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Canada's Newest CCRF Research Chair in Neuromusculoskeletal Health

Profile – Dr. Paul Bruno DC, PhD

Dr. Paul Bruno DC, PhD
CCRF Research Chair in Neuromusculoskeletal Health
University of Regina, Saskatchewan

The University of Regina has announced that Dr. Paul Bruno DC, PhD has taken up the new and distinguished CCRF Research Chair in Neuromusculoskeletal Health in the Faculty of Kinesiology and Health Studies at the University of Regina as of July 1, 2010.

Dr. Bruno received his Bachelor of Human Kinetics degree in 1999 at the University of British Columbia. In 2004, he graduated magna cum laude from the Canadian Memorial Chiropractic College in Toronto. Dr. Bruno has received the distinguished Elsevier International Post-Graduate Research Prize in 2005, 2006 and 2007. In 2008, Dr. Bruno received his doctorate from the University of Portsmouth in the UK.

Most recently Dr. Bruno was a faculty member at the Anglo-European College of Chiropractic in Bournemouth England where he also maintained a clinical practice. Dr. Bruno joins the University of Regina in this new research position as an Assistant Professor and Clinician-Scientist.

Dr. Bruno's primary responsibility will be to facilitate research and scholarship in the clinical aspects of Neuromusculoskeletal Health. He will conduct a major program of research, pursue external funding to support his research program, teach courses at the graduate and undergraduate level, supervise undergraduate honours students and graduate students, and pursue opportunities as a clinical chiropractor.

Dr. Bruno's research interests are primarily focused on the fields of motor control and rehabilitative exercise therapy for low back pain patients. The studies he has conducted have investigated quantifying the activation patterns of muscles around the lumbar spine and pelvis during clinical testing procedures used to detect specific motor control deficiencies in patients. The results have provided insight into the validity and usefulness of these procedures and make preliminary recommendations to clinicians regarding the implementation of specific rehabilitative exercises aimed at restoring normal motor patterns in particular patients.

The Faculty of Kinesiology and Health Studies is located in the $32 million Centre for Kinesiology, Health and Sport, which opened in September 2004. The Centre has outstanding laboratory and research facilities, including the fully equipped Neuromechanical Research Centre, and also houses the Allied Health Centre and the Dr. Paul Schwann Applied Health and Research Centre.

Congratulations to Dr. Paul Bruno DC, PhD!

Profile – Dr. Jean-Philippe Pialasse, DC, MSc

Dr. Jean-Philippe Pialasse, DC, MSc,
PhD candidate
Doctorate in Kinesiology
Université Laval, Québec

Dr. Jean-Philippe Pialasse completed his chiropractic degree in January 2004 from the only chiropractic college in France: the "*Institut Franco-Européen de Chiropratique" (IFEC)*, and immediately undertook full time practice in Toulouse in the south of France. During this same period, he was also elected as member of the Board of Governors of IFEC and one of his commitments was to establish a second site of IFEC in Toulouse. He succeeded in establishing the first year program in September 2006 with the help of all the IFEC staff, and after one year was granted a scholarship from IFEC to pursue a Masters degree.

Dr. Pialasse joined the Masters in Kinesiology program at the "*Université du Québec à Trois-Rivières*" (UQTR) where he was supervised by Martin Descarreaux, DC, PhD. His thesis focused on the cervical flexion relaxation phenomenon, which is a cervical extensor muscles electromyographic silence observed during full flexion. This work helped in determining the onset and cessation angle of this silence, and also the speed of movement and load effect on these angles. The Masters opportunity allowed him to publish his two first articles, and also to present work at congresses in Ontario, Quebec, USA and France.

From January 2010, Jean-Philippe enrolled in the PhD kinesiology program at "*Université Laval*", supervised by Martin Simoneau, PhD, and co-supervised by Martin Descarreaux, DC, PhD. His thesis will focus on idiopathic scoliosis, and the influence of vestibular asymmetry on its evolution. The purpose of this project is to confirm the existence of vestibular asymmetry in adolescents with idiopathic scoliosis, and to determine if this asymmetry precedes the deformity. A second purpose of this project is to help determine which of the adolescent population is more subject to have severe evolution of the scoliosis. The project will provide collaboration between UQTR and "*Université Laval"*, orthopaedic surgeons and also private chiropractic practices.

The project received financial support from the "*Fondation Cotrel de la Fondation de France"*, for 3 years. Dr. Pialasse has been awarded by the "*Fondation de Recherche Chiropratique du Québec*", a bursary, in order to pursue his PhD. He is also the first chiropractor from IFEC to be enrolled in a PhD program, even though the college was created in 1983!

Dr. Pialasse is also secretary of the AFC Board of Governors and is involved in the ongoing project of regulation of Chiropractic in France.

Profile – Dr. Craig Jacobs DC, MSc, FCCS(C)

Dr. Craig Jacobs DC, MSc, FCCS(C)
University of Toronto

Dr. Craig Jacobs had a successful career as a professional dancer primarily with the Batsheva Dance Company in Tel Aviv, Israel. After retiring from performance, Dr. Jacobs was artistic director of Batsheva's junior company before pursuing a chiropractic career. He completed his BFA from the University of North Carolina's School of the Arts in 2000. After graduating magna cum laude from CMCC in 2005, Dr. Jacobs' was accepted into CMCC's Clinical Sciences Residency Programme.

Dr. Jacobs began collaborating with Dr. J. David Cassidy, director of research at the University Health Network's Centre for Research Expertise in Improved Disability Outcomes (CREIDO) and director of Artists' Health Research at the Toronto Western Hospital, to study musculoskeletal injuries in professional dancers. He piloted this research on the National Ballet of Canada, completed his residency and became a Fellow of the College of Chiropractic Sciences.

Dr. Jacobs received a CIHR Master's Award to implement his research on an international scale while pursuing a Master of Science degree at the Institute of Medical Science, University of Toronto. Dr. J. David Cassidy was Dr. Jacobs' supervisor and Dr. Pierre Côté his co-supervisor.

Dr. Jacobs' research involved the National Ballet of Canada, Toronto Dance Theatre, Royal Swedish Ballet, Cullberg Ballet (Sweden), Royal Danish Ballet, Batsheva Dance Company (Israel) and Kibbutz Contemporary Dance Company (Israel). This involvement of elite dance companies has made this study the largest cross-sectional study of professional dancers to date and the only international study of its kind.

Dr. Jacobs' research focused on the prevalence and associated factors of injury in professional dancers, dancers' attitudes and perceptions of injury, and issues surrounding injury reporting. He has presented at the International Association of Dance Medicine and Science's Annual Meetings in Cleveland (2008) and The Hague (2009), the International Federation of Sports Chiropractic Symposium, and the World Federation of Chiropractic's Congress in Montreal (2009). Dr. Jacobs has published in scientific journals including *Spine* and the *Journal of Orthopaedic Trauma*.

Dr. Jacobs received his Master of Science from the University of Toronto in June. He works as a Clinical Research Coordinator for the University Health Network's Whiplash Intervention Trial headed by Dr. Pierre Côté, maintains a clinical practice in Toronto, and is an Assistant Professor at CMCC in the Department of Clinical Education.

Chiropractic Science: A Contemporary Neurophysiologic Paradigm

Dr. John Srbely DC, PhD

Dr. John Srbely DC, PhD
CCRF Professorship in Spine Mechanics and Human Neurophysiology
College of Biological Sciences
Department of Human Health and Nutritional Sciences
University of Guelph

In order for chiropractic to reach its full potential as a healthcare profession, it must be universally integrated into the mainstream healthcare model. For this to be realized, chiropractic must first be unconditionally embraced by mainstream science. With growing competition for today's healthcare dollar, health policy makers are increasingly relying on an evidence basis to guide decision making. The value that government and other stakeholders assign to chiropractic services will rely on the ability for chiropractic to validate the basic physiologic mechanisms of spinal manipulative therapy through high quality controlled studies.

Central Sensitization and Neurogenic Inflammation: The Neurophysiologic Pillars of the Contemporary Chiropractic Paradigm

The evidence suggests that effects of spinal manipulative therapy is primarily neurophysiologic, most likely mediated by intense stimulation of large myelinated fibers in the capsular and/or periarticular tissues.[1] Basic science also demonstrates that large fiber stimulation can modulate dorsal horn excitability by inducing segmental inhibitory mechanisms.[2] The phenomenon of dorsal horn excitability, also referred to as central facilitation or sensitization, is pivotal to the contemporary chiropractic paradigm. Sensitization is defined as a heightened responsiveness of a neuron to an input stimulus.[3] Central sensitization is defined as heightened responsiveness of a second (or higher) order neuron in the nervous system .[4]

Central sensitization has been clinically observed with a broad spectrum of pathologies but its cause-effect relationship is still unclear. It is the result of sustained peripheral nociceptive inputs into the dorsal horn[5] and these nociceptive inputs may originate from a broad spectrum of etiologies.[6] Nociception arising from axial tissues is more likely to initiate central sensitization than peripheral tissues and it is has been suggested that spinal pathomechanics produces changes in dorsal horn excitability.[7] These collective observations imply that the spine and its asso-

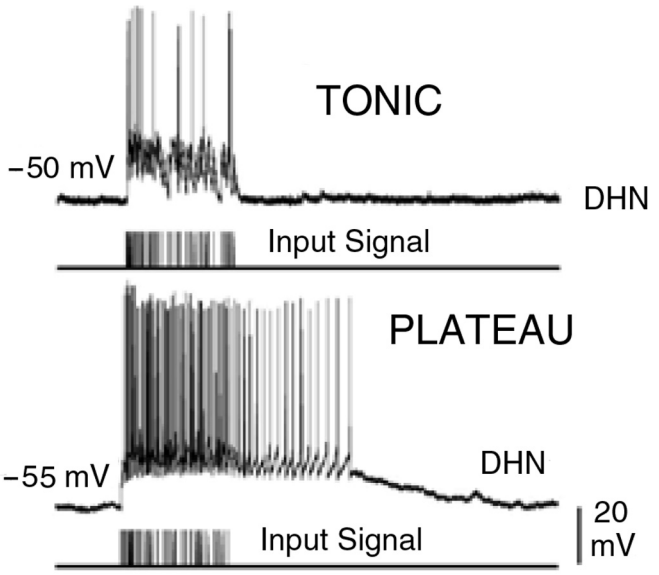

Figure 1 *Input – Response Profile of Tonic (normal) vs Plateau (sensitized) states of the Dorsal Horn Neuron (DHN) in rats (Derjean, 2003). The DHN's response signal (top tracing in each example) in the plateau state demonstrates a higher frequency and longer duration as compared with tonic DHNs. Input signal (bottom tracing in each example) is identical in both examples. (Adapted with permisssion from Derjean, 2003)*

ciated structures may be important considerations in the pathophysiology of central sensitization.

Central sensitization is a neuradaptive mechanism with significant implications in the study of pain, joint mechanics, disease and optimal health. One of the most important reasons for this is that central sensitization has significant impact on signal transmission in the dorsal horn. Electrophysiologic data from animal models demonstrate that dorsal horn sensitization can lead to considerable signal amplification and persistent firing.[8] A comparison of response profiles from sensitized (plateau) versus normal (tonic) dorsal horn neurons in rats (Figure 1) reveals that sensitized dorsal horn neurons not only exhibit higher response frequencies but also show persistent activity after removal of the input signal.[8] The physiologic importance of this is that the information encoded in the input signal (peripheral afferent) is clearly modulated in the sensitized state, as compared to the tonic state. These altered signals are then either transmitted to higher levels of the nervous system or directly to effector organs where they may initiate abnormal physiologic responses and, potentially, pathogenic processes if allowed to persist. These mechanisms may therefore be the neurophysiologic basis for how disease and dysfunction of the spine impacts health and disease. How these aberrant signals are processed, and what role spinal manipulative therapy plays in modulating these signals, is an important area for chiropractic research because these concepts form the foundation for the neurophysiologic paradigm of chiropractic.

Another mechanism by which central sensitization may impact health is through the initiation of a process known as neurogenic inflammation. Neurogenic inflammation is defined as a peripheral inflammatory response that is mediated antidromically through nociceptors.[9] This phenomenon is caused by the release of proinflammatory mediators peripherally via antidromic mechanisms to create a localized inflammatory response in the receptive field of the affected nociceptor. Central sensitization has been recognized as a primary cause of neurogenic inflammation.

The importance of neurogenic inflammation is its potential role in the clinical expression of somato-visceral and viscero-somatic responses. Convergence of neural tracts is a basic architectural construct of the nervous system and the dorsal horn is where nociceptors of somatic and visceral origin are known to converge. Consequently, somatic pain, especially pain of axial (spinal) origin, can sensitize the dorsal horn to evoke neurogenic inflammatory responses in visceral pathways, and vice-versa. This phenomenon has been confirmed experimentally in animal models[10–13] and has also been hypothesized as a primary mechanism in the pathophysiology of myofascial pain syndrome.[14]

Modulation of Central Sensitization: The Neurophysiologic Basis for Spinal Manipulation in Health and Wellness Management

Spinal manipulation-evoked modulation of central sensitization is an important, and perhaps foundational, scientific tenet which has the potential to establish chiropractic as an essential player in the future of mainstream healthcare. Furthermore, based on this rationale, chiropractic is well-positioned to play a leading role the conservative management of somatic pain such as myofascial pain

syndrome, an increasingly prevalent condition of generalized muscle pain resulting from central sensitization.[15] The incidence of myofascial pain in the elderly is reported as high as 85% and it is estimated that by the year 2050 the ratio of the elderly population to general population in Canada will double,[16] making myofascial pain syndrome one of healthcare's foremost challenges. Ensuring its role in the future of mainstream health and wellness care will rely on the ability for chiropractic research to validate these physiologic mechanisms using the language of basic science.

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Chiropractors and collaborative care: An overview illustrated with a case report

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Although not typical, there appears to be a growing trend of chiropractors working within collaborative care settings. We use a case report to highlight features of patient care and education related to chiropractic practice within a collaborative care model. This paper hopes to offer some insight into how a chiropractor might fit into a collaborative setting and what training might help them to function effectively. The case report used is an example where a chiropractor provided a secondary diagnosis and complementary care not previously considered by the allied team resulting in symptom control and return to work by the patient. By the nature of a chiropractor's ability to provide a primary or secondary musculoskeletal diagnosis, they have the capacity to offer an additive approach to patient care within collaborative care models. However, chiropractors wishing to work in these environments, such as a family health team, would benefit from further education.
(JCCA 2010; 54(3):147–154)

KEY WORDS: chiropractor; collaborative care; education; family health team; electronic medical record

Bien qu'elle ne soit pas typique, il semble y avoir une tendance croissante chez les chiropraticiens de travailler dans un contexte de soins collaboratifs. Par le biais d'un exposé de cas, nous soulignons des caractéristiques relatives au soin des patients et à l'éducation en matière de chiropractie en contexte de soins collaboratifs. Ce document souhaite offrir un aperçu des manières selon lesquelles un chiropraticien peut cadrer avec un contexte collaboratif, ainsi que de la formation qui peut l'aider à fonctionner efficacement. L'exposé de cas employé est un exemple dans lequel un chiropraticien émet un diagnostic secondaire et propose des soins complémentaires qui n'avaient pas été considérés par les membres de l'équipe paramédicale, ayant pour résultat le contrôle des symptômes du patient et son retour au travail. En raison de la capacité du chiropraticien d'établir un diagnostic musculosquelettique primaire ou secondaire, il peut offrir une approche additive au soin des patients, dans un contexte de soins collaboratifs. Cependant, les chiropraticiens qui souhaitent travailler dans de tels environnements, comme une équipe de santé familiale, profiteraient de formations supplémentaires.
(JCCA 2010; 54(3):147–154)

MOTS CLÉS: chiropraticien; soins collaboratifs; éducation; équipe de santé familiale; dossiers médicaux électroniques

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Introduction

Collaborative care models have been proposed to deal with the complexity underlying many human health conditions. Such models can also be complex, varying in philosophy, structure, process and outcome.[1] As a consequence, the blurring of roles and responsibilities in the treatment of shared patients may occur. In this report we use collaborative care as defined by Boon et al. (2009), namely, "an interprofessional process for communication and decision-making that enables the separate and shared knowledge and skills of health care providers to synergistically influence patient care provided."[1]

Although chiropractors typically practice independently of other health care providers, there is evidence that a growing number of chiropractors are collaborating or being integrated into multidisciplinary care environments.[2,3] Successful co-management of patients in such environments in part relate to good communication, patient interest, and openness to discussion. As well, co-management has been found to be a key factor for developing a chiropractor's involvement within a collaborative care setting.[4,5] This co-management often involves a chronic musculoskeletal condition.

Conversely, studies suggest that communication between medical practitioners and chiropractors outside of collaborative care settings is often limited resulting in poor information sharing which leads to fragmented and compromised quality of patient care.[5,6,7]

We use a case report to highlight the co-management of chronic tension-type headache (CTTH) and the additive effect chiropractic management played in achieving a return-to-work (RTW). This co-management intensified after the secondary diagnosis of CTTH by the chiropractor in a patient with a longstanding anxiety disorder. Chiropractors at this location have been co-located within a Family Health Team (FHT) setting for greater than five years.

Chronic Tension-type Headache Epidemiology and Pathophysiology

CTTH is common, contributing to significant loss of work and high socioeconomic costs.[8,9,10] It also has considerable impact on work performance and daily functioning.[11,12] It has been estimated that between 2% to 3% of patients suffer with CTTH for the greater part of a lifetime.[12] Chronic pain, including CTTH, can be demoralizing in addition to debilitating. Associated negative emotions such as helplessness, fear or anxiety, and depression can further exasperate the impact of physical pain or functioning.[13]

Both muscular and psychogenic factors are believed to be associated with tension-type headache.[14] The exact pathophysiology of CTTH is uncertain,[15] as many people have no known mechanism of onset or underlying pathophysiological causes. One of the most prominent abnormal findings in patients with CTTH is a high degree of muscle tenderness.[16,17,18]

Case History

Prior to a diagnosis of CTTH, a 44-year old female was referred by her family physician to a mental health counselor with concerns of anxiety attacks. She complained of anxiety attacks on a daily basis with heart palpitations, nausea, increase in perspiration, and dizziness. She was prescribed an antidepressant but stopped the medication after one month because of unwanted side effects. She had been using Lorazapam, a benzodiazapene, as needed for anxiety for approximately two years in addition to over-the-counter analgesics for her headache pain.

At age 25, she worked in an office where her job worries led to significant weight loss and her first anxiety attack. Her anxiety attacks continued through her adult life and were provoked by work stress, driving on highways and taking a bus. Occasionally, she also experienced anxiety upon leaving the house and during the long commutes to work.

She complained of sleep disturbance during workdays that contributed to her feeling exhausted. This was compounded by her having to wake up very early in the morning to commute to work. She attributed all of the above symptoms to causing her muscle tension, headaches and "feeling on edge".

The patient was laid off from her project management position approximately 3 years ago and was unemployed. She was motivated for change and had good insight into her health problems.

Path of Co-Management

The following summaries highlight the perspectives taken by the various health care providers and the eventual team co-management. At their initial visit, each provider fo-

cused on their related area of expertise to address the patient's anxiety condition and later the secondary diagnosis of CTTH.

Family Physician

With the establishment of her medical diagnosis of panic disorder with agoraphobia, the treatment and subsequent management process was initiated. Due to the patient's goal of decreasing her pharmacologic load, alternative possible therapies were explored with the input from various health care providers on the team.

Mental Health Counselor

The patient was subsequently referred for counseling. As described in the case history, the patient presented to the counselor with the goal of stopping her use of benzodiazepine and over-the-counter analgesics. As with this case, patients with CTTH often use self-administered pain-relieving medications with little efficacy.[19]

She reported experiencing anxiety attacks in a variety of situations. She avoided driving on highways and taking a bus. She avoided situations in which she had experienced prior anxiety attacks and noted for a short time being unable to leave her house because of her anxiety. Thus, she was referred to an anxiety and treatment research centre for assessment and cognitive behavioural therapy (CBT) intervention.

Anxiety Treatment and Research Centre

She was referred to an anxiety treatment and research centre for consultation due to "excessive worry" and frequent anxiety attacks which interfered with her functioning. She underwent both medical consultation by a psychiatrist and a Structured Clinical Interview by a psychologist. She was provided a confirmatory diagnosis of Panic Disorder with Agoraphobia in keeping with her family physician's original conclusion. Although experiencing transient periods of depressed mood, her symptoms did not meet the criteria for the diagnosis of a mood disorder. She was also referred for a short-term, 12-week group CBT intervention for panic disorder under the joint supervision of a combination of a psychologist and psychiatrist.

CBT, either individually or in a group format, has been shown to be effective in reducing anxiety, fear and avoidance[20] by providing individuals with the knowledge and skills to identify and modify anxious thoughts and behaviours that help to maintain anxiety and anxiety-related difficulties.

