considered individually, 1/17 (6%) cases did not demonstrate any clinically important improvement. The remaining 16/17 (94%) cases demonstrated clinically important improvement. The average time to initial clinically important pain relief was 4.5 (range, 0–13) days after initial presentation, and the average number of visits undergone up to that point was 1.8 (range, 1–5). At termination of care, the average pain scale score of these 16 cases was 1.3 (range, 1–4). The average time to termination of care was 24 (range, 5–62) days after initial presentation, and the average number of total visits undergone was 5.6 (range, 3–15). No adverse effects were reported in any of the 17 cases.

DISCUSSION

This study, although low-level evidence by design, appears to present the most significant outcomes data for chiropractic treatment of pregnancy-related low back pain to date. The results support the hypothesis that chiropractic treatment including high-velocity, low-amplitude spinal manipulation may be safe and effective for patients with pregnancy-related low back pain. Substantial prospective work is needed to test this hypothesis.

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Chiropractic and Culture Trends
Philosophy and Health for the Age Wave

Cynthia Lund, C.T., A.L.C.P. (Hon), Palmer College of Chiropractic

As Yogi Berra once remarked, "The future ain't what it used to be." After a systematic review of relevant literature, this author suggests that a cultural shift is occurring and that a look at culture trends and their relationship to potential chiropractic patients is useful and applicable for chiropractors and chiropractic educators. A large and influential generation of people, the baby-boomers, have been named the "Age Wave" to graphically describe their powerful and sweeping influence and impact on all aspects of the culture, including health care. Some chiropractors have written about the influx of this generation and warned that the chiropractic profession would do well to prepare, citing the potential of huge numbers of people turning to chiropractic, and the reasons that may prompt them to do so.

DISCUSSION

Social statistics describe the scope of the Age Wave. Seventy-eight million people were born in the United States between 1946 and 1964. In the second half of life, this group of people may be turning from the "science as proof" context it has grown up with and turning toward invisible, intangible components of existence. The pay-off for this group will not be evidence, but will be ability and experience instead of evidence. Examples include an ability to cope with the frenetic world and flourish mentally or an ability to create an optimal state of mind. The business world in general, and the medical profession in particular, is paying attention to this trend. Marketers wishing to promote a product and/or service to patients are moving from telling the patient toward a collaborative, experiential model. Allopathic physicians are being advised to "ride the Age Wave" by embracing this group's worldview, and to focus on balance, harmony, and self-empowerment; to encourage active participation by the patients; and to respect the significantly different approach they take.

The largest segment of the population is seeking "something new" in health care, and doing it in a very large way. This is demonstrated in studies and reports from the health arena, as well as reports of attitudinal shifts regarding traditional medicine. The data are supporting the prediction and framing the culture trend: Age Wavers are turning to something other than the usual and traditional for their health, and for reasons other than the expected and anticipated physical problems.

Chiropractic care contains elements that fit perfectly with the emerging needs of the Age Wave, and chiropractors are uniquely positioned to be a source of the health care this group will want and need. Chiropractors can use the available evidence-based data for a foundation of patient education, but it may be the other factors that will be the ones to impact future patients. These factors include concepts of innate intelligence, self-empowerment and how that affects health, relational modes of healing, and even "wellness," if one defines wellness as a holistic combination of mind, body, and spirit, all functioning at optimum levels. Chiropractors and chiropractic educators could consider the image or "brand" they are projecting and evaluate it for the approaching marketplace. If the members of the Age Wave will ask questions and search for health care that produces state-of-mind benefits, human connection, a more solid sense of self, and ultimately, a way to stay actively involved in one's own good health, then chiropractors should produce answers to those questions.

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Characterizations of Side Effects Sustained by Chiropractic Students During Their Undergraduate Training in Technique Class at a Chiropractic College

A Preliminary Retrospective Study

Kim Macanuel, B.Sc, D.C., **Amy Deconnick**, B.Sc, D.C., **Katie Sloma**, B. Kin, D.C., **Monique LeDoux**, B.Sc, D.C., Private Practice, and **Brian J. Gleberzon**, D.C., Canadian Memorial Chiropractic College

OBJECTIVE

The purpose of this study was to characterize the type, nature, and frequency of injuries sustained by chiropractic students during their undergraduate training.

METHODS

The Institutional Review Board (IRB) of the Canadian Memorial Chiropractic College (CMCC) approved this study. Chiropractic students in their 2nd, 3rd, and 4th year of study were asked to complete a questionnaire that chronicled and described the occurrence of any injuries they may have sustained at the hands of their peers at CMCC. Students were instructed that the questionnaire was confidential and that they were not to put their name or students numbers on it.

RESULTS

Of 450 questionnaires distributed, 292 were completed and returned to the authors, 163 from women and 129 from men, representing a response rate of 64.8%. Of the 292 respondents, 127 reported to have experienced an injury, although the total number of injuries was 161. The most common site of injury was the lumbopelvic region, followed by the cervical spine and thoracic spine. Students reported that it was during their 2nd year of study that they experienced the highest number of injuries. Symptoms occurred the same day as the event in 85% of cases. The most common characteristic of symptoms reported was pain, followed by local stiffness, headache, dizziness, fatigue, diffuse stiffness, and cramps. Other symptoms, such as falling, vomiting, and loss of consciousness were reported in less than 1% of cases. Roughly one-third of students described the extend of their injuries as either "light" or "moderate," while roughly one-half described the extent of injuries as "a fair bit" or "a lot." About three-fourths of injuries resolved within the first 72 hours of the event. No treatment was sought by 89/127 (55%) of injured respondents. More than half of the injured students reported that their activities of daily living were either not or "somewhat" affected. There were no reports of long-term disabilities. No statisticall differences were found between injured and noninjured students with respect to their age, gender, weight, or height.

DISCUSSION

The few published studies in the peer-reviewed literature report chiropractic patients frequently experience adverse reactions to therapy in clinical practice; however, the frequency and characteristics of those injuries were very similar to the injuries described by chiropractic students in this study. Based on a literature review and hand search of other chiropractic conferences, this is the first study on this topic that has been published. The information gathered from this study may encourage faculty members involved in the teaching of high-velocity, low amplitude psychomotor skills to adopt different pedagogical strategies in order to minimize the occurrence and frequency of student injuries sustained in class. Such strategies may include suggesting that students reduce the number of consecutive attempts at achieving joint cavitation; minimizing the amount of time a student is placed in a rotated pretension position prior to such an attempt; reducing the time allocated to the acquisition of any particular set of psychomotor skills each class meeting; and devoting more time in selecting an appropriate clinical target. It may also be prudent for teaching faculty to caution students midway through their undergraduate training to be more wary of injuring each other.

Future studies could be more prospective in nature and a larger, intercollegiate study could be conducted in order to determine if the characteristics of injuries sustained by students during technique class is similar at other chiropractic colleges. In addition, this could permit a determination of which, if any, chiropractic technique system places students at a greater relative risk of injury during their college education.

Masters of Science in Diagnostic Imaging (MSDI)
New York Chiropractic College's Establishment of an Accredited Academic Degree-Granting Program in a Chiropractic Specialty

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Postgraduate education in diagnostic imaging has a rich tradition throughout chiropractic history and continues to evolve.

OBJECTIVE

The objectives in creating a new type of diagnostic imaging residency program were to identify the necessity for changing the traditional model based on a strong desire for accreditation of the educational aspect of specialty training.

DISCUSSION

Many healthcare professions have moved toward specialty education that leads to an academic degree and prepares graduates to be eligible for specialty board certification. New York Chiropractic College (NYCC) has adopted this model by creating a Master's Degree in Diagnostic Imaging (MSDI) that runs concurrently with a full-time, 4-year residency program. The program represents a reorganization of traditional chiropractic diagnostic imaging residencies and incorporates an additional year for research and advanced imaging studies. The MSDI residency program is recognized by a regional accrediting body and offers residents the same benefits as any other full-time graduate student. By virtue of its emphasis on research, the MSDI residency program at NYCC will have the additional advantage of encouraging scholarly activity within the profession.

