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What is “Evidence”?

We, as practitioners need to educate ourselves on the use of evidence to strengthen and sometimes, to justify our clinical decisions. Evidence can help expand our knowledge base about a specific condition or clinical presentation.

Evidence-based Practice is “the integration of best research evidence with clinical expertise and patient values” (Sackett, 2000). A practitioner needs to develop the ability to ferret out, understand and critically evaluate evidence. Compiling evidence in conjunction with incorporating one’s own expertise and the values of the patient in making clinical decisions makes the practitioner more informed about his or her own clinical practice.

Although the body of evidence for the chiropractic care of the pediatric population is gradually emerging, there is often no evidence available to consult when a particular clinical case presents itself to our offices. It is in these situations where being able to author a clinical case report or work with a team to develop a research study is important to the future of chiropractic for children.

Dr. Roni Evans from Northwestern Health Sciences University, expounded on the Evidence “Informed” Practice model in which a clinician can use evidence, in conjunction with “their own experience, the historical experience of a profession, clinical findings, patient preferences and research. Importantly, research is viewed as a resource, and is only one piece of the clinical puzzle... this approach stresses the importance of the clinician practicing his or her ‘art’, where all these pieces are skillfully brought together to provide the appropriate care to the (pediatric) patient.” (Evans, 2009)

The Evidence Informed Practice model can then be applied by a practitioner to design an individualized treatment approach for one child as well as in the development of strategies and policies amongst chiropractic colleagues who render care to the pediatric population. A practitioner’s desire to maintain quality practice standards and their curiosity about the daily clinical interactions of their practice directs them to being critical of their own professional practice and draws upon strategic, reflective and analytical thinking. This application of evidence along with self reflection and inquiry into one’s practice helps to improve the practitioner’s clinical knowledge and skills and raise the bar for other colleagues in their profession, and in

their area of clinical expertise.

Informed clinical decision making should be supported by good quality research evidence. The general population of field practitioners need to learn how to critically appraise and interpret evidence (including evidence-based resources such as published clinical guidelines), systematically considering its validity, results and relevance. It would also be good practice to seek out any opposing evidence to compare and contrast.

Once we have found evidence that is relevant and applicable to our practice, and we set a specific protocol in place, it then makes sense to establish a methodology to record outcomes as they compare to the baseline evaluation of the patient. Outcomes are the impacts, effects or consequences of our clinical approach or treatment. This is how we measure if the evidence or guidelines selected and employed, yielded us the outcome we sought. This, in turn, is how we produce relevant data that has the potential of being collated and utilized in a suitable format by the next practitioner searching out information about a specific clinical presentation.

The Evidence Based Practice has been criticized for not taking the ‘art’ of chiropractic into consideration when requiring practitioners to use the ‘best available evidence’ in their decision making process. The Evidence Informed Practice, by including the expertise of the practitioner and the preferences of the pediatric patient and their family, allows and promotes both ‘art’ and ‘science’ in this process.



Sharon A. Vallone, D.C., F.I.C.C.P.
Editor

REFERENCES

- News release, Northwestern Health Sciences University, 2009.
- Sackett, D.L., Straus, S.E., Richardson, W.S., Rosenberg, W., & Haynes, R.B. (2000). Evidence-based medicine: How to practice and teach EBM. Edinburgh: Churchill Livingstone.
- Glasziou P Evidence based medicine: does it make a difference? Make it evidence informed practice with a little wisdom *BMJ* 2005;330:92 (8 January), doi:10.1136/bmj. 330. 7482.92-a

Knee Pain in a 14-Year-Old Male: Steps in Making a Correct Diagnosis

SUSAN M. LARKIN-THIER, D.C., PHYLLIS J. HARVEY, M.Ln.
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ABSTRACT

Objective: To discuss the case of an adolescent patient who presented to the clinic with a history of right knee pain for two years. Using evidenced-based concepts enables clinicians to ask the right questions and use the proper diagnostic tools to make an accurate diagnosis.

Clinical features: A 14-year-old male athlete presented to the clinic with right knee pain. The adolescent had been seen by his family physician and doctor of chiropractic during a two year time period. Neither practitioner had performed diagnostic procedures of the knee.

Outcome: Radiographic studies revealed a large defect of the femur's lateral condyle consistent with advanced osteochondrosis dissecans. The patient was referred to an orthopedist who recommended surgical intervention.

Conclusion: Doctors are frequently reluctant to order X-ray or other diagnostic studies on children and adolescents, but when a pediatric patient presents with a persistent complaint and significant examination findings further diagnostic studies are warranted.

Key Indexing Terms: osteochondritis, dissecans, manipulation, chiropractic, knee, adolescent, radiography, drugs, non-prescription

INTRODUCTION

A 14-year-old male accompanied by his parent entered the clinic with a complaint of right knee pain. The adolescent informed the examiners that he had done research on the Internet and had self-diagnosed his condition as Osgood-Schlatter syndrome. He indicated that the supra patella region was the location of discomfort. The quality of the pain was described as a localized, dull achy sensation at rest which exacerbated to a sharp and grinding pain upon motion. Using the Visual Analog Scale (VAS), the pain was rated as 4 at rest and upgraded to a 7 while involved in sport activities of soccer, weightlifting, basketball, track and golf. The patient stated his symptoms began two years ago and his pain is now constant in nature and fairly high in intensity. He also indicated he was experiencing muscle weakness and an aching sensation of the calf musculature.

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HISTORY

The adolescent's past history revealed that he had been active in sports since early childhood, participating in school and league sports. He was also involved in a plyometrics training program sponsored by a local orthopedic group. He had been treated by a local doctor of chiropractic earlier this year for a strain/sprain injury of his low back occurring during a track event. The low-back condition resolved; however, additional treatment by manipulation of the knee antagonized the knee complaint.

The family history is unremarkable. Social history revealed that the adolescent was self-medicating daily with non-prescription medication, taking six tablets at a time; recently he had begun taking a family member's prescription pain medication in order to perform sports activities. The knee condition was limiting his ability to be involved in recreational activities of basketball, running and soccer. Other recreational activities such as golf and hunting caused increased symptoms.

EXAMINATION

The examination revealed a well-developed, alert, 5 foot 10 inch tall, 158-pound adolescent male whose vital signs were within normal limits. The neurological exam

produced an abnormal right-knee jerk deep tendon reflex which was graded as a 3 on a 0-4 scale. Muscle testing of the right extremity was graded as 4 on a 0-5 scale in extension, flexion, and ankle inversion/eversion. The left leg tested 5 on a 0-5 scale. Musculoskeletal examination revealed palpable edema and tenderness of the joint space and tibial tuberosity. Comparing the orthopedic examinations of the left extremity to the affected extremity revealed no significant finding of the left compared to the right. On the right knee, McMurray's patella grinding, adduction and abduction test produced a positive response, while the anterior and posterior drawer signs were negative. A KOOS (Knee injury and Osteoarthritis Outcome Score) outcome assessment of the knee was performed. KOOS consists of 5 subscales; 1) Pain, 2) Other Symptoms, 3) Function in daily living (ADL), 4) Function in sport and recreation (Sport/Rec) and 5) Knee related Quality of life QOL.¹ The adolescent scored high in the areas of pain, symptoms and ADL's and low in sports/recreation and quality of life.

As the result of the history, points of special note included the history of sports involvement, duration of the complaint, and the need to self-medicate. These factors along with the significant examination finding prompted the need for a radiological evaluation. The standard Palmer College of Chiropractic, Davenport Clinic radiographic knee examination of A-P (anterior-posterior), lateral and open-joint views were taken. In this case, the tunnel view was taken as the open joint view.

The radiology report was as follows:

RIGHT KNEE: AP, lateral, open joint

A large defect is evident involving the lateral femoral condyle consistent with osteochondrosis dissecans. Mild sclerosis is evident adjacent to the defect and there is mild fragmentation adjacent to the joint space. Mild irregularity with fragmentation is observed involving the anterior tibial tuberosity.

Impressions:

1. Osteochondrosis dissecans involving the lateral femoral condyle.
2. Probable Osgood-Schlatter disease. Correlate with clinical history and presentation.

Recommendations:

1. Orthopedic consultation.
2. MRI would be helpful in delineating the hyaline cartilage adjacent to the lateral femoral condylar defect.

The patient and his parents were informed of the diagnosis and the need for an immediate referral to an orthopedist. The attending clinician coordinated the referral. The clinician had a contact person at a local orthopedic clinic who facilitated an immediate appointment with an orthopedic doctor who specialized in this condition.



Anterior to Posterior x-ray of knee showing lesion of lateral femoral condyle



Lateral x-ray of knee showing lesion of lateral femoral condyle



Open Joint (Tunnel View) x-ray of knee showing lesion of lateral femoral condyle

The family member was given supporting documents and radiographs to take to the appointment. The orthopedist concurred with the diagnosis and removed the child from all sports activity including physical education class after a radiograph from that clinic revealed a similar finding in the left knee. Bilateral knee MRI studies were to be performed to determine the type of treatment, including surgery, which may be necessary.

DISCUSSION

Osteochondritis dissecans (OCD) is an increasingly common cause of knee pain and dysfunction among skeletally immature and young adults.² The incidence has been increasing in the past 40-50 years. It is thought that the higher numbers are related to the increased exercise activity of children of both sexes who are involved in year-round sports. There are two types of osteochondritis, juvenile (JOCD) and adult form, depending on the status of the skeletal maturity.^{3,4} Adult OCD is thought to be JOCD that did not heal.

The actual cause of OCD remains controversial.^{2,4-7} Its possible causes have been described as stress, and compression of the bone-ranging from articular cartilage injury to osteochondral avulsion fracture,⁸ due to repetitive impaction in sports activities, or repetitive microtrauma.^{7,9} It has been suggested that repetitive trauma may induce a stress reaction resulting in a stress fracture within the underlying subchondral bone. If the repetitive loading persists, necrosis of the fragment may occur and eventually lead to fragment dissection, separation and nonunion.^{2,9} Other proposed causes include a hereditary ossification defect, familial localized abnormality in cartilage nutrition or micro emboli with peripheral necrosis of bone.^{7,8}

50% of JOCD demonstrated healing in 6 to 18 months with nonoperative treatment, indicating a better prognosis than adult OCD. However both types of OCD that do not heal have a potential for later complication such as osteoarthritis.^{2,4,10} Osteoarthritis is more likely to occur if the defect is large or affects the lateral condyle.¹⁰

Pediatric patients may have a higher likelihood of injuries with less severe trauma associated with growth plates, porous bone, and susceptibility to injury during adolescent growth spurts.⁷ In many cases the patient will not have a history of a specific trauma. It is believed that the repetitive microtrauma leads to subchondral bone stress, especially in the athletic patient. Impaction of the tibial spine and patella on fragments of the femoral condyle are indicated

as a probable cause. 20-30% of the time the condition is bilateral.⁷

INCIDENCE

The incidence of OCD in the general population is estimated to be 15-30 cases per 100, 000 persons.^{5,7} It has typically been known to affect males between 10-20 years-of-age.^{2,7} Because of increased sports participation, especially in girls, the incidence for females could be on the rise.^{2,5,7} According to Hixon, the regions most often affected by OCD in decreasing frequency are the femoral condyle, talar dome, capetellum of the humerus and the patella.⁷ The most common site of OCD lesions is the posterolateral aspect of the distal medial femoral condyle, which accounts for approximately 70-85% of the cases.^{2,9} Lesions of the inferior-central lateral condyle account for 15-20% of the cases.² The presentation of the condition will vary depending on the location of the lesion. Medial condylar lesions will lead to patellofemoral joint pain and dysfunction of the extensor mechanism. Lateral condylar lesions lead to tibiofemoral derangement and are more prone to fragmentation.¹¹

CLINICAL PRESENTATION

Clinical presentation is usually vague knee pain without a history of trauma. A study by Heftie et al reported that 32% had little or no pain at all and another study found that only 21% reported any signs and symptoms related to an injury.⁷ The pain will be described as being worse with activity and the patient may limp due to a "stiff" leg sensation. The patient may also mention a "locking" or "giving out" sensation. According to Cahill the majority of the patients will have had knee pain for approximately 14 months before seeking care.³

Typical symptoms that the patient's with OCD present with are the following: joint pain, worsening of joint pain with activity, increased pain with weight bearing, stiffness after periods of disuse, unable to fully extend the extremity involved and walking with external tibial rotation.⁷ Examination findings reveal effusion, crepitus, and joint line tenderness. Wilson's sign may be positive,⁹ which is elicited by flexing the knee to 90 degrees, internally rotating the tibia, and extending the knee slowly, watching for pain response.^{2,9}

As many of the signs of OCD are nonspecific, a high degree of suspicion for the diagnosis should be maintained in any child in the susceptible age group of 10-to-20 years-old. One study did demonstrate a high percentage

of specificity for diagnosing OCD by clinical examination. This underscores the importance of a high index of suspicion and appropriate clinical training for the recognition of OCD of the knee.⁹

RADIOLOGICAL FINDINGS

According to Hixon, "Clinical findings may be subtle, so clinicians should have a low threshold of suspicion for obtaining radiographs."⁷ However, musculoskeletal imaging in sports medicine is rapidly developing, driven by advancing technology and improved understanding of the disabilities that may result from sporting injuries.¹² As imaging tests become more sophisticated and sensitive, the importance of clinical judgment in determining both when to order the test and the relevance of abnormal findings increases. Some feel this is because real but incidental anatomical derangements and asymptomatic degenerative changes are frequently detected. Studies have shown that a subclinical pathological change is present in a large proportion of asymptomatic or minimally symptomatic athletes.¹²

Radiological imaging is essential because OCD is diagnosed by changes noted on radiographs.^{7,9} The anterior-posterior (AP) and lateral views are indicated. However, due to the fact that most lesions occur on the posterior aspect of the medial femoral condyle, tunnel views should be done to improve the information obtained, aiding in the diagnosis.⁵ If a lesion is noted, some authors recommend doing contralateral knee views as well.^{7,9} Characteristic findings include a well-circumscribed area of subchondral bone separated by a crescent-shaped sclerotic radiolucent outline of the fragment.⁹ All lesions found on radiographs should be staged for stability with MR imaging.²

Magnetic resonance imaging (MRI) is now a routine part of diagnostic evaluation of OCD.² MRI provides several advantages, including high accuracy of diagnosing JOCD and clearer pictures of the size and location of the lesions. For these reasons, MRI is currently considered the gold standard for the evaluation of OCD.⁹ MRI's have 97% sensitivity for detecting unstable lesions.^{5,7} It can accurately estimate the lesion size, as well as the status of the cartilage and subchondral bone, extent of bone edema, appearance of high signal zone beneath the fragment, and the presence of loose bodies which are characteristic of OCD.^{2,7,9}

MRI studies provide the most detail regarding the lesion's stability and are used to determine the stage of the lesion preoperatively.¹⁰ OCD lesions are staged into 4 categories based on their stability according to the MRI. In Stage 1, there is thickening of articular cartilage and low

signal changes. In Stage 2, the articular cartilage is breached and there is a low signal rim behind the fragment indicating fibrous attachment. At Stage 3, the articular cartilage is breached and there is a high signal change behind the fragment indicating synovial fluid between the fragment and the underlying subchondral bone. Finally, Stage 4 consists of a loose body.⁹ It is critical in clinical management that the lesion is staged correctly. Stages I and II are stable lesions while lesions III and IV are unstable and indicate that not only is the cartilage breached but that synovial fluid exits between the fragment and underlying bone.⁷

In addition, bone scans are also used to determine the degree of the stability and the healing potential of the lesion.^{5,7,13}

CLINICAL MANAGEMENT

The primary objective of the treatment protocol is to allow symptom free activities of daily living. The goal of treatment is to preserve the articular joint, accomplished by non-surgical and/or surgical intervention.

The recommendation for conservative treatment is as varied as the authors. The one consistent theme is that early diagnosis before physis closure increases the probability of a more favorable prognosis.^{3,7} In 10-18 months, approximately one-half of the lesions will resolve with conservative measures. Females younger than 11 years of age and males younger than 13 have demonstrated a more promising prognosis. Patients over 20-years-old and those with large lesions have a poorer prognosis and are more likely to need surgical intervention.^{7,10} Non-surgical conservative management consists of: 1) observation, 2) avoiding competitive sports for 2-4 months,^{2,5} 3) stretching and range of motion exercises, and 4) quadriceps strengthening.^{2,5,7} If there is pain upon ambulation, patients are to use crutches, with weight-bearing as tolerated. This period of assisted weight-bearing will persist for 6 to 8 weeks, with no running or jumping allowed during this time.³ Some recommend monitoring every 8 to 10 weeks, with increasing activities as improvement occurs symptomatically and on bone scan.^{3,10}

At one time, immobilization was the gold standard for treatment, whereas currently there is a disagreement in the literature as to the effectiveness of immobilization.^{3,7,10,11} Some experts feel that immobilization with casting and/or bracing actually complicates the condition.^{2,7}

A huge challenge in treating these patients is patient compliance. In Cahill's study it was found that 50% of the

time conservative treatment is not successful.³ The children who are likely to develop JOCD are children from families in which an active, athletic lifestyle is the norm. Also, there frequently is a guilt factor on the part of the parents for not being more observant of the child. The extended time period the child will need to be out of competitive sports also plays a role. In order for the conservative treatment to be successful, the patient and parent, coached by the physician, need to recognize the severity of the condition and the consequences of non-compliance.³

The goal of surgical intervention would be to maintain joint congruity, rigid fixation of the unstable fragment, and repair of osteochondral defects.² Surgery is always recommended for stage III and IV lesions⁹ and would include arthroscopic removal of loose bodies, cartilage debridement, and drilling lesions to promote revascularization.^{4,7,9} Removal of large fragments has shown poor long-term results with a substantial risk of developing arthrosis.⁴ Post-operative care would include range of motion exercises and quadriceps strengthening. Kocher and Czarnecki et al felt that given the relatively high healing rate, good functional outcome, and low complication rate, they could advocate internal fixation of unstable JOCD lesions of the knee.⁴

EVIDENCE-BASED CHIROPRACTIC--BACK TO THE BASICS WITH PATIENT-ORIENTED CARE

What is unique about this case study is that during the preceding year, this patient had been seen by at least one primary care physician and one chiropractor and had participated in a sports training clinic run by a major orthopedic clinical organization — and yet all had failed to identify his condition. This certainly verifies that OCD is an elusive and subtle condition that requires experience and the proper evidence-based steps to help the caregiver make the proper diagnosis. It also illustrates a point: if the health care personnel had practiced a basic element of evidence-based medicine or chiropractic, this condition may have been identified much earlier. Listening to the patient and being in touch with physical issues important to the patient is a key element in providing appropriate care.

Haneline uses a Venn diagram to illustrate a three-faceted description of evidence-based chiropractic practice (EBCP) consisting of best research evidence, clinical expertise and patient preferences.¹⁴ Haneline continues by describing four reasons for using evidence-based chiropractic: first, for patient-specific issues when a patient presents with conditions that are unusual or unknown to the practitioner; second, condition-specific issues when it may be advantageous for the chiropractor to acquire knowledge

about conditions he or she is unaccustomed to treating; third, for the self-education of the practitioner; and fourth, to practice and master evidence-based chiropractic methods.¹⁴ Feise stated, “Evidence-based chiropractic (EBC) promotes the synthesis and application of the most reliable research-derived evidence (tempered by patient needs and wants) when making clinical decisions.”¹⁵ Bolton describes EBP (evidence-based practice) as “clinical decision-making based on (1) sound external research evidence combined with individual clinical expertise and (2) the needs of the individual patient.”¹⁶

All of these definitions advise the practitioner to include some type of patient oriented focus when practicing evidence-based chiropractic. Much has been written about patient-centered care in the chiropractic literature.¹⁷⁻²¹ Good communication skills rank as a top priority in patient-centered care.¹⁷⁻¹⁹ Constructive communication requires establishing interpersonal rapport with the patient. How can the practitioner do this? In a definition of patient-centered care, Miller has six steps a practitioner can take to give better patient care:

1. Respect for patient's values, preferences and expressed needs.
2. Coordination and integration of care with the patient.
3. Information for, communication with and education of the patient.
4. Ensuring physical comfort of the patient.
5. Emotional support for the patient.
6. Involvement of the patient's family and friends where appropriate and ethical.¹⁹

In several studies, patient satisfaction with chiropractic care has been ranked high.²² But the only consistent link to a predictor of patient satisfaction in the studies was found to be high-quality communication.²² This is a good reminder to practitioners to make sure they get back to the basics of focusing on patient-specific issues when giving clinical care. This is especially critical in dealing with pediatric and adolescent patients. Doctors need to be especially in tune and aware when interviewing their pediatric and adolescent patients in order to make the best diagnosis and treatment decisions for them.