Nurse Practitioner

As a result of her ongoing symptoms and accompanying milder musculoskeletal complaints, the patient attended a nurse practitioner. The patient complained of intermittent neck and chest pain on the left side radiating into the back of her chest and arm. There also was a repetitive strain injury of the right side of the chest wall for which she wished some form of therapy to regain function. She conveyed she was quite anxious.

The patient was then referred by the nurse practitioner for chiropractic care for her neck tension and headaches, repetitive strain injury of the right side of the shoulder girdle and the chronic nature of neck and thoracic pains. The patient's history of panic attacks and chest pain was also highlighted.

Chiropractor

On examination, the chiropractor noted sub-occipital and trapezius muscular pain and tightness. Active and passive ranges of motion were decreased in flexion and bilateral lateral flexion and rotation. The patient reiterated her insomnia, recurrent sinus infections and ongoing daily headaches.

In this multidisciplinary care setting, it is commonplace for hallway consultations to occur on mutual patients. These consultations are often triggered by review of the electronic medical record (EMR) to determine common benefits of concurrent care. Thus further discussions by the chiropractor with the counselor and with the patient indicated that the muscular pain, tension and headaches acted as a threshold trigger for the patient's panic attacks. The patient was hoping the care would offer a way to teach her how to control her pain.

A secondary diagnosis of CTTH was made by the chiropractor in this case to quantify the pain-related headache symptoms. To this point her other care providers had only managed the anxiety disorder, as providing a headache diagnosis is typically out the scope of practice of non-medical providers in this setting. Previous authors have noted that co-morbid headaches are common with anxiety disorders reflecting the burden of the disease.[21,23,23]

How Chiropractic Practice is Different in this Model

Chiropractors within this FHT setting are offered some distinct advantages over traditional solo practice. Co-location offers them the ability to interact in person with all other health care providers, each with their own area of expertise, to draw from for their patient care decisions. Questions on patient care can be directed immediately and in person to the appropriate co-located provider to further answer clinical queries or streamline patient flow for testing, referrals or follow up. This potentially reduces patient visits and wait times as well as assists in timely clinical care decisions by the chiropractor.

Sharing of information from the EMR provides the chiropractor the ability to review the entire patient's health record including all labs, imaging, specialist notes, counseling visits, dietitian records, demographics and medications. With patient consent and authorized records release, clinical notes from all providers are available to the chiropractor and vice versa. This complete clinical picture allows the chiropractor to formulate an appropriate diagnosis and treatment plan.

In order to clarify a differential diagnosis or treatment plan, the chiropractor can immediately recommend additional imaging, labs, or specialist referrals to the appropriate authorizing provider in person. Their recommendations can be subsequently arranged with the assistance of either nursing or support staff depending on the nature of the request.

As part of the culture of this FHT setting, students from disciplines of medicine, chiropractic, pharmacy, dietetic, social work, midwifery and nursing attend for placements. Students will crossover multiple disciplines depending on their interests and often do shadowing observations with chiropractors. Having a student from a different profession offers opportunity for the chiropractor to explain the profession and learn the skill of communicating in common terminology for the benefit of identifying additive solutions to patient care delivery. As well, the chiropractor gains knowledge on how the student from a different profession may approach a clinical situation. Related to this particular case report, a medical student was present for a portion of this patient's chiropractic care.

Lastly, over the long term, group rounds or education sessions with various professions using mutual complex patient cases offers providers a better understanding of each other's scope of practice to demonstrate both the limitations and potential for additive solutions to improve patient care through co-management.

Collaborative Management

Following each of the patient's initial assessments, hallway consultations occurred between health care providers to co-ordinate outcomes so a consistent message was conveyed to the patient in regard to lifestyle and the association between her neck pain, headaches and her panic attacks.

A hallway consultation involves literally walking down the hall and knocking on the provider's treatment room door. However, there are procedures in place within the practice setting that dictate levels of interruption such as immediate during emergency situations. Interactions also may occur between patient room transfers such as when a patient is waiting to see another provider or communication may proceed through either the provider's nurse or assistant in more process related queries such as imaging or lab requests. Lastly, there are internal electronic messaging mechanisms for lower category items such as arranging group meetings or conveying information at times when both providers work on separate days.

Such encounters involve the mutual viewing of the entire patient record by all providers via EMR and case consulting over each provider's goals respective to their profession. This process is used in times of general patient care and more importantly in times of follow-up on complicated cases to improve the continuity and delivery of patient care for future encounters. Initially, this process can be slow to a new provider; but once mutual trust and understanding of each other's scope is established these are very brief encounters. Charting of hallway consultations in the EMR usually occurs at the location of the encounter.

In this case report, discussions between the providers occurred at various times during the patient's care and across health care provider scopes of practice. This is a dynamic process based on each provider's ability to use a patient-centered approach to formulate additive solutions using the most appropriate provider and intervention at the most appropriate time. The ultimate goal was to improve patient outcomes. The value of these impromptu hallway consultations is that they require no more than one minute of time. Co-location of providers is the best

facilitator of these encounters. This form of informal consultation concerning a patient is common in collaborative care settings.[24,25]

After hallways consultations, the treatment plan of the chiropractor was formulated in conjunction with the mental health counselor and nurse practitioner, and included:

1. explanation and reassurance on the lifestyle link between stress levels and neck pain with headaches.
2. home neck and shoulder stretching regularly and at times of increased stress.
3. periodic visits as needed for manipulation and myofascial release techniques related to the neck and upper thoracic spine.

In this instance, the additive approach was a consistent message to the patient from the counselor and chiropractor at periodic visits, and confirmed in the EMR, on the linkage between stress and neck pain with encouragement of neck stretching during times of anticipated stress to elicit a sustained behaviour change in the patient.

As a result of this multidisciplinary intervention of CBT and manual therapy spanning 4 months, the patient reported a return to gainful work. She also reported a cessation of medications through the support of her family physician. SF-12 measures[26] improved by 5 points to a score of 49 on the physical and by 7 points to a score of 54 on the mental component summaries between pre-treatment baseline and 4 weeks. Despite the subjective improvement in symptoms, there were no differences in neck pain or the neck disability index between pre-treatment baseline measures and at 2, 4, and 8 weeks. A recent systematic review describes the occurrence of a floor-ceiling effect of this measurement tool, where a measurement cannot take a wider range value due to the limitation of the measurement scale, that may explain this finding as a too minimal sensitivity of scale difference to be significant.[27]

The patient also reported as part of the subjective portion of her re-assessment that both her depressive and anxiety symptoms that were present over the last 20 years were now under control, yet she still experiences pain. She described that the collaborative care she received appeared to increase the threshold for the trigger of her CTTH and panic attacks thereby improving her ability to sustain her activities of regular work. This subjective outcome was of interest to the providers involved and when further questioned, the patient described the cumulative effects of the included chiropractic care being beneficial over previous attempts in her long past history to address these concerns.

Psychosocial Implications

In addition to physical implications, chronic pain, including CTTH, can have wide ranging and interdependent impact on cognitive, affective, behavioural, and social factors.[13] Stress and mental tension, such as depression, are the most common factors that cause CTTH.[28]

A biopsychosocial approach views chronic pain and disability as a complex and dynamic interaction among physiological, psychological and social factors that may perpetuate or worsen clinical presentation.[29] There is evidence from a review of seven randomized controlled trials and two systematic reviews of the therapeutically efficacious nature of comprehensive pain programs for chronic non-malignant pain conditions, including headaches.[29] These are programs in which various pain-related disciplines work as a team to provide comprehensive, interdisciplinary care (e.g. physicians, physical therapists, psychologists) with a focus on functional restoration rather than cure. Given their expertise and scope of practice, chiropractors appear ideally suited as team members able to provide a unique and complementary perspective within comprehensive pain programs.

Implications for Clinical Education

Part of the scope of chiropractic in Canada is the requirement to communicate a musculoskeletal diagnosis to the patient. In a collaborative care model, few health care providers outside of medicine are afforded this responsibility due to their scope of practice. This case is an example of the contribution chiropractors can make in reducing the burden on the mainstream health care system in the management of complex chronic disease populations with secondary musculoskeletal conditions. This change in care delivery takes time to build both health care provider and patient trust within a collaborative setting.

Chiropractors who wish to operate in collaborative care environments would benefit from some form of further education. The importance of this education would be to facilitate the transition from operating in a solo fashion to the dynamic of team-based care. Specific learning objectives could be to:

- communicate verbally via concise hallway consultations and thoroughly while writing clinical notes using a terminology other health care providers understand
- understand the scope of practice of other health care providers through case-oriented clinical rounds
- be able to mentor students from various health care professions on the role chiropractic care plays in the treatment of musculoskeletal conditions in a collaborative clinical setting
- understand and be able to communicate both chiropractic treatment limitations and the instances of added effects of concurrent chiropractic care
- be able to traverse health care system processes in a additive versus alternative approach to streamline care and wait-times for patients
- be aware and able to make suggestions on referral for the appropriate use of other musculoskeletal care providers within the broader health care system to improve patient care
- review and understand how to access appropriate patient information
- further clarify the musculoskeletal diagnosis through use of imaging, labs and medical specialist documentation
- effectively use the EMR as a follow up feedback tool to assess the impact of chiropractic interventions for complex conditions
- champion quality improvement measures from their knowledge of solo practice to reduce challenges within collaborative care models[30]

In our case report all these learning objectives were useful to the outcome for this patient. As well, for all future similar cases an additive feedback effect occurs on reviewing multiple similar case progressions through the EMR. This likely improves the skill level of the chiropractor in identifying important secondary musculoskeletal diagnoses and formulating additive treatment plans for subsequent complex chronic disease patients.[31]

As a result of cases such as this one, quality improvement measures were attempted at a process level within this FHT setting to help with earlier identification of chronic pain secondary diagnosis patients for triage to chiropractic management. To be sustainable these measures require effective communication strategies within the provider team to change perceptions on utility.[5] Time is required for this to develop as perceptions regarding chiropractic by medical practitioners are likely to be formed after medical school as described in a recent survey to orthopedic surgeons.[32] Interprofessional communication may be the most common route of education that occurs between solo practice chiropractors and other health care professionals and vice versa. A multidisciplinary collaborative setting allows for a positive change in communication beyond secondhand patient feedback as a form of learning.

Factors such a patient-centered approach with structured team discussions, information sharing, framing team tasks as intellective and a team climate of collaboration has been found to enhance a team's ability to process information.[33] Lastly, co-location or regular face-to-face contact with mutual trust is an essential component to facilitating the ease of communication between collaborative care providers.[34]

Conclusion

Chronic diseases, such as CTTH, are costly to manage and profoundly impact a patient's ability to work.[9] This report highlights multidisciplinary care provided in a functioning collaborative clinical environment. It offers some suggested educational goals that would be useful to a chiropractor to function effectively in a FHT setting.

Collaborative care provides patients with therapeutic options within an environment where health care providers and patients are informed. Communication is increased thus limiting the fragmentation of care, while optimizing the continuity and quality of care offered to patients suffering from multiple chronic conditions.[5] It also matches current literature review findings on the emerging models of RTW settings for musculoskeletal disorders where factors of clinical, psychosocial, work environment and involvement of stakeholders are taken into account.[35,36]

This case provides an example of the coordinated functionality within a FHT. With all health care providers on site, working collaboratively through both hallway consultation and the EMR, this patient's multi-dimensional health care needs were easily met. Ultimately, cross-referral to the chiropractic arm of the health care team appeared beneficial to the patient from an occupational and therapeutic perspective.

Limitations of our conclusions were the rigor of a case report, applicability of education initiatives over time, and

relevance to other collaborative care models. There were also strengths to our conclusions. There was a greater than five-year time span that chiropractors were integrated into the model. This indicates the inclusion of chiropractors in a collaborative care model is sustainable over time.

In closing, by the nature of a chiropractor's responsibility to provide a primary or secondary musculoskeletal diagnosis, they have the capacity to offer an additive approach to patient care within collaborative care models.

Key Points

- Co-location or regular face-to-face contact facilitates communication and helps build trust between health care providers
- Chiropractors wishing to pursue integration into a collaborative model would benefit from further education
- Health care system processes may realize quality improvements from the application of a chiropractor's additive approach to care in a collaborative setting

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A randomized controlled (intervention) trial of ischemic compression therapy for chronic carpal tunnel syndrome

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Study Design: *Randomized clinical trial.*

Objective: *The aim of this study was to evaluate the effect of ischemic compression therapy in the treatment of chronic carpal tunnel syndrome.*

Method: *Fifty-five patients suffering from carpal tunnel syndrome were randomized to two groups. Thirty-seven patients received 15 experimental treatments which consisted of ischemic compressions at trigger points located in the axilla of the shoulder, the length of the biceps muscle, at the bicipital aponeurosis and at the pronator teres muscle in the hollow of the elbow. Eighteen patients received the control treatment involving ischemic compression on trigger points located in the deltoid muscle, supraspinatus muscle and infraspinatus muscle. Of the 18 patients forming the control group, 13 agreed to receive the experimental treatments after the 15 control treatments. Outcome measures included a validated 18-question questionnaire to assess the severity of symptoms and functional status in carpal tunnel syndrome, and a quantification of the patients' perceived improvement, using a scale from 0% to 100%. Outcome measures evaluations were completed at baseline, after 15 treatments, 30 days following the last treatment, and 6 months later.*

Results: *For the disability questionnaire, a significant reduction of symptoms was noted only in the experimental group. In the experimental group the outcome at baseline was 33.5 (SD, 10.3); after 15*

Méthodologie : *essai clinique randomisé.*

Objectif : *le but de la présente étude est d'évaluer l'effet de la compressothérapie ischémique dans le traitement du syndrome du canal carpien chronique.*

Méthode : *Cinquante-cinq patients souffrant du syndrome du canal carpien ont été séparés aléatoirement en deux groupes. Trente-sept patients ont reçu 15 traitements expérimentaux, qui consistaient en des compressions ischémiques à des points gâchettes situés dans le creux axillaire de l'épaule, le long du biceps, à l'aponévrose bicipitale et au muscle rond pronateur situé dans le creux du coude. Dix-huit patients ont reçu le traitement contrôle, qui comprenait des compressions ischémiques sur des points gâchettes situés dans le muscle deltoïde, le muscle sus-épineux et le muscle sous-épineux. Des 18 patients du groupe contrôle, 13 ont accepté de recevoir les traitements expérimentaux à la suite des 15 traitements contrôles. Les mesures des résultats incluent un questionnaire validé de 18 questions servant à évaluer la gravité des symptômes et les capacités fonctionnelles relativement au syndrome du canal carpien, ainsi qu'une quantification des améliorations perçues par les patients, au moyen d'une échelle allant de 0 % à 100 %. Les évaluations mesurant les résultats ont été effectuées au niveau de base, après 15 traitements, 30 jours après le dernier traitement et six mois plus tard.*

Résultats : *du côté du questionnaire sur l'invalidité,*

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treatments it was 18.6 (SD, 7.0). The control group outcome at baseline was 36.3 (SD, 15.2); after 15 treatments it was 26.4 (SD, 9.9) and after the crossover (15 control treatments plus 15 experimental treatments) 20.2 (SD, 12.2). A significant between group difference (P < 0.021) was noted in the patients' perceived improvement after 15 treatments: 67 (SD, 26) percent and 50 (SD, 25) percent respectively for the experimental and control groups.

Conclusion: *This practice-based clinical trial suggests that myofascial therapy using ischemic compression the length of the biceps, at the bicipital aponeurosis, at the pronator teres and at the subscapularis muscles could be a useful approach to reduce symptoms associated with the carpal tunnel syndrome. Patients' perceived improvement in functional capacities persisted over a 6-month period.*
(JCCA 2010; 54(3):155–163)

KEY WORDS: chiropractic, myofascial trigger points, ischemic compression, carpal tunnel syndrome, randomized clinical trial

une diminution significative des résultats n'a été remarquée que chez le groupe expérimental. Pour le groupe expérimental, le résultat au niveau de base était de 33,5 (écart-type : 10,3); après 15 traitements, il était de 18,6 (écart-type : 7,0). Le résultat du groupe contrôle au niveau de base était de 36,3 (écart-type : 15,2); après 15 traitements, il était de 26,4 (écart-type : 9,9) et après le traitement croisé (15 traitements contrôles et 15 traitements expérimentaux) de 20,2 (écart-type : 12,2). Une différence significative entre les groupes (p < 0,021) a été notée dans la perception qu'ont les patients de leur amélioration après 15 traitements : 67 % (écart-type : 26) et 50 % (écart-type : 25) respectivement pour le groupe expérimental et le groupe contrôle.

Conclusion : *Cet essai clinique fondé sur la pratique suggère que la thérapie myofasciale au moyen de compressions ischémiques le long du biceps, à l'aponévrose bicipitale, au muscle rond pronateur et aux muscles subscapulaires pourrait s'avérer un moyen utile de réduire les symptômes associés au syndrome du canal carpien. L'amélioration des capacités fonctionnelles, telle que perçue par les patients, a persisté pendant 6 mois.*
(JCCA 2010; 54(3):155–163)

MOTS CLÉS : chiropratique, point gâchette myofascial, compressions ischémiques, syndrome du canal carpien, essai clinique randomisé.

Introduction

Carpal tunnel syndrome (CTS) is one of the most common and most clinically significant of all nerve entrapment syndromes.[1] Numbness and paresthesia along the distribution of the median nerve in the hand, i.e. the thumb, index, major and half the ring finger are common symptoms related to CTS. Symptoms and concurrent discomfort often peak at night and may wake the patient several times. To ease pain and discomfort, the patient will shake the affected hand(s) and flex the fingers vigorously.[2]

Point prevalence of CTS is estimated at 2.7% and it is typically diagnosed in adults over the age of 30.[3] The symptoms generally originate from a nerve compression occurring when the median nerve runs through a fibrous or fibro-osseous tunnel or switches direction around a fibrous or muscular band.[2,4]

Forty-seven percent of CTS cases can be related to the patient's occupation. Over the last decades, there has been a major increase in work-related CTS cases.[5,6] Compression or entrapment may be present at a number of sites along the median nerve.[7,8] To describe such phenomenon, Leahy uses the expression "the whole nerve syndrome".[7]

Conservative allopathic treatment usually includes wrist support, change in activities and anti-inflammatory medication. If symptoms are not relieved by a conservative approach within a six-month period, cortisone injections may be used. Wrist surgery (carpal tunnel release) is considered where symptoms remain pronounced and

motor and sensitive functions decline.[4,9] There are three main reasons why patients agree to undergo surgery for CTS: (1) relief of night pain (36% of surgical patients), (2) relief of hand numbness (21%), (3) relief of daytime pain (13%).[10]

Furthermore, almost a third of the patients who have undergone CTS surgery experience persistent or recurrent symptoms after surgery and report that the initial improvement associated with carpal tunnel surgery is lost within less than two years.[10] The most significant discomfort described by patients after carpal tunnel surgery is pain in the area of the scar, and a weakened hand.[10] On average, two years following surgery, 30% of patients characterize their results as being poor to medium.[11]

Natural history of CTS

When CTS is not treated surgically, the symptoms usually disappear after nine months in the case of one half of those patients who do not move on to a surgical procedure. However, 22% of such patients continue to have symptoms eight years later.[12]

Self-rating scales represent the most valid assessment method for CTS.[13] When clinical symptoms are not conclusive and common CTS diagnostic procedures are unable to confirm the presence of median nerve compression, it may be necessary to use electrodiagnostic procedures.[13–15] These procedures are rarely appropriate for initial CTS assessment, but are essential when it comes to pre-surgery examinations.[13–15]

Carpal tunnel syndrome is commonly treated in chiropractic. In 1988, the number of cases of CTS declared by various specialists broke down as follows: chiropractors (23%), specialists in internal medicine (19%), neurologists (14%), and family physicians (9%).[5]

A CTS survey study involving 254 physicians was carried out in 74 outpatient sentinel practices in 30 US states and three Canadian provinces. The authors of the study collected data from 552 CTS patients.[16] Of this number, 23.5% were women, 70.4% were aged between 30 and 49, and 61.4% said that their work involved physical strain or repetitive movements. Clinicians determined that 43.1% of these cases were caused by the work itself. These practitioners rarely used electrodiagnostic procedures, preferring conservative initial treatment such as wrist support and anti-inflammatory medication, while cortisone injections were rarely used.[16] Another study showed that 40% of 125 CTS sufferers who received conservative treatments over a period of 30 months said that they were willing to put up with their low-level residual symptoms for the rest of their life.[17]

Rationale for using ischemic compression therapy in the treatment of carpal tunnel syndrome

Since, in patients suffering from carpal tunnel syndrome, the median nerve is more than twice (2.1 times) its normal size when it enters the carpal tunnel,[18] the authors of the present trial hypothesized that part of the cause of the related oedema could be noxious myofascial sites along the median nerve course. Along its course, part of this nerve enters the axilla of the shoulder, runs immediately adjacent to the biceps, and descends within the hollow of the elbow under the pronator teres muscle and the bicipital aponeurosis. Other authors suggest that compression or entrapment may be present at a number of sites along the median nerve.[7–8] In the present trial, the clinicians found hypertonicity and trigger points (TrPs) along the biceps of every participant. Trigger points in the hollow of the elbow were also present in all cases. It was suspected that eliminating the trigger points located along the median nerve course would diminish the CTS symptoms with or without normalizing the size of the median nerve.