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Regional Variation in Plain-Film X-Ray Utilization in a Chiropractic Managed Care Network

Craig F. Nelson, M.S., D.C., American Specialty Health

The most recent clinical guidelines suggest that the proper rate of utilization of plain-film radiographs for the management of uncomplicated low back pain is between 5% and 10% of patient complaints. Appropriate utilization rates for related neuromusculoskeletal pain syndromes such as cervical spine pain, headache, and thoracic spine pain are similar. Actual utilization among all provider types is considerably higher.

OBJECTIVE

The purpose of this study was to measure the rates of utilization of plain-film radiography for back pain, neck pain, and related disorders in a chiropractic managed care network. Rates were measured for the entire chiropractic network and broken down by quarter, by year, by region, and by diagnosis. This presentation discusses the regional variations in these rates among chiropractors and the likely causes of such variations.

STUDY DESIGN AND METHODS

A retrospective analysis of administrative claims data was performed. Claims data were collected for the period from January 1, 2001 to December 31, 2003. Descriptive statistics (rates, percentages, and raw counts) were generated for all study variables. Rates are reported in terms of numbers of x-ray studies per 1000 patient episodes.

RESULTS

The rates of x-ray utilization per 1000 patient episodes for the entire chiropractic network, for the different diagnostic categories were: neck (uncomplicated), 170.56; neck (complicated), 227.91; lower back (uncomplicated),143.58; lower back (complicated), 219.31; thoracic spine and rib disorders, 95.84; headache, 142.67; upper extremity, 99.08; lower extremity, 109.47; nonspecific myalgia or arthralgia, 76.19;

latent effects conditions, 90.23; and other, 164.19. For calendar year 2003, the rates of x-ray utilization per 1000 patient episodes for different geographic regions were: southwestern region, 184.55; western region, 107.82; southeastern region, 573.91, northeastern region, 135.61; northwestern region, 261.86.

DISCUSSION

The variation in x-ray rates among the different diagnostic categories is explainable in terms of the clinical variation among these categories. The highest rates are in the categories of "low back pain, complicated," and "neck pain, complicated." The complicated category designates those ICD-9 codes that indicate discopathy or radiculopathy. Similarly, the lowest rates are in the categories of "nonspecific myalgias," and "latent effects," diagnostic categories indicative of chronic, low-grade, and nonspecific pain syndromes that are less likely to require radiographic exams.

However, the regional variations are not explainable in clinical terms. The more than fivefold difference between the lowest rate (western region) and the highest rate (southeastern region) cannot be the result of different patient populations. The phenomenon of geographic variation in rates of clinical procedures is well documented. A variety of factors have been identified as being responsible for geographic variations. These include differences in reimbursement rates, primary professional education, and years in practice in a managed care network, and differences in local customary practices. Future studies should identify factors influencing rates of utilization that are not clinically driven.

CONCLUSION

There is considerable variation in the utilization of plain-film radiographs within a chiropractic managed care network. Utilization rates vary by diagnostic category as well as by geographic region.

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Improving Formative Assessment Feedback Strategies in Undergraduate Chiropractic Education

Dave Newell, Ph.D., and **Christina Cunliffe**, Ph.D., McTimoney College of Chiropractic

Mixed-mode education combines a number of different styles of course delivery. The McTimoney College of Chiropractic has recently designed and implemented a new 5-year mixed mode degree that contains a significant formative assessment element utilizing a directed learning diary. The perception by the students of the timeliness and use made of feedback from the tutors was surveyed using a questionnaire designed to gauge the effectiveness of the feedback. The results have led to a revision of our feedback template in an attempt to improve the students' learning during the assessment task.

METHOD

A modified questionnaire was used to collect data from the students relating to their perceptions of the success/usefulness of various aspects of feedback that they received during the completion of their directed learning diaries. Feedback given for a basic science subject-directed learning diary in year 1 and year 2 was the focus of the study.

RESULTS

A total of 51 and 31 questionnaires were returned, comprising 93% and 84% of years 1 and 2, respectively. Responses to questions concerning the quantity and perceived usefulness by the student could range from "a lot" to "somewhat" and "none/not at all." In general, the responses fell into the "somewhat" category with some areas concerning development of intellectual, learning, and writing skills scoring the worst responses. The scores for timeliness and usefulness of the advice the students received ranged from "all of the time" to "some of the time." However, the use made by the students of the feedback differed between the modules.

CONCLUSION

Overall it is clear that improvements in the types of feedback could be made and the college undertook to revise the feedback template in the light of student perceptions and educational best practice. It is hoped that the new directed learning diary feedback template will significantly improve the usefulness to the student and the use made by the student of the formative feedback.

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Should Chiropractors Recommend Saw Palmetto for the Treatment of Benign Prostatic Hyperplasia?

Paul A. Oakley, M.Sc., D.C., Private Practice

Benign prostatic hyperplasia (BPH) is a benign, nonmalignant growth of epithelial and stromal elements of the prostate gland that leads to lower urinary tract symptoms (LUTS). It is one of the most common medical conditions in older men and affects as many as 40% of those older than 70 years of age and 90% of those older than 80 years of age.

Although there are many current medical treatment options for treating BPH, many are invasive and have dramatic potential side effects, such as sexual dysfunction, incontinence, and bleeding. These risks have led many to try the alternative treatment of phytotherapeutics. An increasing number of people are self-prescribing herb consumption for symptom management, including saw palmetto (SP) for BPH. This is raising concern by primary care providers over the lack of FDA regulation, scientific validation of efficacy, variability in product quality, variability in product recommended dosages, invalid claims by its retailers, possible pharmaceutical interactions, possible adverse events, and general safety of use.

OBJECTIVE

This article reviews the current evidence for the use of SP for the treatment of BPH and associated LUTS. Consideration of the role that chiropractors may play in recommending/discouraging the use of this herb as a treatment option/cotreatment for their patients with BPH is also discussed.

METHODS

A review of the relevant literature was performed and is summarized in this review for chiropractors.

RESULTS

Upon review of the relevant literature, it appears that there exists a substantial body of scientific evidence for the efficacious use of SP extract in the treatment of BPH and associated LUTS. Although there are several meta-analyses found on MEDLINE that have reviewed dozens of clinical trials of good quality, it was found that this search engine is not sufficient as a stand-alone source for identifying the majority of scientific evidence evaluating herbal use. It was determined that the most critical issues in considering the use of SP include: (1) known efficacy; (2) outcome assessment changes; (3) usage safety including herb–drug interactions and adverse events; (4) product source quality; (5) dosage recommendations; and (6) the chiropractor's role in discussing treatment options for patients suffering from BPH.

DISCUSSION

There is general consensus that SP is efficacious in the treatment of BPH and associated LUTS. Some have suggested its orthodox use and evaluation of value for prevention. SP-treated groups have reported improvement in LUTS, decreased nocturia, and increased peak urine flow. SP was as effective as finasteride, but with fewer side effects. Although its mechanisms of action are not fully understood, SP clearly has a polypharmaceutic nature. SP has only mild and infrequent adverse effects with no known drug interactions. It is regarded as a safe herb for men. Prostate cancer should always be ruled out before beginning SP usage as it may cause a false-negative PSA test. Since herbal supplements are unregulated, the selection of an appropriate supplement deserves careful attention. It is recommended that only brands featured in clinical trials or those independently validated for quality and benchmark be used. The most widely reported dose of SP has been 2×160 mg per day.

Unlike medical physicians, many chiropractors discuss the use of supplements with their patients. Because more people are taking herbs such as SP, it is recommended that chiropractors inquire about their use and discuss the critical issues aforementioned.

CONCLUSION

Based on the current scientific evidence, notwithstanding any regulatory jurisdictions, chiropractors should discuss the use of a quality standardized saw palmetto extract as a valid treatment option or cotreatment for those patients presenting with BPH and related symptoms.