CONCLUSION

A succinct summary for the practitioner to keep in mind is a quote from an article that discusses patient-

oriented care: "In order to enhance the doctor-patient relationship, an authoritative approach that focuses on the signs and symptoms of patients is paramount. This relationship is achieved by understanding the whole person and asking questions about how the condition impacts the patient."²¹

Patient-specific skills, such as actively listening to the patient and asking the right questions can enable clinicians to use their clinical judgment to make better patient diagnosis and treatment decisions. Practicing this idea led the clinician to use the proper diagnostic tools to make the correct diagnosis in this case. Doctors are frequently reluctant to order radiographs or other diagnostic studies on adolescents. However, applying evidence-based chiropractic practices indicates that when a pediatric patient presents with a persistent complaint and significant examination findings, then further diagnostic studies and possible referral are warranted. The use of radiographs or other diagnostic studies could result in early detection and treatment of conditions such as OCD. The early detection could prevent or minimize long-term disability. Using this basic concept of evidence-based practice can lead to offering better care for all patients.

Triano gives all doctors of chiropractic excellent advice when he states "The doctor's role is that of an advisor and teacher. He or she can guide the patient to better health by listening and integrating information specific to the patient with knowledge, prior experience, and when necessary, personal intervention."¹⁴

REFERENCES

1. Knee injury and Osteoarthritis Outcome Score, Ewa Roos. <http://www.koos.nu/>. Accessed 2/4/2008.
2. Kocher MS, Tucker R, Ganley TJ, Flynn JM. Management of osteochondritis dissecans of the knee: Current concepts review. *Am J Sports Med.* 2006;34(7):1181-1191.
3. Cahill BR, Ahten SM. The three critical components in the conservative treatment of juvenile osteochondritis dissecans (JOCD) physician, parent, and child. *Clin Sports Med.* 2001;20(2):287-98.
4. Kocher MS, Czarnecki JJ, Andersen JS, Micheli LJ. Internal fixation of juvenile osteochondritis dissecans lesions of the knee. *Am J Sports Med.* 2007;35(5):712-718.
5. Wall E, Von Stein D. Juvenile osteochondritis dissecans. *Orthop Clin North Am.* 2003;34(3):341-353.
6. De Smet AA, Fisher DR, Graf BK, Lange RH. Osteochondritis dissecans of the knee: Value of MR imaging in determining lesion stability and the presence of articular cartilage defects. *AJR Am J Roentgenol.* 1990;155(3):549-553.
7. Hixon AL, Gibbs LM. Osteochondritis dissecans: A diagnosis not to miss. *Am Fam Physician.* 2000;61(1):151-6, 158.
8. de Villiers RVP. Osteochondritis dissecans in adolescence. *International SportMed Journal.* 2001;2(5):1-4.
9. Robertson W, Kelly BT, Green DW. Osteochondritis dissecans of the knee in children. *Curr Opin Pediatr.* 2003;15(1):38-44.
10. Obedian RS, Grelsamer RP. Osteochondritis dissecans of the distal femur and patella. *Clin Sports Med.* 1997;16(1):157-174.
11. Sailors ME. Recognition and treatment of osteochondritis dissecans of the femoral condyles. *J Athletic Train.* 1994;29(4):302.
12. Orchard JW, Read JW, Anderson IJ. The use of diagnostic imaging in sports medicine. *Med J Aust.* 2005;183(9):482-486.
13. Schenck RC, Jr, Goodnight JM. Osteochondritis dissecans. *J Bone Joint Surg Am.* 1996;78(3):439-456.
14. Haneline MT. Evidence-Based Chiropractic Practice. Sudbury, Mass: Jones and Bartlett Publishers, 2007.
15. Feise RJ. Chiropractic philosophy & clinical technique. evidence-based chiropractic: The responsibility of our profession. *JACA J Am Chiropract Assoc.* 2001;38(1):50-52.
16. Bolton JE. The evidence in evidence-based practice: What counts and what doesn't count? *J Manipulative Physiol Ther.* 2001;24(5):362-366.
17. Jamison JR. Reflections on chiropractic's patient-centered care. *J Manipulative Physiol Ther.* 2001;24(7):483-486.
18. Gatterman MI. The patient-centred paradigm: A model for chiropractic health promotion and wellness. *Chiropr J Aust.* 2006;36(3):92-96.
19. Miller PJ, Gemmell HA. Patient centred care in chiropractic practice. *Clin Chiropr.* 2004;7(3):141-146.
20. Jamison JR. Chiropractic patient-centred care: Suggestions from an international case study. *Chiropr J Aust.* 2001;31(3):92-97.
21. Pollard HP, Hardy KE, Curtin D. Biopsychosocial model of pain and its relevance to chiropractors. *Chiropr J Aust.* 2006;36(3):82-91.
22. Gaumer G. Factors associated with patient satisfaction with chiropractic care: Survey and review of the literature. *J Manipulative Physiol Ther.* 2006;29(6):455-462.



Chiropractic Care of a Child with Cryptorchidism

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ABSTRACT

Objective: The objective of this case report is to discuss the presentation of a 7-year-old male who sought chiropractic consultation after receiving a medical diagnosis of cryptorchidism and a recommendation for the surgical procedure known as orchiopexy.

Intervention and Outcome: The child was adjusted using a combination of Thompson and Sacro-Occipital Techniques over a 4-month period with favorable results.

Conclusion: Cryptorchidism, a condition in which one or both testes are undescended, is considered one of the most common disorders of the male genitourinary system. The outcome of this case suggests the value of additional study of the benefits of spinal etiologies and the utilization of chiropractic adjustments in the resolution of this condition.

Key Indexing Terms: cryptorchidism, chiropractic, adjustments, pediatric, Thompson Technique, Sacro-Occipital Technique

INTRODUCTION

Cryptorchidism is a term that literally means “hidden testis”. It generally refers to a testis that is undescended and lies outside of the scrotum.¹ It is one of the most common disorders of the genitourinary system affecting approximately 3% of full-term male newborns and 20-30% of premature males at birth.¹⁻¹⁴ In over half of these cases the testes descend by the second month.^{1,5,6} By the age of one, the incidence of undescended testes is approximately 1%.¹⁻¹⁰ Spontaneous testicular descent is unlikely after age one.^{1,2,4,8-10} If left uncorrected, cryptorchidism can result in an inguinal hernia, testicular torsion, increased susceptibility to testicular trauma, testicular cancer, testicular atrophy, impaired sperm production, and the possible psychological effects of an empty scrotum.^{1-10,13,15} Cryptorchidism may be unilateral or bilateral and failure to find one or both testes in the scrotum may indicate any variety of congenital or acquired conditions including true undescended testes, ectopic testes, retractile testes or absent testes.^{1-6,9}

A 7-year-old male presented with cryptorchidism that his mother reported being present since birth, but not medically diagnosed until he was five years old. His mother stated that the testes had never truly descended, the left being farther down than the right, but both remaining just beyond the inguinal opening. She said that she was told by their medical physician that the spermatic cord was not

long enough to allow complete descent of the testes into the scrotal sac and that this condition developed in utero. The physician recommended consultation with a urologist for orchiopexy, a surgical procedure to suture the testes down in the scrotal sac, thereby preventing them from ascending.^{16,17} The mother refused that recommendation due to the invasiveness of the procedure and stated that no other treatment had been done on the child. She brought him in for chiropractic evaluation as a second opinion.

HISTORY

The patient's history revealed that he was a full term infant delivered two weeks overdue by uncomplicated vaginal birth. Birth weight was 10 pounds and length was 20 inches. His immediate family unit consisted of mother, father and five siblings all living at home. Childhood illnesses included chickenpox which was contracted at a young age, specific age unknown. At age five he was hospitalized due to an upper respiratory infection and fever induced seizure.

EXAMINATION

Physical examination revealed a healthy 7-year-old male. Vital signs included a height of 4'2", weight of 63 pounds, blood pressure of 118/79, pulse of 70 beats per minute, respirations of 22 per minute, and 20/20 vision. Physical exam of eyes, ears, nose, throat, heart, lungs, abdomen and central nervous system were within normal limits except for undescended testes. Orthopedic evaluation, spinal range of motion, and reflexes were also within normal limits. Posture analysis was negative for head tilt, high shoulder, rib humping, and high ilium.

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CHIROPRACTIC EVALUATION AND CARE

Chiropractic evaluation revealed tenderness over the right posterior superior iliac spine (PSIS), decreased fluid motion of the right sacroiliac joint as it was motioned in a prone position contacting the PSIS, and a positive Derifield leg check on the right using the Derifield-Thompson leg analysis.¹⁸ The right ilium was adjusted to correct a posterior and inferior misalignment using Thompson Technique. This was accomplished by placing the child prone on a Thompson adjusting table and setting the pelvic drop piece at light tension appropriate to the weight of the child. The doctor's thenar eminence was placed over the child's right PSIS and three quick, shallow thrusts were delivered with a line of correction of posterior to anterior and inferior to superior. Unexpectedly, the testes descended sometime after the first adjustment and were still descended at the time of the second adjustment five days later.

During the following month, the mother noted that the child had repeated episodes of his testes ascending. This was accompanied by a recurring sacroiliac joint dysfunction which was found at the following chiropractic visit. Again, chiropractic evaluation revealed tenderness over the right PSIS, decreased fluid motion of the right sacroiliac joint and a positive Derifield leg check on the right. The child was then evaluated for a psoas muscle contracture using Sacro-Occipital Technique (SOT) protocol.¹⁹ From that point on, the psoas muscle was balanced by reducing contracture according to SOT protocol along with correction of the sacroiliac joint dysfunction on each visit. This procedure was followed for three visits, after which the child's mother stated that her son's testes had descended further than they had in the past. After 4 months of chiropractic care, which included a visit frequency of two times per week for six weeks followed by one time per week for eight weeks, then one chiropractic visit per month. Because this patient experienced improvement of his condition under chiropractic care, his mother did not feel that consultation with a urologist was necessary. Over the next seven years the child had periodic relapses of his right testis ascending but episodes were short in duration and each resolved with chiropractic adjustments and psoas work as previously described.

DISCUSSION

True Undescended Testes: Also known as true cryptorchidism, true undescended testes are found along the normal path of descent and are associated with a patent processus vaginalis (pediatric hernia) 90% of the time. In most cases, non-descent is thought to be the result of

an abnormality in testicular development such as a short spermatic artery, short spermatic cord, adhesions, fibrous bands or endocrine disorders.^{1-2,4-6,9,15}

Ectopic Testes: Also known as ectopic cryptorchidism, ectopic testes are presumed to develop normally and have completed their descent through the inguinal canal but end up in a subcutaneous location other than the scrotum. The most common position is lateral to the external inguinal ring just below the subcutaneous fascia.^{1,6,9,14}

Retractile Testes: Also known as pseudocryptorchidism, retractile testes are normal testes that have retracted into the inguinal canal due to an exaggerated cremasteric reflex. A diagnosis of retractile testes is likely if the testes are palpable at birth but become non-palpable later.^{1,2,4,9,14}

Absent Testes: Also known as anorchia. Approximately 20% of non-palpable testes are absent. Any phenotypically male newborn with bilateral non-palpable testes should be evaluated for congenital adrenal hyperplasia (CAH), which is a life-threatening genetic defect resulting in reduced hormone production by the adrenal glands.²⁰ The hormones most affected in this disorder include cortisol and aldosterone which are important in regulating glucose metabolism, blood pressure, and sodium/potassium balance. If left untreated, CAH can quickly lead to adrenal insufficiency, dehydration, shock, and death. Also of note, when cortisol and aldosterone are lacking, the body produces more androgen which is a male sex hormone. This causes male characteristics to appear early or inappropriately leading to the potential of having a genetic female with male genitalia. In many states, doctors are required to conduct hormonal tests for CAH by analyzing blood that is drawn from a heel prick shortly after birth.

When an older child presents with bilateral non-palpable testes, he should undergo hormonal evaluation for testicular absence. This is accomplished with blood studies measuring levels of testosterone, luteinizing hormone (LH), follicle-stimulating hormone (FSH), and mullerian-inhibiting substance (MIS). Elevated LH and FSH along with the absence of MIS indicates probable testicular absence.²⁰

Medical treatments for cryptorchidism include hormone therapy, evaluation for sex chromosome abnormalities and surgical exploration and repair. All are invasive and not without risk to the patient.^{2-3,5-10,12-13,16-17,21-22}

A review of the literature was conducted by searching

the Index to Chiropractic Literature (ICL), Manual and Alternative and Natural Therapy Index System (MANTIS), and Ebscohost's databases Alt-Health watch, AMED, CINAHL, Academic Search Premier, Health Source: Consumer Edition, and Health Source: Nursing/Academic Edition. The following keywords and subject headings were input in various combinations: cryptorchidism, orchiopexy, chiropractic, and cryptorchidism as a key word and a MeSH (medical subject heading) with the subheadings classification, diagnosis, and therapy. In some cases in order to narrow results, limits were placed to include the last 5 years, all children 0-18 years, and review articles only. Items were selected upon review of the abstract based on information that this author wanted to convey to practicing chiropractors. As of March 2008, there were no published studies relating cryptorchidism and chiropractic care. It is therefore of benefit to present this case report which showed unexpected results for cryptorchidism using conservative chiropractic care.

The actual classification of cryptorchidism involved could not be definitively determined without surgical exploration but we can conclude that no permanent anatomical malformation existed in this patient that would prevent testicular descent. Rather, due to the fact that the testes descended after the first adjustment and then repeatedly retracted several times during the following month, it can be suggested that this patient's cryptorchidism be classified as retractile testes.

Four possible explanations may explain why chiropractic adjustments provided results with this case:

1. A pelvic joint dysfunction existed causing the inguinal canal, superficial inguinal ring or related soft tissue structures to be torqued or narrowed to the extent that it disallowed complete testicular descent. Upon removal and stabilization of the joint dysfunction, soft tissue compromise on the inguinal canal and/or superficial inguinal ring was removed allowing for widening of these structures and the continued descent of the testes into the scrotal sac.
2. In this case of cryptorchidism consider the involvement of the following 2 muscles and their nerve supply. The cremaster muscle is a covering that the internal oblique and transversus abdominus give to the spermatic cord and testis. The action of the cremaster muscle is to retract the testis. It's nerve supply is the genitofemoral nerve which originates from the first and second lumbar nerve roots.²³ The psoas muscle takes origin from the lateral sides of the vertebrae and intervertebral

disc of the twelfth thoracic through the fifth lumbar.²³ Therefore, in this author's opinion, a spasm of the psoas muscle may cause vertebral joint dysfunction at any level from T12-L5 with associated aberrant nerve function. This in turn may cause retractile testes due to an exaggerated cremasteric reflex.

3. Another possibility exists with the same structures noted previously in that the ventral rami of L1-L4 nerve roots pass through the psoas muscle as they emerge from the intervertebral foramina.²³ Therefore, in this author's opinion, impingement and resulting nerve pressure of the L1 and L2 nerve roots or the genitofemoral nerve as it passes through a spasmed psoas muscle may cause retractile testes due to an exaggerated cremasteric reflex.
4. One can also consider the possibility of spontaneous remission in close proximity to the commencement of chiropractic adjustments. However, due to the immediate response to the adjustments coupled with the return of the sacroiliac joint dysfunction and the condition, followed by several episodes where the joint dysfunction and condition appear to be present and then in remission at the same time, it is this author's opinion that spontaneous remission does not seem exceedingly likely.

CONCLUSION

This is an interesting case of unexplained response of cryptorchidism to chiropractic care. Due to the invasive nature of orchiopexy, the outcome of this case to conservative chiropractic care is encouraging. While the result was unexpected, the results of this offer clinicians one possible intervention for managing such cases. We still urge caution, of course, because we cannot generalize beyond our findings. Nonetheless, this interesting case should be a positive addition to our information base.

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REFERENCES

1. Gibbs TD. Cryptorchidism and orchiopexy – part one. *AUAA* 1983; October-December: 4-9.
2. Osaki FA, DeAngelis CD, Feigin RD, McMillan JA, Warshaw JB. Principles and practice of pediatrics. Philadelphia: J.B. Lippincott Co., 1994: 1765-1766.
3. Andreoli TE, Bennett JC, Carpenter C, Plum F. Cecil essentials

- of medicine. Philadelphia: W.B. Saunders Co., 1997: 525-527.
4. Behrman RE, Kliegman R. Nelson essentials of pediatrics. Philadelphia: W.B. Saunders Co., 1994: 607-608.
 5. Merenstein GB, Kaplan DW, Rosenberg AA. Handbook of pediatrics. Norwalk, Connecticut: Appleton & Lange, 1994: 756-757.
 6. Hathaway WE, Groothuis JR, Hay WW, Paisley JW. Current pediatric diagnosis and treatment. San Mateo, California: Appleton & Lange, 1991: 796.
 7. Rudolph AM, Hoffman JI, Rudolph CD. Rudolph's pediatrics. Stamford, Connecticut: Appleton & Lange, 1996: 1404-1405.
 8. Colodny AH. Undescended testes — is surgery necessary? *New Eng J Med* 1986; 314(8): 510-511.
 9. Behrman RE, Kliegman RM, Jenson HB. Textbook of pediatrics. Philadelphia: W.B. Saunders Co., 2000: 1650-1651.
 10. Emans SJ, Laufer MR, Goldstein DP. Pediatric and adolescent gynecology. New York: Lippincott-Raven, 1998: 69-70.
 11. Barthold JS, Gonzalez R. The epidemiology of congenital cryptorchidism, testicular ascent and orchiopexy. *J Urol* 2003; 170(6 Pt 1): 2396-2401.
 12. Toppari J, Kaleva M. Maldescendus testis. *Horm Res* 1999; 51: 261-269.
 13. Riquelme M, Aranda A, Rodriguez C, Villalvazo H, Alvarez G. Laparoscopic orchiopexy for palpable undescended testes: a five-year experience. *J Laparoendosc Adv Surg Tech* 2006; 16(3): 321-324.
 14. Hitzeman N, Usatine R. A boy with undescended testes. *West J Med* 2001; 174(4): 238-239.
 15. Hutson JM, Hasthorpe S, Heyns CF. Anatomical and functional aspects of testicular descent and cryptorchidism. *Endocr Rev* 1997; 18: 259-280.
 16. Gibbs TD. Cryptorchidism and orchiopexy — part two. *AUAA* 1984; January-March: 5-10.
 17. Taran I, Jack E. Results of orchiopexy for the undescended testis. *World J Urol* 2006; 24: 231-239.
 18. Zemelka WH. Segmental drop adjusting featuring the Thompson technique. Multiple Interest Services Corporation, 2004: 8-16.
 19. DeJarnette MB. Sacro occipital technic. Nebraska City, Nebraska: DeJarnette, 1984: 105-107.
 20. Docimo SG, Silver RI, Cromie W. The undescended testicle: diagnosis and management. *AAFP* 2000; 62(9): 2037.
 21. Ritzen EM, Bergh A, Bjerknes R, Christiansen P, Cortes D, Haugen SE, Jorgensen N, Kollin C, Lindahl S, Lackgren G, Main KM, Nordenskjoeld A, DeMeyts ER, Soder O, Taskinen S, Thorson A, Thorup J, Toppari J, Virtanen H. Nordic consensus on treatment of undescended testes. *Acta paediatr* 2007 May; 96(5): 638-643.
 22. Ziylan O, Oktar T, Korgali E, Nane I, Ander H. Failed orchiopexy. *Urol Int* 2004; 73: 313-315.
 23. Basmajian JV. Grants method of anatomy. Baltimore: Williams & Wilkins Co., 980: 126-132, 187-190.
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Chiropractic Care Helps Patient with Pregnancy-Related Posterior Pelvic Pain

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ABSTRACT

Objective: The purpose of this paper is to discuss the chiropractic management of a patient with pregnancy-related posterior pelvic pain (PRPPP).

Design: A case study.

Setting: Private practice.

Patient: A 28-year-old female, 32 weeks pregnant, presented to our chiropractic office with a chief complaint of sharp, stabbing pain starting at the left sacroiliac joint with radiation into the posterior left thigh. Despite two previous pregnancies and successful deliveries, she had not experienced this type of condition prior to coming in for care. The pain had started to adversely affect her activities of daily living.

Results: The patient experienced 50% relief from the frequency and intensity of pain within two weeks of chiropractic spinal manipulation using drop table mechanisms; 90% improvement in function and decrease in pain occurred by the 6th week, despite re-aggravation of her condition from a fall during her 4th week of care.

Conclusion: Chiropractic care in this clinical situation helped to decrease the frequency and intensity of the patient's PRPPP. No adverse effects resulted from the adjustments indicating that chiropractic spinal adjustments may be a safe alternative treatment for pregnancy-related posterior pelvic pain.