Figure 1 illustrates the trigger point locations along the biceps, at the bicipital aponeurosis and in the pronator teres muscle. In skeletal muscles the blood flow is extremely variable and it is tied to the activity level. At rest, only 25% of their capillaries are open.[19] With exercise the blood flow can increase up to 10 times, at which point almost all the capillaries open up to admit more blood.[19] In the present trial, the affected biceps (principally) was in partial and continual contraction because of TrPs. It is known that TrPs in a muscle cause a partial contraction.[20,21] This contraction state results in higher consumption of oxygen and glucose. However during the night, with blood flow being much less, the supply of oxygen and glucose diminishes and lactic acid then accumulates and accentuates the contraction state. The authors of the present trial speculate that, during the night, the median nerve being more irritated, the patient is awakened by increased numbness and pain in the hand. Shaking the arm vigorously increases the blood flow, eliminates the lactic acid, and consequently the biceps relaxes partially, the median nerve is less irritated and the numbness and pain diminish.

Our primary hypothesis of interest was that private clinic patients with CTS who are treated with ischemic compression on TrPs localized along the biceps, in the axilla and in the hollow of the elbow would exhibit more significant reduction in the severity of symptoms and improvement in functional status in comparison with patients treated with ischemic compression on TrPs localized in the deltoid, supraspinatus and infraspinatus muscles.

Methods

Participants

This prospective randomized clinical trial was conducted in a private clinic located in Trois-Rivières, Québec. The study was approved by the ethics committee of the Université du Québec à Trois-Rivières.

An advertisement was placed in a local newspaper on three different occasions offering CTS sufferers the opportunity to take part in this research project. The first 55 eligible patients were included in the study and underwent a course of 15 chiropractic treatments at a rate of three treatments per week (see Table 1). Thirty-seven patients received the experimental treatment; eighteen were given the control treatment (see Patient Flowchart). Patients accepted into the study were required to read and sign an informed consent form.

Randomization procedure

Each subject was randomly assigned to either the experimental group or the control group at a 2:1 ratio using a table of random numbers. Sixty numbers (2/3 even, 1/3 odd) were mixed in an envelope, and an independent research assistant drew a number for each participant, who was then allocated accordingly.

Treatment protocols

All the patients included in this study presented multiple trigger points (TrPs) and taut bands along the biceps and at the bicipital aponeurosis. TrPs at the pronator teres muscle were also common clinical findings, but were not present in two patients. Twenty patients had TrPs in the axilla of the shoulder. All patients were examined for TrPs in these four areas while in a supine position, the arm supine and spread along the body or, in the case of the axilla of the shoulder, the hand of the patient under his head.

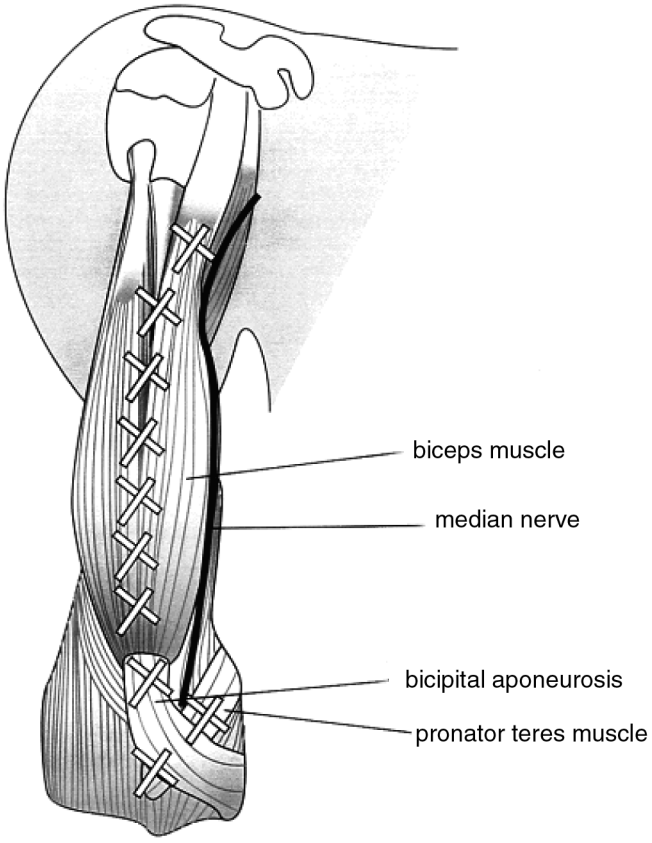

Figure 1 *Trigger point location along the biceps, at the bicipital aponeurosis and in the pronator teres muscle.*

Patients were advised to stop any treatments other than that provided by the chiropractor treating their CTS. During the treatment, at each visit, pressure was applied for 5–15 seconds to each of the identified trigger points. Thumb tip pressure (one thumb over the other) was then applied for 5 seconds every 2 cms, along the biceps. For the TrPs located in the hollow of the elbow (pronator teres, biceps aponeurosis) and in the axilla (subscapularis), the pressure was maintained for 15 seconds. Trigger points were treated using a light pressure, which was gradually increased until it reached the participant's maximum pain tolerance level. The patients were blinded to treatment allocation and therefore did not know whether they were in the control or the experimental group.

Table 1 *Inclusion and exclusion criteria*

Inclusion	Exclusion
• Be between 20 and 60 years old. • Suffer from numbness in the hand affecting the thumb, the index finger, the middle finger and one half of the ring finger. • Have suffered on a daily basis for at least 3 months. • Agree to a course of 15 chiropractic treatments at no cost. • All patients had to show at least 2 of the following physical signs: a Tinnel positive sign, a Phallen positive sign, sleep problems caused by hand discomfort.	• History of upper limb or neck surgery, pregnancy and systemic pathologies possibly related to CTS, such as hypothyroidism, diabetes and rheumatoid arthritis.

Seventeen patients received 15 control treatments consisting of ischemic compressions of latent or active trigger points located in the posterior region of the clavicle (supraspinatus area), on the deltoid (anterior and lateral region), and on the center of the shoulder blade (infraspinatus area). Since TrPs are often found in these locations, this control treatment would appear plausible to the patient and the authors believed that it would not induce significant clinical changes as concerned CTS symptoms. Following the control treatment phase of the study, the 18 patients who received fifteen control treatments were offered the opportunity to receive fifteen further treatments. They were still blinded to the kind of treatment they would receive. Thirteen agreed to continue with the treatment and, this time, only the experimental treatment was given.

Outcome measures

In order to quantify the severity of symptoms and the functional status of patients, a standard validated questionnaire[20] specific to patients suffering from CTS was used. The scales used in this questionnaire are highly reproducible (Pearson correlation coefficient, R = 0.91 and 0.93 for severity of symptoms and functional status, respectively) and internally consistent (Cronbach alpha, 0.89 and 0.91 for severity of symptoms and functional status, respectively).[20] This type of questionnaire was chosen because carpal tunnel patients generally consult their clinicians due to the severity of the symptoms experienced and the difficulty they have in carrying out normal daily tasks. The first part of the questionnaire defines the functional status of the patient while carrying out eight daily activities. The second part, using 10 simple questions, defines the severity of the symptoms experienced by the patient. All participants completed the questionnaire before and after the treatment protocol. A numerical scale where patients could rate their perceived improvement from 0% to 100% was also used. For the experimental group the questionnaire and numerical scale were also completed 30 days after the last treatment and 6 months later. For the control group, the questionnaire and the numerical scale were also completed after the crossover. The questionnaires were filled in without the assessor being present.

Statistical analysis

To test the effects of experimental treatment over the Time, a repeated-measures one-way ANOVA was performed. The same analysis was completed to test the cross-over effect in the control group. When a main effect of Time was observed for the experimental group, *post hoc* comparisons were performed using Tukey tests. A t-test for independent samples was used to compare the perceived improvement percentage between the control and experimental groups after 15 treatments. For all analyses statistical significance was set at $p < 0.05$.

Results

All 55 participants received the initial fifteen treatments and completed the questionnaires as intended. Fifty-five patients were randomly assigned to one of the two treatment groups. The t-test showed no statistically significant difference between the two groups' baseline characteristics (see Table 2).

The experimental group symptoms and functional status scale questionnaire mean scores (and standard deviations) were 33.5 (SD, 10.3) at baseline; 18.6 (SD, 7.0)

Table 2 *Baseline characteristics of the experimental and control groups. ( ) = SD*

Group	N	Gender	Age	Symptoms duration (years)	Disability score
Experimental	37	11M; 26F	46 (6.7)	4.3 (2.9)	33.5 (15.2)
Control	18	10M; 8F	47 (7.2)	2.4 (3.1)	36.3 (10.2)

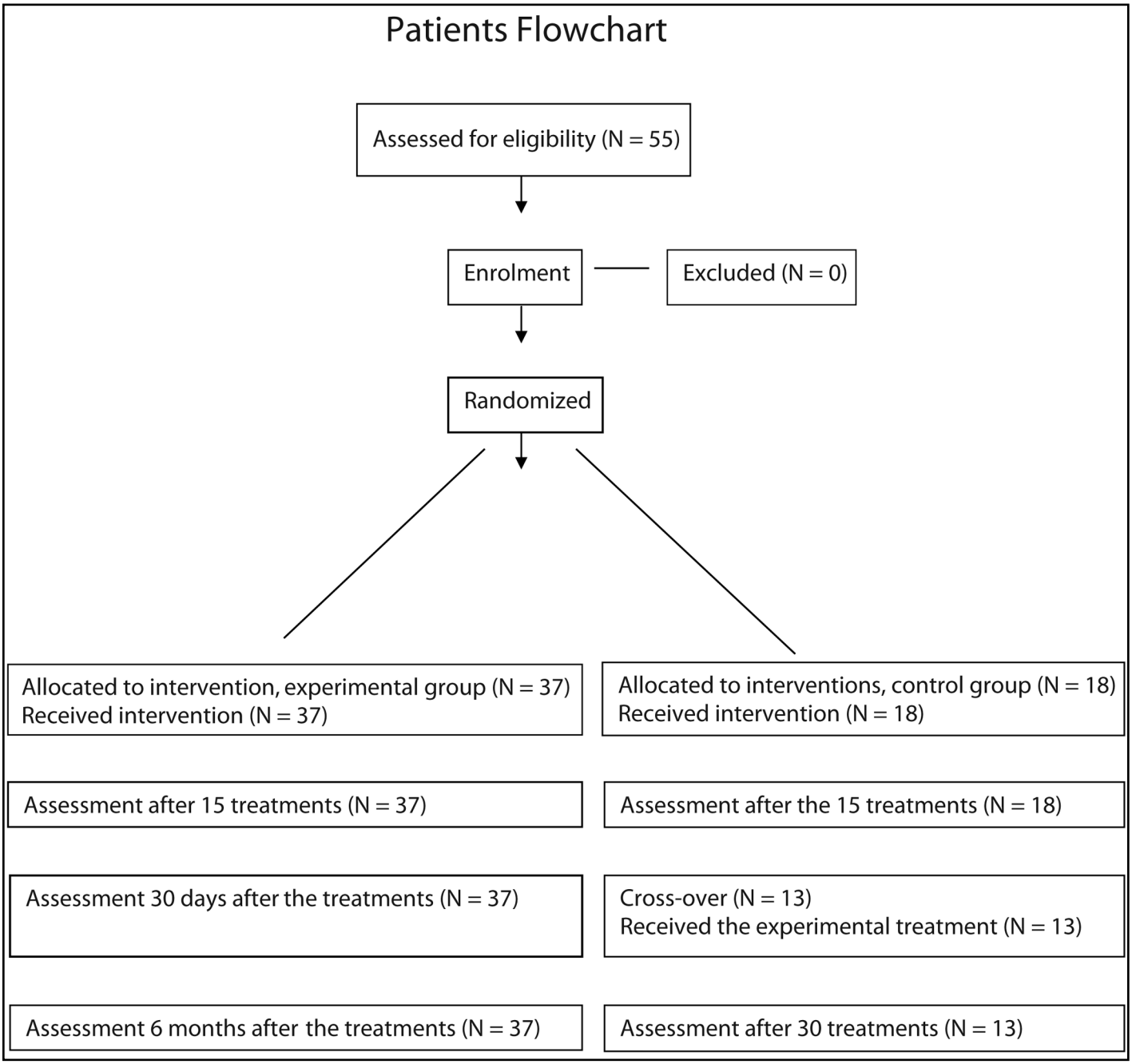

Table 3 *Mean (SD) improvement in severity of symptoms and functional status (%).*

	15 treatments	30 days after treatments	6 months after treatments	15 control plus 15 experimental treatments
Experimental (N = 37)	42 (21)	45 (21)	36 (23)	
Control (N = 18)	26 (18)	_	_	48 (15)

Table 4 *Mean (SD) score from the perceived improvement numerical scale (%).*

	15 treatments	30 days after treatments	6 months after treatments	15 control plus 15 experimental treatments
Experimental (N = 37)	67 (26)	67 (30)	56 (35)	
Control (N = 18)	50 (25)	_	_	75 (21)

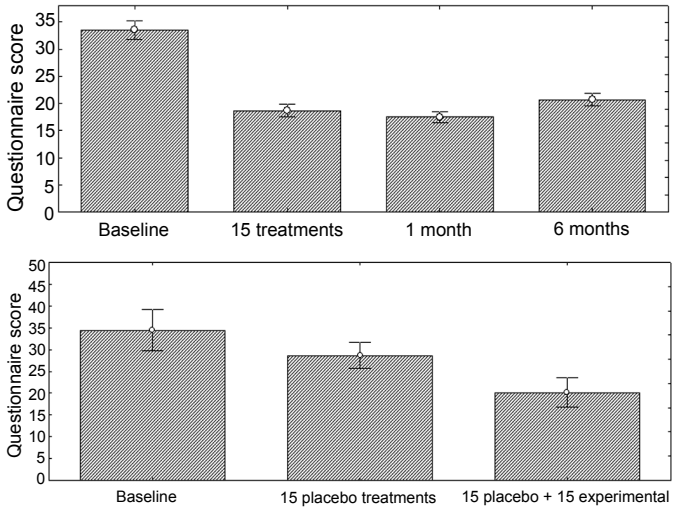

Figure 2 *Mean (SE) symptoms and functional status scale questionnaire scores for the experimental and control groups throughout the trial. The top set of bar graphs is for the experimental group and the bottom is for the control group.*

after 15 treatments; 17.5 (SD, 6.1) thirty days following the last treatment, and 20.7 (SD, 7.4) at 6 months. The experimental group maintained a significant reduction in the symptoms and functional status scale questionnaire scores at both follow-up evaluations (One-way ANOVA: $F(3, 108) = 39.2$, $p < 0.0001$). Conversely, the repeated-measure ANOVA yielded a significant decrease for the control group only after the cross-over: 36.3 (SD, 15.2) at baseline; 26.4 (SD, 9.9) after 15 placebo treatments; and 20.2 (SD, 12.2) after the cross-over (One-way ANOVA: $F(SD, 2, 24) = 10.1$, $p < 0.001$). Figure 2 illustrates the symptoms and functional status scale questionnaire changes in both groups throughout the trial. Mean (SD) improvement in the symptoms and functional status scale questionnaire are presented in Table 3.

A significant difference ($p < 0.021$) was noted between the two groups regarding the perceived improvement scores after 15 treatments. The mean perceived percentage of improvement was 67 (26) and 50 (25) for the experimental and control groups respectively. Table 4 presents the mean scores from the perceived improvement numerical scale for both groups throughout the experiment.

Discussion

In this study, patients' symptoms associated with CTS improved in the majority of patients who received ischemic compression therapy in the axilla of the shoulder, the length of the biceps, at the bicipital aponeurosis and at the pronator teres muscle. The data from the two questionnaires showed an improvement in both groups, but the improvement was significantly greater in the experimental group than in the control group. Moreover, a significant reduction in pain and improved functional status were noted after the crossover (75% improvement) when the participants in the control group received the

experimental treatment. Even though the study protocol included 15 treatments, many patients (89%) in the experimental group reported improvement within six treatments. They either said so spontaneously or when asked by the clinician during the 6th visit. In this study, only ischemic compression therapy was used, but one may suppose that the results could be improved if such therapy was combined with ergonomic recommendations per se.[23] No side effects were reported during the treatments, except for a slight sensitivity reported by a small number of patients after the first few treatments.

The most pathognomonic symptom of myofascial pain syndrome is the presence of pressure-sensitive palpable nodules that reproduce the chief complaint: they are called trigger points.[24] These TrPs may be located in muscles, ligaments, tendons, fascias and articular capsules.[25] Ischemic compressions are amongst the most popular methods of treatment used by chiropractors for patient care of the myofascial pain syndrome. The National Board of Chiropractic Examiners 2005 Job Analysis reported that over 91% of chiropractors use trigger point therapy for passive adjustive care.[26]

Overuse of the biceps can cause myofascial irritations and subsequent hypertonicity. Gerwin[22] claims that a myofascial trigger point refers to a zone of intense pain in a hardened muscle band that triggers pain when mechanically stimulated by plucking it manually. He added that there is a segmental hyper-contraction within the muscle fiber. The present authors speculate that the hypertonicity of the biceps, pronator teres and subscapularis muscles can irritate the median nerve and may cause local oedema. Consequently, the nerve may be pinched when it runs through the narrow space of the carpal tunnel, and this would result in numbness and impairment of distal motor and sensory functions. The longer this process lasts (months-years), the more severe the neuropathy becomes, causing muscular weakness in the hand. We would argue that eliminating the TrPs along the median nerve relaxes the muscles and removes a source of irritation to the median nerve.

The treatment of the whole median nerve was used effectively in a case study by Leahy.[7] The median nerve may be damaged along its whole length, from its root, between the cervical vertebrae, down to and including the wrist.[8] According to Bonebrake et al.,[27] conservative treatment of CTS is intended to lessen muscular and fibrous restriction. In their study, treatment was applied along the whole median nerve and, amongst other techniques, they used ischemic compression. In a recent trial by George,[28] five patients suffering from CTS were treated three times weekly for two weeks using the Active Release Technique (ART) with a protocol designed to affect the median nerve. Using the Boston Questionnaire, they concluded that ART offered a significant reduction of the symptom severity and improvement of the functional status of the patients.

Davis[29] published a randomized clinical trial that showed a significant improvement in CTS syndrome amongst the patients. Myofascial massage along the median nerve was used with the chiropractic group but, since there were other modalities involved, the authors could not assess which was the active component of their intervention.

Limitations of the study

The total number of participants was small and there were only two treating chiropractors. The number of patients in the control group was small, compared with the number of those in the treatment group. The reason for this was that the treating clinicians found it difficult to construct a practice-based study that provided a group with what they considered would be a near placebo treatment. There was only a short-term follow-up comparison of the two group results and therefore it is unclear whether the results reported in this study would persist beyond the point of treatment cessation. The compression sites treated by the clinicians were considered very important on the basis of clinical experience, though very few others have treated these sites in the context of carpal tunnel syndrome. Finally, the control group was crossed over immediately after the 15 initial control treatments. In the absence of a wash-out period, a potential nonspecific effect of the placebo intervention could have carried over into the active treatment period among those patients who did participate in the crossover portion of the study.

Conclusion

This practice-based (pragmatic) clinical trial suggests that myofascial therapy using ischemic compression along the biceps, at the bicipital aponeurosis, at the pronator teres and at the subscapularis muscles could be a useful approach to reducing symptoms associated with the carpal

tunnel syndrome. Patients' perceived improvement in functional capacities persisted over a six-month period. This last observation is based only on the before-and-after analysis of within group data. Future research on CTS should include a larger number of participants, a parallel placebo treatment group and long-term assessments.