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Intraexaminer and Interexaminer Reliability of a New Hand-Held Device for Measuring Lumbar Posteroanterior Stiffness

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Spinal stiffness assessment is frequently performed as part of the patient evaluation in chiropractic and physical therapy. Often referred to as posterior to anterior stiffness, in chiropractic the method might be called motion palpation or joint endplay assessment. The clinician typically will use the palm of the hand to press on the spine and feel for restricted movement. Early studies of motion palpation in chiropractic found limited interexaminer reliability of the assessment, leading researchers to develop instruments to help improve the objectivity of the measures.

OBJECTIVE

The purpose of this report is to describe briefly a new device and to examine the repeatability of stiffness measures between and among examiners on an inanimate test object with varying force/displacement properties.

METHODS

The posterior to anterior stiffness device itself consists of a plastic rod 2 cm in diameter mounted firmly to a wood block. An in-line force transducer is mounted 4 cm from the lower end of the rod and a position tracking sensor is mounted at the upper end. A Polhemus Liberty motion tracking system (Virtalis Group, Manchester, UK) monitors the location of the rod, while Motion Monitor (Innovative Sports Training, Chicago, IL) software records data on both rod location and force.

For preliminary tests of its accuracy, the authors developed a mechanical model with adjustable and repeatable flexibility. The mechanical model consists of a steel bar supported on the ends by wood blocks. Moving the blocks closer to each other has the effect of simulating a stiffer bar, since the same force produces less displacement due to bending. A small wooden dowel is mounted at the center of the steel bar to serve as a contact point for the concavity at the end of the posterior to anterior stiffness device. For testing, four examiners tested the bar's apparent stiffness in three-point bending at each of three standardized block positions. Beginning with the posterior to anterior stiffness device in light contact with the center of the bar, the examiner depressed the bar gradually up to a maximum of 80 N of force in five cycles. The computer provided audible feedback when 80 N was reached. Linear regression was used to calculate the slope of the force versus displacement relationship in the range between 55 and 75 N, resulting in a stiffness value in N/mm. Each run consisted of five depression cycles. The stiffness value for the first depression was ignored and an average stiffness value for the run was calculated from cycles 2 to 5.

RESULTS

The three configurations of the steel bar provided significant variation in the stiffness measured at each position. The lowest stiffness value averaged 3.93 N/mm ($SD = 0.10$) and the most stiff configuration measured 14.74 N/mm ($SD = 0.665$). There was a tight grouping of the findings by each operator in the different runs, especially at the lower stiffness configuration. Intraclass correlation coefficients suggest very high inter- (0.990) and intraexaminer (0.996) agreement across the whole range of measures. Using the 95% confidence interval as an indication of accuracy of the measure, the percent error is comparable across all three bar configurations. In the "Bar A" configuration, there was a range of 0.84 N/mm out of the full 14.74 measure, a 5.7% error. The measures at the lower stiffness levels were 5.8% and 3.3%, respectively.

CONCLUSION

The human-operated, computer-monitored lumbar posterior to anterior stiffness system performed well in this initial test of accuracy and reliability. The accuracy of the measures is within 6% or less through the full range of testing. The intraclass correlation coefficients showed very high repeatability both among and between operators over a wide range of stiffness values.

A Cross-Sectional Study Comparing Pain and Disability Levels in Low Back Pain Patients With and Without Transitional Lumbosacral Vertebrae

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Transitional lumbosacral vertebrae occur in 4–8% of the population, are usually asymmetrical in morphology, and are a known risk factor for degenerative disc disease and disc herniations at the motion segment immediately above this anomaly.

OBJECTIVE

The objective of this study was to determine whether or not patients with this congenital anomaly report more pain and disability compared to patients with "normal" lumbar vertebrae.

METHODS

Radiographic and questionnaire data were collected from 353 consecutive patients with low back pain. Back pain severity was measured using two scales: pain over the entire episode and pain during the previous week. All patients also completed the Revised Oswestry Disability Questionnaire (RODQ) before radiography was performed. Patients were divided into two groups: those with and those without transitional lumbosacral vertebra. Differences between patient groups were investigated using the unpaired t test. Multiple linear regression analysis was applied to investigate the effect of the transitional lumbosacral vertebra on pain and disability controlling for the effects of age and gender.

RESULTS

There were 43/353 patients (12%) with transitional lumbosacral vertebra, but there were no differences in pain or disability levels between the two groups on any of the pain scales or RODQ subscales. Older patients reported greater levels of pain and disability than younger patients ($p = .039$ and .002, respectively).

CONCLUSION

The presence of transitional lumbosacral vertebra is not related to increased levels of reported low back pain or disability.

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Three-Dimensional Contact Loads of Chiropractic Students Performing Posterior to Anterior Thoracic Adjustments

Laura C. Petrie, B.S.E., **Maruti R. Gudavalli**, Ph.D., and **Robert M. Rowell**, D.C., Palmer Center for Chiropractic Research

Although various studies have investigated the biomechanics of spinal manipulation, several sources point to a need for more biomechanical research. This project is one step toward creating a system that gives chiropractic students real-time biomechanical feedback about the loads they are exerting during chiropractic adjustments. Improved feedback could improve student education. A major obstacle to this is lack of information about the biomechanics of chiropractic student adjustments and how their biomechanics compare to experienced practitioners. Many measuring systems used in previous studies involving experienced chiropractors have measured unidimensional local applied loads or

three-dimensional global transmitted loads. Measuring applied loads along three axes can give a more complete description of the forces exerted by the adjustor.

OBJECTIVE

The objectives of this project are to measure and characterize the three-dimensional forces and moments applied by chiropractic students during posterior to anterior thoracic adjustments and to obtain student input about the measurement equipment.

METHODS

This study was reviewed and approved by the Institutional Review Board of Palmer College of Chiropractic. Five externs currently providing patient care at the Palmer College of Chiropractic Clinics adjusted five different subjects each. Information including height, weight, and number of adjustments performed was collected from the externs. Subjects who demonstrated a need for a chiropractic thoracic adjustment were recruited from the student population of Palmer College of Chiropractic. Externs performed adjustments under the supervision of a licensed chiropractor, using their choice of either the double transverse or the double thenar diversified technique maneuvers. Externs recorded information about each adjustment performed including rating the adjustment delivered. Subjects were asked about their level of satisfaction with the adjustment they received.

Small force transducers (model Mini-45, ATI-Industrial Automation, Greensboro, SC) were used to collect the three-dimensional force and moment data at the extern/subject interface. The z-axis was pointed anteriorly, the x-axis inferiorly, and the y-axis right laterally. The data were collected at 1000 Hz using Motion Monitor software. Force-time histories were plotted. The data were analyzed using MathCAD to determine magnitude of peak load, time to peak load, and magnitude of moment.

RESULTS

The majority of subjects felt that the force transducer did not have a negative effect on the adjustment. Input about the equipment from externs varied. Some externs had little difficultly delivering what they perceived to be successful adjustments. Others felt "disconnected" from their subjects and felt that the equipment detracted from their adjusting ability. However, by the end of the study those externs who expressed concerns felt more comfortable with the use of the equipment. The maximum posterior to anterior component force (z-axis) applied by either hand was 358 N. The maximum force applied was 64 N in the x-axis and 89 N in the y-axis. The shortest time to peak was 132 ms. In either hand, the maximum resultant applied moment was 3.9 Nm.

DISCUSSION

This preliminary study demonstrates that equipment can be successfully used to measure extern adjustments. Force and moment data are similar to published data from experienced chiropractors. Time to peak was longer for the externs. More research is needed that identifies specific areas where students differ from experienced clinicians. In future studies, a familiarity period may be needed for externs to become comfortable using the equipment before data are collected. Modifications should be made for ease of student use prior to introduction of the equipment into an educational setting.