Keywords: pregnancy, low back pain, pelvic pain, chiropractic, spinal manipulation, adjustment

INTRODUCTION

A study by Wang et al. from Yale has shown that the incidence of low back pain (LBP) related to pregnancy to be approximately 68%.¹ Other surveys have shown it to be as high as 72%.² Despite the high prevalence of LBP in this parturient population, only 32% of the women affected informed their prenatal care provider of their condition, and of these informed care providers, only 25% made recommendations for treatment.¹

Previous theories postulated to explain this phenomenon have focused on joint and ligament laxity caused by the increased levels of relaxin due to pregnancy.^{3,4} This is thought to cause instability of the sacroiliac joint leading to LBP. However, recent work done by Ritchie centers around the biomechanical changes in the axial skeleton. The growing uterus shifts the center of gravity anterior in the mother thereby causing the pelvis to shift as well in accommodation. This places a strain on the low back and pelvic girdle.⁵

In Sweden, a cohort study explored the prevalence of

LBP further by differentiating it into simple lumbar pain, pregnancy-related posterior pelvic pain (PRPPP) or a combination of both.⁵ PRPPP presents with a very specific pain pattern which has been defined as a sharp, stabbing pain in the buttocks that extends distal and lateral from the sacroiliac joint.⁶ There may or may not be radiation of pain into the posterior thigh or knee, but the foot remains unaffected.⁷ The patient may experience intermittent pain-free intervals and retain full ROM in the pelvis and hip.^{6,7}

Most PRPPP can be confirmed with a positive posterior pelvic pain provocation test (PPPPPT) which is performed while the patient is supine.⁸ The patient's hip is placed at 90 degrees flexion and pressure is applied at the knee with anterior to posterior pressure along the long axis of the femur. The examiner's other hand stabilizes the opposite hip at the anterior iliac spine.⁸ Reproduction of the patient's pain results in a positive test.

It is important for the healthcare provider to delineate whether the patient presents with true LBP or PRPPP before proper treatment can be recommended. A search of the literature on PRPPP showed that conventional treatment for PRPPP included patient counseling on muscle reconditioning and strengthening exercises and a pelvic

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belt worn around the patient's greater trochanters which is used to stabilize the sacroiliac joints.^{6,9,10}

Although there is sufficient data to be found on chiropractic treatment of low back pain in the non-pregnant population, very little can be found on the effect of chiropractic spinal manipulation in the pregnant population. This case study explores the effect of chiropractic spinal manipulation on a patient with PRPPP which resulted in a decrease of her pain symptoms.

HISTORY

Anna (not her real name) presented to the office in her 30th week of pregnancy. She complained of "sciatic pain" that was greater in the left buttock and leg versus the right. The condition had begun two months prior without any predisposing trauma. She described the pain as a sharp, shooting sensation that would start at her tailbone and extend down her left buttock into the back of the left thigh and just past the knee.

This pain would come and go at unpredictable intervals throughout the day and evening and last about 20 minutes each time. During these episodes she would be unable to stand up or walk due to the pain and discomfort. On occasion, there would be an accompanying numbness and tingling in the buttock and thigh as well.

Anna initially stated that she had no previous trauma, surgeries or fractures in her medical history.

During the initial patient interview Anna stated that she had two other children from two previous pregnancies. Both were carried to term, labor was not induced and she had completely drug-free, vaginal deliveries each time. Both pregnancies were non-complicated and she did not experience the type of pain that had brought her into our office.

It was upon further questioning that Anna suddenly remembered falling down a short flight of stairs and landing on her tailbone while carrying her youngest child. This accident had occurred just before her current pregnancy. X-rays were taken at the hospital and were negative for fracture or dislocation. She said that she was sore and bruised for several weeks afterward.

CHIROPRACTIC EXAMINATION

Postural exam demonstrated a right head tilt, elevated left scapula and an elevated right iliac crest. ROM in the lumbar spine was reduced in right and left lateral bend

with pain elicited in the left inguinal region in addition to localized pain along the left sacroiliac joint. All other ROMs were within normal limits.

Motion and static palpation^{11,12,13} revealed tenderness and edema along the left sacroiliac joint. Segmental dysfunction was found at L5/S1 with the sacrum fixed in nutation and rotated posterior on the left. Heel to buttock motion confirmed this fixation as there was restricted flexion of the left leg compared with the right. There was also palpable muscle hypertonicity along the left paraspinal musculature.

Orthopedic testing showed the PPPPT to be positive bilaterally with the elicited pain being more severe on the left. Pelvic Distraction, Gaenslan, Fabere and Hibbs all reproduced the same pain along the left sacroiliac joint and buttock.

Muscle strength and reflex testing were all within normal limits.

Due to the patient's parturient condition, x-ray analysis was not performed.

Anna's weight gain up to this point was only 13 pounds.

Chiropractic diagnosis at the time was pregnancy-related posterior pelvic pain resulting from sacral fixation in nutation and left posterior rotation of the sacrum.

CARE AND INTERVENTION

Anna's initial treatment plan consisted of two visits a week for 4 weeks, one visit a week for 4 weeks and one visit every two weeks for a month. We were aware that Anna would deliver before the end of the treatment plan but she was prepared to be consistent with her visits until that time. The treatment plan that was suggested to Anna was based on the author's past clinical experience with this condition.

A chiropractic assessment was performed at the start of each visit which involved motion and static palpation of the spine to evaluate for vertebral misalignment. Prone, bilateral leg flexion was also used to evaluate for restriction and rotation of the sacrum. Spinal adjustments were given with the patient in the prone position. The table had a thoracic swing away piece for patient comfort. Anna presented with a right pelvis that had moved posterior and inferior. To correct this misalignment, the pelvic drop piece was

raised and set at minimal tension. A right thenar contact was placed over the patient's right posterior superior iliac spine and a high velocity, low amplitude thrust was applied in an anterior and superior direction.

Anna also demonstrated a right posterior rotation of the sacrum. This was also corrected with her lying in the prone position using the pelvic drop piece. The doctor stood on the patient's left side, facing her feet. A knife-edge contact was made along the right side of the sacrum. A high velocity, low amplitude thrust was applied in an anterior and inferior direction to correct this misalignment.

Anna was also given pelvic tilt exercises^{14,15} to strengthen and condition the muscles surrounding the pelvic girdle.

Because Anna was the primary caregiver to her two other young children at home, she was also given instructions on proper posture and ergonomics¹⁶ whenever she needed to carry them. She had admitted to carrying them often on her hip which would distort her pelvic girdle even further.

RESULTS AND FOLLOW-UP

There was no reported change in Anna's condition in the first week. However, during the second week of care Anna began to notice that the frequency and intensity of her pelvic and leg pain had decreased by approximately 50%.

Unfortunately during the fourth week of care, Anna reported that she had fallen backwards over a chair and felt the pelvic and leg pain return almost immediately with the same intensity as before. At this time it was suggested that she continue with twice a week visits for another 4 weeks to address the injury from the fall. She immediately agreed.

By week 6, Anna reported that the frequency of pain in her left buttock and thigh had decreased by at least 90%. The intensity of pain was also drastically reduced and she said that if she felt any discomfort at all, it was localized to the area around the left sacroiliac joint.

A re-examination was performed during week 7. The PPPPT and Gaenslan test still produced some discomfort along the left sacroiliac joint but the intensity was much less compared to the initial exam. Tests were negative for Pelvic Distraction, Fabere and Hibbs.

A week after this re-exam, Anna delivered a healthy baby boy.

Two months after delivery, Anna's pelvic and leg pain

had not returned but she did experience occasional mild low back discomfort which she felt was simply her body re-adapting to a non-gravid uterus. She continued to come in once a month for follow-up visits to address any spinal misalignments and have them corrected with chiropractic care.

At the most recent follow up, four months after the delivery, Anna states that she still remains asymptomatic for pelvic pain.

DISCUSSION

LBP and pelvic pain is more prevalent in pregnant women than in the general population.^{17,18} Despite past literature attributing this to the extra relaxin and estrogen production causing joint and ligament laxity,^{3,4,20} an alternative theory places more emphasis on the biomechanical changes that occur in the axial skeleton.⁵

According to Ritchie, as pregnancy progresses it causes a lumbar hyperlordosis which accentuates an anterior pelvic tilt.⁵ The extra weight gain from the growing uterus intensifies this shift in the center of gravity and results in increased mechanical stress on the low back, sacrum and pelvis.⁵ The sacroiliac joint's normal function is to resist the anterior tilt of the sacrum²¹ however this may be compromised due to the ligament laxity stemming from the relaxin and estrogen in the body.^{3,4,19,21} A combination of the hyperlordosis from the gravid uterus and the biomechanical stress on sacroiliac joints that now have joint laxity can cause pain and discomfort in the patient's body.

Ritchie states that even a 20% weight gain during pregnancy is enough to increase the mechanical stress on a joint by as much as 100%.⁵ Although the patient's weight gain was less than 15% at the time, it was still enough to shift her center of gravity to cause extra stress on her sacroiliac joints.

It is of importance to note that the patient's first injury when she fell down the stairs and landed on her sacrum may have predisposed her to experience pelvic issues during pregnancy. If her sacrum was already misaligned or rotated from the fall, the joint laxity from the pregnancy and the extra weight of the gravid uterus would have accentuated the mechanical stress in her pelvic girdle.

Correcting the misalignment in her pelvis and sacrum through chiropractic adjustments may have decreased some of the biomechanical stress caused by the hyperlordosis and anterior pelvic shift. As a result,

this brought relief to the pain symptoms experienced by the patient.

There is very little data on the effect of chiropractic spinal adjustments for LBP or pelvic pain in pregnancy. However, one retrospective case series reported an overall decrease in pain intensity in almost 95% of participants who underwent chiropractic treatment for LBP.²² No adverse effects were reported in any of the participants so it was concluded that chiropractic may be a safe alternative for the treatment of LBP.

With the high prevalence of pregnancy-related LBP and pelvic pain, it is surprising to find in the literature that less than one third of this population reported this to their prenatal care provider,¹ even though other surveys have found that over 60% of pregnant women would consider complementary and alternative healthcare to treat their condition.²³ It becomes especially important to educate these women on the possible choices available for treatment since over half of these women experience pain that is severe enough to impair their activities of daily living.¹

CONCLUSION

Conservative chiropractic care was found to be effective in reducing the pain and discomfort of pregnancy-related posterior pelvic pain (PRPPP) in this patient. As this is a single case study, it is difficult to generalize the results for a larger parturient population. Further studies are indicated in the use of chiropractic care for the treatment of LBP and pelvic pain in the pregnant population.

REFERENCES

1. Wang SM, DeZinno P, Maranets I, et al. Low back pain during pregnancy: prevalence, risk factors, and outcomes. *Obstet Gynecol* 2005; 104(1): 65-70.
2. Mogren IM, Pohjanen AI. Low back pain and pelvic pain during pregnancy: prevalence and risk factors. *Spine* 2005; 30:983-991.
3. Kristiansson P, Svardstudd K, von Schoultz B. Serum relaxin, symphyseal pain, and back pain during pregnancy. *Obstet Gynecol* 1996; 175: 1342-47.
4. MacLennan AH, Nicolson R, Green RC, et al. Serum relaxin and pelvic pain of pregnancy. *Lancet* 1986; 2: 243-45.
5. Ritchie JR. Orthopedic consideration during pregnancy. *Clin Obstet Gynecol* 2003; 46:456-66.
6. Gutke A, Ostgaard HC, Oberg B. Pelvic girdle pain and lumbar pain in pregnancy: a cohort study of the consequences in terms of health and functioning. *Spine* 2006; 31(5): 149-55.
7. Smith MW, Marcus P, Wurtz LD. Orthopedic issues in pregnancy. *Obstet Gynecol Surv* 2008; 63(2): 103-11.
8. Ostgaard HC, Roos-Hansson E, Zetherstrom G. Regression of back and posterior pelvic pain after pregnancy. *Spine* 1996; 21: 2777-80.
9. Ostgaard HC, Zetherstrom G, Roos-Hansson E. The posterior pelvic pain provocation test in pregnancy. *Eur Spine J* 1994; 3: 258-260.
10. Nilson-Wlkmar L, Holm K, Oijerstedt R, et al. Effect of three different physical therapy treatments on pain and activity in pregnant women with pelvic girdle pain: a randomized clinical trial with 3, 6, and 12 months follow-up postpartum. *Spine* 2005; 30: 350-56.
11. Marcotte J, Normand MC, Black, P. Measurement of the pressure applied during motion palpation for cervical spine rotation. *J Manipulative Physiol Ther* 2005; 28(8): 591-96.
12. Leboeuf-Yde C, van Dijk J, Franz C, et al. Motion palpation findings and self-reported low back pain in a population-based study sample. *J Manipulative Physiol Ther* 2002; 25(2): 80-87.
13. Potter L, McCarthy C, Oldman J. Intraexaminer reliability of identifying a dysfunctional segment in the thoracic and lumbar spine. *J Manipulative Physiol Ther* 2006; 29(3): 203-07.
14. Krafchin R. Build core strength. *Yoga Journal* Nov/Dec 2000; 99
15. Shelton L. Back to the core. *Natural Health* 2004; 34(10): 70-75.
16. Amosun SL, Falodun PT. Low back pain — back care through proper lifting technique. *Cent Afr J Med* 1001; 37(4):120-23.
17. Ostgaard HC, Zetherstrom G, Roos-Hansson E, et al. Reduction of back and posterior pelvic pain in pregnancy. *Spine* 1994; 19:894-900.
18. Ostgaard HC, Andersson GB, Karlsson K. Prevalence of back pain in pregnancy. *Spine* 1991; 16(5): 549-52.
19. Gutke A, Ostgaard HC, Oberg B. Predicting persistent pregnancy-related low back pain. *Spine* 2008; 33(12): 386-93.
20. Borg-Stein J, Dugan SA, Gruber J. Musculoskeletal aspects of pregnancy. *Am J Phys Med Rehabil* 2005; 84(3): 180-92.
21. Foley BS, Bushbacher RM. Sacroiliac joint pain: anatomy, biomechanics, diagnosis, and treatment. *Am J Phys Med Rehabil* 2006; 85(12): 997-1006.
22. Lisi AJ. Chiropractic spinal manipulation for low back pain of pregnancy: a retrospective case series. *J Midwifery Womens Health* 2006; 51(1): 7-10.
23. Wang SM, DeZinno P, Fermo L, et al. Complementary and alternative medicine for low-back pain in pregnancy: a cross-sectional survey. *J Altern Complement Med* 2005; 11(3): 459-64



Management of a Fractured Clavicle in an 18-Month-Old Toddler

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ABSTRACT

Objective: The purpose of this article is to present the case of an 18-month-old child who sustained a trauma and presented to a chiropractic office. It addresses co-management strategies for a fractured clavicle between a chiropractor and orthopedist. The co-management strategies were based on the normal fine motor development of the trunk and shoulder girdle.

Design: A case study

Setting: Private practice

Patient: 18-month-old toddler

Methods: Orthopedic treatment consisted of a simple arm sling for approximately 3-4 weeks and lengthening shoulder stabilizing muscles. Co-treatment initially consisted of diversified chiropractic adjustments of C2 and myofascial release of the sternocleidomastoid and levator scapulae muscles for 6 weeks with a 6 and 12 month follow up.

Results: Chiropractic care addressed the altered segmental and extremity motion. The patient responded well to care. The fractured site reunited without overlap between the medial and lateral components of the clavicle. There was no palpable mass upon visual inspection and palpation.

Conclusion: The neurological developmental age of the child is critical in determining the appropriate strategies for influencing normal remodeling of bone.

Key Indexing Terms: chiropractic, adjustment, manipulation, fractured clavicle, pediatrics, clinical management, developmental osteology, fixing, vestibular, proprioception, developmental milestones

INTRODUCTION

This case represents a co-management strategy between a chiropractor and an orthopedist in the management of a fractured clavicle in an 18-month-old female child. Traditional non-surgical orthopedic management includes a simple sling or a figure-eight-strap for shoulder immobilization in children.¹ It was the opinion of an orthopedist that the child would benefit the most from chiropractic care during the acute healing phase of the fractured site. The opinion is founded on the post-natal development of the head, trunk and shoulder and the postural reflexive facilitation during the first three years of life.²

CASE REPORT

History and Examination

An 18-month-old female child presented to a chiropractic office having suffered an acute trauma. The toddler

had fallen off an aerobic step she had been climbing over during a “mommy and me” class. While in a seated posture she lost her balance falling approximately 6 inches from the top. She landed on her right scapula followed by the remainder of her body weight.

The toddler’s past medical history was insignificant. Her family history included mild hypertension. She was a home delivery without complications. She was breast fed for 13 months; her first solid food was avocados at six months of age. At the time of presentation she was on a certified organic diet. The toddler had been under chiropractic care since birth. She met all normal guidelines for her age in gross motor skills, social skills, fine motor skills, communication skills and adaptive skills.

Physical examination measurements included: length 80 cm, weight 22 pounds, head circumference 47 cm, blood pressure 110/80 bilaterally and pulse 120 bilaterally, respirations 25. At presentation she appeared to be in physical distress, and was unable to actively or passively move her head without distress. Her cervical region was tested for tone and soft tissue texture revealing severe muscle spasms in the sternocleidomastoid, upper trapezius fibers, levator

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scapulae and both anterior and posterior scalenes. Visible inspection revealed a mild swelling between the proximal and distal clavicle. Held in the vertical posture with legs hanging down exacerbated her symptoms. Radiographs were taken to rule out clavicle fracture. Neurological and orthopedic tests were not performed on the initial visit. The radiograph confirmed a clean break in the “S” curve, dividing the proximal and distal portions of the clavicle. Orthopedic consult was obtained.

The orthopedist discussed the development of fine motor shoulder stability that was occurring in this patient. Initially infants have poor control of their extremities. Infants maintain their extremities close or fixed to their bodies. Fixing is part of normal development as the infant attempts to stabilize their body in gravity. The initial phase is referred to as progravity until the appropriate muscles can fix or stabilize against gravity or antigravity. The child with shoulder stability will be able to reach and lift objects using all the muscles around the shoulder girdle. This process of fine motor movement will take approximately 18 months to refine and will not be completed until 30 months. This toddler was in this developmental stage. Her shoulder girdle was acquiring stability through traction and compression in gravity. Since she demonstrated an upright posture when sitting, the shoulders were pulled in gravity by contraction of the rhomboids. The window of her development would ensure the natural repositioning of her clavicle, naturally.

The orthopedist recommended a simple arm sling for approximately 3-4 weeks.³ He further recommend that the child refrain from being lifted under her arms, only carried by adult caregivers, and kept as quiet as possible. The orthopedist confirmed the toddler could receive spinal adjustments by the chiropractor. In addition, he recommended lengthening shoulder stabilizing muscles once, tolerable to the toddler.

Full spine examination by the chiropractor revealed the child had restricted range of motion in the cervical and thoracic spine, restricted range of motion in the right glenohumeral and scapula joints, loss of segmental function at C2, and severe muscle splinting in the involved sites. The cervical spine was evaluated through motion palpation: C2 had decreased rotation and lateral flexion to the right interpreted through lightly pushing and stressing the C2 segment. The child was adjusted at the acute office visit. A light thrust was administered to the articular pillars of C2. She responded well and was sent home for rest and support. The instructions included: the use of a simple sling,

restrictions of movement, avoid dangling her legs when holding her under the arms and keep her body supported during the acute phase of healing.

The toddler returned the following day. Further evaluation revealed swollen cervical lymph nodes, a rectal temperature of 101.4 F and swelling over the right clavicle. She was congested but in less distress than the previous day. The cervical spine was evaluated for subluxation, revealing the same pattern as the day before. An adjustment was administered in addition to light lymph pumping to stimulate draining of deep and superficial lymph nodes in the SCM. The parents were given the same instructions for home patient care as the previous day including increased vitamin C.

The lymphadenopathy of the right cervical region resolved within three to four days. The child was monitored for the next six weeks after the clavicle fracture. Her full spine was examined one time a week during this six week period. At each office visit a subluxation was found at C2, it was adjusted until resolved.

The child progressed well and the clavicle healed without palpable mass and without alteration to postural positioning of the shoulders. The child continued to develop normally. She was evaluated at 6 months and again at 12 months. The fractured site reunited without overlap between the medial and lateral components of the clavicle. There was no palpable mass upon visual inspection and palpation.

DISCUSSION

Developmental landmarks include the primitive reflexes. Primitive reflexes are stereotypical movements appearing and disappearing in an expected order during infant development. The following developmental landmark is known as the postural reflexes. The postural reflexes control the trunk and extremities in gravity. In this particular case the Asymmetrical Tonic Neck Reflex (ATNR) may be of particular interest in the role of developmental influence on healing a fractured clavicle.

The ATNR is a gross motor reflex which provides neural programming for basic postures of the torso and limbs as demonstrated during crawling and reaching. The anatomical “fencing posture” is seen when the infant turns his head to one side, with arm extension and upward palming rotation of the hand. The opposite arm is postured in flexion and palm pronation.²

The ATNR is an asymmetrical influence on the position of the head. As the ATNR diminishes there is less influence on the cervical extension reflex. This is a developmental landmark as it establishes reciprocal inhibition with the cervical extensors to relax or lengthen dependent on body position. From a supine position the neck, trunk and abdominal flexors begin to work as antigravity muscles directing the head to a midline position.