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Femoroacetabular impingement syndrome: a narrative review for the chiropractor

Peter Emary, BSc, DC*

Objective: *To familiarize the chiropractic clinician with the clinical presentation, radiographic features, and conservative versus surgical treatment options for managing femoroacetabular impingement (FAI) syndrome.*

Background: *FAI syndrome is a relatively new clinical entity to be described in orthopedics, and has been strongly linked with pain and early osteoarthritis of the hip in young adults. Hip joint radiographs in these patients often appear normal at first—particularly if the clinician is unfamiliar with FAI. The role of conservative therapy in managing this disorder is questionable. Surgical treatment ultimately addresses any acetabular labral or articular cartilage damage, as well as the underlying osseous abnormalities associated with FAI. The most commonly used approach is open surgical hip dislocation; however, more recent surgical procedures also involve arthroscopy.*

Conclusion: *In FAI syndrome—a condition unknown to many clinicians (including medical)—chiropractors can play an important role in its diagnosis and referral for appropriate management.*
(JCCA 2010; 54(3):164–176)

KEY WORDS: acetabulum/abnormalities, femoral neck/abnormalities, osteoarthritis, hip joint

Objectif : *Familiariser le chiropraticien clinicien avec la présentation clinique, les caractéristiques radiographiques, et les options de traitement conservateur par opposition aux traitements chirurgicaux dans la gestion du syndrome du conflit fémoroacétabulaire.*

Contexte : *Le syndrome du conflit fémoroacétabulaire est une entité clinique dont la description orthopédique est relativement récente et qui a été fortement mise en lien avec la douleur et l'arthrose précoce de la hanche chez les jeunes adultes. Des radiographies de l'articulation de la hanche de ces patients apparaissent souvent normales a priori, surtout lorsque le clinicien n'est pas familiarisé avec le syndrome du conflit fémoroacétabulaire. Le rôle d'une thérapie conservatrice dans la gestion de ce trouble est discutable. Le traitement chirurgical aborde ultimement tout dommage du cotyle labial ou du cartilage de l'articulation, en plus des anormalités osseuses sous-jacentes associées au syndrome du conflit fémoroacétabulaire. L'approche la plus communément employée est la luxation chirurgicale effractive de la hanche. Toutefois, des procédures chirurgicales récentes emploient également l'arthroscopie.*

Conclusion : *En ce qui concerne le syndrome du conflit fémoroacétabulaire, un trouble inconnu de plusieurs cliniciens (y compris le personnel médical), les chiropraticiens peuvent jouer un rôle important sur le plan du diagnostic et du renvoi vers une gestion convenable.*
(JCCA 2010; 54(3):164–176)

MOTS CLÉS : acétabulum/anormalités, col fémoral/anormalités, arthrose, articulation de la hanche

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Introduction

Femoroacetabular impingement (FAI) is now widely recognized as a major cause of pain and early osteoarthritis (OA) of the hip in young adults.[1–7] The pathomechanics of this disorder involve abutment of the proximal femur (i.e. head-neck junction) against the acetabular rim during end-range hip motion (Figure 1). Inside the joint, repetitive impingement can damage the acetabular labrum, the adjacent cartilage, or both. Plain film radiographs may appear normal at first; however, careful inspection will often uncover subtle osseous abnormalities. There are two distinct types—cam and pincer—although, many patients have a combination of both (Figure 2).[2] The cam (or "pistol-grip") deformity is known to be associated with femoral neck fractures, slipped capital femoral epiphysis (Figure 3), and Legg-Calvé-Perthes' disease.[8–10] The etiology of most FAI-causing abnormalities, however, has not been identified.[3]

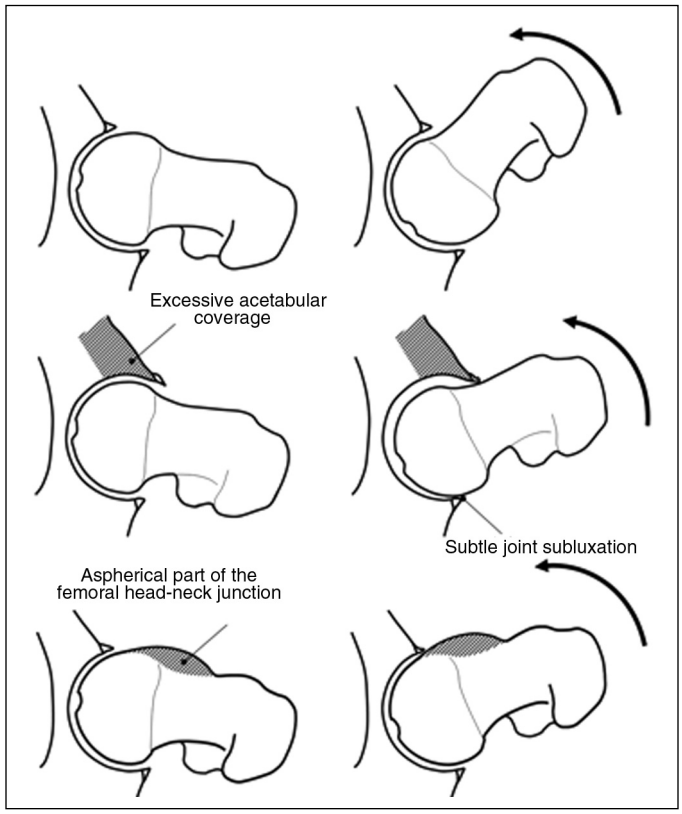


Figure 1 Femoroacetabular impingement. *Normal configuration of the hip with sufficient joint clearance allows unrestricted range of motion (top). Excessive acetabular coverage leads to early linear contact between the femoral head–neck junction and acetabular rim, resulting in labrum degeneration and significant cartilage damage. The posteroinferior portion of the joint can be damaged (i.e. contrecoup lesion) due to subtle subluxations (centre). With abnormal morphology of the proximal femur, the aspherical portion of the femoral head–neck junction is jammed into the acetabulum (bottom)*
(Source: Reprinted with permission M. Tannast, K.A. Siebenrock, S.E. Anderson, Femoroacetabular Impingement: Radiographic Diagnosis—What the Radiologist Should Know, *AJR Am J Roentgenol*, 188(6), p. 1541, © 2007 American Roentgen Ray Society.)

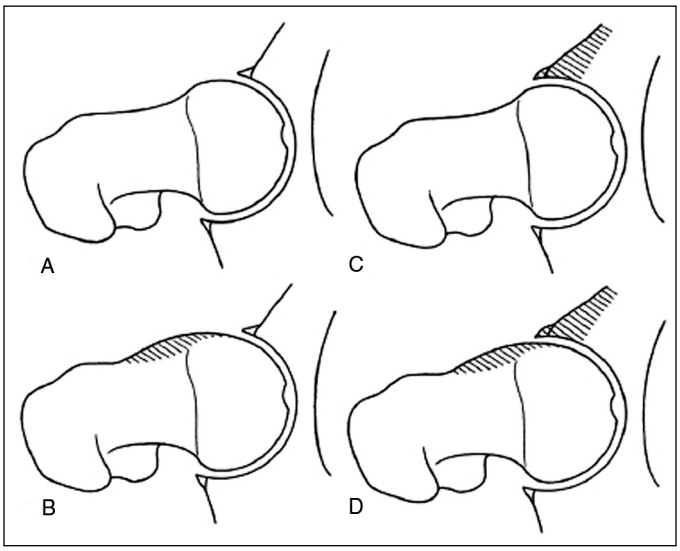
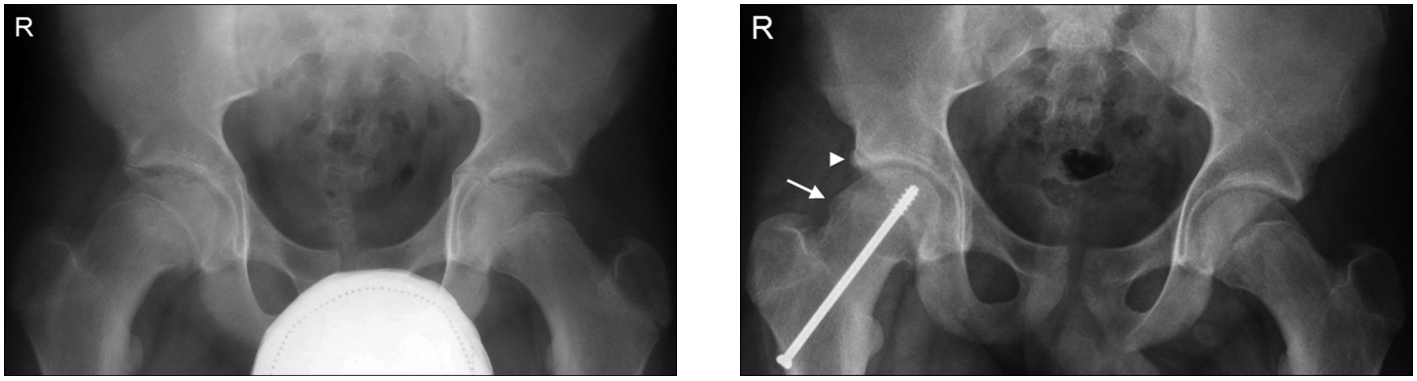


Figure 2 Impingement types. *Diagram showing a normal acetabular fossa along with the typical concavity of the anterolateral femoral head-neck junction (A), the aspherical femoral head/convex anterolateral head-neck junction in the cam-type deformity (B), excessive acetabular coverage in the pincer-type (C), and mixed cam and pincer (D).*
(Source: Reprinted with permission from M. Lavigne, J. Parvizi, M. Beck, K.A. Siebenrock, R. Ganz, and M. Leunig, Anterior Femoroacetabular Impingement Part I. Techniques of Joint Preserving Surgery, *Clin Orthop,* 418, p. 62, © 2004 Lippincott Williams & Wilkins.)

Figure 3A and 3B Slipped capital femoral epiphysis (SCFE) and the "pistol-grip" deformity. *AP pelvic radiographs of a 16-year-old male patient showing a right-sided SCFE (A), and a cam-type (or pistol-grip) deformity (arrow) of the same hip, along with an os acetabulum (arrowhead), after two year follow-up from in situ surgical pinning (B).*



Chiropractors frequently see patients who present with hip pain that may be associated with FAI. Presented here is a review of its typical clinical and radiographic features, conservative and surgical treatment options, as well as a discussion on the role chiropractors can play in managing this disorder.

Clinical Presentation

FAI syndrome presents most often in athletes of sports requiring forceful and repetitive hip flexion, internal rotation, and adduction (e.g. ice hockey, soccer, martial arts, ballet).[5–7] The cam-type is most common in young men between the ages of 20–30; whereas, the pincer-type is more common in middle-aged women.[4] Initially, FAI symptoms are insidious and include intermittent groin pain, lateral trochanteric pain, or both.[1,6] As the acetabular labrum and articular cartilage degenerate, pain frequency increases. The chief complaint is a dull ache in the anterior groin, especially after prolonged sitting. Occasionally, a sharp or catching pain is felt during activity, indicating a tear of the acetabular labrum.[11] Examination may reveal the Trendelenburg sign (i.e. abductor weakness with full weight-bearing of the hip). Passive hip joint range of motion (ROM) is limited, and often painful, in flexion and internal rotation.[5] The hip impingement test elicits anterior groin pain in most patients (Figure 4).

Radiographic Features

Radiographic examination of FAI includes an anteroposterior (AP) pelvic view, and either a frog-leg (i.e. femur externally rotated) or axial cross-table lateral view (i.e. patient supine with the hip internally rotated 15°, and the central x-ray beam is horizontally angled 45° to the superior—from across the table—towards the inguinal fold).[12] The AP pelvic radiograph (with the hips internally rotated 15°) provides better visualization of the contour of the lateral femoral head-neck junction; whereas, the frog-leg[13] or axial cross-table[8] lateral view allows for assessment of the anterior femoral head-neck offset (i.e. distance between the widest diameter of the femoral head and most prominent part of the anterior femoral neck; Figure 5).

Cam Impingement

Cam FAI is characterized on radiographs by an aspheric femoral head with morphologic rounding (i.e. lack of concavity) of the anterolateral head-neck junction, creating a decreased femoral head-neck offset (Figure 6; see also Figure 5b).[14] Because of this abnormal morphology, hip flexion and internal rotation force the aspheric femoral head/convex head-neck junction into the anterosuperior acetabulum (see Figure 1, *bottom*), inducing compression to the cartilage and shear stress between it and the labrum. As a result, the majority of chondral and labral lesions in cam impingement are located anterosuperiorly.[1,2]

Cam-type abnormalities can be further quantified on radiographs with measurement of the alpha (α) angle (i.e. angle formed between a line drawn along the axis of the femoral neck, and a second line drawn connecting the

Figure 4 Hip impingement test. *The patient's hip is forcibly rotated internally, while in adduction and 90º of flexion. This manoeuvre approximates the anterolateral femoral head-neck junction with the anterosuperior acetabular rim, creating a shearing pressure on the acetabular labrum (or adjacent articular cartilage). A positive test produces anterior groin pain.*

centre of the femoral head to the anterior head-neck junction; see Figure 5). On the axial cross-table lateral view, an α-angle greater than 55º is a reliable indicator of cam impingement.[12,15] The α-angle can also be measured on the frog-leg lateral view to indicate cam FAI;[13] however, factors such as radiographic technique, patient positioning, and image quality make this view less reliable.[16]

Pincer Impingement

Pincer FAI is distinguished from the cam-type by the presence of either focal or generalized acetabular overcoverage of the femoral head (e.g. acetabular retroversion, coxa profunda; Figures 7 & 8).[12] The crossover sign (see Figure 7) has been validated as a reliable indicator of retroversion on conventional AP pelvic radiographs.[17] With hip flexion and internal rotation in pincer FAI, the femoral neck abuts against the anterosuperior acetabular labrum (which in this case acts as a buffer), compressing it into the articular cartilage and subchondral bone (see Figure 1, *centre*). As a result, chondral damage is restricted in pincer FAI to a narrow band along the acetabular rim.[1,2] Repeated microtrauma induces bone growth with subsequent ossification at the labral base.[2]

As with cam impingement, most chondral and labral lesions in the pincer-type are located at the anterosuperior acetabular rim. With persistent pincer impingement, however, the femoral head is chronically leveraged (or subluxated) posteroinferiorly into the acetabular fossa (see Figure 1, *centre)*. The increased pressure between the posteroinferior acetabulum and the posteromedial aspect of the femoral head can result in a 'contrecoup' lesion to the posterinferior acetabular cartilage.[1,2,12] This contrecoup lesion has been observed in the femoral head and the posteroinferior acetabulum in 62% and 31% of pincer FAI patients, respectively.[2]

Radiographic Pitfalls

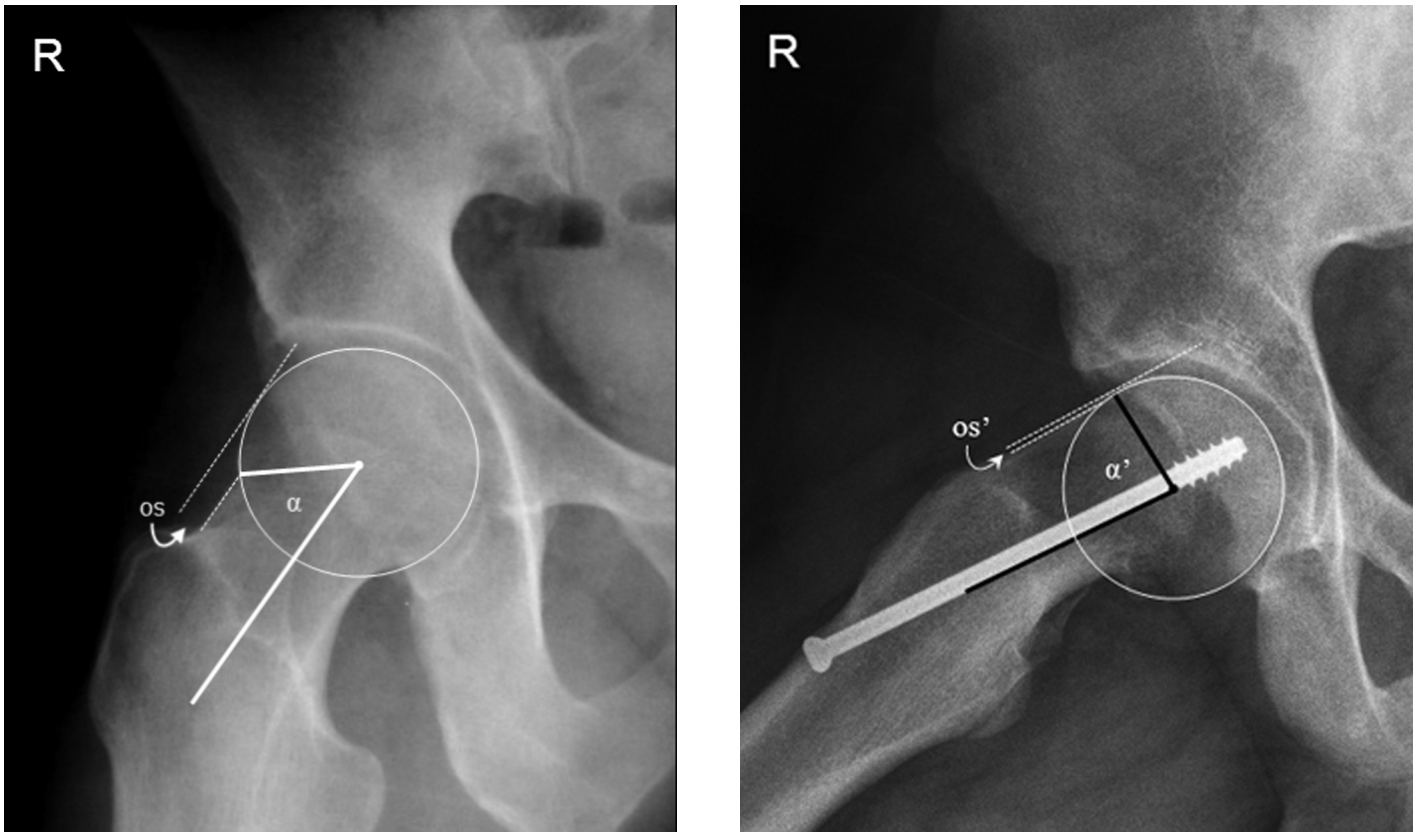
Chiropractors taking their own x-ray films must use good radiographic technique when examining patients. For example, without 15° of internal rotation on the AP pelvic view, normal hips can be incorrectly diagnosed with lateral cam impingement (Figure 9). When measuring for acetabular retroversion, improper patient positioning (e.g. pelvic rotation, improper pelvic tilt) on the AP pelvic radiograph can also lead to an apparent crossover sign, and overestimation of pincer impingement.[12,18] Conversely, if an AP hip joint radiograph is taken instead of an AP pelvis view, the crossover sign can be missed; thereby, leading to underestimation of pincer impingement.[12]

Many chiropractors will also find that in certain hips, it is difficult to distinguish between the anterior and posterior walls of the acetabulum. As a general rule, it is helpful to start from the inferior edge of the acetabulum where the posterior rim line can always be readily identified.[12] When in doubt, send the films to a chiropractic (or medical) radiologist for further review.

Secondary Radiographic Findings

Additional radiographic features of FAI may include an accessory ossicle along the superior acetabular rim (os acetabulum; see Figures 3 & 6), or herniation pits within the femoral neck (see Figures 6 & 8)—both historically viewed in chiropractic (and elsewhere) as normal skeletal variants.[19,20] In both cam and pincer FAI, the os acetabulum results from a reactive ossification of the acetabu-

Figure 5A and 5B Femoral head-neck offset and alpha angle. *(A) Right frog-leg radiograph of a 57-year-old female patient with a normal anterior femoral head-neck junction. The head-neck offset (os) and alpha angle (α) are indicated. (B) Right frog-leg, post-surgical radiograph (of the same patient in Figure 3) showing a small anterior femoral head-neck offset (os') and large alpha angle (α')—both characteristic of cam FAI.*



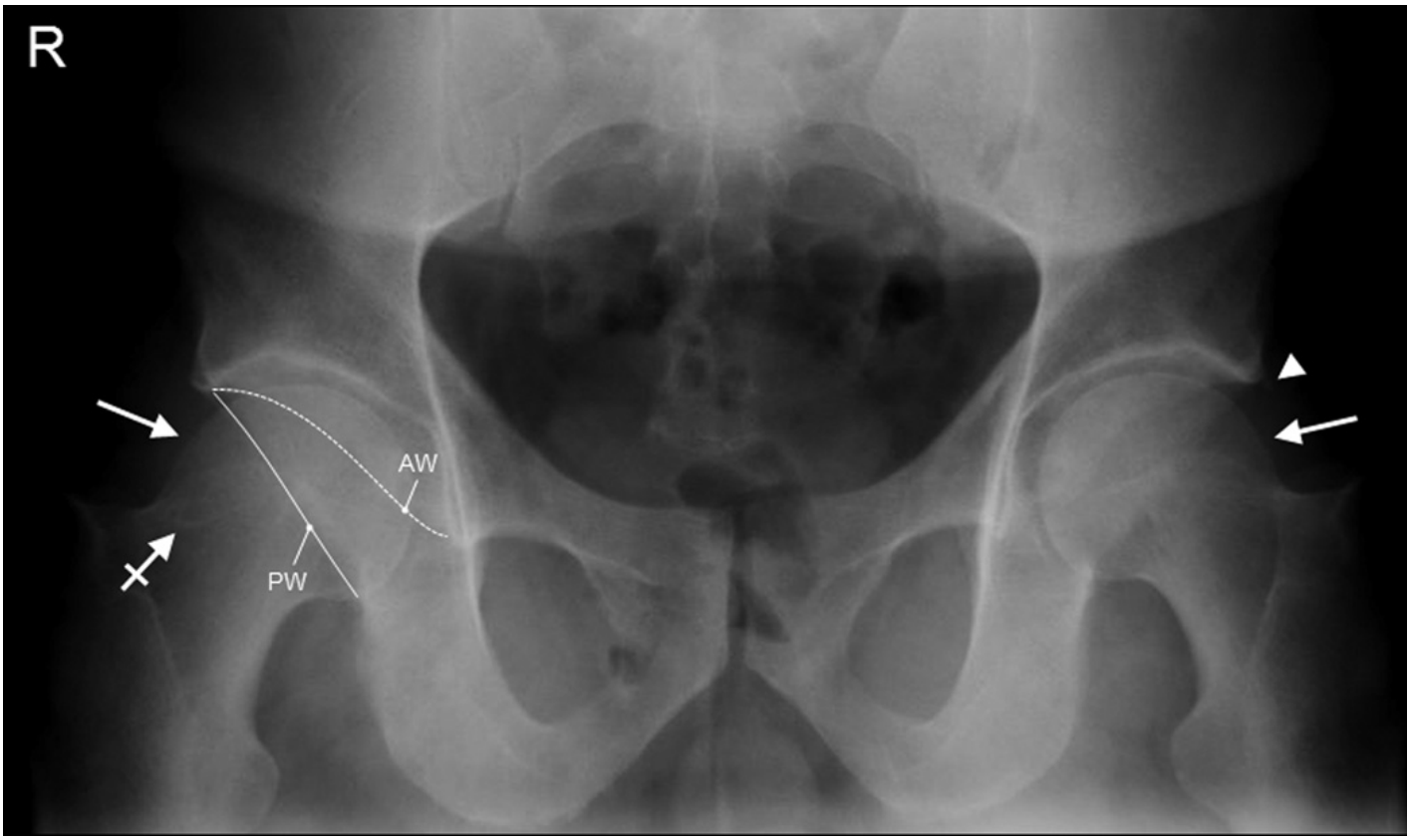
lar labrum because of chronic irritation (i.e. persistent FAI).[21] Any additional ossification or enlargement of this ossicle leads to further deepening of the acetabular fossa, worsening the impingement problem.