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Perceptions of Depression Among Chiropractors

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Major depression is the leading cause of disability in the United States and worldwide. Depressive disorders affect an estimated 9.5% of Americans ages 18 and over in a given year, or about 1.8 million people in 1998. Nearly twice as many women (12%) as men (7%) are affected by a depressive disorder each year. The staggering economic costs of untreated or undertreated depression in the United States are an estimated $44 billion. In spite of the high prevalence and impact of depressive disorders, it is commonly not recognized in primary care medical practice. Clearly there is

a need for chiropractors to screen for depression among their patients and assure that effective treatment and follow-up are provided. There are no data found related to chiropractors' attitudes and knowledge of depression.

OBJECTIVE

The purpose of this pilot project was to survey clinical faculty on perceptions of depression at two chiropractic colleges.

METHODS

This project was reviewed and approved by the Institutional Review Board of Cleveland Chiropractic College. A survey was developed in 2000 by the Mid-America Coalition on Health Care (MACHC) to evaluate attitudes and knowledge of depression in the workplace. A goal of the coalition was to de-stigmatize depression and find out employees' knowledge about depression and availability of resources within their workplace. To date, over 6000 people have participated in the Kansas City Metropolitan region and results are now being evaluated. This survey, with permission of the MACHC, formed the basis of the current survey with some additional questions added to gain knowledge of chiropractic specific interests. This pilot project was a nonrandom survey of chiropractic clinical faculty at two separate chiropractic colleges. Responses were voluntary and confidential with no identifying information requested on the questionnaires. Surveys were sent by interoffice mail and returned in the same manner. A descriptive analysis was performed including frequencies of responses and calculation of mean responses to grouped frequencies.

RESULTS

Surveys were returned by 18 chiropractors employed as clinical faculty at two separate chiropractic colleges.

DISCUSSION

In this small sample, chiropractors were accurate in identifying signs of depression, but prevalence of depression and risk of suicide were underestimated. There may be some confusion related to feelings of depressed mood and clinical depressive disorder, and this indicates a need for education of chiropractors. This sample of respondents is comfortable with a range of interventions, but prefer herbal supplements, exercise, and counseling over use of prescription medications. The majority of respondents felt that chiropractors should screen for depression and then refer to other healthcare professionals. Interestingly, in spite of no published evidence, the majority of respondents believe that chiropractic care is helpful for depressed patients. Larger than expected numbers of respondents report personal history of depression, but this again may be lack of understanding of normal, occasional depressed mood or may be an indicator of unique stress within this population. Larger numbers of respondents are needed in future research to see if these responses are representative of the profession. Future research is needed to determine if chiropractors are evaluating patients for the presence of depressive disorders and providing appropriate referral and follow-up. Limitations of this study include small sample size and lack of randomization. Future research should also go beyond self-reporting by chiropractors regarding management of depression to actual measurement of practice behaviors.

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Relief of Depressive Symptoms in a Patient With Low Back Pain and Chronic Pelvic Pain

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OBJECTIVE

The purpose of this article is to describe the case of a patient with depressive symptoms that improved under chiropractic care and to discuss the clinical features of depression, including screening.

CLINICAL FEATURES

A 71-year-old female with low back pain sought chiropractic care. Her initial score on the Beck Depression Inventory (BDI) was 8.

INTERVENTION AND OUTCOME

The patient was treated with flexion-distraction chiropractic technique, moist hot packs, and interferential current to the lumbar spine a total of 11 times over 11 weeks. The BDI was administered at baseline and again 3 times during care. Her scores went from 8 (indicated moderate depression) to 4 (indicating no or minimal depression) to 0 during her care.

DISCUSSION

The BDI is a valid and reliable instrument to evaluate depression in the family practice setting. While nonmusculoskeletal complaints as a chief complaint make up a small percentage of chiropractic practice, chiropractors see large numbers of patients with low back pain and depression. There is scant literature about the effect of chiropractic care as a treatment for depression. There are reports of other CAM treatments for patients with depression, as well as reports of depression screening and awareness in chiropractic practice. This patient's depression improved while under chiropractic care. This may have been due to a variety of factors, such as natural progression, therapeutic effect of touch, patient–doctor interaction, or improvement secondary to improvement of her back pain and CPP.

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Influence of Comorbidities on Improvement of Fibromyalgia Symptoms When Treated With Acupuncture

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Fibromyalgia is a prevalent musculoskeletal disorder associated with a high degree of pain, mood alteration, and disability. A structured and effective treatment plan capable of providing significant palliative care and deterring increased disability has not been identified. The etiology of fibromyalgia is unknown, although epidemiological and clinical studies have attempted to uncover the causal links. Fibromyalgia primarily occurs in older persons and women.

OBJECTIVE

The goals of the study were to determine the effectiveness of needling at specific acupuncture points, and to determine which cohort group experienced the greatest or least improvement based on fibromyalgia-associated comorbidity.

METHODS

This study was reviewed and approved by the Institutional Review Board of the Southern California University of Health Sciences. Using the American College of Rheumatology criteria for diagnosis of fibromyalgia, 21 participants completed the study. The mean age was 54 ($SD = 8$). Data were collected at baseline, 1 month, and 2 months. Acupuncture treatments included 17 points for fibromyalgia symptoms and 3 to 5 points relevant for treatment of comorbidity, twice per week for 8 weeks. Demographic, disease-related information and data on eight outcome measures were collected.

RESULTS

The Fibromyalgia Impact Questionnaire (FIQ) showed significant improvement at 1 and 2 months for both. Participants reporting irritable bowel syndrome (IBS) as their comorbidity had the poorest level of recovery (35%). Participants reporting migraine or upper respiratory syndrome as their comorbidity improved on the FIQ most, 58% and 63%, respectively. For the SF-12, three subscales showed significant differences between baseline and end of treatment. By end of treatment, the least improvement was reported by those with sleep disorder (36%) or upper respiratory syndrome (16%). Those participants with migraine comorbidity showed 93% improvement. For the visual analog scale (VAS) scale, four of six items were statistically significant. For "severity of pain now," "most severe pain," and "function question," participants with migraine as their comorbidity improved most. Participants with sleep disorder as their comorbidity improved most in mood state. Those with chronic fatigue and IBS generally had the poorest recovery

on this scale. The mean number of total symptoms between baseline and 2 months was significantly different. For this measure, migraine comorbidity participants had the best improvement and those with IBS had the least. There was a significant improvement in Beck Depression Index at 1 and 2 months ($p = .007$ and .0001, respectively). The least improvement in the Beck Depression Index was found in participants with IBS (47%) or upper respiratory syndrome (25%) and the most improvement was experienced in participants with migraine (69%). For the Catastrophe Index of the Coping Strategy Questionnaire, significant differences were found comparing baseline with end of treatment ($p = .006$). Participants with migraine comorbidity improved 20% at 1 month, but did not continue to improve in the 2nd month. Persons reporting IBS improved 26% by 1 month, and 42% by end of treatment. Overall, pain threshold scores were significantly different at end of treatment for knee, occiput, trapezius, gluteal, and supraspinatus tender points bilaterally. Number of weeks in treatment, number of doctors who treated, or total number of general health symptoms did not have any significant effect on participants' outcome.

DISCUSSION

For the combined cohort with comorbidity, significant improvement was experienced at 8 weeks of treatment. Participants with IBS comorbidity generally had a lower percentage of improvement than other comorbidity cohort groups for most measures. This finding has implications for treatment and expectations for improvement.

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A Comprehensive Musculoskeletal Management Program Reduces Pain and Disability in Pregnancy

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LBP/PP (low back and/or pelvic pain) during pregnancy is prevalent and has a negative effect on quality of life. Indeed, women have reported feeling ignored by their physicians and even attempt to ignore the pain themselves. Alterations in biomechanics, in response to LBP/PP during pregnancy, can predispose the patient to further clinical problems, such as overuse patterns and chronic pain syndromes. These findings suggest that LBP/PP in pregnancy has negative effects that necessitate researching treatment considerations. While studies suggest that physical therapy interventions can alter LBP/PP in pregnancy, there is limited qualitative research.