As cephalocaudal development continues in the supine position, there is controlled movement of the upper extremities, first with volitional movements and subsequent stabilization of the shoulder. The shoulder stabilizes in weight-bearing function from the prone on elbows position. Supine positioning influences the shoulder in for non-weight-bearing function.⁴

During the first 3 months of life, having little control over the upper extremities, the infant maintains the extremities close or fixed to the body. Fixing is part of normal development as the infant attempts to stabilize their body in all postures in gravity. The initial phase is referred to as progravity until the appropriate muscles can fix or stabilize against gravity or antigravity. The child with shoulder stability will be able to reach and lift objects using all the muscles around the shoulder girdle. This process of fine motor movement takes approximately 18 months to refine and will not be completed until 30 months.⁴

It is important to have good trunk stability in order for shoulder stability to adequately develop. Shoulder stability is necessary for the development of hand stability which contributes to grasp for writing and fine motor projects. Activities which provide joint compression and traction at the shoulder will assist with development of stability.

During the development of upright posture, the child is using progravity contraction of the trunk, hips and knee flexors to fix into gravity. Initially, the child sits in a high guard posture with shoulders retracted assisting as an adjunct to spinal extension. The rhomboid muscles are secondary stabilizers of the trunk in gravity. The rhomboids serve as a midline trunk stabilizer against the pull of gravity demonstrated in tall kneeling and erect standing, as the child's center of mass moves higher in space relative to the supporting surface.⁴

A clavicle fracture in children is commonly caused by injury or trauma. Most injuries occur while the child is at play. This child fell from an aerobic step approximately 10-12 twelve inches above the floor surface. She fell with

her hands outstretched landing on her right shoulder. As revealed in the examination, the child demonstrated restricted range of motion in the cervical and thoracic spine, restricted range of motion in the right glenohumeral and scapula joints, loss of segmental function at C2, and severe muscle splinting in the involved sites. The abnormal motion, muscular dysfunction and inflammatory response associated with the injuries sustained in this fall were addressed using chiropractic care. Maintaining motion to a region reduces the impact of inflammation during the remodeling phase.⁵ The chiropractic adjustment improved global range of motion, segmental motion integrity and muscular strength to the cervicothoracic region.

Chiropractic management goals included minimizing loss of range of motion and improving segmental integrity during the fine motor development phase for shoulder and trunk stability. An injury, such as this child experienced, may have affected the child's ability to fix herself in gravity. During this phase of development, sensory integration is heightened. The loss of normal motion may alter the vestibulo-proprioceptive components of spatial adaptation.⁶

There are two advantages for children healing from a fractured bone. First, the healing process is very rapid. The incident of nonunion in the pediatric population is rare. The second benefit is that there is a very good remodeling capacity. Treatment will depend on the damage and the fracture type. Most broken clavicles self resolve. Restricted mobilization is necessary to allow the clavicle to heal properly. The younger the child is, the faster the fracture will heal without further problems.

Another component accelerating the healing time in children is a thicker periosteum surrounding the bones. As a consequence, fractures in children tend to be more stable and less displaced than those seen in adults. The greater bone-forming potential of the pediatric periosteum results in faster bone healing in children. Non-unions are rare in pediatric fractures.

The clavicle is the most commonly broken bone in children and athletes. Of the most common fractures, 80% of all fractured clavicles will break between the medial and lateral segments. The mechanism of injury is predictable, such as a fall with outstretched hand or a fall on the shoulder. The second most common mechanism of clavicle fracture occurs during the birth process, reported in 3% of obstetric deliveries. Typically, there is no consequence. However 5% of the reported cases of clavicle fracture during

the birth process also resulted in a brachial plexus injury.¹

The pectoral girdle anteriorly is made up of the clavicle, articulating with the scapula, on the lateral border and the manubrium on the medial border. The scapula articulates with the humerus on its lateral border at the shoulder joint. The clavicle is considered a strut bracing the upper limb to the thorax. The clavicle provides four functions:

- To provide a bony framework for muscle attachment
- To act as a strut, holding the shoulder from the sternum increasing the range of potential movement of the shoulder joint
- To transmit the supportive stresses of the upper limb to the axial skeleton
- To protect the axilla's neurovascular bundle as it passes from the neck into the upper limb

This article reviews the bony surfaces and muscles traumatized by a clavicle fracture resulting from a fall directly onto the shoulder. The inferior surface of the clavicle provides the attachment for muscles that are involved in the framework. The deltoid attaches anteriorly, the trapezius muscle attaches posteriorly at the trapezoid ridge of the inferior portion of the clavicle, which possibly creates a groove for the subclavian artery. The costoclavicular ligament is the major support to the clavicle, connecting the inferior surface of the clavicle to the upper surface of the first rib and costal cartilage. The strength of this ligament makes dislocation rare. However, trauma may cause the ligament to tear.⁷

The lateral border of the clavicle consists of the acromion process of the scapula and the acromioclavicular joint. The joint is held by the strong coracoclavicular ligament inferiorly and the weaker acromioclavicular ligament located superiorly. The movement of the clavicle is passive and determined by the scapula. Movement at the acromial site will cause the opposite movement at the sternal site; the clavicle moves in a back and forth direction anchored by the coracoclavicular ligament.⁷ The ligament's position restricts and binds the clavicle that when traumatized the most common result is a fracture. The fracture occurs between the medial and distal components of the clavicle. The medial junction is known to be the weakest site between two ligaments and is an area not protected by muscles.⁷

Subsequent to the fracture, the trapezius muscle is unable to support the upper limb. The lateral border of the

limb will drop and roll medially due to the action of the teres major, latissimus dorsi and pectoralis major muscles. Even though the fracture site is difficult to immobilize, the break will reunite as the clavicle displays marked ability to heal. The clavicle will heal rapidly; the infant's site reunites within 2 weeks, children in 3 weeks, young adults in 4-6 weeks and mature adults around 6 weeks.⁷ A fractured clavicle may be cause for concern in some cases, the following identifies consequences and associated adversities: "pneumothorax in 3% of the cases, re-fracture 2%, death 2%, and haemothorax 1%, neurological disruption (percentage unreported)."⁷

Diagnosis of a fractured clavicle is easily made by examination and radiographic evaluation. The fractured clavicle is easily identified on anteroposterior view of the clavicle and additionally some physicians prefer a cephalic view to diagnosis the fracture. The fracture segments of the clavicle usually overlap by 1-2 cm.

The typical orthopedic non-surgical standard of care consists of a simple sling, or if greater immobilization is necessary, a figure-eight clavicle strap is used. The strap will maintain the shoulders in the extended position minimizing the amount of overlap at the break site maximizing function and cosmetic relief.^{8,9}

The development of the shoulder, including bone and soft tissue, guide the repositioning of the fractured site. Early development of the clavicle follows a cephalocaudal growth direction. The pectoral girdle develops before the pelvic girdle and larger parts of both become cartilage before smaller parts of both. The scapula develops from the mid-cervical region; the embryological and fetal clavicle does not reach a horizontal position until the shoulders have completely descended. The shoulders begin their descent at age one and are completed by age four.

There is thought to be two separate ossification centers; one for the medial portion and one for the lateral portion. Ossification begins on the 39th day initiating a bony bridge fusing the two separate bones by the 7th week of gestation. The clavicle gains its characteristic "S" curve between weeks 8 and 9, achieving adult structure by week 11 of gestation. Adult morphology attained during pregnancy indicates that the clavicle is not greatly affected by post-natal mechanical stresses and forces. Following fetal development of the clavicle through ultrasound and direct examination demonstrates an approximate 1mm per week linear growth. A full-term clavicle typically measures 40-41 mm with a small increase between the 5th and 7th year.⁷

Secondary ossification centers commence in the epiphyseal cartilage mass around the 13th and 14th year. "The medial end of the clavicle is, for some unknown reason, a slow-maturing epiphysis and fusion to the diaphysis will not occur until at least 10 years after its initial formation."⁷ The fusion between the diaphysis and epiphysis commences around the 16th-21st year with complete ossification around 30 years of age.⁷

CONCLUSION

The bone is said to be a "dynamic organ," ever changing, especially in the pediatric population. The healing capacity of bone in this population makes it unique in interpretation and treatment. The result of trauma on the mature skeleton and the result of trauma on the growing skeleton are unparalleled.

This case represents a co-management strategy between a chiropractor and orthopedist. The professionals reviewed the fine motor process of shoulder stability and its influential benefit on healing a fractured clavicle in gravity. The developmental process defines the role of the chiropractor in serving the pediatric population.

REFERENCES

1. Zlowodzki, M., Zelle, Boris, A., Cole, P., Jeray, K., Michael D. (2005). Treatment of Acute Midshaft Clavicle Fractures: Systematic Review of 2144 Fractures: On behalf of the Evidence-Based Orthopaedic Trauma Working Group. *Journal of Orthopaedic Trauma* 2005; 19(7):504-507.
2. Pieper A (1963). Cerebral Function in Infancy. New York, NY. Consultants Bureau. 156-210.
3. Nuber, GW, Bowen, MK (1997). Acromioclavicular joint injuries and distal clavicle fractures. *J Am Acad Orthop Surg* 1997; 5:11-18.
4. Schneider, J.W., Lee, W., Chasnoff, I.J. (1988). Field testing of the movement assessments of infants. *Phys Ther* 1988; 68; 321-327.
5. Lindaman, LM. (2001). Bone healing in children. *Clin Podiatr Med Surg* 2001; 18(1): 97-108.
6. Crucia, GP, Barrett, AM, Schwartz, RL, Bowers, D., Triggs, WJ, Friedman, W., Heilman, KM. (2000). Cognitive and vestibulo-proprioceptive components of spatial ability in Parkinson's disease. *Neuropsychologia* 2000; 38(6): 757-767.
7. Scheuer, L., Black, S. (2000). London, NW1. Academic Press., 2000. Pages 244 – 263.
8. Behram, R.E., Kliegman, R.M., Arvin, A.M.. (1996). Nelson Textbook of Pediatrics, 1996s. Philadelphia, Pennsylvania. W.B. Saunders Company. Pages 1955-1956.
9. Smith, M. F., Braud, S. M. (1954). Two Simple Office Techniques in Pediatric Practice. *Journal of the Louisiana State Medical Society*. June 1954; 106(6) 212-214. Retrieved October 24th, 2007 from Department of Veterans Affairs Medical Center/ AHEC LRC / Alexandria / LA USA, database.



Chiropractic Management of Six-Year-Old Child with Attention Deficit Hyperactivity Disorder (ADHD)

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ABSTRACT

Objective: The objective of this paper is to discuss the case of a male child, six years and 10 months of age who had been diagnosed with and medicated for attention deficit hyperactivity disorder (ADHD) and the protocol used at the Kentuckiana Children's Center integrating chiropractic with ancillary modalities when he presented for care.

Methods and Treatment Plan: The child's treatment plan included chiropractic adjustments, craniosacral therapy, movement exercises and nutritional supplementation over an initial intensive 6 week period with recommendations for follow up care.

Results: At 6 weeks, improved focus and more compliance with directives was noted. The patient retained the correction of the vertebral subluxation complex post adjustment after the first 4-5 adjustments. Subjective input from teachers and bus drivers noted marked improvement in behavior. Through this course of treatment, the child was able to discontinue use of the medication previously prescribed to control the symptoms of ADHD.

Conclusion: This case study shows the positive improvements of one child's symptoms of ADHD under the care of a chiropractor. As pharmaceutical research continues to be undertaken, so should the study of alternative, non pharmaceutical recourses such as chiropractic adjustments based on practice-based information of positive outcomes with few side effects.

Keywords: chiropractic, subluxation, spinal adjustment, craniosacral therapy, Attention Deficit Disorder, Kentuckiana Children's Center

INTRODUCTION

According to the National Institute of Mental Health, it is estimated that anywhere from 3-5 percent of children have Attention Deficit Hyperactivity Disorder (ADHD).¹ However, the National Center for Health Statistics relays a much higher percentage of 7.4 based on the 2006 National Health Survey.²

Currently, there are no laboratory tests available that screen or test for ADHD. Therefore the diagnosis is primarily made when three qualifying factors are present. First, there has to be at least six or more symptoms of inattention and/or hyperactivity-impulsivity that have persisted for at least six months. Second, some of the symptoms causing impairment must be present before age seven. Thirdly, some impairment from the symptoms must be present

in two or more settings. The Diagnostic and Statistical Manual of Mental Disorders defines that there are three patterns of behavior that indicate ADHD. The first two patterns primarily display either hyperactivimpulsive type behaviors or inattention. The third pattern is a combined type displaying symptoms of hyperactivity impulsivity and inattention.³

Dr. Heinrich Hoffman first described a child with ADHD in his book of children's poems in 1845 and Sir George F. Still, in 1902, published several lectures on children with ADHD. Since then, there have been numerous studies and papers on the symptoms, diagnosis, cause, and treatment for ADHD.^{1,4} Most of these papers and studies revolve around allopathic treatment rather than natural care. Over the years there has been an increased use of medication for the treatment of ADHD related symptoms. Stimulants continue to be the most common type of medication prescribed and include different formulations of methylphenidate and amphetamine available in short, intermediate and long acting forms. The classic example of a stimulant is Ritalin, which has been the drug of choice for nearly 40 years. Other stimulants similar to Ritalin include Concerta, Metadate, and Daytrana, which are all forms of methylphenidate. Adderall is an amphetamine, Focalin

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is a dexamethylphenidate, and Dexedrine is considered a dextroamphetamine.⁵⁻⁷ Effects of stimulants have still not been studied for long term safety and effectiveness. Along with the potential for long term effects, there are a number of side effects which may include nervousness, sleeping difficulties, loss of appetite, weight loss, headaches, restlessness and agitation. There are now non-stimulant drugs used such as Strattera, which is an atomoxetine. Strattera, however, can also cause side effects including, but not limited to loss of appetite, drowsiness, headache, nausea and dizziness.^{5,7}

Over the past 10-15 years, there has been a substantial increase in the prescription of ADHD medications.⁷⁻⁸ The increased use of medications and their associated side effects, however, have left many parents and professionals seeking alternative, nonpharmaceutical treatments for ADHD. Amongst these non pharmacologic approaches is the chiropractic adjustment.

Since the predominant population seen at Kentuckiana Children's Center during the past decade has been children diagnosed by co-treating allopathic physicians as being on the autistic spectrum or with an associated disorder, it was of interest to the authors and pertinent to clinical treatment planning to review the current published literature on the effect of chiropractic adjustments on individuals with ADHD. This search was conducted using the following data bases: Pub Med, Index to Chiropractic Literature, International Chiropractic Pediatric Association — Research Foundation, International Chiropractors Association Council on Chiropractic Pediatrics Journal Abstracts, and The Chiropractic Resource Organization. The search produced a few case reports citing the benefits of Chiropractic care for children and adults with ADHD.⁹⁻¹⁵ The following report is one additional such case.

CASE HISTORY

A six-year, 10-month old male child who had been diagnosed with ADHD by his pediatrician at age six and prescribed 30 mg daily of Ritalin LA presented for care at the Kentuckiana Children's Center clinic. His main challenges at school as described by his mother were excessive talking, inability to remain seated, and impulsivity as displayed by constantly interrupting other students. His mother reported that he often displayed this impulsive behavior, but that he was also considered to have above average intelligence. He received good grades and his reading was at an advanced level. His mother attempted to enroll him into a behavioral program offered at his school while still in the 1st grade but was unable to do so. The child was extremely active and frequently played outdoors. He

did not participate in any organized sports.

The mother's pregnancy was uneventful aside from elevated maternal blood pressure during the last trimester. The child was born at 39 weeks gestation via c-section after a prolonged labor of nearly three days that failed to progress. There were no complications noted directly after birth. He was breastfed for approximately one week before being switched to a dairy based formula. Mom noted that she did not produce enough milk and was unfamiliar with methods of increasing breast milk production. Developmental milestones were achieved within the normal time frame. He crawled normally for about six months before walking when he was one year old.

His immunizations were current according to the current AAP recommendations. He had occasionally experienced constipation, but at the time of presentation was regular in his bowel movements. He slept soundly. His diet was limited in vegetables, but he ate some fruits like grapes. He drank about 16 ounces of water and 16 ounces of juice every day. His diet was high in fast food and processed, frozen foods. He was taking an over-the-counter children's multivitamin and 1,000 mg of vitamin C every day.

The child presented to Kentuckiana Children's Center (KCC) during the summer between first and second grade. His parents decided to stop medication over the summer months. They said their main goal was to get him off medications, yet still have him be able to calm down and focus. Based on a 2004 Survey by Eli Lilly and Company, almost half of parents with kids with ADHD plan to reduce or eliminate their child's medication over the summer, despite their feelings that the medication would benefit their child with summer activities. Many parents hope that giving their child a break from medications over the summer will help the child gain weight and height.¹⁶

PHYSICAL EXAMINATION

A thorough physical examination was performed that included vital signs, eyes, ears, nose, throat, chest, abdominal, neurological, spinal, and cranial examinations. Auscultation of the heart revealed a mild murmur, which was followed-up by a cardiologist.

Postural assessment revealed an elevated right mastoid and elevated right shoulder. There was a notable increase in muscle tone of the posterior suboccipital muscles on the right. Chiropractic examination revealed atlas subluxated laterally to the right with the right lateral mass rotated posteriorly, T3 and T4 vertebral body rotated to the right, and

right posterior sacral base. Chiropractic cranial palpation and assessment did not reveal any osseous asymmetries.¹⁷ A computerized thermal scan from Insight Millennium revealed moderate imbalance in autonomic nervous system tone throughout the spine (Fig. 1).¹⁸

METHODS AND COURSE OF TREATMENT

At Kentuckiana Children's Center, a treatment plan is devised and coordinated by the staff chiropractor and implemented by the chiropractor and one or more adjunctive therapists as appropriate for the individual child's care.

The child's initial treatment plan included chiropractic adjustments twice a week for two weeks and then once a week for four weeks. The chiropractic treatment plan was supplemented with cranial therapy, nutritional counseling and supplementation. The atlas subluxation was corrected with the boy lying supine on the adjusting table. The tip of the index finger on the adjusting hand contacted the posterior lateral mass on the right side and the stabilization hand contacted the mastoid and occiput while the index finger stabilized the lower cervical spine. The line of correction was from right to left, through the joint plane and with an inferior arcing motion towards the end range. The T3 and T4 right vertebral body rotation was corrected with the boy lying prone on the adjusting table. The pad of the index finger contacted the left transverse process and the pad of the middle finger contacted the right transverse process. The pisiform of the other hand contacted the middle finger. The line of correction was posterior to anterior with slight medial to lateral projection. The right posterior sacrum was corrected with the boy lying prone on the adjusting table. A reinforced pisiform contacted the right sacral base. The line of correction was posterior to anterior.