Femoral herniation pits (also known as "Pitt's pits") have been found in up to 33% of FAI patients.[22] Based on their histologic appearance and consistent location in the anterosuperior femoral neck, these intraosseous fibrocystic lesions are believed to be a result of recurrent FAI rather than an incidental finding in patients with hip pain. Therefore, chiropractors should be suspicious of FAI if an os acetabulum and/or femoral herniation pits are visualized on patient radiographs. It should be noted, however, that these secondary radiographic findings are not always associated with symptomatic hip impingement.

Magnetic Resonance Imaging

Subsequent to plain film, FAI is often further medically imaged with magnetic resonance imaging (MRI) arthrography (with gadolinium joint injection), and is used to confirm injury to the acetabular labrum or adjacent articular cartilage (Figure 10).[23] MRI is also useful in determining the α-angle and the femoral head-neck ratio.[15] In a retrospective study, Pfirrman et al.[24] found that patients with cam FAI had larger α-angles and chondral lesions at the anterosuperior femoral head-neck junction, as well as osseous bump formation at the femoral neck—when compared to those with pincer FAI. The latter were found to have more pronounced chondral and labral lesions posteroinferiorly, along with greater acetabular depth.

Figure 6 Cam FAI. *AP pelvis radiograph of a 47-year-old male patient with bilateral cam-type FAI (arrows). Note the herniation pit within the superolateral femoral neck on the right (crossed arrow), and the small ossicle (os acetabulum) along the superior acetabular rim on the left (arrowhead). A normal anteverted acetabulum is highlighted on the right, where the anterior wall (AW) projects medial to the posterior wall (PW).*

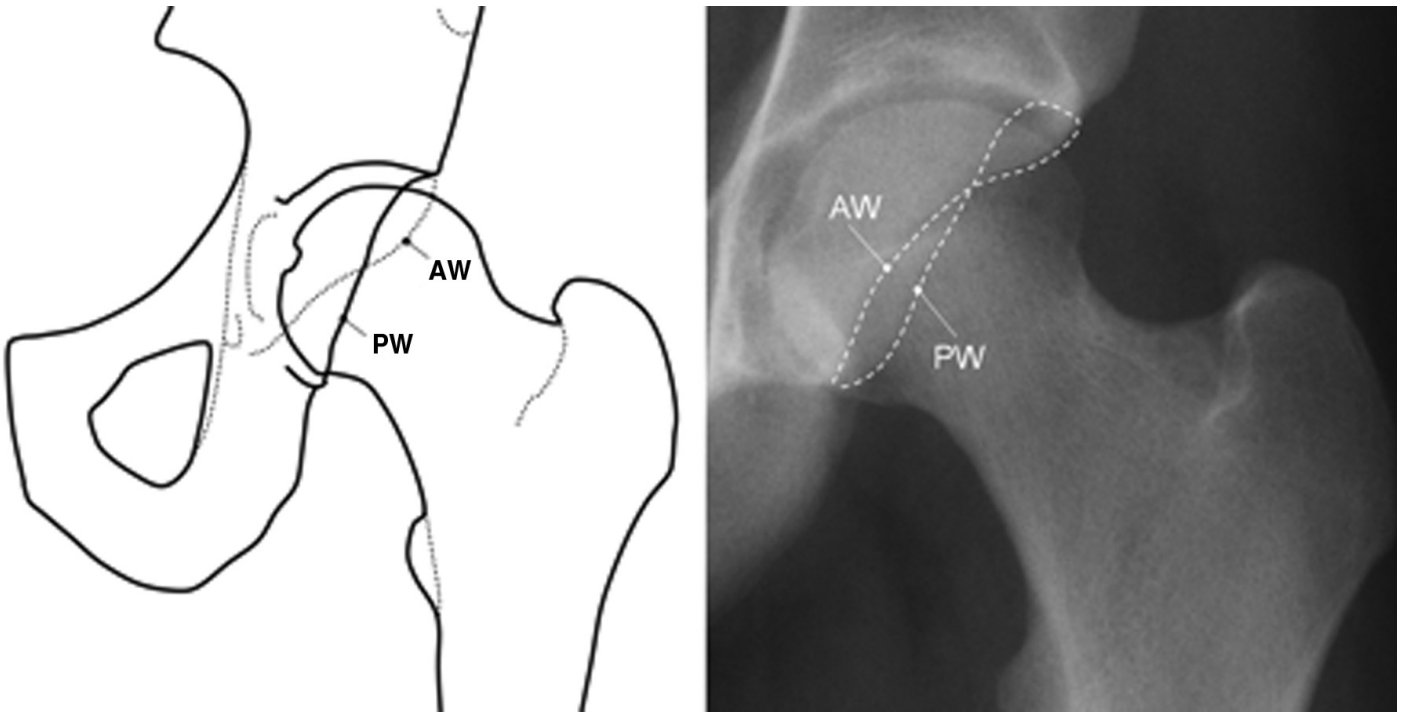


In comparison to plain film, Dudda et al.[25] found MR arthrography (with radial slices in the axis of the femoral head-neck junction) to be more sensitive in the assessment of the α-angle and femoral head asphericity; standard AP pelvis and lateral cross-table radiographic views resulted in underestimation of these parameters in 34.6% of patients. Clohisy et al.[26] also found limited reliability with many of the standard plain film radiographic parameters used in diagnosing FAI; however, in order to better simulate the clinical setting (of radiographic interpretation), x-ray parameters in this study were subjectively assessed rather than exact measurements made. For MRI, Nouh et al.[27] also showed that subjective evaluation of the α-angle in cam FAI is inaccurate, and clinical experience does not seem to help radiologists "eyeball" this angle any better. Conversely, other studies using objective rather than subjective impingement markers have shown good reliability for both plain film[13,28,29] and MRI.[30] To the chiropractor, the diagnosis of FAI syndrome should not rely on radiographic findings alone; of equal (if not greater) importance are the patient history and physical examination.

Conservative Treatment

As with any musculoskeletal condition, FAI warrants an initial trial of conservative therapy including rest, activity modification, NSAIDs, physiotherapy (or chiropractic), and if needed, corticosteroid injections.[7,31] Initial treatment must include temporarily limiting or stopping the

Figure 7 Focal acetabular over-coverage. *Acetabular retroversion is visualized on AP pelvic radiographs by carefully tracing the anterior (AW) and posterior (PW) walls of the acetabular fossa to form the 'crossover sign.' A normal acetabulum is anteverted with the anterior rim projecting medial to the posterior rim (see Figure 6). In a retroverted acetabulum, the anterior rim projects lateral to the posterior rim proximally and crosses over in a medial direction distally.* (Source: Reprinted with permission M. Tannast, K.A. Siebenrock, S.E. Anderson, Femoroacetabular Impingement: Radiographic Diagnosis – What the Radiologist Should Know, *AJR Am J Roentgenol*, 188(6), p. 1545, © 2007 American Roentgen Ray Society.)



aggravating activities (e.g. ice hockey, running). Treatment can also address hip flexor tightness, which is often associated with hip impingement.[7] Conservative approaches may be effective in the short-term for relieving acute pain, but they do not address the underlying osseous abnormalities of FAI. If the patient returns to sports activity, the symptoms will likely return.

Chiropractic treatment focusing on stretching and manipulation/mobilization of the FAI hip to improve passive ROM may actually exacerbate the condition. More importantly, Leunig et al.[3] believe that delay in the surgical correction of symptomatic patients with clinical and radiographic evidence of FAI (including MRI findings of labral or chondral damage) may lead to disease progression—to the point where joint preserving surgery is no longer indicated.

Surgical Treatment

In symptomatic patients *without* advanced hip OA, the main goals of surgery are to improve clearance for hip motion and alleviate the femoral impingement against the acetabular rim. In 'open' hip surgery for patients with cam impingement, the hip joint is openly dislocated and the thickened anterolateral femoral neck/aspherical head is trimmed (via resection osteoplasty), restoring the normal concavity of the femoral head-neck junction.[31] For pincer impingement, the focal or global acetabular over-coverage is addressed by trimming the acetabular rim, or

Figure 8 General acetabular over-coverage. *AP pelvic radiograph of a 43-year-old female patient with bilateral pincer-type FAI. General acetabular over-coverage is characterized by a deepened acetabular fossa. In this case, bilateral coxa profunda is evident, and highlighted on the right, with the medial floor of the acetabular fossa (AF) overlapping the ilioischial line (IIL – a line drawn tangentially along the margin of the pelvic inlet and outer border of the obturator foramen; in protrusio acetabuli, the femoral head crosses this line). Note also the large herniation pits located within the superolateral femoral head-neck junction, bilaterally (arrows).*

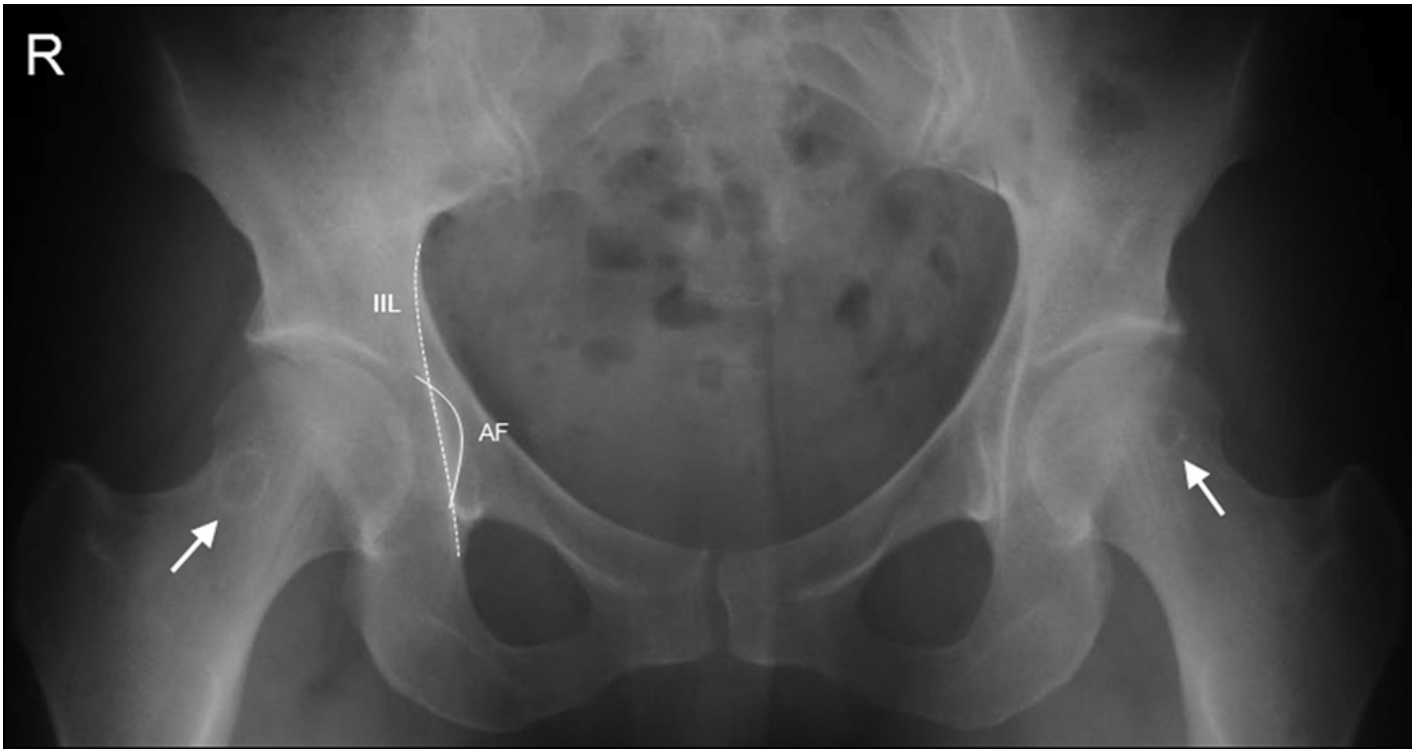
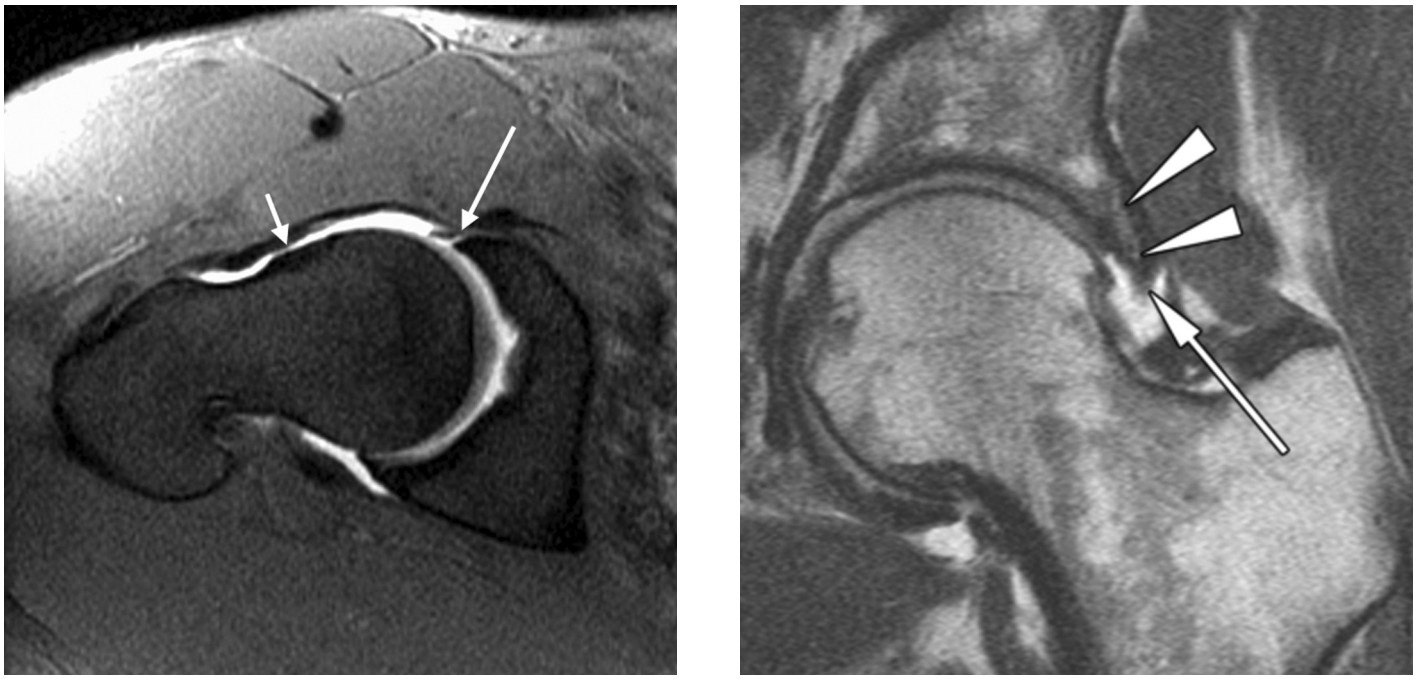


Figure 9A and 9B 'Pseudo' pistol-grip deformity. *AP pelvic radiographs of a 37-year-old male patient without the femurs internally rotated 15° (A) – giving the appearance of a 'pseudo' pistol-grip deformity on the right (arrow), and with the femurs internally rotated 15° (B) – clearly showing the concavity of a normal lateral head-neck junction (crossed arrow).*

Figure 10A and 10B MR arthrography in FAI. *(A) Oblique sagittal fat-saturated T1-weighted MR arthrographic image (600/8) of the hip in a patient with cam FAI. An abnormal anterior femoral head-neck offset (short arrow) and anterosuperior labral tear (long arrow) are shown.* (Source: Reprinted with permission A. Kassarjian, L.S. Yoon, E. Belzile, S.A. Connolly, M.B. Millis, W.E. Palmer, Triad of MR Arthrographic Findings in Patients with Cam-Type Femoroacetabular Impingement, *Radiology*, 236(2), p. 592, © 2005 RSNA.) *(B) Coronal spin-echo sequence T1-weighted MR image (524/14) showing ossification of the acetabular labrum in a patient with pincer FAI. Bone marrow signal (arrowheads) extends into the substance of the acetabular labrum (arrow).* (Source: Reprinted with permission C.W.A. Pfirrman, B. Mengiardi, C. Dora, F. Kalberer, M. Zanetti, J.Hodler, Femoroacetabular Impingement: Characteristic MR Arthrographic Findings in 50 Patients, *Radiology*, 240(3), p. 784, © 2006 RSNA.)



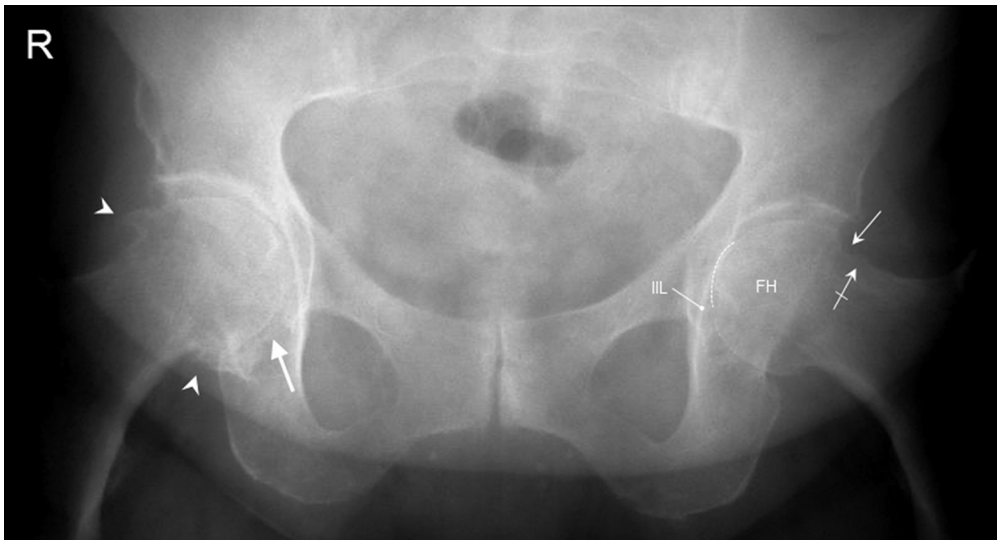
by reorientation of a retroverted acetabulum (via periacetabular osteotomy).[31,32] Less invasive surgical approaches utilizing arthroscopy are also evolving.[33] This is an attractive alternative to patients, particularly professional athletes, because arthroscopy involves smaller incisions, a shorter recovery time, and a lower morbidity rate.[34] Surgery must, however, address both the labral or cartilage lesions along with the underlying osseous abnormalities causing the FAI; otherwise, the impingement problem may continue, leading to persistent pain and possible progressive hip joint degeneration (Figure 11).