OBJECTIVE

The primary aim of this study was to determine if a comprehensive treatment approach would alter pain and function in a population of pregnant women. Because guidelines and evidence for treatment of LBP in nonpregnant populations is multimodal, the treatment protocol included a continuum of patient education, soft tissue mobilization, joint mobilization and manipulation, and specific stabilization exercise.

METHODS

Over a 3-month period, 170 patients registered with the Musculoskeletal Pain in Pregnancy Clinic (MSPP) at Barnes-Jewish Hospital in affiliation with Washington University School of Medicine in St. Louis, MO. Attending OB/GYN physicians and Maternal-Fetal Medicine Fellows staff all clinics. Chiropractic physicians, chiropractic residents, and chiropractic interns staff the MSPP. Fifty-eight women agreed to participate in the study. All of the women were given the Bournemouth Questionnaire (BQ; 5) upon entry into the MSPP. At their first follow-up appointment, a second BQ was given. The data consisted of 58 pairs of scores. In examining the data, two approaches were used. First, a repeated measures analysis of variance (RM ANOVA) was used to determine if changes occurred over time. Second, an intraclass correlation was computed as a measure of reliability.

RESULTS

The average time interval between the first and second visit was 22 days ($SD = 29$). The authors found that using RM ANOVA that there is a significant difference between

the first and second visit [$F(1, 57) = 8.12$, $p < .01$]. In examining the means, it is clear that a lower value for the BQ was obtained during the second visit (visit 1 = 45, $SD = 23$; visit 2 = 34, $SD = 22$). The test was shown to have good reliability between the ratings ($r = .602$).

DISCUSSION

In this study, pregnant women with complaints of pain were given an individualized treatment program including patient education, manual therapy, and specific stabilization exercises. Surprisingly, the participants reported a significant improvement after only one encounter. The findings suggest that a musculoskeletal intervention can reduce pregnancy-related LBP. The authors are currently conducting a similar trial that includes a matched control group.

Approximately 25–30% of women with chronic back pain report their first episode of back pain during pregnancy. Therefore, in contrast to the view that LBP/PP in pregnancy is simply a transient phenomenon that will be resolved following delivery, this suggests that pregnancy is a trigger and high risk factor for developing chronic and disabling LBP. Taken together with previous studies, this study demonstrates that LBP/PP during pregnancy can be altered. With these findings, the authors now not only present the problem of back pain during pregnancy, but provide evidence that this is a problem with a solution.

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Muscle Activation Patterns for the Jaw and Neck During an Endurance Task

Clayton D. Skaggs, D.C., Logan College of Chiropractic, **John R. Gray**, M.S., and **S. M. McGill**, Ph.D. University of Waterloo

While the clinical approach to temporomandibular joint disorder is evolving to include functional characteristics common to most musculoskeletal conditions, the clinical research to substantiate this practice for this difficult problem is very limited. The interplay between the sensorimotor systems of the neck and jaw has been well studied in animals and similar studies are being initiated in humans. Clearly, coordinating motor programs exist for the jaw and neck that seem to be modulated in the presence of pathology. Exercises for the opening and closing muscles of the jaw, as well as behavior modifications using the tongue to offset mandibular load, have demonstrated improvements in patient outcomes but have not been studied physiologically or with high-quality methodology.

OBJECTIVE

The purpose of this study was to evaluate muscle recruitment patterns of the jaw and neck during a functional test for the cervical spine. It was hypothesized that conscious activation of the orofacial muscles will increase muscle coactivation for the jaw and improve performance during a neck stability and endurance task.

METHODS

This study was reviewed and approved by the Institutional Review Board of the University of Waterloo. Five women and one man were recruited from the university population. All subjects were healthy with no history of temporomandibular joint pathology. Subjects were supine and held their heads in anatomic neutral slightly off of the support surface while surface electromyography (SEMG) of the suprahyoid (digastric), masseter, sternocleidomastoid (sternal head), suboccipital, and upper trapezius muscles was obtained. Three conditions for tongue-assisted orofacial activation were randomly assigned. EMG was normalized to maximum activity recorded from isometric trials taken in the test position. Differences in average normalized activity (nEMG) between conditions for each muscle were assessed using a one-way analysis of variance (ANOVA) with Bonferroni correction ($\alpha = 0.01$).

RESULTS

Level of orofacial activity did not have a significant effect on average muscle activity in the test position ($F = 0.0076$ to 0.4823, $F_{crit} = 6.359$). Overall, the digastrics showed the greatest relative increase in contraction. On observation of the results graphically, many subjects exhibited significant left-right differences in EMG activity, especially for suprahyoids and sternocleidomastoid muscles. One-way ANOVA did not reveal any differences in asymmetrical muscle activity present in each condition ($F = 0.0005 - 0.3967$, $F_{crit} = 6.359$).

DISCUSSION

Masseter and suprahyoid activity increased, with the greater change occurring in the suprahyoids. These findings are consistent with previous studies in that there is clearly muscle activation associate with this so-called rest

position. Surprisingly, conscious activation of rest position and forceful lip closure did not improve orofacial and neck muscle asymmetries. This may be due the lack of training that the individuals received. Interestingly, the suprahyoids had the highest increased contraction of all muscles for the neck stability task. While very little attention is given to the suprahyoids in diagnosis and treatment of the neck problems, our results suggest the need for further investigation.

CONCLUSION

These results suggest that conscious activation of orofacial muscles does not lead to changes in performance of peripheral neck muscles during a stabilization and endurance task. This implies that head stabilization strategies are largely reflexive and that cocontractive efforts, conscious or unconscious, decrease the ability of the neck to stiffen.

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Chest Pain Report from a Multidisciplinary Focus Group

Monica Smith, D.C., Ph.D., **Dana J. Lawrence**, D.C., and **Robert M. Rowell**, D.C.,
Palmer Center for Chiropractic Research

Chiropractors serve as first point of contact with the healthcare system for patients presenting with a broad range of conditions, and their professional responsibilities to patients with chest pain include proper assessment, documentation, and treatment, and appropriate and timely referral as needed.

METHODS

A multidisciplinary focus group (DCs and MDs) was formed to explore attitudes and experiences of clinicians with chest pain patients and to identify research questions to improve diagnosis, treatment, management, and coordination of care of chest pain patients between MD and DC providers. Our convenience sample included two DCs, two MD cardiologists, and one dual-degreed DC, MD. The IRB of Palmer College approved this study of human subjects, Informed Consent document, and procedures to protect subject confidentiality. Content analysis of the focus group transcripts was undertaken to identify key themes and concepts.

RESULTS

Six key themes emerged. Examples of key thematic issues are summarized below.

1. *Diagnosis*: A good history and physical exam are essential and important to good diagnosis. History should include all prior care received for that condition. Records of prior care should be obtained directly from the source provider. History, exam, and differential diagnosis are central to the provision of portal-of-entry primary care as well as secondary specialty care. Musculoskeletal chest pain is principally a diagnosis by exclusion.
2. *Treatment and Prognosis*: DC and MD participants both noted lack of formal clinical studies examining effectiveness of manual/manipulative approaches to manage (diagnose and treat) musculoskeletal chest pain, and lack of evidence supporting effectiveness for medical Rx interventions for musculoskeletal chest pain (e.g., oral nonsteroidal anti-inflammatory drugs or steroid injections into chest wall). Both effectiveness and safety concerns should direct the appropriateness and order of trying various clinical approaches to resolve musculoskeletal chest pain in a given patient.
3. *Chest Pain as a Chronic, Multifactorial, or Comorbid Condition*: Chronic recalcitrant chest pain is associated with high resource use and unsatisfied, distressed patients. It is unknown to what extent early manual/manipulative intervention in acute musculoskeletal chest pain may prevent development of chronic musculoskeletal chest pain.
4. *Interprofessional Coordination of Care*: The path of referral for chest pain will depend on the nature of the condition and the urgency of the situation. The nature of the referral (e.g., amount and type of information accompanying the referral) may depend on the nature of the condition, whether the referral is for reasons of diagnosis and/or treatment, the preference of the provider, and the relationship between the providers. Patients with comorbidities (e.g., having both musculoskeletal and nonmusculoskeletal chest pain) may be more likely to receive concurrent care from more than one provider.
5. *Best Practices and Standardization of Care*: Standardizing care within a profession may facilitate opportunities for interprofessional referrals. Interactions between providers and professions (e.g., referrals) may also be standardized.
6. *Training/Education*: Competencies in exam, diagnostic, and clinical decision-making skills for chest pain were raised as issues for both DCs and MDs. There was a perception that medical practice is more consistent with medical training (i.e., DCs' clinical practice may be more likely to deviate from what they were taught). Medical training includes skills/competencies in referral practices (e.g., standardized referral forms are used in medical academic practice and teaching clinics).