Cranial rhythm and osseous cranial motion was further evaluated by one of the Center's cranial therapists. The therapist that worked on this child is a licensed massage therapist who had completed over 200 hours of additional training in Craniosacral Therapy (CST). The style of craniosacral therapy practiced by the therapist working with this child was based on the work of John E. Upledger, DO,¹⁹ as well as the Visionary CranioSacral work developed by Hugh Milne, DO.²⁰

The cranial treatment plan was on a weekly basis for six weeks in conjunction with his chiropractic adjustment. The cranial techniques employed are used to evaluate and restore normal movement of the cranial bones and flow of the cerebral spinal fluid throughout of the craniosacral system (CSS). The CSS is comprised of the membranes

and the cerebrospinal fluid that surrounds and protects the brain and spinal cord. It also includes the body parts that directly affect the membranes, such as the cranial bones and the vertebrae. The membranes addressed include the dura, arachnoid, and pia mater, which collectively line and compartmentalize the skull and line the spinal column. This therapist's focus was to optimize the position, fluid movement, and energy of this child's CSS, while bringing the CSS back to balance.¹⁹ The style of cranial work utilized requires lightness of touch on the practitioner's part, that being approximately 5 grams of pressure.²⁰

Therapeutic cranial sessions with this child focused on his whole body system. Throughout the course of these sessions the focus was on calming and balancing the reticular activating system. Specific tissue focus was on occiput, sacrum, balancing craniosacral rhythm through the dural tube, easing restrictions, and balancing the falx cerebelli, falx cerebri, and the tentorium cerebelli. In the first few sessions, the membranes of the cranial vault seemed compressed with a pressured and heavy feel to the cranial wave. Gradually the cranial wave increased in amplitude and the quality became more fluid and easy. Use of a motion table²¹ rather than a massage table was introduced in the second session. This allowed the child to remain available for hands on work for 10-12 minute intervals. He began to demonstrate the need for pressure by choosing to push against the therapist's hands with his feet as well as responding positively to the use of weighted blankets and pillows.²²⁻²³ The use of verbal skills in lieu of impulsive behavior was supported by planning the session ahead of time with the child. For example, time was outlined for stationary work with the option for a more physical movement activity if he cooperated. The child tolerated the light touch of CST better when the session began with deep pressure activity. Many therapists, in particular occupational therapists, have noted that light touch activates hypervigilance in the nervous system while deep pressure is relaxing and calming.²²⁻²⁶

It was also suggested the child begin taking cod liver oil capsules (@1,000mg of DHA/EPA),²⁷⁻³² 375 mg of Dimethylglycine (DMG) with folic acid and vitamin B12,³²⁻³³ 1 oz. of a liquid children's multivitamin³⁴ and a vitamin complex specifically designed for increasing attention span.³⁵ Dietary changes were suggested to help decrease the amount of food dyes and additives.^{27,36-37}

After the first four weeks, movement exercises were implemented to further enhance focus and attention.⁷ These exercises included gradual revolutions or spinning (on a spinner board while sitting upright and cross

Figure 1. Computerized Thermal Scan

Patient Name:
Patient Number:
Patient Identifier:

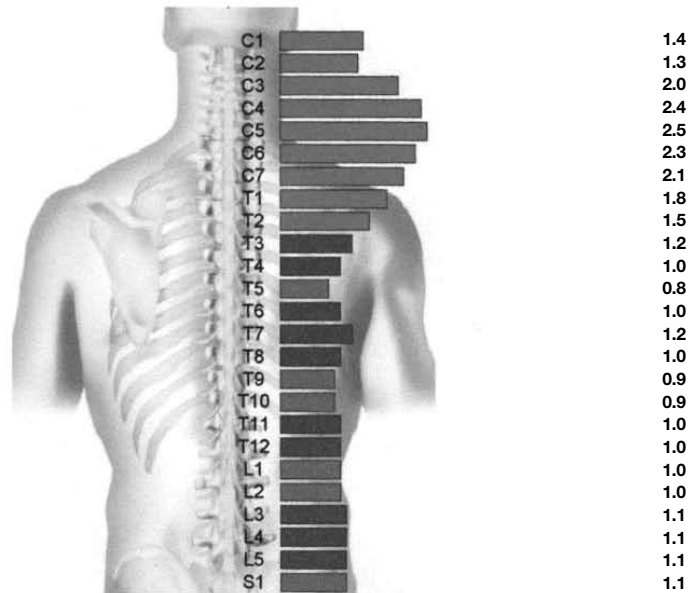
1550549

Practice Name:
Practice Address:

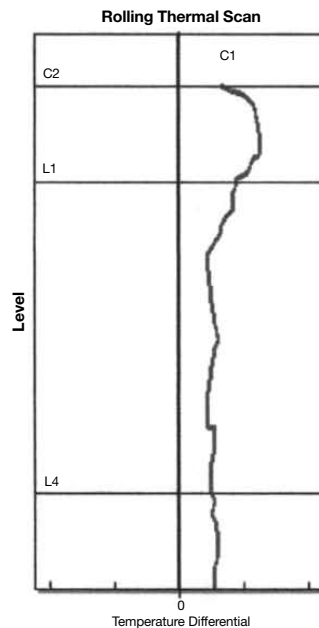
Kentuckiana Children's
1810 Brownsboro Road
Louisville, KY 40206

Rolling Thermal Scan NCM Comparison on (06/28/2007 10:50 AM)
6 degrees Farenheit

+1 +2 +3



Rolling Thermal Scan Graph (06/28/2007 10:50 AM)
6 degrees Farenheit



legged) with eyes closed and timed as closely as possible to one minute in one direction, a few seconds rest, and then equally slow return. This exercise was followed by rapid turning with eyes open. The spinning exercises were followed by log-rolling and jumping on a trampoline for about 5 minutes. These exercises were used to improve the vestibular function, eye tracking, and auditory integration, which have shown to have a positive impact on attention and focus.^{24,38}

RESULTS

At his six-week re-evaluation, the child's mother noted improved focus and more compliance with directives. Excessive talking continued, though his mother noted that she also talked excessively.

The patient retained the correction post adjustment after the first 4-5 adjustments, often only needing one vertebral level adjusted, which was usually the atlas, on subsequent visits. The six-week Insight Millennium thermal scan revealed marked improvement in the balance between sympathetic and parasympathetic nervous systems (Fig. 2).

After the 6-week evaluation, the treatment plan was reduced to every 2-4 weeks for chiropractic adjustments and as needed for craniosacral therapy. The exercises were continued when in office and the log rolling and trampoline exercises were given as homework during the intervals between visits to the clinic. School started shortly after the initial 6-week reevaluation. Teachers and bus drivers noted marked improvement in behavior and his report card showed he was receiving good grades at the follow up visits. He continued to take the recommended supplements listed above, but remained medication free.

DISCUSSION

This child was initially prescribed Ritalin to help control his symptoms of impulsivity, hyperactivity, focus, and excessive talking. As mentioned in the introduction, Ritalin is a form of methylphenidate, a central nervous system stimulant. Methylphenidate works by increasing the levels of dopamine in the brain and by blocking the reuptake of dopamine.^{7,39-42} The most prevalent theory is that ADHD results from a dysfunction in brain circuits dependant on dopamine. Dopamine and norepinephrine both affect alertness, focus, sustaining thought, effort, and motivation. Dopamine is a precursor to norepinephrine synthesis in the brain. Several studies have shown that people with ADHD have more dopamine transporters than

people without ADHD (dopamine transporters are proteins on the dopamine producing cells that are responsible for the reuptake of the excess dopamine), which could in turn, deplete the levels of dopamine and lead to decreased levels of alertness, motivation, attention, etc...^{7,43} A study conducted by the U.S. Department of Energy's Brookhaven National Laboratory concludes that the increased number of dopamine transporters alone is not indicative of ADHD. Their study indicates that there is most likely an additional variable present to account for ADHD, such as lower amounts of dopamine being released.⁴³

If Ritalin and other stimulant drugs work to increase dopamine levels in the brain, then why do parents and other professionals continue to seek natural and better alternatives to medication? Medications like Ritalin do not cure ADHD. They simply control the symptoms of hyperactivity and inattention, by increasing dopamine.^{5,7} Aside from the side effects, Ritalin is a central nervous system stimulant, which is similar to amphetamines or cocaine. Methylphenidate (Ritalin) and amphetamines, more specifically, release norepinephrine and dopamine in the prefrontal cortex. The prefrontal cortex controls behaviors and this in turn creates a feel good effect or high.^{7,42} While the pill/oral form of Ritalin is not considered addictive because of its delayed effect on the brain, when injected or snorted, Ritalin can be highly addictive.^{41,44}

It is our hypothesis that chiropractic can offer an alternative to the mainstream medical approach through the chiropractic adjustment. It is important to briefly review the anatomy and physiology of a subluxation. The main subluxation or dysfunctional motion segment for this child was C1 (atlas). The atlas is the first cervical vertebra that articulates with the occipital condyles and the superior articular facet and anterior articular facet of the axis or C2. Subluxation at this level can affect the length and efficient contractility of numerous ligaments, muscles and surrounding blood and lymphatic vessels. Aberrant stimuli from the associated mechanoreceptors, nociceptors, muscle spindle and golgi apparatus bombard the central nervous system via cranial nerves and cervical spinal nerves via the spinal cord with potentially wide ranging physiologic consequences. Nociceptors and mechanoreceptors are the primary afferent/sensory receptors that innervate joints. The nociceptor accounts for over 90 percent of joint innervation. It is important to note that nociceptors do not equate as pain receptors, although pain is relayed through nociceptors. To further classify the nociceptors, there is an alphabetical classification and Roman numeral classification. C-fibers or group IV afferents are the primary nerve

Figure 2. Six-Week Follow-Up Computerized Thermal Scan

Patient Name:
Patient Number:
Patient Identifier:

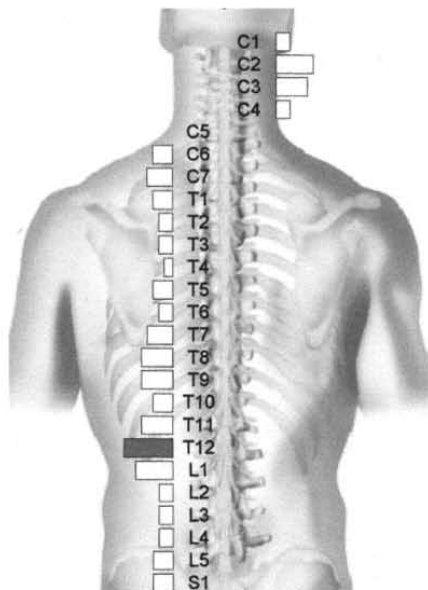
1550549

Practice Name:
Practice Address:

Kentuckiana Children's
1810 Brownsboro Road
Louisville, KY 40206

Rolling Thermal Scan NCM Comparison on (08/08/2007 9:56 AM)
 6 degrees Farenheit

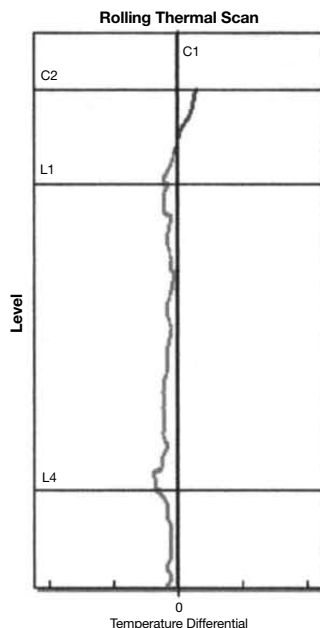
0.0
 0.3
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Rolling Thermal Scan Graph (08/08/2007 9:56 AM)
 6 degrees Farenheit



fibers that innervate spinal joints.⁴⁵ Subluxations increase the firing of nociceptors and inhibit the activity of mechanoreceptors.⁴⁵⁻⁴⁶ A complete review of the anatomy and physiology of the cervical spine and joint can be found in numerous texts and atlases.^{45,47-49}

There is evidence that the chiropractic adjustment stimulates paraspinal muscle reflexes and alters motor neuron excitability. The chiropractic adjustment is proposed to affect the physiology of the nervous system by its affect on the inflow of sensory information to the central nervous system thus potentially modulating central facilitation, specifically by means of golgi tendon organs and muscle spindle afferents.^{7,50} Furthermore, motor activity and activity that affects the postural muscles, directly affects the brain. Therefore the chiropractic adjustment can have a profound effect on the brain and the brain's ability to process sensory information, as well as exercises such as jumping and spinning. In this way, the chiropractic adjustment does not "treat" ADHD, but by reducing the subluxation it minimizes aberrant afferent stimulus which directly impacts CNS processing and it maximizes the "body's natural self healing capabilities".⁷

Carrick offers the opinion that "ADHD is caused by a problem with the reticular activating system (RAS)." Afferent input to the CNS from the innervation of the peripheral joints is an important source of stimulation to the reticular activating system. PET (positive emission tomography) scans have revealed areas of the brain that are underfunctioning.⁷ This under functioning may be related to the attention deficit attribute because of a depressed level of alertness of cortical function. At the same time, although seemingly paradoxical, this same individual may manifest hyperactive behavior in an attempt to self stimulate by bombarding the RAS with peripheral articular and muscular stimuli to increase cortical activity, awareness and attention.³⁸ This same under functioning, if related to the level of stimulation of the brain, may be positively influenced by the chiropractic adjustment via mechanoreceptor stimulation of the RAS.

The subluxation and concurrent postural distortions, can also result in increased pain sensation due to chronic nociceptive stimulation. In 2004, Bastecki, Harrison and Haas discussed altered spinal biomechanics associated with abnormal posture and related the significant neurologic stress and malfunction to the manifestations of ADHD.¹² In 2006, Lovett and Blum queried whether the result of pain and/or subclinical symptoms influence behavior, performance and concentration in children with ADHD

and that it is possible that some children were experiencing spinal dysfunction prior to the diagnosis of ADHD.¹¹ Two additional case reports of chiropractic and ADHD from Kentuckiana Children's Center detail improvements in behavior, decreased hyperactivity, and improved attention following chiropractic care and nutritional therapy over a span of one year.⁹⁻¹⁰

Craniosacral therapy focuses on balancing the activity of the autonomic nervous system thus affecting change in physiological dysfunction within the body and promoting the body's inherent self-healing capabilities. The craniosacral works to improve overall health by balancing the interrelated functions of the central nervous system and the autonomic nervous system by influencing their respective neurologic tone through the promotion of functional craniosacral motion and restoration of normal cerebral spinal fluid flow through the supporting membranous system or dura.⁵¹

It is our opinion that the success of chiropractic is not only through the chiropractic adjustment, but in the holistic approach to care that may also include nutrition and supplementation. The movement to stop using drugs is supported by Dr. Russell Blaylock, MD who says that ADHD medications can lead to pathologic cellular changes that could lead to brain diseases later in life and further emphasizes that long term safety and effectiveness have not been studied enough. As an alternative, Dr. Blaylock promotes dietary changes and use of supplements to treat ADHD. He recommends removing food additives, like preservatives and dyes (excitotoxins), that are toxic to the brain.⁵² Dr. Ben Feingold, MD first noted the benefits of removing food additives in the 1970's and continues to offer support of dietary changes.^{27,36-37} Despite the health benefits of removing the food additives, removing them does not always improve behavior for every child. Biomedical testing is available to assess the child's individual nutritional needs and deficits. Testing can check levels of essential fatty acids, amino acids, allergies, peptides, vitamins, minerals, etc.⁵³⁻⁵⁴ In this child's case, it was recommended to eliminate food additives since a diet diary indicated that his diet was high in fast foods and processed foods, while limited in fresh fruits and vegetables. Testing was not utilized for this particular child due to the cost of testing and the reduction in symptoms noted after the initial treatment plan.

Several supplements (cod liver oil, Dimethylglycine (DMG) with folic acid and vitamin B12, liquid multi-vitamin, and an additional liquid supplement for ADD/ADHD) were also recommended for this child based on his

diet and studies showing the benefits of these supplements. Although the etiology is unclear, several studies and papers show that children with ADHD have low levels of essential fatty acids.²⁷⁻³¹ Cod liver oil is one of the most crucial supplements for children with ADHD, if not all children, because of the omega 3 fatty acids or DHA. Omega 3 fatty acids are vital to brain and nerve tissue function and aid in transmission of nerve impulses needed for normal brain functioning. Essential fatty acids, specifically omega 3 fatty acids, have repeatedly been shown to improve symptoms of ADHD when supplemented.^{27-28,32} DMG is a derivative of the amino acid glycine and is chemically similar to the B vitamins. Its main role is enhancing neurotransmitter function and is thought to support healthy mental function in some children. DMG can also enhance cardiovascular and liver function by promoting oxygenation.³²⁻³³ The liquid multiple vitamin recommended for this child is free of artificial preservatives and artificial dyes and made from whole foods. In addition, the combination product that was used for additional nutritional support provided additional amino acids and B vitamins that are essential for proper brain development and function. Several sources cite the benefit of supplementing with vitamins and minerals. Deficiencies in minerals like magnesium have been correlated in children with ADHD.^{27-28,32}

CONCLUSION

This case study shows the positive improvements of one child's symptoms of ADHD with a chiropractic protocol of treatment. As pharmaceutical research continues to be undertaken, so should we undertake the study of alternative, non pharmaceutical recourses such as chiropractic adjustments based on case reports of positive outcomes with few side effects. More research should be done to demonstrate the physiological effects of the chiropractic adjustments on children with a diagnosis of ADHD.

In this specific case, there were no controls which would substantiate that it was the chiropractic adjustment alone that affected the patient's predominant symptoms. This child received a variety of new treatments including chiropractic adjustments, craniosacral therapy and nutritional therapy. There were also no measurement tools utilized to rate changes during treatment, rather, all noted changes were subjectively reported by the patient's mother, teachers, and/or bus drivers.

As a result of this self critique, the authors suggest that this case merits the design of a pilot study utilizing standardized measurement tools used to diagnose and evaluate the progress of a child with ADHD. This type of pilot study or

studies with larger populations employing specific controls might yield practitioners more information for evidence based practice.⁵⁵

REFERENCES

1. National Institute of Mental Health. Attention Deficit Hyperactivity Disorder. [updated 2008 Jan 3]; <http://www.nimh.nih.gov/health/publications/adhd/complete-publication.shtml>.
2. Center for Disease Control, Hyattsville: U.S. Department of Health and Human Resources; [updated 2007 Dec 06]. National Center for Health Statistics: Attention Deficit Hyperactivity Disorder (ADHD). <http://www.cdc.gov/nchs/fastats/adhd.htm>.
3. American Psychiatric Association: *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Ed, Text Revision. Washington, DC, American Psychiatric Association, 2000.
4. Hoffman H. The Story of Fidgety Phillip: The First Description of ADHD. <http://www.adhdstrategies.com/FidgetyPhillip.asp>.
5. Smith M, Segal R, Jaffe J and Segal J. Medications for Treating ADD/ ADHD: Benefits, Safety, and Side Effects. [updated 2007 Sept 15]. http://www.helpguide.org/mental/adhd_medications.htm.
6. Keep Kids Healthy, LLC. . [updated 2004 Dec 10]. http://www.keepkidshealthy.com/medicine_cabinet/adhd_medications.html
7. Schetchikova N. Children with ADHD Medical vs. Chiropractic Perspective and Theory. *J of American Chiropractic Association*. 2002 July: 28-38.
8. Kent C. Children, ADD/ADHD, and Chiropractic. *The Chiropractic J*. 2002 Aug. <http://www.chiro.org/>.
9. Anderson C and Partridge J. Seizures Plus Attention Deficit Hyperactivity Disorder: A Case Report. *ICA International Review of Chiropractic*. 1993 July/August: 35-7.
10. Barnes T. A Multi-Faceted Chiropractic Approach to Attention Deficit Hyperactivity Disorder: A Case Report. *ICA International Review of Chiropractic*. 1995 Jan/ Feb: 41-3.
11. Lovett L and Blum C. Behavioral and Learning Changes Secondary to Chiropractic Care to Reduce Subluxations in a Child with Attention Deficit Hyperactivity Disorder: A Case Study. *J Vertebral Subluxation Res*. 2006 Oct 4: 1-6.
12. Bastecki A, Harrison D, and Haas J. Cervical Kyphosis is a Possible Link to Attention Deficit Hyperactivity Disorder. *J of Manipulative and Physiological Therapeutics*. 2004 Oct;27(8): 525.e1-e5.
13. Barnes T. Attention Deficit Hyperactivity Disorder and the Triad of Health. *J of Clinical Chiropractic Pediatrics*. 1996; 1(2): 59-65.
14. Alcantara J and Davis J. Prospective Cohort of ADHD Patients Under Chiropractic Care. *Pathways*. 2005 winter: 8-9.
15. Giesen JM, Center DB, Leach RA. An Evaluation of Chiropractic Manipulation as a Treatment of Hyperactivity in Children. *J Manipulative Physiol Ther*. 1989 Oct; 12(5).
16. Parents More Likely to Modify ADHD Medication Over Summer, Despite Results Showing Treatment Helps Beyond School USA. *Medical News Today*. 2004 June 10. <http://www.medicalnewstoday.com/printerfriendlynews.php?newsid=9316>.
17. Pick MG Cranial Sutures: Analysis, Morphology & Manipulative Strategies Eastland Press: Seattle WA, 1999.
18. *Subluxation.com*. The Science & Validity Behind the Insight