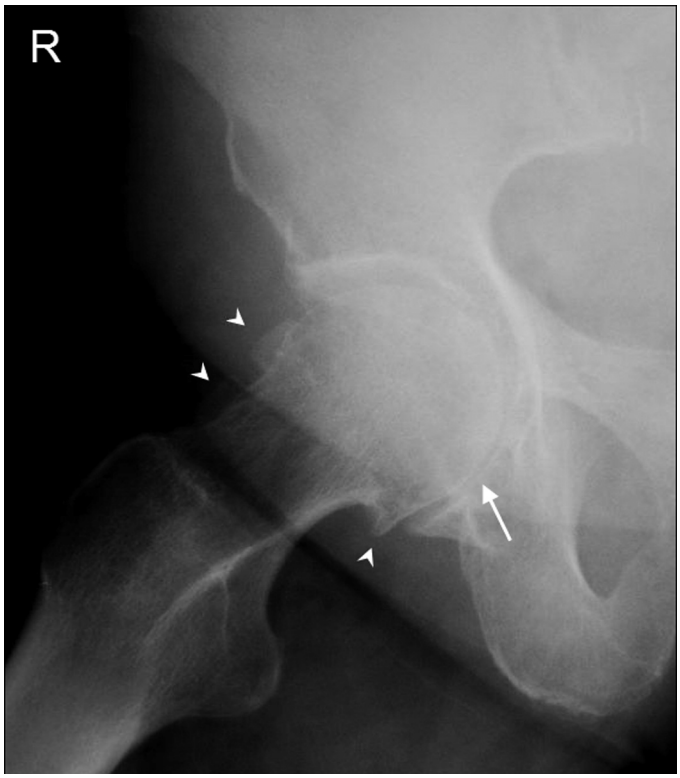
Early and mid-term results from the open surgical hip procedures are promising, with good to excellent clinical outcomes in approximately 70–80% of patients.[35–37] In patients with advanced OA of the hip joint, or in those where joint preserving surgery fails, total hip replacement (i.e. arthroplasty) is the treatment of choice. Post surgical rehab of FAI typically includes the use of a continuous passive motion device (with hip flexion limited to 70º) for the first 2–3 weeks, in order to facilitate early ROM and prevention of capsular adhesions.[31] Toe-touch weight-bearing while in crutches (for approximately eight weeks) is also prescribed. Albeit small, hip surgery carries risks including infection, thromboembolism, heterotopic ossification, and neurovascular damage.[5]

Discussion

Despite the dramatic increase in recent literature on FAI

Figure 11A and 11B End-stage hip degeneration in FAI. *AP pelvis (A) and frog-leg right hip (B) radiographs of an 80-year-old female patient with bilateral pincer FAI, and severe right hip joint OA. Note the posteroinferior (i.e. contrecoup) joint space narrowing (arrow) and multiple osteophytes (arrowheads) on the right; coxa profunda is also evident. Protrusio acetabuli is evident and highlighted on the left, with the femoral head (FH) overlapping the ilioischial line (IIL). Note also the linear indentation (small arrow) and reactive cortical thickening (small crossed arrow) on the superolateral head-neck junction of the left femur.*





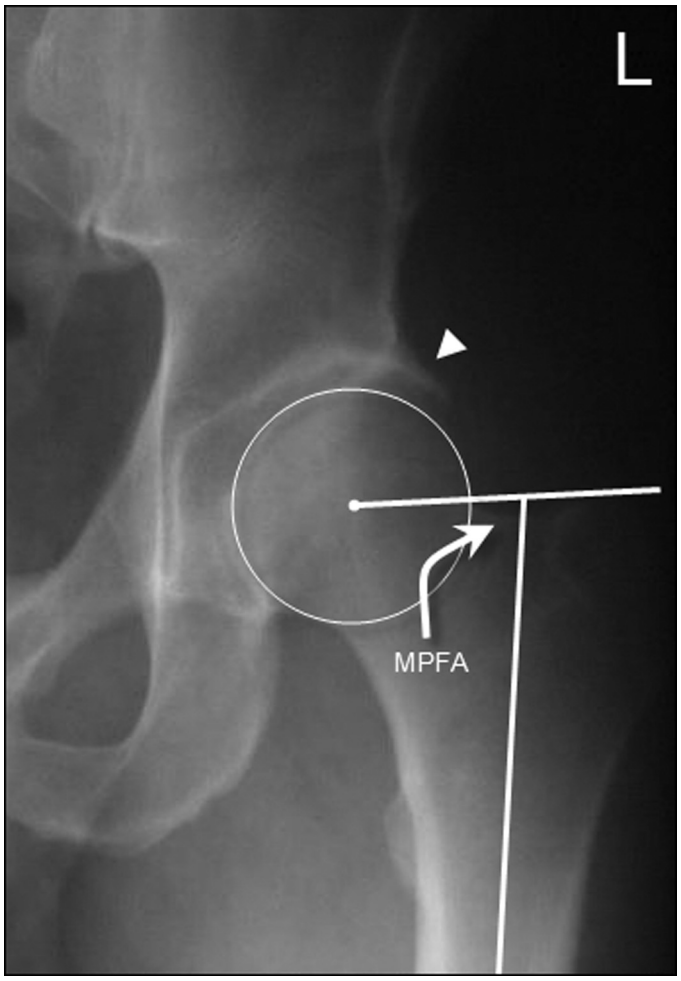


Figure 12 Medial proximal femoral angle (MPFA). *AP radiograph of the left hip joint (in a 36-year-old male patient) showing the modified MPFA. A line is drawn from the superior tip of the greater trochanter through to the centre of the femoral head. A second line is drawn (representing the anatomical axis of the proximal femur) from the midpoint of the most distally visible aspect of the femoral shaft, and up proximally through the piriformis fossa. The medial angle formed by these two lines is the MPFA (normal range = 80º to 89º). Note the ossification of the lateral acetabular labrum (arrowhead), resulting in pincer FAI.*

and its association with hip pain and OA, very little information is available regarding its natural history.[3] This presents a challenge to chiropractors when offering clinical recommendations to patients. For instance, will every patient with radiographic evidence of FAI—regardless of symptoms—progress to end-stage hip OA, and should therefore, be referred for joint preserving surgery? In a recent study, Bardakos and Villar[38] examined AP pelvic radiographs of 43 patients with a pistol-grip deformity of the femur, and mild or moderate OA of the hip. After ten-year follow-up, progression of OA was observed in 28 of the 43 patients. In other words, hip OA in one-third of these patients did not progress. Of those who did, the most important risk factors found were a lower medial proximal femoral angle (MPFA), an indication of coxa vara (Figure 12), and the presence of the 'posterior wall' sign (i.e. posterior acetabular wall projects medial to the femoral head centre—indicating retroversion). The authors of this study suggest that a reduced MPFA in cam femurs may lead to hip abductor dysfunction, and that this biomechanical imbalance—especially when combined with pincer impingement—may contribute to OA progression in FAI patients.

In the current literature, surgical treatment of FAI has been shown to be most successful in the absence of advanced degenerative OA.[3] It is still unclear, however, whether 'preventative' surgery should be performed in asymptomatic patients, despite radiographic evidence of FAI.[4] Absence of symptoms in these cases may be due to lack of inciting activities, or FAI being at an early stage in its development. In symptomatic cases, a failure to resolve with conservative treatment warrants referral for MRI arthrography, and in the presence of labral or chondral damage, orthopedic surgical consultation. Chiropractors (or medical doctors) may, however, have difficulty finding a surgeon with experience in treating FAI, because it is still a relatively new entity within orthopedics.[6] Thus, practitioners in these situations will need to familiarize themselves with orthopedic surgeons specializing in hip joint preservation procedures, in order to make an appropriate patient referral.

Conclusion

FAI syndrome typically presents in young adults with insidious onset groin pain, often in association with sports activity. The hip impingement test is positive in most of these patients. Hip joint radiographs may appear normal at first—particularly if the clinician is unfamiliar with FAI. Plain films showing a cam (or pistol-grip) deform-

ity—especially in femurs with a reduced MPFA—combined with pincer FAI may indicate increased risk of OA progression. Chiropractors should also be aware of the Trendelenburg sign when examining FAI patients, as hip abductor weakness/dysfunction, if present, may be an additional risk indicator for progressive hip degeneration. More research is necessary, however, to determine the precise etiology and natural history of FAI syndrome. Nevertheless, chiropractors can play an important role in identifying patients with possible FAI syndrome, and in facilitating the appropriate management of this disorder.

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Trigeminal neuralgia and chiropractic care: a case report

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The following case describes a 68 year-old woman with a 7½ year history of worsening head and neck pain diagnosed as trigeminal neuralgia following surgical resection of a brain tumor. After years of unsuccessful management with medication and physical therapies, a therapeutic trial of chiropractic was carried out. Chiropractic care included ultrasound, manual therapies (manipulation and mobilization), soft tissue therapies, and home stretching exercises. After an initial treatment period followed by 18 months of supportive care the patient reported satisfactory improvement. It became evident that there were at least three sources of her symptoms: mechanical and/or degenerative neck pain, temporomandibular joint syndrome, and trigeminal neuralgia. While never completely pain-free, the patient continued to report that her pains reduced to minimal at times. At the most recent follow-up, the pain had not returned to pre-treatment intractable levels. This case study demonstrates the importance of diagnosing and treating multiple sources of pain and the positive role chiropractic care can have in the management of patients with these clinical conditions. The potential for convergence of sensory input from the upper three

Le cas suivant décrit une femme de 68 ans qui présente un historique de 7,5 ans de douleurs qui s'aggravent au niveau de la tête et du cou.Le diagnostic : névralgie essentielle du trijumeau à la suite d'une résection chirurgicale d'une tumeur cérébrale. Après des années de tentatives de gestion infructueuses au moyen de médicaments et de physiothérapie, elle a suivi un essai de traitements thérapeutiques chiropratique. Les soins chiropratiques reçus incluent des ultrasons, de la thérapie manuelle (manipulation et mobilisation), des thérapies de tissus mous et des exercices d'étirement à domicile. Après une période initiale de traitement suivie de soins de soutien pendant 18 mois, la patiente a rapporté une amélioration satisfaisante. Il est devenu évident que ses symptômes découlaient de trois sources : douleurs mécaniques ou dégénératives au cou, syndrome de l'articulation temporomandibulaire, et névralgie essentielle du trijumeau. Bien qu'elle ne soit toujours pas entièrement libre de douleur, la patiente continue à rapporter que ses douleurs sont minimales à certains moments. Lors du suivi le plus récent, la douleur n'était pas revenue aux niveaux réfractaires prétraitement. Cette étude de cas démontre l'importance du diagnostic et du traitement des sources multiples de douleur, ainsi que le rôle positif que joue les soins chiropratiques dans la gestion des patients qui présentent ces troubles cliniques. Le potentiel pour la convergence de l'apport sensoriel provenant des trois nerfs rachidiens cervicaux

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cervical segments and the trigeminal nerve via the trigeminocervical nucleus is discussed.
(JCCA 2010; 54(3):177–186)

KEY WORDS: trigeminal neuralgia, spinal nucleus, facial pain, neck pain, head pain, chiropractic

supérieurs et du nerf trijumeau par le biais du noyau trigéminocervical fait l'objet d'une discussion.
(JCCA 2010; 54(3):177–186)

MOTS CLÉS : névralgie essentielle du trijumeau, noyau rachidien, douleur faciale, cervicalgie, céphalalgie, chiropratique

Introduction

The International Association for the Study of Pain (IASP) defines Trigeminal neuralgia (TN) as a sudden, usually unilateral, severe, brief, stabbing recurrent pain in the distribution of one or more branches of the fifth cranial nerve.[1]

The lifetime prevalence has been reported at 107.5/1,000,000 for men and 200.2/1,000,000 for women, the incidence has been reported at ranging from 3.4–4.7/100,000 for men and 5.9–7.1/100,000 for women.[2] TN is roughly twice as common in females compared to males.[3,4] However, epidemiological research on TN is limited.

Based on its rarity, it has been estimated that the primary care physician would encounter this disease entity up to four times within a thirty-five year professional career.[5] Chiropractors will likely encounter TN with even less frequency. However, chiropractors may play a role in the management of TN through recognition, diagnosis, referral (when necessary), symptom monitoring and management.

The following case describes a patient with a long standing history of TN, neck and head pain.

Case

A 68 year old female presented with a 7½ year history of right-sided head and neck pain and parasthesia. In 1995, she had surgical resection of a brain tumor (meningioma). She had further resection in March, 2000 following a recurrence (See Figure 1). Ten days following the second surgery she developed severe facial and head pain. She was subsequently diagnosed with TN by her neurosurgeon. In the 7½ years since the onset of symptoms, her pain had gradually worsened. She had tried acupuncture, physiotherapy, pain medications and anti-seizure medications for pain control. Unfortunately, longer-term relief could not be obtained. She also experienced negative side-effects from several of the medications, including dry mouth, lethargy, and loss of concentration.

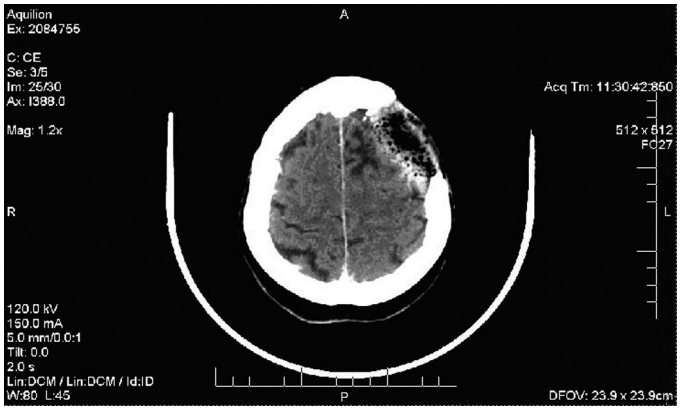


Figure 1 *Contrast enhanced computed tomography taken of patient in March, 2000 showing surgical site. Resection of a portion of the left cranium and underlying grey matter is observed*

Upon presentation to the chiropractor's office, her pains were constant, fluctuating between moderate and, at times, intractable levels. Head and facial pain and parasthesia had insidiously become progressively more severe over the previous few months and were now significantly impacting activities of daily living. She rated her pain at 10/10 on a numerical rating scale, "the worst pain she had ever experienced". She was seeking chiropractic care on the recommendation of a friend as a "last straw" in search of relief. She could not identify any precipitating or aggravating factors for her pains.

Although she was not considered suicidal, she said the pains were so severe that she could not take it anymore. Aside from this pain response, she was considered to have a normal psychosocial profile. She is married and lives at home with her husband, who runs his own business. She enjoys gardening in the summers and going to

the casino in the winters. Her children are grown and out of the house. She describes herself as a worrier, and has disturbed sleep as a result at times. She is a non-smoker, and infrequently drinks alcohol. She has hypertension and hypothyroidism, both of which are managed with medication. There was no family history of brain tumour or neuralgia.

Her pain was located over the right parietal and temporal regions of the head, and the lateral face including the cheek, mandible, and mouth. Pain was described variably, ranging from sharp, to deep, to electric like, to feeling like hot water or formication (bugs crawling on the skin). She also described painful and bumpy "lesions" on the inside of the mouth. In addition to the head and facial pains, she also had right-sided pain in both the upper and mid-cervical regions. There was no associated extremity or upper dorsal pain or paresthesia.

On examination, the patient stood with a straight spine on a level pelvis, without observable lateral curvatures to her spine. Slight anterior head carriage was apparent. Facial features were symmetrical without signs of paralysis. There was cranial asymmetry over the surgical site.

Neurological examination of the upper extremity, including motor power, deep tendon reflexes and sensation to light touch, was unremarkable. Cranial nerve screening tests were within normal limits, with the exception of an area of hyper-sensitivity over the face and hemicranium on the right. Light pressure over these regions produced severe pain, especially over the cheek, and less so over the scalp and jaw/anterior neck. Tongue pressure inside the right cheek produced pain to the right side of the face. There were no visible lesions inside the mouth.

Physical examination revealed tenderness upon digital palpation and segmental joint dysfunction of the right C0-1, C1-2 and C2-3 facet joints, and at the C5-6 joint bilaterally. Overlying spasm in the suboccipital and upper cervical paraspinal muscles was apparent. Palpation of the upper cervical paraspinal tissues referred pain to the lateral head and face. The right temperomandibular joint (TMJ) was tender to palpation as were the masseter, pterygoid and temporalis muscles. Cervical axial compression testing with and without rotation was positive for neck pain, but no dorsal or arm pain was produced. Right cervical rotation and extension were painfully restricted during range of motion testing and produced pain in the mid-upper cervical region that did not refer to the face or upper back. Other cervical ranges of motion were within normal limits.

Radiographs of the cervical spine, taken approximately 18 months prior to the initial visit to the chiropractor, showed a loss of the normal cervical lordosis and disc space narrowing with moderate osteophyte formation at the C5-6 and C6-7 levels. The neural foramina were narrowed bilaterally at C5-6 (See Figure 2). These age-related degenerative changes were expected, and were not considered directly related to her symptoms of TN.

The patient was diagnosed with upper cervical joint and muscle dysfunction, and OA of the mid-lower cervical spine. She was also told that TMJ dysfunction may be contributing to her symptoms. She was offered a course of manual therapy consisting of soft-tissue therapy and joint mobilization/manipulation to the cervical spine. It was also recommended that she perform cervical spine lateral flexion exercises at home. It was explained to her that the cervical dysfunction could be related to the symptoms of TN, or could be a separate entity altogether. The trial of therapy was to consist of two-to-three treatments per week for about two-to-four weeks, after which she would be reassessed. As it was just before the Christmas holiday, it was suggested she do a series of stretches for a week or two and return for treatments after the holidays. She was treated with ultrasound (3 minutes pulsed, 1.9 watts/cm^2) over the upper cervical joints on the right, mobilization (rotary and lateral flexion impulses, and manual intermittent long axis traction) and soft tissue therapy (long-fibre and cross-fibre massage). She was shown again how to perform the stretches at home, and released.

The patient returned one week later and was very excited about the relief she had obtained. She reported a 50% improvement that started within a day or two after the first session. She reported her symptom improvement verbally using a scale of 1–10 (or 0–100%), with no improvement being 0 and all better being 10 (or 100%). It was explained to her that this immediate relief was not uncommon, and that time would tell if the relief would be sustained. She was treated again in the same manner, and released until after the New Year holiday. One week later she returned to start the recommended course of therapy. Some of her symptoms (lateral face/chin tenderness and electric "shock-like" pains) had returned, but not to the same intolerable level.