DISCUSSION

This study carries implications for undergraduate and postdoctoral chiropractic clinical training relative to enhancing diagnostic competencies in chest pain (both musculoskeletal and nonmusculoskeletal), as well as the need to ascertain and possibly improve those skills, competencies, and standards for referrals and sharing of clinical information that may improve cross-disciplinary coordination of care for chest pain patients.

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Attributes of the Effective Clinical Teacher

John Stites, D.C., D.A.C.B.R., Palmer College of Chiropractic

The culmination of the chiropractic curriculum is in the student's clinic experience under the mentorship of a faculty clinician. Although the importance of this experience is generally recognized, very little has been published on the attributes of effective clinical educators. A review of the literature using the Index to Chiropractic Literature and Medline identified no article addressing this issue in chiropractic. Although there has been discussion of behavior and attitudes of clinical teachers and work has been done on the attributes of surgical mentors, the subject is largely unexplored.

OBJECTIVE

The purpose of this project was to explore the attributes deemed important in an effective clinical teacher in chiropractic education in one college.

METHODS

A survey was developed based primarily on the attributes of clinical teachers published by the General Medical Council of the United Kingdom. These attributes were arranged as a series of statements with an associated 5-point Likert scale. Participants were asked to rate each of the attributes from most important (5) to least important (1). A second part of the survey asked participants to outline the three attributes they believed were most important. The survey was piloted with a group of five students, refined, and administered to clinic faculty at a chiropractic college during a departmental meeting.

RESULTS

A total of 37 surveys were completed. Eleven of the participants were female, the mean age was 45 (range, 27–64) and mean length of clinical teaching experience was 11 years (range, 1–26). The respondents viewed commitment to teaching and learning, willingness to develop as a doctor, adjusting skills, and patient management skills as the most important attributes in the rating portion of the survey. Understanding research methods, commitment to peer review of teaching, business skills, and knowledge of extracurricular techniques were seen as least important. Age, years of experience, and gender had no apparent influence on the survey outcomes. A number of attributes were identified on the written portion of the survey which included patience, respect for students, passion, and availability.

DISCUSSION

Teaching is a distinct profession, as is the practice of chiropractic. To teach in a chiropractic college clinic requires a distinct skill set incorporating elements of both professions. Based on the literature, these skills have not been evaluated by any scholarly process. The survey gathered information on faculty views of clinical teacher attributes associated with effectiveness. It is possible that the skills the faculty possessed influenced their selection of what skills they considered important. The perceived importance of various skills may also reflect the individual college's priorities. For example, if there is no expectation for clinicians to participate in research or for students to be exposed to the clinical research processes, this may influence the clinician's perception that understanding research methods is relatively unnecessary for an effective clinical teacher. The next step is a project to survey students at various levels in their clinical experience and recent graduates. This information will allow identification of disconnects between what students and faculty deem important. It may be found that students need different skills in their mentors at different stages in their clinical education. This may have implications for institutions in placing faculty where their skill sets will most likely provide the greatest benefit for student education. This information may also be useful for developing hiring criteria and for faculty development.

CONCLUSION

This is an initial foray into defining the attributes of clinical educators in chiropractic. This project sets a foundation for further projects assessing student opinion on important attributes of clinical teachers.

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Segment-Specific Correlation Between Cervical Pillar Hyperplasia and Degenerative Joint Disease

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Cervical pillar hyperplasia (CPH) is a recently described phenomenon of unknown etiology and undetermined clinical significance. The only effect of CPH reported in the literature is a straightening influence on the cervical lordosis. Other undiscovered consequences of this architectural variation of the pillar need to be pursued in order to determine its clinical significance. The possibility that a change in architecture may change the biomechanics of the cervical spine has led to the idea that individuals who have CPH may be predisposed to more biomechanical stress as is involved in the predominantly accepted theory of the development of degenerative joint disease. Global assessment of pillar hyperplasia of the cervical spine as a unit has not shown a relationship between the two conditions, but a more sensible explanation of the architectural influence of CPH on cervical spine biomechanics would be segment-specific, meaning that a hyperplastic pillar at a specific cervical level may be related to a higher prevalence of degenerative joint disease (DJD) in adjacent cervical segments.

OBJECTIVE

The objective of this study was to determine the level of association between DJD and cervical pillar hyperplasia in an age- and gender-matched sample on a by-level basis.

METHODS

Two hundred forty radiographs were assessed to determine the presence/absence of CPH and DJD. This sample size, based on the reported prevalence of CPH, was predicted to yield the minimal estimated requirement of 46 radiographs at each level. The sample ranged in age from 40 to 69 years and consisted of a mix of both genders. Films of poor radiological quality and radiographs that showed evidence of a pathologic condition or abnormality other than signs of osteoarthrosis were excluded. The two primary outcome measures used in the study were the segmental presence/absence of cervical pillar hyperplasia and segment-specific presence/absence of degenerative joint disease. The 240 neutral lateral cervical radiographs were examined to determine the presence/absence of cervical pillar hyperplasia at each level from C3 to C6 and the same set of radiographs including APOM, AP lower cervical, and neutral lateral views were examined for the presence/absence of DJD at each intervertebral disc and zygapophyseal joint from C1 to C7. The contingency coefficient, at the 5% level of significance, was used to determine the strength of the correlation between CPH and DJD at each level.

RESULTS

Our present study suggests that a weak correlation exists at C4 and C5 CPH and adjacent level degenerative disc disease (DDD); with the strongest (overall) correlation demonstrated at C5 CPH versus C4–5 DDD. Age-stratified results demonstrated the same pattern of correlation (with one exception), even reaching the initially proposed "moderately strong" correlation of $C \geq .4$ ($p \leq .05$) in some age categories. Pillar hyperplasia at C4 versus C4–5 DDD in the 50- to 54-year age category had the strongest age-stratified correlation; nevertheless, the segmental relationship between CPH and DJD did not reach the initially hypothesized correlation of clinical importance ($C \geq .4$) across all age categories. No statistically or clinically significant correlations were present at the C3 level, except for the 45- to 49-year age subgroup for C2–3 facet degeneration.

CONCLUSION

Our results suggest that cervical pillar hyperplasia is weakly correlated with the presence of degenerative joint disease; therefore, it may be but one of several factors which contribute to some degree to the development of DJD. Chiropractic clinicians need to be aware of all conditions, including cervical pillar hyperplasia, which may influence their patients' clinical presentation, susceptibility to available treatments, and their prognosis.

A Randomized Controlled Trial of the Effects of Full Spine Manipulation on Rocker Board Performance

Rodger Tepe, Ph.D., **Monica Matzker, Eric DeRoche**, and **Rebekah Schell**, Logan College of Chiropractic

Over 5 million patient visits per year are prompted by symptoms of dizziness, vertigo, and related equilibrium problems. Disorders of balance interfere with ability to work or enjoy leisure as well as increasing injury and decreasing performance in physical activities. Many of these balance problems are due to dysfunction in proprioceptive signaling and/or processing. A founding principle in chiropractic is that spinal manipulation "normalizes" neurological functioning and should, therefore, have beneficial effects on balance problems due to proprioceptive dysfunction. The use of spinal manipulation in treating proprioceptive dysfunction has important implications for chiropractic practice, education, and research.