- Subluxation Station. Mahwah: Chiropractic Leadership Alliance; c2008. <http://www.subluxation.com/>
19. *Upledger.com*. Palm Beach Gardens: The Upledger Institute, Inc.; c2007 [updated 2008 June 27]; <http://www.upledger.com/>.
20. *Milneinstitute.com*. Big Sur: Milne Institute, Inc.; c2007. <http://www.milneinstitute.com/>.
21. *Redbarn-enter.com*. Phoenix: RedBarn Enterprises, Inc. c2004. <http://www.redbarn-enter.com/redesign.html/pages/motiontable.html>
22. ADHD Improves With Sensory Intervention, Study Finds. *Medical News Today*. 2005 May 14. <http://www.medicalnewstoday.com/printerfriendlynews.php?newsid=24358>.
23. VandenBerg NL. The Use of Weighted Vest to Increase On-Task Behavior in Children with Attention Difficulties. *American J of Occupational Therapy*. 2001 Nov/Dec; 55(6).
24. Ayres, AJ. Sensory Integration and the Child. Los Angeles: Western Psychological Services; 2000.
25. Grandin T. Calming Effects of Deep Touch Pressure in Patients with Autistic Disorder, College Students, and Animals. *J of Child ad Adolescent Psychopharmacology*. 1992; 2(1).
26. Kranowitz CS. The Out-of-Sync Child. New York: The Berkley Publishing Group; 1998.
27. Schetchikova N. Children with ADHD Medical vs. Chiropractic Perspective and Theory — Part 2. *J of American Chiropractic Association*. 2002 August: 34-44.
28. *ADD-ADHD-Help-Center.com*. Chesterton: Nutrition Health Center. http://www.add-adhd-help-center.com/adhd_diet.htm
29. Colter A, Cutler C, and Meckling KA. Fatty Acid Status and Behavioural Symptoms of Attention Deficit Hyperactivity Disorder in Adolescents: A Case-Control Study. *Nutrition J*. 2008 Feb 14; 7(8). <http://www.nutritionj.com/content/7/1/8>.
30. Richardson AJ. Omega-3 Fatty Acids in ADHD and Related Neurodevelopmental Disorders. *Int Rev Psychiatry*. 2006 April; 18(2): 155-72.
31. Antalis DJ, Stevens LJ, Campbell M, Pazdro R, Ericson K, Burgess JR. Omega-3 Fatty Acid Status in Attention-Deficit/Hyperactivity Disorder. Prostaglandins Leukot Essent Fatty Acids. 2006 Oct-Nov; 75(4-5): 299-308. Epub 2006 Sep 8.
32. Bell R and Peiper H. The A.D.D. and A.D.H.D..Diet. revised ed. Markham: Safe Goods/ New Century Publishing 2000; 2001.
33. Product Information Sheet: DMG (N,N- Dimethylglycine). [accessed on 2008 April]. http://www.purecaps.com/prod_info_sheets.asp.
34. *LiquidHealthinc.com*. Liquid Health Children's Multiple. C2000-2008. <http://www.liquidhealthinc.com/prodInterior.php?prodID=15>.
35. *LiquidHealthinc.com*. Liquid Health Attention. C2000-2008. <http://www.liquidhealthinc.com/prodInterior.php?prodID=10>.
36. Feingold BF. Why Your Child is Hyperactive. New York: Random House, Inc; 1975.
37. Center for Science in the Public Interest. A Parent's Guide to Diet, ADHD, and Behavior. 1999. Washington DC: CSPI.
38. Melillo R, Leisman G. Neurobehavioral Disorders of Childhood: An Evolutionary Perspective. New York: Springer Science + Business Media, Inc; 2004.
39. Hunt R. Functional Roles of Norepinephrine and Dopamine in ADHD. *Medscape Psychiatry and Mental Health*. 2006 ;11(1).
40. American Psychiatric Association. Dopamine Role in ADHD May Explain Drug's Efficacy. *Psychiatric News*. 2001 Mar 16.
41. New Brookhaven Lab Study Shows How Ritalin Works. Brookhaven National Laboratory. 2001 Jan 16.
42. Arnsten AF. Stimulants: Therapeutic actions in ADHD. *Neuropsychopharmacology*. 2006 Nov; 31(11): 2376-83.
43. High Dopamine Transporter Levels Not Correlated with ADHD. Brookhaven National Laboratory.2006 Nov 29. http://www.bnl.gov/bnlweb/pubaffpr/PR_display.asp?prID=06-124.
44. *Addictionca.com*. Ritalin. <http://www.addictionca.com/FAQ-ritalin.htm>.
45. Seaman D. Subluxation and the Nervous System. *Dynamic Chiropractic*. 2004 Feb 12 22(4).
46. Flesia JM, Jr. The Vertebral Subluxation Complex: An Integrative Perspective. *ICA International Review of Chiropractic*. 1992 Mar.
47. Netter, FH. Atlas of Human Anatomy. Colacino S, consulting editor. Summit: Medical Education & Publications, Ciba-Geigy Corp; 1989.
48. *Upcspine.com*. The Anatomy of the Atlas Subluxation. Niagara Park (Australia): Up C Spine; c2003-2005. <http://www.upcspine.com/anatomy2.htm>.
49. Kandel ER, Schwartz JH, and Jessell TM, editors. Principles of Neural Science. 3rd ed. Norwalk: Appleton & Lange; 1991.
50. Pickar JG. Neurophysiological Effects of Spinal Manipulation. *Spine J*. 2002 Sep; 2(5).
51. Upledger J. Exploring the Therapeutic Value of CranioSacral Therapy. *Massage Today*. 2006 Feb.
52. Totheroh G. Stop Medicating Your ADHD Child. CBN News Science and Medical Reporter. 2009. <http://www.cbn.com/cbn-news/news/050928a.asp?option=print>.
53. *GenovaDiagnostics.com*. Ashville: Genova Diagnostics; 1998-2008. http://www.genovadiagnostics.com/index.php?option=com_gpanel&Itemid=2&nav=doc.
54. *Greatplainslaboratory.com*. Lenexa: The Great Plains Laboratory; c2008. <http://www.greatplainslaboratory.com/home/eng/home.asp>.
55. Villaneuva-Russell Y. Evidence-based medicine and its implications for the profession of chiropractic. *Soc Sci Med* 2005;6(3):545-561.)



The Incidence and Etiology of Spondylolysis and Spondylolisthesis in Adolescent Cricket Fast Bowlers

HAMISH B. MACMILLAN, B.Sc., B.CHIRO, D.I.C.C.P.

ABSTRACT

Background: Much of the current literature concerning spondylolysis due to sporting injuries focuses on those sports which are prevalent in North America. This paper reviews the research literature relating to the incidence of spondylolysis and spondylolisthesis in one of New Zealand's biggest summer sports, cricket.

Literature: Included in this literature review are 12 different articles and one case study investigating the prevalence and etiology of spondylolysis and spondylolisthesis and other injuries in young cricketers. Two text books are also referenced for background information. Studies included are predominantly from Australian and English sources in addition to two inclusions from the literature of South Africa and West Indies.

Findings: The articles reviewed disagreed regarding the most common level of the spine to be effected by spondylolysis, however most agreed that the condition was far more likely to occur on the contralateral side from the bowling arm. It was unclear whether workload played an important part in the incidence of spondylolytic injuries.

Conclusions: It is important that chiropractors dealing with adolescent cricketers understand the frequency of spondylolysis and spondylolisthesis in various sporting activities. Adolescent cricket fast bowlers are at a much higher risk of spondylolytic injuries than the general population. Literature is in general agreement that chiropractic management at the onset of a spondylolytic spondylolisthesis injury is very effective. For second and subsequent injuries, management of the injury additionally requires rest and graduated return to activity. It is important to completely analyze the spine, pelvis and extremities to ensure that correct biomechanical function occurs during the fast bowler's delivery action.

BACKGROUND

There is a wealth of information readily available regarding spondylolysis and spondylolisthesis when applied to those athletes competing in common North American sports such as gymnastics, horse riding, football (gridiron) and springboard or high diving. There is however a growing body of research in Australia, South Africa, England and the West Indies investigating the incidence of acquired spondylolytic injuries in cricket players, particularly young fast bowlers.

In reviewing the literature, this paper attempts to identify and discuss the incidence, location of the injury, etiology, possible management techniques and prevention strategies. It is important that chiropractors dealing with adolescent cricketers understand the frequency of spondylolysis and spondylolisthesis in this sport.

Spondylolisthesis is defined as a condition in which

anterior slipping of a vertebra occurs on the vertebral structure below. The cause of this slippage is usually the inability of the posterior structural elements facets and laminae to maintain the position of the involved vertebrae.

Spondylolisthesis is described as an acquired condition involving disruption of the pars interarticularis, the cause of which is generally a mechanism of stress fracture.¹

The presence of spondylolisthesis was first recorded in 1782 by Belgian obstetrician Herbinaux. Although it wasn't until 1858 that Lambl demonstrated the pars interarticularis defect known as spondylolysis.² It should be noted that not all cases of spondylolisthesis require the presence of spondylolysis, however it is the cause that will be examined in this paper. Ninety percent of spondylolytic spondylolisthesis injuries in the general population involve the L5 vertebrae while the remaining 10 percent occur at other levels of the lumbar spine and cervical spine.

There are several possible causes for spondylolisthesis in the adolescent patient

■ Congenital defect

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- Stress fracture
- Acute trauma

Congenital defect is a controversial etiology as there has never been a proven case of pars interarticularis defect present at birth. Both cadaverous and radiographic analysis of the newborn spine have shown no sign of pars defect. The youngest ever recorded case of pars defect is at 4 months old. Therefore, to many authors this research indicates the probability of an acquired etiology.

There does however appear to be a higher incidence of these types of injuries in certain ethnic groups.² For example, Alaskan Eskimos and Native Americans. This may be due to genetic factors relating to the quality of bone with bone weakness predisposing an individual to a spondylolytic defect.

There would appear to be a greater incidence of these types of injuries in populations involved in repetitive vigorous physical activity, especially those that involve greater than normal strain on the lumbar spine. The sports cited in most literature include gymnastics, horse riding, football (gridiron) and high diving. There is however a growing body of research in Australia, South Africa, New Zealand and Japan actively investigating the incidence of acquired spondylolysis and spondylolisthesis in both rugby and cricket players.

There are several different classifications of spondylolisthesis which have been identified:

- *Type 1:* dysplastic, congenital, elongated and attenuated
- *Type 2:* isthmic (break), stress fracture or acute fracture of the pars
- *Type 3:* traumatic acute fracture of the lamina or facet with instability and slippage
- *Type 4:* degenerative (not seen in children)
- *Type 5:* pathologic bone structure weak from developmental dysplasias such as neurofibromatosis or neoplastic lesions.

Cyron and Hutton reported the primary cause of spondylolytic spondylolisthesis to be due to repetitive hyperextension of the lumbar spine resulting in mechanical fatigue of the osseous pars interarticularis.¹⁷ Although acute trauma has been shown to create a non-union at the pars interarticularis, it is very rare for this to occur without

accompanying compression fracture or fracture of other vertebral elements.¹⁷ Spondylolytic spondylolisthesis can often be symptomless in children and may not appear as lower back pain until the adolescent growth spurt.

Symptoms include:

- dull ache in lower back and buttocks
- postural changes: flattening of posterior sacrum and pelvis, shortening of trunk, forward translation of chest, lumbar hyperlordosis
- changes in the gait pattern can also occur, decreased hip flexion, increased knee flexion, and decreased stride length and walking speed.¹

According to Yochum and Rowe, it is diagnostically appropriate to perform radiographic studies on a child or adolescent with these findings to rule out spondylolytic spondylolisthesis. The use of the Myerding grading system to record the degree and severity of these injuries has been well documented.^{1,2}

Progression of the injury from grade 1 to grade 2 is far more likely during the adolescent growth spurt. Therefore in situations where these injuries are identified, careful management and/or supervision of adolescents involved in athletic activities involving hyperextension is warranted including recommending a change of technique.²

LITERATURE

Literature was discovered using electronic searches with the key words spondylolysis and spondylolisthesis, cricket, adolescent, and fast bowler. The primary databases consulted were the chiropractic database Mantis, the medical database Pub Med, and the Google scholarly search engine. The search resulted in many different articles and 13 were chosen based on their specificity to the intended title of the review. Many articles were excluded based on their focus on common North American sports rather than cricket.

FINDINGS

Findings are discussed under the following headings:

- Incidence
- Location of injury
- Etiology
- Management techniques
- Prevention

INCIDENCE

The incidence of spondylolytic spondylolisthesis in adolescent fast bowlers is significantly higher than that of the general population. These injuries occur in approximately 5 to 7 percent of the general population. The minimum incidence in cricketers highlighted in the studies reviewed was 19 percent with the highest incidence identified being 22 percent.⁶ Interestingly, Hardcastle reports an incidence of pars interarticularis defect, with or without forward movement of the injured segment, in a study of 54 percent of a group of elite 16-18 year old fast bowlers.

LOCATION OF THE INJURY

The lumbar spine is identified as the second most common area injured during competitive cricket. Twenty percent of all cricket-related injuries have been related to the lumbar spine while 22 percent were identified as phalange injuries.⁹ The authors of this study noted that phalanges were most commonly injured when trying to catch a hard cricket ball or when batting. A study of South African cricketers showed that the most common mechanism of any injury in a cricket player was the biomechanical mechanism of the delivery and follow through of the fast bowler.¹⁰

Findings regarding the location of these injuries vary significantly with regard to the most common spinal level. Engstrom and Walker cite L4 as the most common level with 22 percent of their participants developing pars defects and associated spondylolisthesis at this level. However, Gregory et al noted L5 as by far the most common area with 45% of subjects showing pars defects at this level.¹¹ Although in an earlier study comparing the incidence of pars defects between cricket and soccer players, he noted L3 has a common site for these injuries as well. This variation in the location of the injury is of great interest since Yochum and Rowe contend that in the general population 90 percent of all spondylolytic spondylolistheses occur at L5 on S1.

There is almost total agreement however on the location of the primary incidence of pars fracture that leads to the spondylolisthesis slippage. All of the articles that investigated the location of the pars interarticularis defect^{6,7,8,9,11,12} discovered that the overwhelming majority of injuries occurred on the contralateral side to the bowling arm.

ETIOLOGY

Unilateral Pars defects are the most common cause of spondylolytic spondylolisthesis in young fast bowlers. Cy-

ron and Hutton maintain that the most common cause of pars defects is a repetitive stress fracture caused by vigorous hyperextension of the spine on a regular basis, as seen in sports such as gymnastics, and high diving.¹⁷ However the delivery and follow through of the cricketer fast bowler brings together a biomechanically unique series of events. Not only does this technique involve repetitive hyperextension on the ipsilateral side of the bowling arm but also a lumbar extension, lateral flexion and thoracolumbar rotation to the contralateral side to the bowling arm. That is on the left side for a right arm bowler.⁷

Lanthois and Pollard⁷ broke down the variations in bowling technique into three distinct groups, front on, side on and mixed technique. Analysis of the front on technique reveals that during the delivery stride of the run up the back foot lands perpendicular to the bowling crease with the shoulders and chest square to the opposition batsman. In the side on technique, the back foot lands parallel with the bowling crease and the shoulders and chest remain side on to the batsman at the moment of delivery. The mixed technique is a combination of the previous two with a forward facing foot and shoulder alignment adopted followed by a side on position of the shoulders during the final delivery stride.^{7,11} Adolescent fast bowlers using the third mixed technique showed a significant increase in the likelihood of spondylolysis and other degenerative changes to the spine.⁷

Another important mechanism of injury to investigate is the effect that increased training workload placed upon the adolescent spine. There is a significant increase in symptoms between the ages of 15 and 17 years old.⁶ As well as being a period of significant growth for adolescent boys, this period also coincides with an increase in the training requirements of competitive cricket. Two contrasting studies have been identified here, both investigating the effects of workload on the incidence of injury, one a British study and the other an Australian study.¹⁴ These studies had very similar research parameters yet found significantly differing results. Dennis et al¹⁴ found that in Australian conditions the more one increased the fast bowling workload the higher the incidence of injury, while in the British study, Gregory et al¹³ saw no corresponding increase between increased workload and increased injury rate. This was despite more than 12 percent of participants exceeding the recommended maximum workload. Interestingly the group that bowled the most deliveries had the second lowest incidence of injury, only bettered by the group with the smallest workload, which was approximately one third that of the top group.

MANAGEMENT

Management of spondylolysis and spondylolisthesis has been the subject of very little well controlled research. Traditionally, rest from the causative activity to allow healing of the pars defect is the management of choice for spondylolysis. Following this rest period, a gradual return to activity through a graduated exercise program is recommended. A more radical treatment option for the persistent injury that does not respond to conservative care is surgical fixation where local screw fusion of the pars interarticularis defect is performed.

Spondylolisthesis may not always be painful and there is some thought that when pain is present it stems from the biomechanical compensations at the facet joint structures and sacroiliac joint¹⁵ not from the location of the spondylolisthesis. This raises an interesting point regarding management protocols for the chiropractic patient.

Lanthois and Pollard⁷ compared the results gained using chiropractic spinal manipulative therapy in three separate case studies. They discovered that during the first presentation of this injury, regular spinal manipulative therapy of the lumbar spine and pelvis allowed for a return to pain free status with no reduction in bowling activity. They argued that this may be because the pain experienced was from a concomitant facet or sacroiliac joint syndrome. This finding held true for the first incidence of a painful injury. However when the same patient presented again 8 months later with a recurrence of the same spondylolytic injury, spinal manipulative therapy had limited success and a combination of traditional conservative treatment including rest from cricket was required. Lanthois and Pollard went on to discuss the importance of spinal manipulative therapy in the management and prevention of spondylolysis. However somewhat confusingly noted that a fracture would be a contraindication to the use of this therapy.

It was noted that management of a patient with a spondylolytic spondylolisthesis should not be limited to the lumbar spine.⁷ Rather, by looking at the biomechanical factors involved in the fast bowling action and allowing for the best expression of range of motion throughout the spine, pelvis and extremities, the likelihood of stress fracture in the lumbar spine is reduced, due to a reduction of stress on focal sites such as the pars interarticularis.

PREVENTION

Prevention of the spondylolytic spondylolisthesis in adolescent fast bowlers is an area that should be explored.

Following the finding of the increased likelihood of injury from proponents of the mixed technique, a west Australian study¹⁶ identified a significant injury reduction through the use of regular small group technique coaching sessions. This study concluded that technique assessment and modification, through an educational process aimed at reducing mechanical features linked to back injury, decreased the incidence and or progression of lumbar spine disc degeneration. Though this study was not specifically aimed at spondylolysis and spondylolisthesis, it would be reasonable to hypothesize that technique improvements which reduce the mechanical stress on the lumbar spine would also result in reduced incidence of injury.

Regular biomechanical assessment and chiropractic adjustments throughout the kinetic chain involved in the fast bowling action have also been shown to reduce the likelihood of initial injury and also relapse of spondylolytic injuries due to a reduction of stress on focal sites such as the pars interarticularis.⁷

CONCLUSION

- Spondylolysis and spondylolisthesis are far more common in the adolescent fast bowler than in the general population.
- Spondylolysis and spondylolisthesis should always be considered as a cause of low back pain in the adolescent fast bowler.
- It is reasonable to expect the spondylolysis or spondylolisthesis to be at L3 or L4 far more commonly than occurs in the general population.
- Chiropractic management of the first spondylolytic spondylolisthesis presentation is very effective. Second and further presentation may require management including rest and gradual return to activity.
- It is important to analyze the whole spine, pelvis and extremities to allow for correct biomechanical function during the bowling delivery.
- Regular chiropractic spinal adjustment for adolescent fast bowlers may reduce the likelihood of injury due to better biomechanical function throughout the kinetic chain involved in the fast bowling action.
- The large amount of biomechanical loading on the contralateral pars interarticularis makes good technique imperative in the prevention of spondylolysis and spondylolisthesis in adolescent fast bowlers.

RECOMMENDATIONS FOR FURTHER RESEARCH

All research studies identified were performed using

male cricket players as subjects. It would be interesting to see if the different body and pelvic shapes of female cricketers would produce differences in the incidence of injury or would alter the successes or otherwise during management of the injuries.

A controlled study of incidence of injury between a chiropractic care group and a non-chiropractic group of young fast bowlers would also provide a useful comparison regarding both the incidence and location of injuries.

REFERENCES

1. Fysh PN. Chiropractic Care for the Pediatric Patient. International Chiropractors Association Council on Chiropractic Pediatrics, Arlington, Virginia, 2002.
2. Yochum TR, Rowe JR. Essentials of Skeletal Radiology, Volume 1. Williams and Wilkins, Baltimore 2002.
3. Batts M Jr. The etiology of Spondylolisthesis. *J Bone Joint Surgery (Am)* 1939; 21: 879.
4. Rowe GG, Roche MB. The etiology of separate neural arch., *J Bone Joint Surgery (Am)* 1953; 35:102.
5. Frederickson BE, Baker D, McHollick WJ, et al. The natural history of spondylolysis and spondylolisthesis. *J Bone Joint Surgery (Am)* 1984; 66: 669.
6. Engstrom CM, Walker DG. Pars interarticularis stress lesions in the lumbar spine of cricket fast bowlers. *Medicine and Science in Sports and Exercise*. 2007 39(1): 28-33.
7. Lanthois PE, Pollard H. Spondylolysis in a professional fast bowler. A case study. *Australasian Chiropractic and Osteopathy*; Vol 6(1):1-9.
8. Hardcastle PH. Repair of spondylolysis in young fast bowlers. *J. Bone Joint Surg Br* 1993; 75(3): 398-402.
9. Mansingh A, Harper L, Headley S, Mansingh G. Injuries in West Indies cricket 2003-2004. *British Journal Of Sports Medicine*. 2006; 40(2): 119-23
10. Stretch RA. Cricket injuries: a longitudinal study of the nature of injuries to South African cricketers. *British Journal of Sports Medicine*. 2003; 37(3): 250-3.
11. Gregory PL, Batt ME, Kerslake RW, Webb JK. Single Photon Emission Computerized Tomography and Reverse Gantry Computerized Tomography Findings in Patients with Back Pain Investigated for Spondylolysis. *Clinical Journal Of Sports Medicine*. 2005; 15(2): 79-86.
12. Gregory PL, Batt ME, Kerslake RW. Comparing spondylolysis in cricketers and soccer players. *British Journal of Sports Medicine*. 2004; 38(6): 737-42.
13. Gregory PL, Batt ME, Wallace, WA. Is risk of fast bowling injury in cricketers greatest in those who bowl most? A cohort of young English fast bowlers. *British Journal of Sports Medicine*. 2004; 38(2):125-8.
14. Dennis RJ, Finch CF, Farhart PJ. Is bowling workload a risk factor for injury to Australian junior cricket fast bowlers? *British Journal of Sports Medicine*. 2005; 39(11): 843-6.
15. Cassidy JD, Potter GE, Kirkaldy-Willis WH. Manipulative management of back pain in patients with spondylolisthesis. *J Can Chiro Assoc* 1978; March 15-20.
16. Elliott B, Khangure M. Disk degeneration and fast bowling in cricket: an intervention study. *Medicine and Science in Sports and Exercise*. 2002; 34(11):1714-1718.
17. Cyron BM, Hutton WC. The Fatigue Strength of the Lumbar Neural Arch in Spondylolysis. *J Bone Joint Surgery*. 1978; 60B: 234-238.