In the following three weeks the patient received six

Figure 2 *Five view cervical spine radiographic series taken approximately 18 months prior to initial chiropractic visit showing degenerative changes at C5, C6 and C7.*

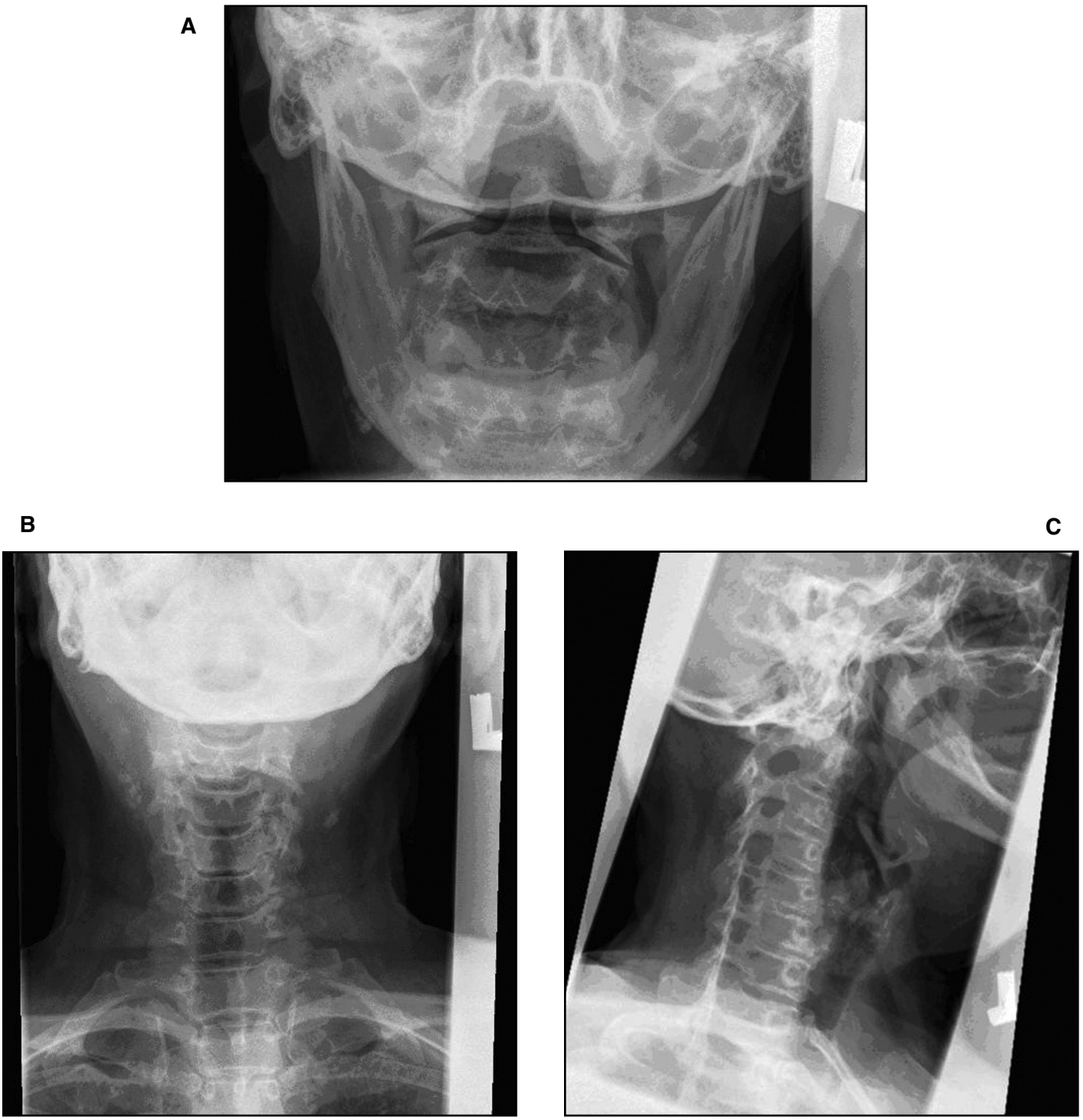
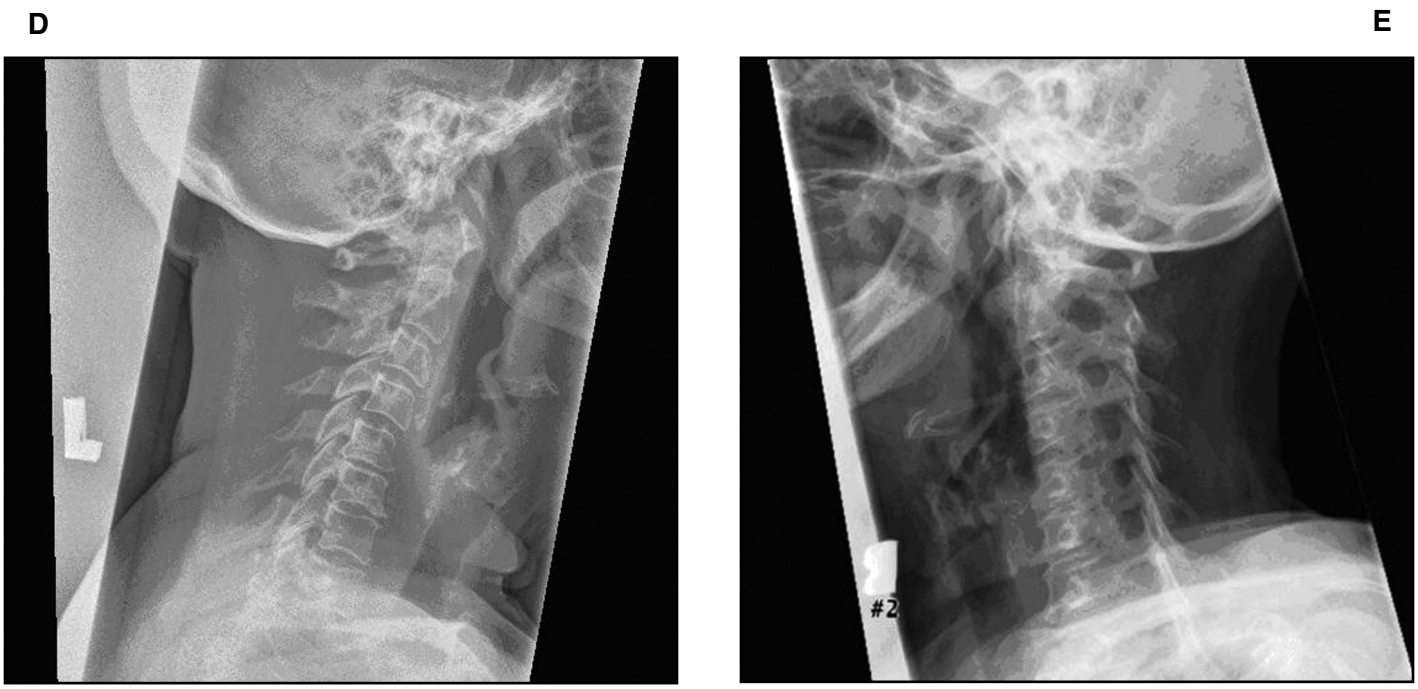


Figure 2 *(Concluded)*



treatments. She was treated with the same methods described above, with additional manual therapies (soft tissue and mobilization) to the temporomandibular joint when required, and manipulation (diversified technique) to the cervical spine when required. Following these treatments she reported 75% improvement in symptoms, with considerably less facial pain. There was less tenderness and hypertonicity to palpation over the right upper cervical muscles, and the upper cervical joints were less restricted. The TMJ region became less tender to palpation.

Over the next eleven days, symptoms gradually worsened. In particular, her temporal and mandibular pains flared, and were made worse with speaking. Despite the recommendation that she return for further treatment, the patient did not return. Symptoms continued to worsen. When the patient returned two weeks after the last treatment, she detailed new medications (carbamazepine and pregabalin) that had been prescribed by her physician. In addition, the patient inquired about a home TENS unit she had previously acquired through a trial of physiotherapy, and was instructed on its use. Two manual therapy sessions within three days of each other were performed, without effect. The patient was then advised to try the home TENS unit, and to return in about two-to-three weeks.

Three weeks later, the patient returned reporting that she had discontinued using the TENS unit. It had apparently aggravated symptoms. Since she stopped using the TENS the symptoms began to improve again, and when she returned to the clinic she rated her pain intensity at 2–3/10. While the frequency of pain was still daily, it was now more controlled. She was advised to continue with the home stretches and massage to the neck, and to return in one month.

Contrary to advice, the patient did not return for five months, with complaints of increased pain which compared to her initial presentation. She was treated with ultrasound, mobilization, and soft tissue therapies to the right upper cervical spine, and anterior thoracic manipulation to the upper thoracic spine. She was given seven treatments over three weeks, to which she reported a 60% improvement. Treatment frequency was reduced to once per week, and she was seen for eight weeks at this frequency. Treatment frequency was then tapered to once every two-to-three weeks, to which the patient was seen

Table 1 *Diagnostic criteria for trigeminal neuralgia according to the International Headache Society.* [2]

Diagnostic Criteria for Classical Trigeminal Neuralgia

A. Paroxysmal attacks of pain lasting from a fraction of a second to 2 minutes, affecting one or more divisions of the trigeminal nerve and fulfilling criteria B and C.
B. Pain has at least one of the following characteristics:
   1. intense, sharp, superficial or stabbing.
   2. precipitated from trigger areas or by trigger factors.
C. Attacks are stereotyped in the individual patient.
D. There is no clinically evident neurological deficit.
E. Not attributed to another disorder.

Diagnostic criteria for Symptomatic Trigeminal Neuralgia

A. Paroxysmal attacks of pain lasting from a fraction of a second to 2 minutes, with or without persistence of aching between paroxysms, affecting one or more divisions of the trigeminal nerve and fulfilling criteria B and C.
B. Pain has at least one of the following characteristics:
   1. intense, sharp, superficial or stabbing.
   2. precipitated from trigger areas or by trigger factors.
C. Attacks are stereotyped in the individual patient.
D. A causative lesion, other than vascular compression, has been demonstrated by special investigations and/or posterior fossa exploration.

five more times. At this time point the patient reported feeling 'really good' and that her pain was 'very manageable.' Pain intensity was rated as lower than 2/10 on most days and she was able to perform all of her activities of daily living without trouble. The tenderness over the upper cervical joints was considerably reduced. Compression tests were negative, and while right rotation remained slightly restricted, it was no longer painful.

Over the next six months, the patient was seen on an as-needed basis. She returned as needed to keep the neck and face and head pains 'at bay.' During flare-ups, treatment frequency increased as necessary, up to six treatments provided over a three week period, to control the pain. Otherwise the patient would span two-to-three weeks between treatment sessions before neck or head/face symptoms would return. Overall, she was pleased with the treatment outcome as it helped to control pain and improve function without the use of medications. She continues to receive chiropractic treatments on an as-needed basis, and at the most recent follow-up, she is "better than ever", without significant head or face pain for the past 4 months.

Discussion

The International Headache Society (IHS) describes two classifications of TN: classical and symptomatic. In short, if there is no neurological deficit and an underlying cause cannot be identified the condition is labeled as classical TN. Symptomatic TN however may demonstrate neurological loss and is attributable to an underlying lesion that has been determined through specialized testing.[6] The full IHS criteria for TN are listed in Table 1.

Defining a predominant age group for TN is difficult, though the majority of patients are over the age of 50 years upon presentation.[7] The pathological origins most frequently identified are vascular compression and demyelination, however patients under the age of 40 years are most likely to have multiple sclerosis or a tumor identified as the causative lesion.[4]

The painful episodes which characterize TN are described as shooting, cutting or lancinating in character by 95% of patients. Pain is primarily felt in one distribution of the trigeminal nerve, unilaterally.[2] Attack duration has been found to average 6.5 seconds (SD 6.1; 2–32) when

experienced in the V1 distribution, with episodic attacks lasting less than 10 seconds in 82.3% of patients.[8] Attack durations longer than 30 seconds were only found in 0.5% of TN episodes.[8] Further study examining 229 patients with TN found that all but one patient stated that painful episodes lasted for seconds in duration, versus minutes.[9] It should be considered however, that patients may overestimate attack duration given the subjective experience of high-intensity pain.[8] Patients were only able to specifically mark a date of onset, therefore defining an acute 1st episode, in 55% of cases. In addition, 75% of attacks were spontaneous in nature.[9]

Attacks typically involve a stereotypical pattern of oral-facial stimulation for each patient, such as shaving or a light touch within a certain facial zone.[4] This mechanism is purported to arise from a sensitization of the wide dynamic range (WDR) neurons, suggested to occur in TN patients.[10] This allows for non-noxious myelinated fibres (such as A-delta fibres) to deliver a maximal stimulus to the spinal nucleus of the trigeminal nerve through the WDR neurons.[10] The result is light touch perceived as pain. This is the proposed 'central mechanism' of TN and explains how the trigeminal nerve can be affected by the stimulus of convergent structures.[10] This theory has been similarly explained elsewhere and coined the 'ignition hypothesis' for TN attacks, stating that stimulus from peripheral sources are abnormally processed via hyperexcitable afferents of the trigeminal system, resulting in pain.[11]

Current medical management of TN involves the use of carbamazepine as a first line therapy. Other drugs such as gabapentin, pregabalin and tricyclic antidepressants have shown efficacy with neuropathic pain as well.[12] Surgical intervention may include microvascular decompression, balloon compression, rhizolysis or rhizotomies and radiofrequency thermocoagulation.[13]

To evaluate manual therapy principles for TN, we must look to proposed mechanisms which initiate pain. It has been postulated that noxious stimulation of cervical afferents can result in headache disorders such as migraine and cervicogenic headache.[14,15] This mechanism centres on convergent neurology within the dorsal horn neurons of the upper cervical segments and the spinal nucleus of the trigeminal nerve (medullary dorsal horn), to which are not separated by definitive boundaries.[15,16] This single column of grey matter is referred to as the trigeminocervical nucleus.[15] Essentially, nociceptive stimulus of the head, face, throat and upper cervical area are all delivered through afferents which terminate on second-order neurons within the trigeminocervical nucleus (Figure 3).

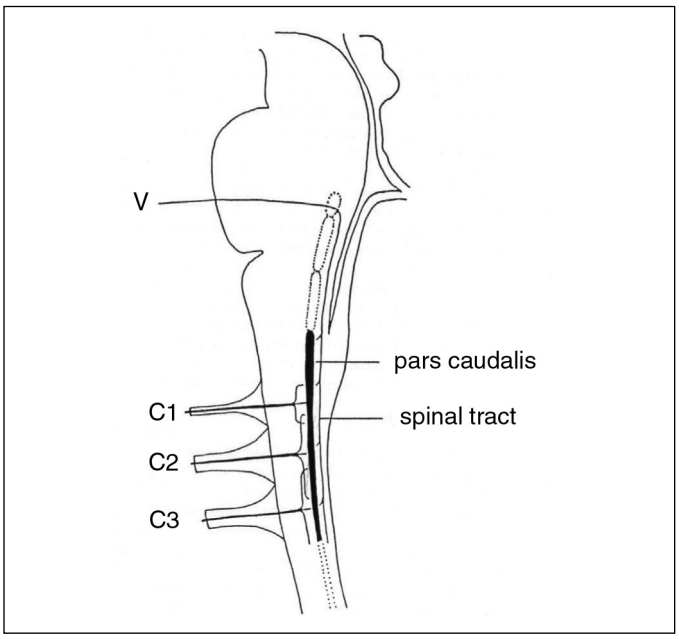


Figure 3 *A sketch of the brainstem demonstrating convergence of the upper cervical segments with trigeminocervical nucleus.*[14]
Reprinted with permission from Elesevier.

The neurophysiologic basis of cervical headache is thought to originate from a prolonged and sustained exposure to deep somatic pain.[17] As the central nervous system becomes sensitized to this input, nociception from cervical afferents converges with the dorsal horn neurons shared with the trigemino-cervical system and is projected.[17] As the trigeminal system is primarily responsible for processing input from cutaneous sources, projected pain is 'felt' within the respective trigeminal fields.[17]

An animal model of central sensitization of the upper cervical dorsal horns and the medullary dorsal horn has been documented via noxious stimulation of the deep cervical paraspinal muscles.[19] Threshold lowering is specifically noted within the WDR neurons of the upper cervical segments, and is relevant in many painful syndromes of the head and neck.[19] Similar concepts of sensitization have been reviewed by Mense.[20] It is subsequently theorized that treatment of the cervical source

can relieve symptomatology in relevant headache disorders.[21] To date, there is a growing body of scientific literature supporting the use of manual therapies, such as joint manipulation and mobilization, in the treatment of such headache disorders.[17,18,22–24]

Based on the central mechanism described earlier, disorders involving neck pain and cervicogenic headache may play a role in lowering the threshold of convergent neurons and sensitizing the trigeminocervical system. This has recently been demonstrated via pressure-pain hyperalgesia in the trigeminal region of patients suffering non-traumatic mechanical neck pain, supporting a sensitizing effect.[25] Therefore, manual therapy of a primary source of sensitization (such as in the cervical region) may improve symptoms through decreased sources of amplification. It should be considered however, that manual therapy of the cervical spine is unlikely to completely resolve a patients TN.

Also, it should be considered that patients may present with more than one type of headache disorder and more than one source of head, neck and facial pain. The discussed patient presented with multiple sources of pain: pain arising from the trigeminal nerve itself, the cervical spine and the TMJ. In addition, the patient presented with multiple classifications of cephalalgia: TN and probable cervicogenic headache. Therefore, this patient presented with multiple potential triggers for TN episodes that included mechanical origins.

Special consideration should be made of other effects of cervical spine pain and dysfunction such as joint position sense error,[26,27] decreased strength and endurance in the local and global cervical musculature,[28–30] allodynia,[31] mechanical hypersalgesia[32–34] and sensory hypersensitivity.[34,35] From these examples, it is clear that nociceptive stimulation within the cervical spine demonstrates broad neuromusculoskeletal effects. With consideration, the broad and sensitizing effects of cervical pain having further effects on the trigeminal system via convergence is a reasonable theoretical assumption. Additionally, the Johansson/Sojka hypothesis surrounding the role of gamma-motor feedback loops could be considered, though this hypothesis remains an unproven theory.[36]

Within the chiropractic literature, a case surrounding the previously described central mechanism of pain has been published. The case describes a patient with TN who induced an accidental and maximum surge from a home-use TENS unit during a painful attack, and the pain terminated immediately. At three year follow-up the patient remained symptom free. It was postulated that through a diffuse noxious stimulus of the A-delta and C fibres, an inhibitory mechanism was generated on the wide dynamic range neurons thought to be responsible for painful episodes in TN.[10] Drawbacks to this case are that the theory of complete symptom resolution is not adequately explained and it provides minimal insight into the use of manual therapy for symptom management in TN patients.

A second case from the chiropractic literature supports the use of manual therapy in a patient with a six year history of TN. However, it pertains to the use of muscle-energy techniques, toggle-recoil manipulation of the atlas and non-specific thoracic and lumbar spine manipulation. Cranial suture manipulation was also employed. The patient received three treatments within close proximity and was then told to return for a two week follow-up. At this time the patient reported of decreased use of carbamazepine and their pain score had decreased to 0.5/10 from 9.5/10. A further three week follow-up revealed exacerbation of symptoms, scoring a 7–8/10 in intensity. Following another three week follow-up period the patient returned reporting slow ablation of symptoms without recurrence. Three month follow-up revealed no recurrence and telephone follow-up at eighteen months revealed that the patient had once again become symptomatic and sought a medical practitioner for laser therapy, which had provided relief.[37] While this case does not demonstrate long term improvement following the withdrawal of care, improvement with concurrent manual therapy and sustained short term improvement is noted. Additionally, the case supports the hypothesis that the trigeminal nerve may be affected via convergent structures of the head and neck.

It is important to consider that within this case report, the patient's symptoms improved via natural history, holding a temporal relationship with the chiropractic treatment plan. This could be possible as TN patients do experience pain-free intervals which range from days to months.[9] However, the discussed patient experienced quick relief with chiropractic care subsequent to a long duration of symptoms prior to care, her symptoms returned with non-compliance to her treatment plan, and she once again experienced relief with return to care and sustained improvement when compliant with supportive care. Additionally, as the natural history of TN is known

to last beyond thirty years, a theory of spontaneous resolution is cautioned.[9] Nonetheless, the hypothesis within this report is speculative. Causation cannot be determined from a single-case design, and our theory requires further validation.

Conclusion

Accepting the limitations of a single-case design, the presented hypothesis may offer new insight into the contribution and exacerbation of TN symptoms in afflicted patients. If such symptoms are augmented by cervical spine syndromes, TMJ syndromes, or other causes of head and facial pain, a trial of manual therapy for those concurrent syndromes may be worth consideration in an attempt to lessen the debilitating impact to patients.

This being said, reliable and reproducible measures of cervical pain and dysfunction which may indicate arthrogenic patterns of pain should be used and monitored during care. Determinants of cervical segmental dysfunction such as motion palpation or static palpation should not be used in isolation when determining the intervention strategy.

More research in the area of TN and cervical spine pain and dysfunction should be conducted to clarify the relationship between them.

Acknowledgements

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The West Family Chiropractic Dynasty: celebrating a century of accomplishment in Canada
Part I: Archibald B. West, DC, Samuel H. West, DC and Stephen E. West, DC: The Founding Father, his Son and Grandson

Douglas M. Brown, DC*

This historical treatise documents the unbroken legacy of the West family of chiropractors which has flourished in Canada for over 100 years. Part I, unearths the origins, development and careers of Archibald West, the founder of this dynasty, his son Samuel and grandson Stephen. Part II, not yet ready for publication, will delve into the lives of Archibald's brother Samson and his chiropractic progeny, as well as a nephew of Stephen and another relative of Frederick West.
(JCCA 2010; 54(3):187–199)

KEY WORDS: West, chiropractic, Canada, genealogy

Ce traité historique documente la contribution toujours intacte des West, une famille de chiropraticiens qui a prospéré au Canada pendant plus de 100 ans. La première partie révèle les origines, le développement et les carrières d'Archibald West, le fondateur de cette dynastie, son fils Samuel et son petit-fils Stephen. La deuxième partie, qui n'est pas encore prête à publier, plongera dans les vies de Samson, frère d'Archibald, et sa progéniture chiropraticienne, ainsi que d'un des neveux de Stephen et d'un autre membre de la famille de Frederick West.
(JCCA 2010; 54(3):187–199)

MOTS CLÉS : West, chiropratique, Canada, généalogie

Genealogy

The heritage of this prolific chiropractic family hails back to c. 1763, with the marriage of William West to Mary (maiden name unknown), in the town of Tonbridge, Kent County, England. William and Mary sired seven children. Their sixth, Henry, married Harriett Crowhurst who gave them 10 offspring. Several of their sons and daughters would leave Tonbridge for North America. In 1834, Stephen and his brother George were the first of this tribe to immigrate to Canada. They probably landed at Québec City and made their way to Kingston, Ontario, where the brothers temporarily separated. George likely moved to the Niagara region of Upper Canada while Stephen, an apprenticed carpenter, stayed to work in the Kingston shipyards and to marry a local woman, Mary Ann Thomas.