OBJECTIVE

The purpose of this study was to evaluate the effects of diversified full spine chiropractic manipulation on proprioceptive functioning as measured by rocker board performance.

METHODS

This study was reviewed and approved by the Institutional Review Board of the Logan College of Chiropractic. Forty-eight consenting, normal volunteer subjects were randomly assigned into control and treatment groups. The treatment group performed 1-minute rocker board trials before and after diversified full spine adjusting, and the control group performed 1-minute rocker board trials before and after 5 minutes of seated rest. The hypothesis tested was that the treatment groups' rocker board performance would significantly improve, while the control group's performance would not improve. Rocker board performance was measured by average deviation during each 1-minute trial. Deviation scores of the treatment and control groups were compared in related samples t tests.

RESULTS

The primary finding of this investigation was that the treatment group's rocker board performance was significantly improved (mean degrees of deviation: before $= 6.8^{\circ}$, after $= 4.4^{\circ}$, $p < .001$) while the control group's was not improved (mean degrees of deviation: before $= 8.3^{\circ}$, after $= 8.0^{\circ}$, $p = .487$).

DISCUSSION

The data analysis supports the authors' experimental hypothesis, that full spine adjusting significantly improved rocker board performance. Full spine manipulation may improve proprioceptive functioning. Many chiropractic theories assert that spinal manipulation affects sensory receptor, spinal cord, and neural integration mechanisms (i.e., "normalizes" nervous system function). Demonstrating efficacy of spinal manipulation in improving proprioception provides evidence supporting the use of spinal manipulation as treatment for the many patients with equilibrium disorders. The encouraging results of this investigation indicate the need for continuing research on the effects of spinal manipulation on proprioception. Studies with larger sample sizes, symptomatic populations, longer treatment times, and additional outcome measures could provide valuable information of the effects of chiropractic adjusting on proprioceptive functioning. Studies combining spinal manipulation, rocker board, and other methods of proprioception training may lead to the development of integrative models useful in treating disorders of equilibrium.

CONCLUSION

The results of this investigation demonstrate that spinal manipulation significantly improved rocker board performance in the subjects tested. This suggests that spinal manipulation may improve proprioceptive functioning.

Confounded Association
Cervical Spine Manipulation and Adverse Cerebrovascular Events

John J. Triano, D.C., Ph.D., **Sharina Gudavalli**, D.C., **Michael Seals**, M.D., and **Nayan Patel**, M.D., Texas Back Institute

The controversy over manipulation for neck patients has increased. Speculative associations between cerebrovascular incidents and exposure to cervical spine manipulation have been reported. The reporting itself has gained some notoriety based on the absence of prospective data, use of poor epidemiologic methods, referral bias, and occasional misrepresentation. The continued controversy is based on the argument of unacceptable risk versus the potential severity of incidents, regardless of cause. The association is influenced primarily by temporal appearance of symptoms. The patient presents with symptoms of neck pain for which manipulation has been sought and absent overt cerebrovascular signs when disease may be preexisting. Developing or subclinical vascular problems manifest by happenstance at the time that they are under care. We present three case studies of confounded relationship and review the factors governing the interpretations of association.

CASE 1

A 46-year-old female with low back, midback, and neck pain exhibited central neurological findings while on the treatment table but before performance of manipulative treatment. Magnetic resonance angiography (MRA) demonstrated diminished flow in the right middle cerebral artery. Circle of Willis anatomy was otherwise normal.

CASE 2

A 52-year-old female had four episodes of neck and occipital area pain over several years. Neurological findings and vertebral artery screening tests were normal. After initial improvement and traumatic aggravation, she presented with flat affect and was in severe distress. MRA showed 100% chronic occlusion of the right vertebral artery. On informing the patient, she replied, "Oh, yes. In 1983, I had some dizziness and was advised I had a kinked artery at the base of my head."

CASE 3

A 35-year-old consulted with an outside chiropractor. The day after treatment, the symptoms switched sides and began to affect the left arm and leg. The patient experienced nausea and vomiting and consulted the emergency room physicians but was sent home with no diagnosis. Two weeks later on presentation to the clinic, MRA revealed vertebral artery dissection.

DISCUSSION

These three cases of confirmed cerebrovascular incident in patients who have undergone cervical spine manipulation individually supports or refutes one or more of the alternate explanations for association. In Case 1, a patient experiences a middle cerebral artery stroke before manipulation of the neck is performed. Case 2 demonstrates a patient with undisclosed and chronic vertebral artery obstruction who experienced multiple episodes of successful cervical manipulation over several ensuing episodes of neck pain. Case 3 describes new symptoms in a patient within 24 hours of manipulation treatment. Two of the three are inconsistent with the assumption of causality. Extending the consideration of evidence beyond the question of temporal patterns, causation requires a biomechanical profile of manipulation that is consistent with tissue damage to either or both of the vertebral and carotid structures. Previous studies estimating the loads passing through the neck during the most common procedures at maximum clinical effort and evaluating strain to the vertebral artery have failed to find sufficiently large loads to cause injury. A remaining alternative is the presence of an underlying structural weakness rendering the artery susceptible to the mechanical loads to which they are exposed during treatment procedures.

CONCLUSION

Iatrogenic adverse events resulting in ischemia to the central nervous system is a serious concern because of the potential severity of residual deficits. The work here attempts to put into context the problems of attributing causation based on temporal association and suggests the hypothesis that association between manipulation and cerebrovascular incident represents a confounded relationship, one more of comorbidity than causation.

Procedural Replication During Spinal Manipulation in Clinical Practice

John J. Triano, D.C., Ph.D., University of Texas and Texas Back Institute, and **Carolyn Rogers**, M.S., Innovative Spinal Technologies

Quantitative information on the mechanics of spinal manipulation is a field of study in its infancy. Effective treatments exhibit characteristic qualities of threshold effects, dosage, and duration. However, other characteristics have not been well determined. The existing data exhibit a wide variation of measured loads, with little evidence explaining the source of this variation. Possible sources include a systematic quality related to provider stature, idiosyncratic preference, or systematic relationship to patient characteristics. Studies on skill development in administering these procedures suggest that moment loads acting through the patient's spine may primarily be derived as a function of control of the operator's body weight, while force components may be more a function of muscular effort.

OBJECTIVE

This project was designed to examine the repeated performance of procedures in a clinical setting by a single provider on the same set of patients. The significance of data of this type is to provide evidence as to whether providers systematically control load development or whether it is more arbitrary. A systematic variation based on clinical experience permits an intrinsic, as yet undefined, dosage effect. Two hypotheses were tested. The first hypothesis posited that therapeutic manipulation delivers the same load dosage on repeated administrations. The second is that experienced providers vary the loads dispensed during treatments systematically in response to patient stature.

METHODS

The project was performed in conjunction with the University of Southern Denmark. An experienced practicing chiropractor participated. A treatment table with a load-sensing platform replaced the provider's personal equipment. Routine loads administered during treatment of the lumbopelvic region were monitored quantitatively. Patients' age, gender, height, and weight were obtained. The provider preloaded the patient in preparation for delivery of manipulation and the recording of table loads was initiated. The patient was scheduled for follow-up within 4 days. Total loads transmitted through the targeted level were calculated using inverse static methods. To evaluate the first hypothesis, loads were normalized to give a ratio of load to patient stature (force amplitude:weight and moment:body mass index. Intraclass correlation coefficients (ICC) were calculated for normalized force and moment amplitudes. For the second hypothesis, load peak values were correlated with patient stature.

RESULTS

A total of 20 patients (15 male, 5 female) participated in the study. Ages ranged from 9 to 53 (36 ± 14) with mean stature of 1.7 m (± 0.17) and mass of 65.7 kg (± 19.3). Average force and speed were 352 N and 2536 N/s on the first manipulation and 387 N and 2615 N/s on the second. ICC comparing load amplitudes and speeds from the first to the second administration ranged from poor to good. Force amplitude gave ICC of 0.57 with speed of 0.48. Moment amplitude ICC was 0.67 but speed fell to 0.14. Correlation coefficients of force to speed, height, and weight were 0.876, 0.716, and 0.781, respectively.