Development of an Integrative Relationship in the Care of the Breastfeeding Newborn: Lactation Consultant and Chiropractor

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ABSTRACT

As physiologically normal birth has yielded to medicalization, the hormonal milieu that directs establishment of breastfeeding is compromised and lactation consultants are confronted with increasing numbers of infants whose innate competency is threatened. The compromised infant reorganizes, rapidly adapting his behaviors to ensure his survival. Compensatory behaviors may or may not facilitate feeding, and may force the infant to rely upon others to accomplish feeding. Interventions that support the infant threaten his competency at breast and risk his ability to direct his relational world, which is the foundation of his developmental success. Often compensatory behaviors lead to premature weaning, as they can be inefficient and physically and emotionally injurious to the mother, thus hope of reclamation becomes less certain. Chiropractic intervention, when applied skillfully and in collaboration with the lactation consultant can support full competency in feeding and offer the infant the opportunity to reclaim his full human potential.

Key Words: breastfeeding, competency, compensation, “sensitive period”, chiropractic, lactation consultant, perinatal, collaboration, integration

INTRODUCTION

There is a growing consensus among psychologists, midwives, lactation consultants, physicians and others who are concerned with the early perinatal period that there is a “sensitive period” (Odent, Klaus) immediately following a physiologically normal birth.^{1,2} During this brief period a very unique hormonal milieu, orchestrated by the birth itself, drives maternal-infant interactions. These interactions are designed to wire the mother and infant for attachment, directing them toward behaviors that optimize the infant’s potential, first for survival and ultimately for well-being.³⁻⁸

While there is much yet to be revealed in our understanding of this sensitive period, the relational wiring in the brain of mother and infant is mediated by their hormonal state, which under physiologically normal conditions is highly advantageous to them both. The ability of the infant to engage his mother and to initiate feeding at breast as he expertly orchestrates his own well-being, is evidence of his biological and neurologic competency.^{2,4,8,9}

COMPETENCY AND COMPENSATION

When the hormonal state of the sensitive period is compromised in non-physiologic birth situations, then the wiring begins to reorganize itself and infant competency is compromised.^{4,8,9,12} Hence, the competency of the infant at birth is a biological imperative that we would do well to reference in all assessments of the mother-infant dyad. When we have any concerns about the well-being of the infant, we must consider all that transpires in this sensitive period, just as we must consider the implications of the prenatal experiences of the dyad.

In our assessment of infant competency, it is essential that we gain new awareness and enhanced skills in discerning physiologically “normal” behavior from that which is only culturally “common”. Because we have lost our compass for the physiologic norm through the medicalization of birth, we must call into question any and all maternal and infant behaviors that we have come to view as “normal”. Indeed, barring a very serious or obvious medical concern at birth, the earliest possible indication of loss of competency in the infant is likely to be an inability to feed at breast.^{2,4,8,9}

Briefly reviewing our understanding of the fully competent infant at birth, we recognize the infant’s ability to elicit maternal response, to recognize and respond to sensory maternal cues and to loop with the mother in a synchrony

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that quickly establishes the vital bond between them. These behaviors assure that his need for the presence of his mother — and food, warmth and firm attachment — is met. Thus, the infant begins to modulate his own experience in the world and his level of competency expands in a symbiotic relationship with his mother.

We recognize the competent infant as one who is able to stabilize, organize and regulate within the environment of the mother's body. The infant, whose intelligence is directed toward rapidly establishing his best neurological path for survival will expertly detect the most effective means toward that end, while rapidly eliminating those pathways that are less efficient. As we observe the infant, we are witness to the elegant brilliance of such a model, a model in which competency is rapidly rewarded with connection, with familiar sensory information (voice, taste, scent of the mother, for example) and with the mother's milk at her breast. Primitive neonatal reflexes drive feeding in the newborn. Repeatedly, the infant actively seeks attachment, and the mother responds. Competency is accomplished as the infant drives attachment and establishes active feeding at breast. In any useful assessment of the dyad, we must always remember the nature of the infant and observe him from the expectation that full competency is his birthright. When we see it from this perspective, we view his social efforts in their truest sense — his effort to actively seek attachment and caretaking.^{2,4,7,8,10-13}

By contrast, we are also able to detect the inherent design risks in a system that relies upon relationships for survival. For example, when birth is interventive, the infant may have to rapidly reorient to a medicated, non-responsive or absent mother; he may struggle to function through his own medicated nervous system, he may have to respond to stresses for which he was not designed and he may have to make so many compensations that he risks losing his orientation altogether. Within the context of the infant's efforts to feed at breast is the entirety of his potential. Whether he succeeds or not is the first issue, but the means by which he does succeed remains just as significant.^{4,8,10-12}

COLLABORATIVE CARE TO RESTORE COMPETENCY

Because competency in feeding at breast is the primary indication that a newborn has the potential to thrive, absence of competency is the first indication that the infant's potential for well-being is compromised. Lactation consultants have long observed that babies born medicated have more difficulty feeding, however a deeper understanding of impaired competency is a complex issue that even lactation consultants are just beginning to consider. As lactation

consultants begin to gain greater understanding of the impairments associated with compensatory behaviors, they will necessarily need to reach for new skills, new tools and new kinds of collaboration in assisting babies in regaining competency.⁹ Collaboration between lactation consultants and other holistic practitioners is a new idea that deserves broad exploration. In this paper we explore the means by which collaboration between lactation consultants and chiropractors can facilitate healing.¹⁴

ASSESSMENT

Since most infants experiencing feeding difficulties will be seen by a lactation consultant prior to any referral for chiropractic care, it is helpful that chiropractors working with breastfeeding babies become familiar with the assessment process utilized by the lactation consultant.

Infants who can feed, do. Infants who do not feed, cannot. While some infants cannot feed well because they are physiologically or neurologically impaired, the vast majority have other impediments, ranging from structural restrictions and birth trauma to inefficient latch and misinformation. While management and latch issues can be rectified through teaching of the family and minor supportive interventions, there are significant issues that need further intervention to correct. Infants who have experienced trauma, who have integrated compensatory behaviors or who have structural restrictions will not regain full competency unless those underlying factors are treated. Some infants cannot feed at all without causing maternal pain or cannot remove sufficient milk, no matter the teaching or management interventions employed. There are other infants who, given such interventions, can feed well enough to gain weight and relieve maternal pain, but who never fully release their compensatory behaviors well enough to achieve optimal competency. In all of these cases, making an informed referral for structural treatment has proven to have excellent outcomes.

It is through the history and functional assessment that the lactation consultant is able to determine a need for chiropractic referral. A complete and thorough evaluation of the nursing dyad facilitates assessment and treatment planning. Many of the components of the IBCLC's assessment overlap that of a thorough chiropractic history and examination¹⁴ and can, with patient permission, be shared during the referral process. (*Table 1*)

MAKING THE REFERRAL

Based upon a thorough intake, the care plan may include various components, but should include referral

TABLE 1
COMPREHENSIVE LACTATION HISTORY AND ASSESSMENT

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PRENATAL CONSIDERATIONS

- mother's own birth
- mother or father breastfed
- feelings about motherhood/breastfeeding
- previous birth or breastfeeding experiences
- infertility
- history of breast reduction surgery, breast implants or breast trauma or injury
- unusual structure or pelvic anomalies
- uterine anomalies, endometriosis, fibroids
- history of injury or trauma (including abuse)
- treatment history such as allopathic (surgery, medications) or holistic (chiropractic, acupuncture, homeopathy, etc)
- pre-existing medical concerns
- cultural biases pro or con

PREGNANCY

- nutritional profile
- emotional experience
- family support
- parity & gravidy
- testing procedures
- complications
- interventions
- illness
- medications
- supplements
- supportive interventions
- breast changes
- breastfeeding education and preparation
- blood type compatibility

LABOR AND DELIVERY

- location of birth
- attendants
- birth intention/plan
- gestational age of infant
- emotional experience of the family
- interventions or concerns including prodromal labor, PROM, antibodies for GroupB strep+, induction, medications, episiotomy, augmentation of delivery, precipitous delivery
- length of labor and delivery
- difficulties with 2nd or 3rd stage, cesarean birth
- physiologic or non-physiologic clamping/cutting of cord
- post-birth pitocin

EARLY PERINATAL PERIOD

- premature cord-clamping
- separation (infant skin-to-skin/to breast before or after — length of separation)
- interventive procedures such as suctioning, drying, warming, resuscitation, eye drops, vaccines, bathing, vit K, swaddling, blood draw
- NICU
- suturing or medication of mother
- medical concerns for mother
- experience of first feeding and attachment — under hormonal or external direction?
- exposure to artificial nipples or artificial feeds (including formula/glucose water)
- birth weight
- circumcision
- elevated bilirubin, use of bili lights
- stooling and voiding patterns

POST-PARTUM PERIOD

- comparison of birth weight vs 2 day or discharge weight, follow-up weights
- date of and experience of onset of Lactogenesis II
- cue or scheduled feeding
- infant's interest in feeding/infant's alertness
- discharge instructions to parents instructions or advice from other HCPs or LC's
- family's expressed commitment to breastfeeding
- co-sleeping/shared sleeping/isolated sleeping

OBSERVATION — VISUAL ASSESSMENT OF INFANT & INTERACTIONS

- infant arrives in car seat "bucket"/soft carrier/in arms, presence of a pacifier, hands swaddled, infant swaddled, responsiveness to baby's cues, talking to baby and making eye contact or avoidance and language that suggests an adversarial tone or blaming of baby vs supportive and nurturing dialogue
- observe for visual symmetry, appearance of comfort/discomfort in body, worried look, skin turgor, fontanels, shape of head, bruising including of eyes, infant prefers to turn head to one side, refuses to turn head to one or either side, or is comfortable in mid-line, chin retracted or tucked, inability to extend or flex, narrowing of face or head esp. in older infant, underdeveloped or overdeveloped musculature, state of organization, rooting, licking, sucking as compensation vs suckling as competent skill, tongue appearance and function,

consideration of ankyloglossia (tongue-tie) including extension, elevation, lateralization, cupping, peristalsis, bunching, thrusting, flattening, shape of palate, clamping, appearance and “feel” of labial and lingual frenula and visual assessment for thrush symptoms

OBSERVATION — VISUAL ASSESSMENT OF FEEDING

- Observe the infant self attach if possible
- observe the feeding prior to interventions and re-observe after teaching to assess improvement
- observe posture, “doing to” baby vs allowing baby to feed such as placing or pushing nipple into baby’s mouth, leaning into baby, allowing baby to slurp nipple, allowing baby to nipple-feed and pushing or holding baby’s head — latch — gape (if wide upon latch, is it sustained), do lips flange, seal or suck in, does he spill milk, click, smack, snort, break seal, have an organized or disorganized feeding pattern — suck/swallow/breathe synchrony, defensive feeding behaviors, abnormal breathing patterns
- observe for arching or aggressive refusal of the breast, single-sided discomfort, preference of certain positions for feeding
- feeding influenced by flow — too rapid/too slow, feeding influenced by maternal fear or pain
- infant falls asleep at breast, feeds in a lethargic state, making ineffective and passive feeding efforts
- infant is effectively nourished, but passively-fed, with much maternal support
- milk transfer evaluation may include observation, fullness vs softness of breasts, evaluation of transfer from container if used (bottle, cup, syringe, supplementer) and test weighing
- use of nipple shield
- observe for variations with interventions in place (positioning, improved latch, focusing on asymmetric latch as mother leans back to allow natural positioning, use of nipple shield, with supplement at breast or with breast compressions, finger feeding, feeding after dosing with Bach Flowers or upon co-bathing). Can baby achieve an efficient and painless (for mom) latch and maintain the latch to achieve satisfying feeding
- is baby removed from breast after falling asleep or long period at breast — wakes, fusses, needs to be immediately put back to breast or does baby finish feeding, suckle for comfort and self-detach fully sated when bottles are used, re-assessment will be made using paced feeding.
- Observation — Further Evaluation
- may observe for mid-line defects, especially if tongue-tie is present, birthmarks, cradle-cap, eczema, “baby acne”, diaper rash, reflux behaviors (and diagnosis or treatment) and bowel habit
- Any suggestion of food allergies or poor gut health in the infant may be met with misguided belief that the infant may be “allergic” to his mother’s milk, inappropriate replacement with formula and failure to properly treat the mother and infant.
- feeding, including comfort or pain, pinching, a “strong suck”, chewing or chomping, burning, a sensation of glass or electricity in her breasts, sand-paper rubbing or other discomfort, as well as the appearance of her nipples before and after feeding.
- assess for secondary pain from thrush or Raynauds of the nipple, for plugged ducts or mastitis and for treatment with antibiotics or other medications
- observe the mother’s nipples and breasts for flatness or retraction of nipples, marked asymmetry, wide-spacing, size and elasticity of nipples, size and elasticity of breast tissue, ductal development (hypoplasia?), appearance of areolar tissue and/or nipples, evidence of tissue trauma including cracks, fissures, blebs or blisters (has mother been wearing any device to provide comfort or to encourage nipple eversion?)
- Does mother express concerns about her milk supply? Has she been expressing her milk? Under what circumstances, how often, by which method and what are the results?
- If pumping, is she using the correct size flanges on her pump? Is the mother who is using a nipple shield using the correct size and attaching it properly?
- Is there reason for concern about supply, although mother is unaware of such? Has mother used galactagogues or other interventions such as chiropractic or acupuncture to support milk supply?
- With supportive teaching and/or interventions, is infant’s feeding improved? Is mother’s experience improved? Is feeding efficient and pleasurable for the dyad?
- Are supportive measure needed for mother’s milk supply?
- Is baby able to feed more efficiently, but only with a nipple shield? Is this to reduce maternal pain or due to infant’s refusal or inability to latch otherwise?
- Is baby able to feed more efficiently but only with supplementation at breast?
- Is it necessary to take baby off breast for a period to offer an alternative feeding method, due to maternal pain?
- Does the infant need supportive nutrition that cannot be delivered at breast or does he need measures such as finger-feeding to support suckling skills?
- Determine if supplementation is necessary and if so, how much and by what method breastfeeding is best supported for the family.

The lactation consultant will attend throughout the interview for the mother’s knowledge of breastfeeding or for misinformation, supporting the mother during teachable moments and utilizing anticipatory guidance where possible.

for neuromusculoskeletal evaluation and appropriate chiropractic treatment when the infant appears to be tonguetied, has visual asymmetry or asymmetric recruitment of musculature, receded chin, abnormal head shape, narrowing of face or high palate, has a preference in turning head to one side, only turns head to one side or maintains head in midline (not turning to either side), exhibits preference to feeding on one side only or mother experiences pain in nipple when feeding on one side only. If the infant has compensatory behaviors consistent with asymmetry, tightness or restrictions that are not resolved through teaching and intervention such as clamping, biting, chewing, sucking in lips, slurping, failure to achieve and sustain a gape, passive feeding, recruitment of compensatory musculature, failure to maintain a latch and sucking but failing to suckle, the referral is appropriate. Refer the infant who exhibits an appearance of physical discomfort while positioned for feeding, if there is a known mal-presentation or birth injury or trauma, prodromal labor or precipitous or prolonged second stage. Refer the infant who exhibits defensive behaviors such as bunching or thrusting tongue, arching, spilling milk, pulling on and off breast, clicking or other indications of breaking suction, failure to suckle for comfort and passive feeding.^{14,15}

CHIROPRACTICE CARE

In utero constraint, the birth process, interventions and birth trauma and early handling of the neonate may all contribute to alterations in structure that affect normal function of the neonate. The chiropractor will assess neurologic integrity (including infantile reflexes like rooting and suckling, suck, swallow, breath synchrony and other neurologic milestones (eye contact, response to sensory stimuli, etc)), cranial, spinal and extraspinal joints for stability and range of motion as well as cerebral spinal fluid rhythm, and finally muscle length, tone and symmetry or asymmetry. In conjunction with the detailed history and observations by the lactation consultant and chiropractor at breast, rest and play, a thorough neuromusculoskeletal examination may indicate concomitant neurologic, genetic or structural problems that could impede breastfeeding, including, but not limited to, ankyloglossia, temporomandibular injury, a fracture (most often cranial or clavicular), avulsion (brachial plexus), hypotonicity (cerebral palsy), diaphragmatic dysfunction resulting in a hiatal hernia (and reflux) or a genetic syndrome.^{14,15}

Any impediment to the normal initiation of the hard wired program to seek sustenance will result in strong compensatory behaviors in the neurotypical neonate. Early

detection and intervention is critical to prevent failure to bond, infant weight loss or failure to thrive, damage to mother's nipple or decreased stimulus for milk production. The longer and more vital the compensation is to the neonate, the impressionably plastic brain will more deeply imprint the behavior. Likewise, any surgical intervention, like a frenotomy, is more easily and safely performed at a young age with only the use of local anesthetics as an outpatient rather than waiting until a child is older than 6 months when the procedure may require general anesthesia and in the rare case, an overnight hospital stay.¹⁵

Examples of trauma or physical limitations that can result in interference with this normal physiologic process follow: a prolonged labor with the fetus in an asynclitic presentation can result in a hyperflexion subluxation at C0. This will restrict the normal extension at the cranial base necessary for the infant to gape widely and encompass the nipple and areola in the mouth to suckle. Examination may reveal hypertonicity of the anterior cervical and submandibular muscles and compensatory behaviors in this infant may manifest as arching away from the breast using the lower cervical and upper thoracic spine. Another example of subluxation as a result of a presenting congenital physical limitation resulting in compensation would be the submucosal tongue tie which causes abbreviated tongue action (extension, elevation and lateral deviation) and mandibular excursion by tethering the mandible sublingually. The compensatory behaviors may include excessive hyperextension at C01 (resulting in inflammation, increased arousal due to sensitivity and pain, muscle spasm and subluxation) in an attempt to gape more widely as well as over development of submandibular muscles. One may also see hypertonicity of the muscles of mastication as this infant attempts behaviors to get the nipple into the mouth and hold it there (walking up the nipple with their lips and gums, clamping or biting the nipple or grinding the nipple by moving the mandible from right to left).¹⁴

Whether or not it is established that there is need for co-management in any of these cases with an additional specialist (pediatric surgeon, orthopod, or neurologist), treatment planning to address these issues usually consists of several visits in rapid succession (1-2 days apart) to help facilitate a successful latch, as further weight loss or failure to gain weight has a more dramatic consequence at this young age. Further, premature weaning may be avoided when the mother experiences rapid, noticeable improvement in breastfeeding.

Treatment consists of myofascial release of associated

soft tissue structures (cranial and submandibular, cervical and tongue muscles), adjustments to the individual cranial bones and spinal vertebrae, lymphatic drainage and light massage techniques and specific stretches or range of motion exercises as indicated.¹⁴ Frequency and length of care is predicated on the pre-existing factors. For example, severe cranial molding from in utero constraint will respond more slowly than an infant who's cranial molding was due to a prolonged labor. The treatment plan may range from 1-3 visits within a week reaching full resolution to an initial 3 visits in one week followed up with 2 visits/week for an additional 3 weeks, 1 visit/week for an additional 3 weeks and 1-2 follow up visits over the next 6 weeks. This plan may be tempered by other interventions. For example, were an infant to require a frenotomy, it would be most efficacious to see the child as soon as possible after the procedure to assure structural integrity secondary to the restraint of the infant cranium during the procedure as well as to facilitate integration of the increased range of motion of the tongue by reducing the interference of any residual structural compensations. Home care protocols¹⁴ should be available for parents to continue to work with the neonate between visits as well as recommendations for ongoing lactation and peer support. Although successful breastfeeding may be the immediate goal, the long-term goal is structural normalization that can potentiate neurologic competency and appropriate development of oral facial structures and oral motor, and in some cases, respiratory skills.