DISCUSSION

The peak force, moment, and speeds were comparable for two repeated measures. The ICC values demonstrate good repeatability in the dosage of transmitted force. Force speed was moderately consistent but consistency on moments was poor. Strong correlations were observed between peek amplitude and procedural speed. Patient stature appears to play an important role in the determination of the force components generated by the provider's musculature but only moderate influence on the moments.

CONCLUSION

Evidence from the manipulations applied to the lumbar spine of patients by a single provider support the hypotheses of this study. Consistency across repeated measures suggests a dosing judgment modified to accommodate patient stature. While the minimum dose effect on clinical outcome remains to be determined, these results suggest that such future studies are likely to be fruitful.

Pilot Implementation of a Pediatric Open Lab
A Preliminary Report

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Chiropractic has become a larger part of the integrative healthcare model in recent years. Part of this professional growth includes the increased demand of chiropractic care for children, including infants. For the students presently in school, efforts are in process to increase their clinical experience with regard to assessment, diagnosis, and treatment of young children and infants. The student is taught about the different pediatric adjusting techniques but never given the opportunity to practice before appearing in clinic and seeing actual pediatric patients.

OBJECTIVE

This report discusses the implementation of an innovative open lab specifically designed to provide an opportunity to interact with children.

METHODS

An open lab class was scheduled for students who had taken an elective clinical pediatric course or participated in the pediatric club on campus. The children who participated were children of the New York Chiropractic College students. A parent from each family was required to be present during the open lab. The students were instructed to observe posture, mobility, gait, and overall coordination. The students were instructed to palpate for the presence of the vertebral subluxation complex, including the components of muscle tone and swelling. Faculty demonstration and verbal direction were provided as needed. A survey to assess the success of the open lab was constructed with the intention of its utilization after the sixth and final lab. Data were collected using a paper survey in the final pediatric open lab offered during the spring trimester. The survey used a 5-point scale system for eight statements (1 = strongly disagree, 5 = strongly agree). The students were also instructed to add additional comments if they so chose.

RESULTS

The average attendance of the pediatric open lab was 17 students and 7 children (age range 0–7 years) to interact with the student doctors. A total of 15 surveys were completed and used for analysis. The results indicated that, in general, the participants felt very positive about the lab. Although there were four students who were comfortable with children before the lab, all students reported a higher comfort level after the lab. All 15 strongly agreed they plan to take the lab again, and recommend the lab to a friend, colleague, or classmate.

DISCUSSION

The popularity and subsequent success of the lab was confirmed with the results of the survey. This was an expected and pleasant outcome, and was the stimulus to continue the pediatric open lab experience. Another expected outcome was that the students felt more comfortable and confident while working with children at the end of the trimester. When looking at the weighted averages, all questions scored above the neutral response with five of the eight questions scoring above 4.5. The author feels this shows a consistency between the goals of the pediatric open lab, the expectations of the students, and the actual learning experienced by the students. The author also feels these high scores validate the effectiveness of the pediatric open lab in teaching the students in a “simulation” situation.

CONCLUSION

The enthusiasm and positive feedback from all involved confirms that the concept of the pediatric open lab was very well received. The more important success was that the participating students of New York Chiropractic College felt more prepared and confident and less anxious about interacting with children and the available pediatric adjustive technique.

Effectiveness of Pragmatic Chiropractic Treatment in Temporomandibular Disorders
A Pilot Study

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Temporomandibular disorder (TMD) is a collective term used to describe a group of conditions that are painful and affect the movement of the jaw. TMD usually affects the temporomandibular joints, the muscles that control chewing and other associated structures. More than 10 million people in the United States suffer from TMD. There is no known specific etiology of TMD. However, most believe that it is due to excessive strain on the muscle group that controls chewing, swallowing, and speech. Symptoms vary among patients, but pain in the temporomandibular joint and the masticatory muscles are the most common symptoms. Other symptoms include clicking, headache, facial pain, limited movement of the jaw, dizziness, and clenching of the teeth. Diagnosis is determined by comprehensive clinical evaluation. Conservative and reversible treatments such as self-care practices, relaxation, stress release, physical therapy, and sometimes painkillers are preferred over irreversible treatments (surgery and intraarticular injections) that change the structure or position of jaw and teeth of TMD patients. The use of chiropractic treatment for TMD is steadily growing because of increased desire for conservative and holistic approaches to treatment. Chiropractic has traditionally applied motion analysis when investigating the spine or extremities. A similar method of motion analysis of mandibular gait by chiropractors could refine diagnosis of abnormality and treatment of TMD using chiropractic manipulative therapy.

OBJECTIVE

This study was designed to investigate the effectiveness of pragmatic chiropractic treatment in relieving the symptoms of TMD using standardized scales.

METHODS

The Institutional Review Board of the Southern California University of Health Sciences reviewed and approved the study protocol. Seven subjects were community recruited for the study. A written informed consent form was obtained from all participants at the time of recruitment. All subjects were given pragmatic chiropractic treatment, which included chiropractic manipulative therapy, myofascial release, Activator, hot or ice packs, and soft tissue massage. In addition, advice on diet, lifestyle, and some exercises for the jaw were also suggested. All the participants were treated for 8 weeks, but the frequency and type of chiropractic treatment were individualized. Outcome measures used to assess the effectiveness of chiropractic treatment were the visual analog scale (VAS) and the Medical Outcomes Study 12-Item Short Form Health Survey (SF-12). Scores for these outcome measures were collected at baseline, 1 month, and 2 months in the study. No adverse events were reported by the participants, except for mild soreness and pain after chiropractic manipulative therapy.

RESULTS

Subjects included six females and one male. The mean age was 36 (range, 22–52, $SD = \pm 11$). Six out of the seven subjects showed positive changes on the VAS and participants reported less severity, frequency, and pain interference at the end of 2 months, in addition to an improvement in their mood state. Confidence in the treatment was high to start with and remained the same at the end of 2 months. SF-12 scores indicated that there was an overall improvement in general and mental health and less pain interference. All participants reported accomplishing more in their daily activities following treatment.

CONCLUSION

Pragmatic chiropractic treatment was found to be effective in treating TMD in this case series.

Influence of an Information Literacy Course on Students' Informational Search Behavior

Daniel J. Weinert, D.C., M.S., D.A.C.R.B., and **Erin M. Palmer**, B.S., Palmer College of Chiropractic

Information literacy is the ability to obtain and evaluate information, with subsequent application toward problem solving. Allied health professions are now assessing information literacy within their curricula.

OBJECTIVE

The purpose of this study was to determine the influence of an information literacy course on students' information-gathering behavior.

METHODS

Two student groups, consisting of 177 and 69 students, respectively, were compared in their performance on a literature review assignment. One group had a prior curricular course in information literacy, while the other did not. Assignment references served as the response variables and included the following categories: total number of references, number and percentage of peer-reviewed journal references, number and percentage of non-peer-reviewed journal references, number and percentage of Web site references, number and percentage of authority opinion references, and number and percentage of textbook references. Referenced Web sites were further divided into the following:. com,. org,. edu, and. gov for both total number and percent utilization. Independent *t* tests were performed, comparing the two groups' means for each of the response variables.

RESULTS

Descriptive data (prior education, cumulative grade point average) was similar for both student populations. Independent *t* test analysis revealed a strong association between increasing both the number and percentage of peer-reviewed references and having the information literacy course. Having the information literacy course and decreased reliance on. com Web site and textbook references approached statistical significance.

DISCUSSION

The introduction of an information literacy course did influence the information-gathering behavior of students. Students having the information literacy course showed greater utilization of peer-reviewed references and less reliance on non-peer-reviewed references.