RESTORING COMPETENCY

Overall, two groups of infants are best served through collaboration between the lactation consultant and the chiropractor. Infants who cannot feed efficiently or who cannot feed without experiencing discomfort or causing discomfort to their mothers, even after corrective interventions have been integrated, compose the first group. This group is more commonly referred for chiropractic care as feeding is significantly compromised and objective measures, such as weight gain and pain tend to be unsatisfactory. They may also be referred for other specialized care, in conjunction with chiropractic care, for example in the case of tongue-tie where a frenotomy can be performed by a pediatric surgeon, ENT or oral surgeon while the chiropractor can address the structural compensations that ensued from the neonate's attempt to succeed at breastfeeding despite the tongue tie. Success is also commonly assessed through the same objective measures and so long as the lactation consultant, chiropractor and mother maintain communication and have clear objectives, full competency may well be restored.^{14,15}

The second group is often overlooked. These are the infants who recover enough function to feed well enough that most parents and practitioners will be satisfied with objective measures such as weight gain, developmental milestones and maternal comfort. Often, this second group never recovers full competency, as compensatory behaviors become integrated and direct the infant's experiences and development. Compensation may stem from unresolved birth or perinatal trauma, including such medical interventions as induction, anesthesia, augmentation of delivery, cesarean delivery, premature cord-clamping, separation and invasive newborn procedures.^{2,4,7-11} Further, supplementation with formula, exposure to antibiotics or hyperlactation, as well as cesarean delivery may damage the gut mucosa and lead to further compensation.

These infants are often described as "high-need" or having an "intense" or "needy" personality. They are often described as having "colic" or are termed "fussy". Many parents describe these infants as "poor sleepers" or "poor nappers", difficult to travel with in a car, often uncomfortable, sometimes having very "high sucking needs". Often, personality is blamed for the difficulties the infant is experiencing. Infants often have symptoms of gut fragility including reflux, allergies, rashes, congestion, gas, infrequent stooling patterns, pasty stools and vomiting or spitting up. They will sometimes exhibit developmental delays, but more often will be at the lower range of normal. When full competency is the goal, these infants may require a broader holistic approach to healing that includes chiropractic, energy medicine (such as homeopathy, Bach Flowers, or EFT) and gut healing.

While we do not yet fully grasp the implications to the human infant, nor to the maternal-infant dyad, when early trauma causes impaired function and loss of competency, we can take significant steps to heal them through awareness, proper assessment and integrative interventions that make full competency the goal. As the lactation consultant and chiropractor find a common language in their abilities to assess form, function, competency and compensations, the dialogue between them can expand and the opportunity to provide broader and deeper healing is a realistic and achievable objective. The very possibility of restoring the competency that forms the foundation for all loving human relationships is surely a worthwhile goal by all accounts.

REFERENCES

1. Klaus MH, Kennell J, Klaus PH, *The Doula Book*, 2002, Da Capo Press, Cambridge, MA, USA.
2. Odent M, *Primal Health: Understanding the Critical Period*

- Between Conception and the First Birthday, 2002, Clairview Books, East Sussex, England.
3. Bergman N, Breastfeeding and Perinatal Neuroscience, Supporting Sucking Skills in Breastfeeding Infants, Genna CW, ed, 2007, Jones & Bartlett Publishers, Sudbury, MA, USA.
 4. Buckley SJ, Gentle Birth, Gentle Mothering, 2009, Celestial Arts, Berkeley, California, USA.
 5. Klaus MH, Jerauld R, Kreger N, McAlpine W, Steffa M, Kennell JH, Maternal Attachment: Importance the First Postpartum Days, *New England Journal of Medicine* 1972; 286:460-63.
 6. Klaus MH, Kennell JH, Klaus PH, Bonding: Building The Foundations of Secure Attachment and Independence, 1995, Merloyd Lawrence, div. Addison Wesley Press, Cambridge, MA, USA.
 7. Bergman N, Restoring the Original Paradigm for Infant Care, Provincial Administration: Western Cape, South Africa, 2005, <http://www.kangaroomothercare.com/prevtalk01.htm>.
 8. Moberg KU, The Oxytocin Factor: Tapping the Hormone of Calm, Love, and Healing, 2003, Da Capo Press, Cambridge, MA, USA.
 9. Bystrova K, Skin to Skin Contact and Suckling in Early Postpartum: Effects on Temperature, Breastfeeding and Mother-Infant Interaction, A Study in St. Petersburg, Russia, 2008, Karolinska Institute, Karolinska University Press, Stockholm, Sweden.
 10. Odent M, Primal Health Research: Two Essays, *Journal of Prenatal and Perinatal Psychology and Health* 2004; 19(2) 85-180: pp115-122.
 11. Odent M, Primal Health Research: Four Essays, *Journal of Prenatal and Perinatal Psychology and Health* 2004; 18 (3) 189: pp 191-220.
 12. Trout M, Adaptation and Resilience in early Life, *Journal of Prenatal and Perinatal Psychology and Health* 2004; 18(4): pp 287-300.
 13. Lewis T, Amini F, Lannon R, A General Theory of Love, 2001, Vintage Books, Random House, New York, New York, USA.
 14. Vallone SA, Chiropractic Evaluation and Treatment of Musculoskeletal Dysfunction in Infants Demonstrating Difficulty Breastfeeding, *Journal of Clinical Chiropractic Pediatrics* 2004; 6(1): pp 349-61.
 15. Coryllos E, Genna CW, Salloum AC, Congenital Tongue-Tie and Its Impact on Breastfeeding, American Academy of Pediatrics, Section On Breastfeeding, Summer 2004: pp 1-6.



Abstracts

J Pediatr 2009 Feb;154(2):267-71. *Epub* 2008 Sep 27

Doctors likely to encounter children with musculoskeletal complaints have low confidence in their clinical skills

Authors: S Jandial, A Myers, E Wise, HE Foster

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OBJECTIVE: To assess self-rated confidence in pediatric musculoskeletal (pMSK) clinical assessment in trainees and experienced doctors in primary care and selected secondary care specialties to whom children with MSK problems are likely to present.

STUDY DESIGN: Attendees at programmed postgraduate teaching sessions within a health care region of the United Kingdom completed an anonymous questionnaire to self-rate confidence in pMSK assessment compared with other bodily systems and describe exposure to MSK teaching.

RESULTS: Respondents (n = 346) were qualified from 23 different medical schools (United Kingdom and 9 non-United Kingdom) and included trainees in Primary Care (n = 75), Pediatrics (n = 39), Emergency (n = 39), Orthopedics (n = 40), and experienced doctors in Primary Care (n = 93), and Pediatrics (n = 60). Self-rated confidence in pMSK assessment was low; the majority had "no" or "some" confidence (21% and 53%, respectively). Conversely, most respondents were confident "in most aspects" or "very confident" for cardiovascular, respiratory, and abdominal systems. pMSK ranked lowest below all other systems. Most respondents (92%) recalled some teaching of adult MSK medicine, mostly at undergraduate level. Fewer (51%) recalled any teaching of pMSK medicine.

CONCLUSIONS: Self-rated confidence in pMSK assessment was lowest, compared with other bodily systems, within doctors to whom children with MSK problems are likely to present. Core clinical skills are learnt at undergraduate level, and this study reflects poor levels of pMSK training which needs to be addressed.

Spine 2009 Feb;9(2):134-41. *Epub* 2008 May 20

High-level physical activity in childhood seems to protect against low back pain in early adolescence

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BACKGROUND: The evidence on the impact of physical activity on back pain in children and adolescents has been contradicting. It has also been shown that the physical activity cannot accurately be estimated in children using questionnaires.

PURPOSE: The aim of this study was to establish if physical activity in childhood had any impact on back pain reporting in early adolescence (3 years later), using an objective instrumental measurement of physical activity.

STUDY DESIGN: Prospective cohort study.

PATIENT SAMPLE: Representative random sample of Danish children from the city of Odense sampled at age 9 years and followed-up at age 12 years.

OUTCOME MEASURES: The 1-month period prevalence of back pain (neck pain, mid back pain, and low back pain) was established using a structured interview.

METHODS: Physical activity was assessed with the MTI-accelerometer. The accelerometer provides a minute-by-minute measure of the physical activity performed. An overall measure of physical activity and time spent in high activity were studied in relation to back pain using logistic regression. The analyses were performed on the total sample and then stratified on back pain (yes/no) at baseline.

RESULTS: High physical activity (HPA) levels seem to protect against future low back pain and appear to actually "treat" and reduce the odds of future mid back pain. When comparing the least active children to the most active children, the least active had a multivariate odds ratio of 3.3 of getting low back pain and 2.7 of getting mid back pain 3 years later. When stratified on back pain at baseline, this effect on mid back pain was especially noticeable in children who had had mid back pain already at baseline, with an odds ratio of 7.2.

CONCLUSIONS: HPA in childhood seems to protect against low back pain and mid back pain in early adolescence. Larger prospective studies with repetitive follow-ups and preferably intervention studies should be performed, to see if these findings can be reproduced.

J Manipulative Physiol Thera 2008 Jul-Aug; 31(6):419-23

Adverse effects of spinal manipulative therapy in children younger than 3 years: a retrospective study in a chiropractic teaching clinic.

Authors: JE Miller, K Benfield

• Anglo-European College of Chiropractic, Bournemouth, UK.

OBJECTIVE: The purpose of this study is to identify any adverse effects to chiropractic care occurring in the pediatric patient and to evaluate the risk of complications arising in the pediatric patient resulting from chiropractic care.

METHODS: A 3-year retrospective study of pediatric case files from the Anglo-European College of Chiropractic (AECC) (Bournemouth, England) teaching clinic practice in Bournemouth, England. All files (n = 781) of pediatric patients younger than 3 years of age were selected manually in sequential order from current files stored in the AECC clinic presenting to the AECC clinic during a

specific period. Most (73.5%) patients presenting were 12 weeks of age or younger (n = 574). Results: Six hundred ninety-seven children received a total of 5242 chiropractic treatments, with 85% of parents reporting an improvement. Seven parents reported an adverse effect. There was a reaction rate of approximately 1 child in 100, or one reaction reported for every 749 treatments. There were no serious complications resulting from chiropractic treatment (reactions lasting >24 hours or severe enough to require hospital care).

CONCLUSION: This study shows that for the population studied, chiropractic manipulation produced very few adverse effects and was a safe form of therapy in the treatment of patients in this age group.

Arch Pediatr Adolesc Med 2009;163(2):150-157

Vitamin and mineral supplement use by children and adolescents in the 1999-2004 National Health and Nutrition Examination Survey

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- University of California Davis School of Medicine, Sacramento (Drs Shaikh and Byrd); and University of Rochester School of Medicine and Dentistry, Rochester, NY (Ms Auinger).

OBJECTIVE: To determine if vitamin and mineral supplement use among children and adolescents in the United States is associated with nutrition, food security, physical activity, and health care access.

DESIGN: Secondary analysis of nationally representative data from the 1999-2004 National Health and Nutrition Examination Survey.

SETTING: Questionnaires, household interviews, and medical examinations.

PARTICIPANTS: Children and adolescents 2 to 17 years of age (N = 10,828).

MAIN EXPOSURE: Vitamin and mineral supplement use in the past month.

MAIN OUTCOME MEASURES: Demographics, nutrition, food security, physical activity, and health care access.

RESULTS: Approximately 34% (SE 1.2) used vitamin and mineral supplements in the past month, with underweight subjects reporting greater intake. Younger age, non-Hispanic white race/ethnicity, being born in the United States, higher milk intake, lower total fat and cholesterol intake, higher dietary fiber intake, higher income, greater food security, lower media/computer use, greater physical activity, lower body mass index, health insurance coverage, better health care access, and better self-reported health were associated with greater use of vitamin and mineral supplements. Such supplements contributed significantly to total daily dietary intakes of vitamins and minerals.

CONCLUSIONS: A large number of US children and adolescents use vitamin and mineral supplements, which for most may not be medically indicated. Such supplements contribute significantly to total dietary intakes of vitamins and minerals, and studies of nutrition

should include their assessment. Since vitamin and mineral supplement users report greater health care access, health care providers may be in a position to provide screening and counseling regarding dietary adequacy and indications for supplement use.

Med Hypotheses 2008 Aug;71(2):266-9. Epub 2008 Apr 29

Maternal vitamin D in pregnancy may influence not only offspring bone mass but other aspects of musculoskeletal health and adiposity

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Osteoporotic fractures, falls and obesity are major health problems in developed nations. Evidence suggests that there are antenatal factors predisposing to these conditions. Data are emerging from Australia and elsewhere to suggest that maternal vitamin D status in pregnancy affects intrauterine skeletal mineralisation and skeletal growth together with muscle development and adiposity. Given that low levels of vitamin D have been documented in many urbanised populations, including those in countries with abundant sunlight, an important issue for public health is whether maternal vitamin D insufficiency during pregnancy has adverse effects on offspring health. The developing fetus may be exposed to low levels of vitamin D during critical phases of development as a result of maternal hypovitaminosis D. We hypothesise that this may have adverse effects on offspring musculoskeletal health and other aspects of body composition. Further research focused on the implications of poor gestational vitamin D nutrition is warranted as these developmental effects are likely to have a sustained influence on health during childhood and in adult life. We suggest that there is a clear rationale for randomised clinical trials to assess the potential benefits and harmful effects of vitamin D supplementation during pregnancy.

J Strength Cond Res 2008 Sep;22(5):1659-69

Yoga as steadiness training: effects on motor variability in young adults

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Exercise training programs can increase strength and improve sub-maximal force control, but the effects of yoga as an alternative form of steadiness training are not well described. The purpose was to explore the effect of a popular type of yoga (Bikram) on strength, steadiness, and balance. Young adults performed yoga training (n = 10, 29 +/- 6 years, 24 yoga sessions in 8 weeks) or served as controls (n = 11, 26 +/- 7 years). Yoga sessions consisted of 1.5 hours of supervised, standardized postures. Measures before and after training included maximum voluntary contraction (MVC) force of the elbow flexors

(EF) and knee extensors (KE), steadiness of isometric EF and KE contractions, steadiness of concentric (CON) and eccentric (ECC) KE contractions, and timed balance. The standard deviation (SD) and coefficient of variation (CV, SD/mean force) of isometric force and the SD of acceleration during CON and ECC contractions were measured. After yoga training, MVC force increased 14% for KE (479 +/- 175 to 544 +/- 187 N, $p < 0.05$) and was unchanged for the EF muscles (219 +/- 85 to 230 +/- 72 N, $p > 0.05$). The CV of force was unchanged for EF (1.68 to 1.73%, $p > 0.05$) but was reduced in the KE muscles similarly for yoga and control groups (2.04 to 1.55%, $p < 0.05$). The variability of CON and ECC contractions was unchanged. For the yoga group, improvement in KE steadiness was correlated with pretraining steadiness ($r = -0.62$ to -0.84 , $p < 0.05$); subjects with the greatest KE force fluctuations before training experienced the greatest reductions with training. Percent change in balance time for individual yoga subjects averaged +228% (19.5 +/- 14 to 34.3 +/- 18 seconds, $p < 0.05$), with no change in controls. For young adults, a short-term yoga program of this type can improve balance substantially, produce modest improvements in leg strength, and improve leg muscle control for less-steady subjects.

Obstetrical and Gynecological Survey 2009;
64(6):416-427

Manipulative therapy for pregnancy and related conditions: a systematic review

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OBJECTIVE: The objective of this review is to evaluate the evidence on the effects of Spinal Manipulative Therapy (SMT) on back pain and other related symptoms during pregnancy.

DATA SOURCES: A literature search was conducted using Pubmed, Manual, Alternative and Natural Therapy Index System, Cumulated Index to Nursing and Allied Health, Index to Chiropractic Literature, the Cochrane Library, and Google Scholar. In addition hand searches and reference tracking were also performed, and the citation list was assessed for comprehensiveness by content experts.

METHODS OF STUDY SELECTION: This review was limited to peer-reviewed manuscripts published in English from 1966 until September 2008. The initial search strategy yielded 140 citations of which 12 studies were reviewed for quality.

TABULATION, INTEGRATION, AND RESULTS: The method-

ological quality of the included studies was assessed independently using quality checklists of the Scottish Intercollegiate Guidelines Network and Council on Chiropractic Guidelines and Practice Parameters. The review indicates that the use of SMT during pregnancy to reduce back pain and other related symptoms is supported by limited evidence.

CONCLUSION: Overall, this body of evidence is best described as emergent. However, since effective treatments for pregnancy-related back pain are limited, clinicians may want to consider SMT as a treatment option, if no contraindications are present.

TARGET AUDIENCE: Obstetricians & Gynecologists, Family Physicians

LEARNING OBJECTIVES: After completion of this article, the reader should be able to describe the concepts of spinal manipulative therapy and types of symptoms for which it might be considered in pregnancy, explain the quality of available research on the use of spinal manipulative therapy, and plan to discuss this therapy with interested pregnant patients.

Pain 2008 Jul 15;137(2):405-12. Epub 2007 Nov 19

Laser acupuncture in children with headache: a double-blind, randomized, bicenter, placebo-controlled trial

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To investigate whether laser acupuncture is efficacious in children with headache and if active laser treatment is superior to placebo laser treatment in a prospective, randomized, double-blind, placebo-controlled trial of low level laser acupuncture in 43 children (mean age (SD) 12.3 (+/-2.6) years) with headache (either migraine (22 patients) or tension type headache (21 patients)). Patients were randomized to receive a course of 4 treatments over 4 weeks with either active or placebo laser. The treatment was highly individualised based on criteria of Traditional Chinese medicine (TCM). The primary outcome measure was a difference in numbers of headache days between baseline and the 4 months after randomization. Secondary outcome measures included a change in headache severity using a 10 cm Visual Analogue Scale (VAS) for pain and a change in monthly hours with headache. Measurements were taken during 4 weeks before randomization (baseline), at weeks 1-4, 5-8, 9-12 and 13-16 from baseline. The mean number of headaches per month decreased significantly by 6.4 days in the treated group ($p < 0.001$) and by 1.0 days in the placebo group ($p = 0.22$). Secondary outcome measures headache severity and monthly hours with headache decreased as well significantly at all time points compared to baseline ($p < 0.001$) and were as well significantly lower than those of the placebo group at all time points ($p < 0.001$). We conclude that laser acupuncture can provide a significant benefit for children with headache with active laser treatment being clearly more effective than placebo laser treatment.

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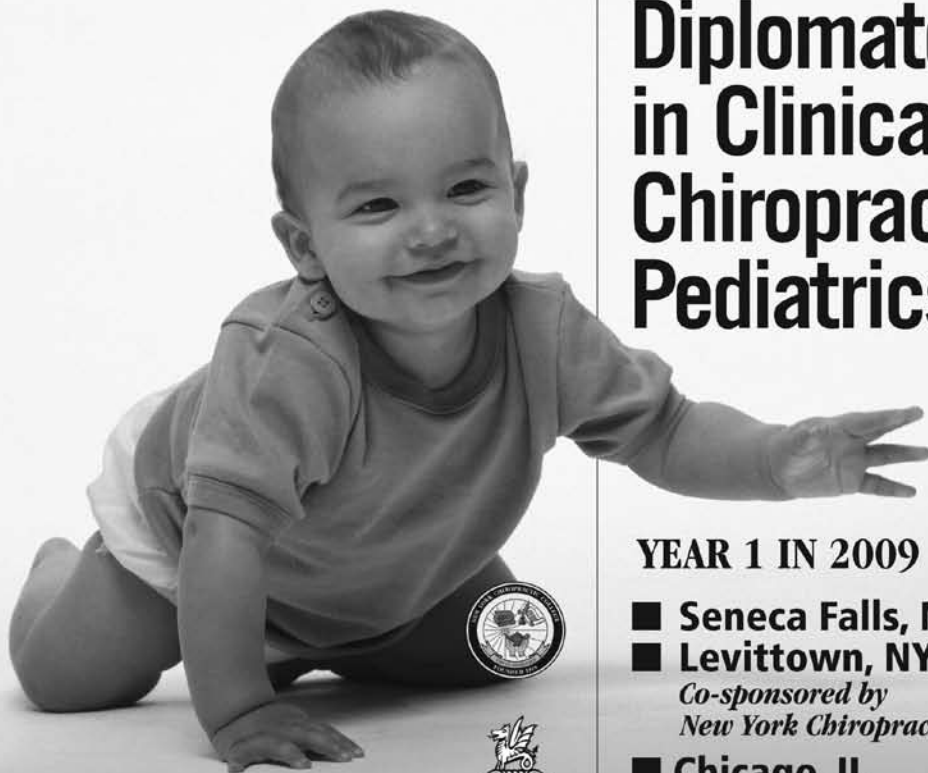
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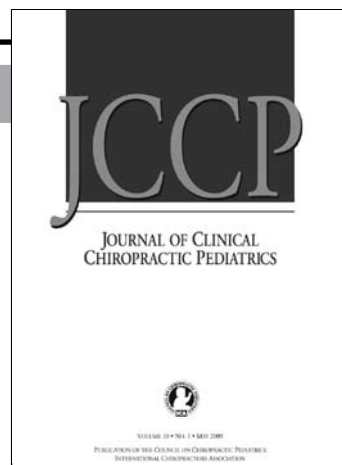
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