Stephen and Mary Ann spent the first ten years of their marriage moving from place to place before settling down to farm in the Forest area of Ontario, about 45 kilometers east of Sarnia. "Like all other pioneers in that area, Stephen and Mary Ann had years of backbreaking work. The trees had to be cut down, burned, and the roots extracted, before crops could be planted. In fact, I believe the crops were planted between the stumps for the first few years while the live stock more or less roamed freely in the bush until housing could be erected for them. Stephen was fortunate that he had sons to help with the work. His sons however, missed out on schooling, and although Stephen could read and write, I don't believe his older children could ... By the census of 1861, Stephen and his wife had graduated to a log house and now had eleven children." Stephen and Mary Ann's fifth child Frederick, married a neighbor's niece, Mary Ann Allan. Frederick worked for farmers in the area for a number of years. Land in southern Ontario was becoming expensive. Unable to purchase

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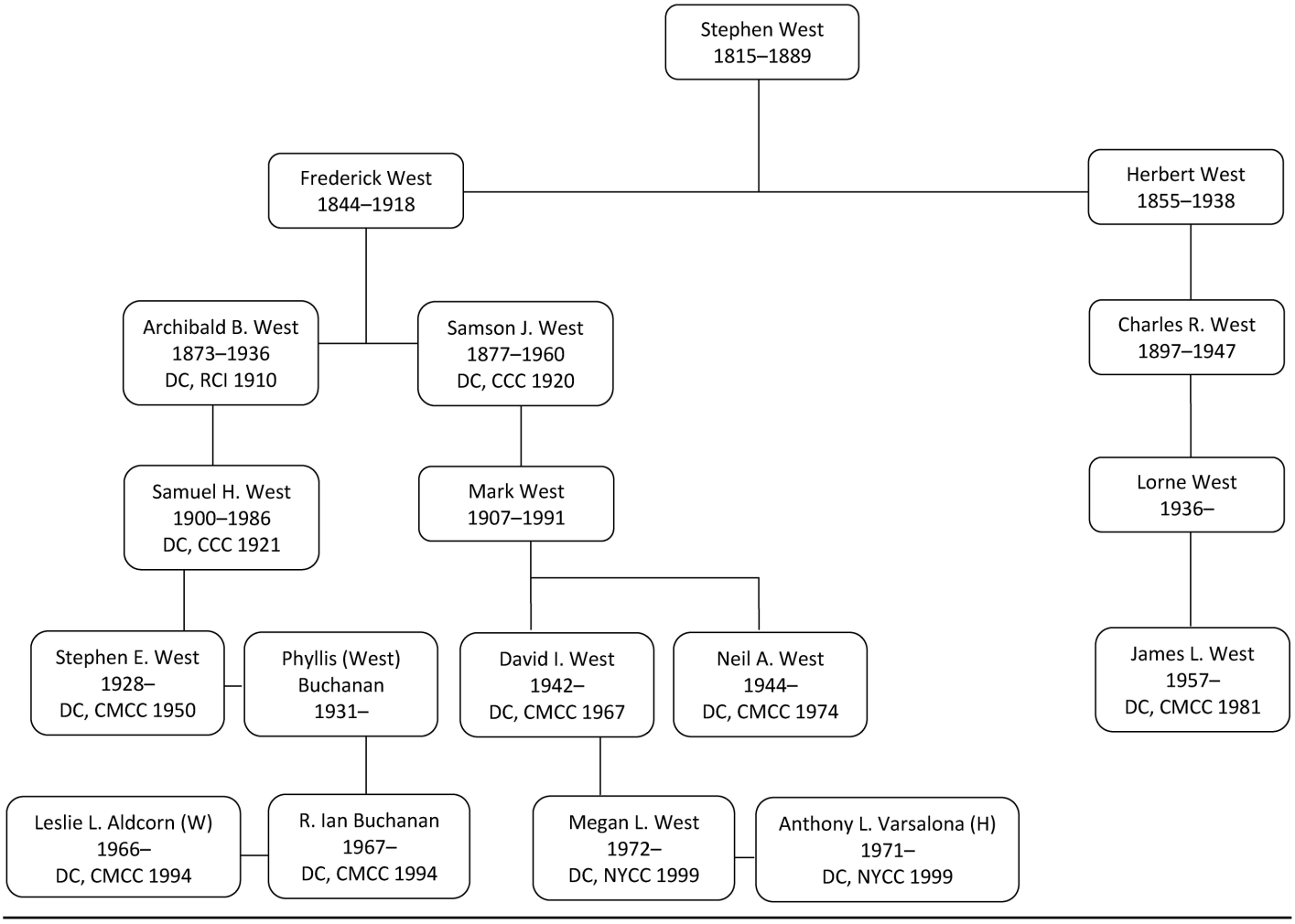
Figure 1 *The West Chiropractic Dynasty Family Tree*



the acreage he needed to support his family, which would grow to 12 children, Frederick and Mary Ann headed by ship to the District of Algoma, disembarking at Bruce Mines, where affordable crown land was opening up. The family "secured land in Plummer Township, where they cleared the land and struggled with mother nature for many years on their farm, eventually retiring to a little white frame house in Bruce Mines ... One advantage that Frederick's children had over his father's was the fact that a school was set up in time for the children. And like Stephen's, most of them would also leave the home area. Today their descendents are scattered all across Canada and the United States." [Notes and genealogical records collected by Jean MacDougall, great, great, granddaughter of the above Stephen West]

Archibald B. West, DC: The Founder

Background

Archibald or "Archie," as he was known, was the eighth of Frederick and Mary Ann's twelve children. Born April 22, 1873, near Forest, Ontario. Archie was only seven years old when his family, with all their possessions, sailed to Bruce Mines for the second time in 1880, yet he retained

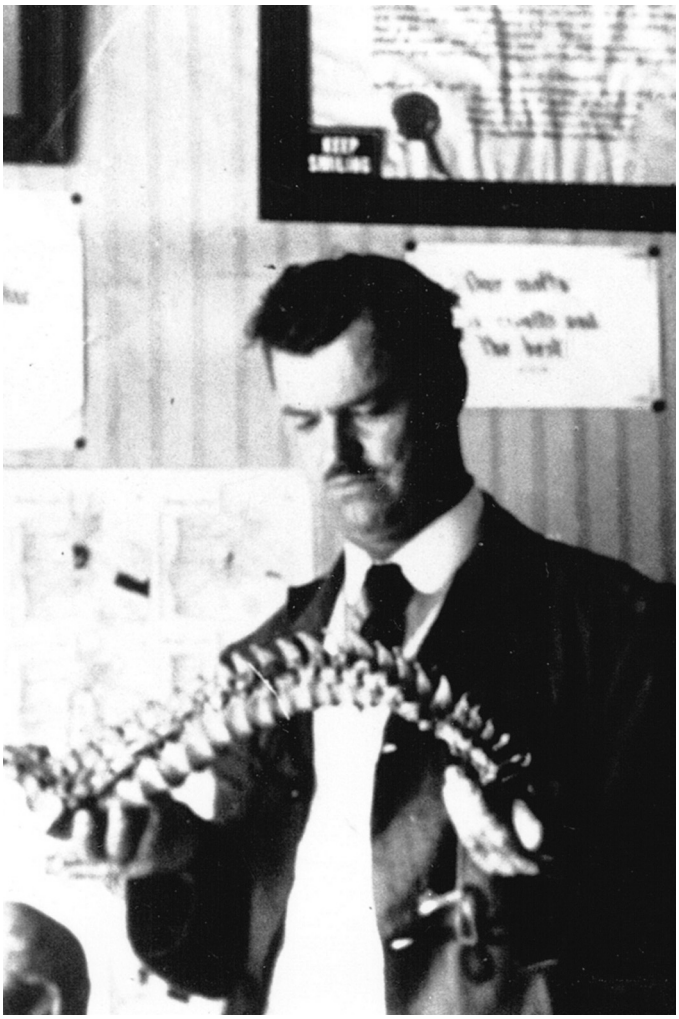


Figure 1 *Archibald West in his Office, c. 1915.*

clear pictures of the stormy voyage and its aftermath. "We came on the Manitoba and landed at the dock about midnight, and a very dark night it was, so dark in fact that three of the cattle and a colt walked over the dock and were drowned." The next day while moving their effects into a rented house, Archie fell off the side of the wagon "into a rut hole and the bind wheel came in on the side of my head making a gash about six inches long," which his mother promptly sewed up with a needle and linen thread. "I remember quite distinctly the time when there was no communication with the outside world except by dog team for six months, and when the first boat came in, it was a welcome sight, and most of the young folks and lots of the older ones would go down to the dock and stay until the boat came in and unloaded whatever cargo was for our town and watch her go out again."[1]

Archie left home at age 14, working at various jobs around the country before marrying Charlotte Marshall of Fort William, Ontario. In 1908 the couple returned to Sault Ste. Marie where Archie found employment as an engineer with an American firm, supervising the installation of the large rolling engines at Algoma Steel. Archie wrenched his back and was off work at home with severe sciatica. Charlotte was pressing heat into his back with a towel and a flat iron, when a close friend, originally from Michigan, dropped by. He told Archie that while visiting California he had consulted a chiropractor for a similar problem. American co-workers at Algoma Steel directed him to WJ Robbins, MD, DC, a medical doctor who had also graduated from the Palmer School of Chiropractic, in Davenport, Iowa, and was practicing in Plainwell, Michigan. Archie made the arduous trip to Michigan where he received the "magic touch" from Dr. Robbins. Archie was a "persuasive" man and convinced Robbins to follow him back to the Sault, where in late 1908 he "set up an office in a new business block on the main street" and soon became so busy he sent for AE Lemon, BA, MD, an American medical colleague with chiropractic training. [West SH. History of chiropractic in Canada, Jan. 19, 1970. Unpublished]

The Robbins Chiropractic Institute

Not satisfied with just having access to chiropractic care, Archie and several prominent citizens urged Robbins to apply for a provincial charter to create a chiropractic college in the Sault. This was quickly obtained and in November 1909, The Robbins Chiropractic Institute Limited (RCI) was opened in the building where Robbins had his office, 264 Queen Street East,[2] and in 1911 it moved to 314–316 Queen Street East.[3] It was probably Canada's earliest chiropractic college and Archie the first student to enroll. The genuine sheepskin Robbins diplomas have these words inscribed at the top: "Incorporated by Letters Patent under the Great Seal of the Province of Ontario." A May 10, 1910, Robbins photo shows Archie as a member of the first graduating class. One of Archie's sons, Samuel, was 10 year old and present at the ceremonies where BJ Palmer, DC, President, Palmer School of Chiropractic (PSC), was the convocation speaker. "Sam" remembered

Figure 2 *Board of Directors of Chiropractic, 1982. Front row L to R: Dr. Frederick Barnes, Vice-Chair, Dr. Stephen West, Chair, Dr. Kenneth Wood, Secretary-Treasurer. Back row L to R: Dr. Robert Wingfield, Doreen Grant, Dr. Stanislaw Stolarski.*

BJ delivering his premier public address in Canada titled, "After tomorrow, what?"[4]

In that era boys and girls often started working in their early teens, so had little or no secondary school education. Not much is known of the entrance requirements for the Robbins Institute except they included the ability to read and write, good morals and a positive personality.[5] Archie's chiropractic education was completed in six months. It cost $300 and presumably consisted of three months of home study and three months in residence. Vear, Lee and Keating have written that, "Since Robbins was an early graduate of the PSC, it is likely that he followed his alma mater's pattern which by 1910 offered a maximum curriculum of barely nine months."[6]

Isa L. Brundage, DC, was on the faculty of the RCI and also a member of the inaugural class, delivering the valedictory address and preparing a "History of Our School," for the occasion. She praises Dr. Robbins for his ability to combine his chiropractic skills with his experience as a medical doctor and surgeon, providing the students with valuable practical knowledge and ''making this Institute a very desirable seat of learning."[7] Dr. Brundage lists the subjects taught directly by Robbins as, symptoms and analysis, pathology, orthopedics, principles and practice of chiropractic, and the art of adjusting. Robbins wife, GS Robbins, DC, was another PSC graduate, and ''had charge of Nerve Tracing and Palpation." Dr. Lemon, "a regular practitioner in the State of Michigan," provided instruction in gynecology, obstetrics and venereal diseases. "Besides the subjects already mentioned, the course included Anatomy, Physiology, Embryology, Histology and Chiropractic Physiology." The school operated a gratuitous daily clinic which afforded the students "splendid practice in palpation and adjusting, and also does a great deal of good, by benefiting, free of charge, a large number of worthy persons." The RCI closed in 1913 and Robbins moved back to the United States.

Archie's Professional Career

Following Robbins' departure, Archie took over his patients and maintained a large practice at 221 Gloucester Street (where the building still stands) for over 25 years. He also made trips to outlying areas as far away as Sudbury. His patients included farmers, loggers, fishermen, steelworkers, businessmen, members of parliament, ministers, lawyers, judges, teachers, and their families. According to his son Sam, "Archie used Specific Upper Cervical technique only; no adjuncts or other therapeutic devices. At first he used a wooden, two-piece adjusting table which could be left open in the middle, but later he imported the first Zenith 'Hylo' tables manufactured in the United States."

Every few years, Archie would travel to the PSC, in Davenport, Iowa, or the National College of Chiropractic (NCC), Chicago Illinois, to further his education and in 1923, was presented with an honourary Specialist of Chiropractic (SpC) degree from NCC. In 1915, the hospital in the Sault became the first institution in the district to have X-ray facilities and in 1916, Archie followed suit by purchasing his own Fisher machine. Although advised to wear a lead apron, Archie didn't comply, which may have been the cause of subsequent chest symptoms. He died of cancer, July 18, 1936.

The Canadian Chiropractic College

In 1913, when the RCI closed, John A. Henderson, DC, a 1911 Robbins graduate, purchased the Institute's charter and in 1914, used it to help found the Canadian Chiro-

Figure 3 *Canadian Chiropractic College Class of 1918.*

practic College (CCC); probably assisted by Albert L. Price, DC, a 1912 RCI graduate.[8] Dr. Henderson's next move was to convince Ernst DuVal, DC, to return to Canada and become President of the CCC. Dr. DuVal was a PSC graduate c. 1911, who had served as Chair of Chiropractic Philosophy at both Palmer and the Universal Chiropractic Colleges. This ensured that CCC's "orientation was straight and patterned after the PSC." DuVal and five of his family members so dominated the school's teaching and administration, that it has occasionally been misnamed "The DuVal College of Chiropractic." In 1922, the CCC's devotion to Palmer principles was recognized when it was listed among the six chiropractic colleges endorsed by the Universal Chiropractic Association in the United States (an organization created by BJ Palmer).

First located at 267 King Street West in Hamilton, by 1917 the CCC had moved to the former Hamilton Library Building on Main Street, where it occupied half the ground floor and in 1919 it relocated again to 757–759 Dovercourt Road in Toronto. In 1921, 70 students were enrolled. Although several authors recorded that it remained on Dovercourt Road until the College closed in

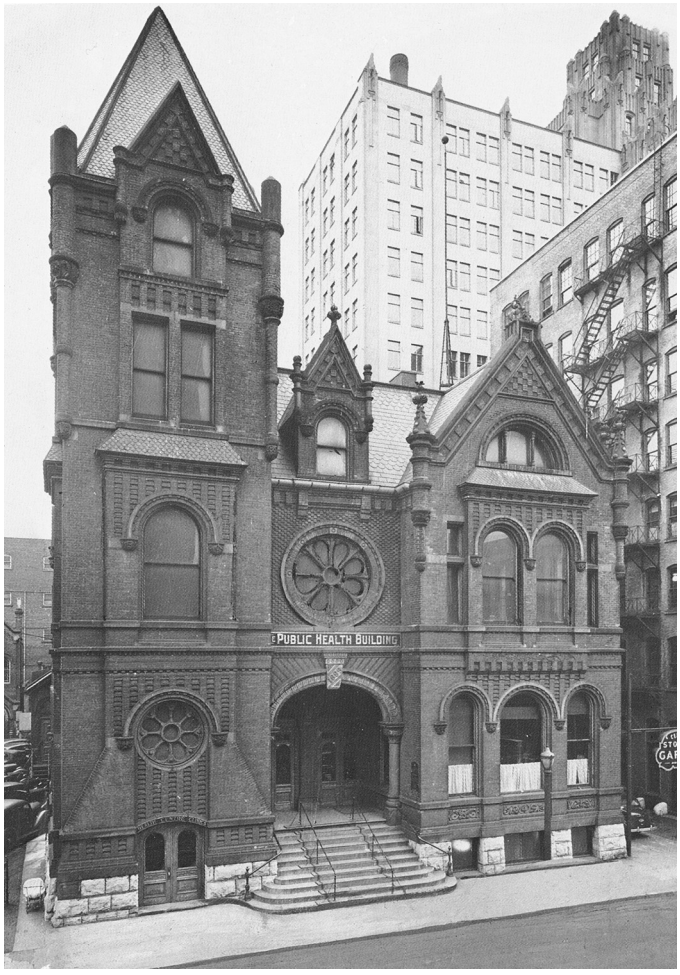


Figure 4 *Canadian Chiropractic College, 2nd home – Formerly Hamilton Library*.

Figure 5 *Dr. John A. Henderson, c. 1950.*

1923, the CCC 1923 Prospectus pictures it then at 2477–2492 Dundas Street West.[9] The Class photo taken in April that year, shows 39 students and seven faculty.

Samuel H. West, DC: The Founder's Second of Six Children

"Sam," was born November 14, 1900, in Port Arthur, Ontario, but moved with his family to the Sault, when he was two years old. As previously mentioned, he was just 10 when his father Archie, graduated from the RCI in 1910. In September 1918, at age 17, Sam was the youngest of the 20 students on campus, when he entered the CCC, then located on Main Street, in Hamilton. The course duration was 12 months, could be taken incrementally and cost him $600. Sam had attended for about three months before a flu epidemic closed the school, along with all public buildings and theatres in the area. He remembered seeing death notices hung on the doorknobs of numerous homes. Sam returned for another three months of instruction in the falls of 1919, 1920 and 1921. During the summers he worked for his father Archie, at his office in the Sault.

On March 9, 1921, Sam received a Doctor of Chiropractic (DC) Diploma from the American College, Department of Chiropractic, Chicago, Illinois, and graduated from the CCC with a DC Diploma on December 19, the same year. The CCC also awarded him a SpC (Specialist of Chiropractic) Diploma. SpC recipients were re-

quired to sign a "Declaration," pledging themselves "to abide implicitly by the spirit and letter of the Diploma. ... Neither will I use any adjunct, method or system, whether artificial or by hand, than that which is directly and specifically for the relieving of nerve impingement at the Neuroskeletal frame, strictly by hand, as taught at the Canadian Chiropractic College." In 1921 the College contained 70 students.

Sam's Professional Career

Following graduation, Sam began working for his father in the Sault and was sent to Thessalon to look after a judge, his family, and people in the surrounding area. Sam would travel to Thessalon by bus, work for a few days in the parlor of someone's home, then go back to the Sault, to care for his patients there. After a while Sam moved his headquarters to Thessalon, from where he visited places such as Blind River, Bruce Mines, Iron Bridge and Dean Lake. In his main office he had a power-driven Palmer-Evans table, but on the road he used a small, wooden, two-piece portable adjusting table, that fit into a suitcase (David West keeps a similar table, owned by his grandfather Samson West, among his treasured memorabilia). After a year, Sam moved back to the Sault, opening his own office at 478 Queen Street East.

Sam and Archie were both committed to continuing education. In 1924, father and son attended the eighth Annual Palmer Chiropractic Lyceum, which attracted 7,000 people. This figure likely included the 4,000 students currently enrolled in the PSC, as well as chiropractors from North America and other parts of the world. Sam remembers David Palmer, BJ Palmer's only son, delivering his "maiden" speech titled, "What does that make me?" David's talk recounted the accomplishments of his grandfather DD Palmer, the "discoverer" of chiropractic, his father BJ, known as its "developer," and his mother Mabel, who among other things, served as the school's anatomist, and ended with David's musings on what his role might prove to be. At this Lyceum, Sam received a side-posture, upper cervical adjustment from BJ Palmer, which he described as "the same adjustment which my father gave me in 1910." In 1928, Sam received certificates for Post-Graduate Studies, Dissection and X-ray, from the National College of Chiropractic (NCC) and another certificate for a course in Physiotherapy, from the Chicago General Health Services. Panoramic photos taken at PSC Lyceums in 1929, 1930 and 1935, show Sam and Archie present.

Sam was also interested in research and was selected to head the first Canadian chiropractic research association. Although it dissolved after a few sessions, he was appointed executive member for Canada of the International Chiropractic Biophysical Research Society, which held meetings in Denver, Chicago and Los Angeles and was headed by George Wilson, DC, former research director of the Spears Hospital.

Sam was 74 when interviewed by David West, DC, in 1974. At that time he was practicing afternoons and one hour most evenings. Formerly he had seen from 75 to 100 patients, five days a week, often working weekends as well. In the beginning, fees were $1 per adjustment or $5 for six adjustments, however during the depression he often received eggs, chickens, fruit and vegetables, in lieu of money. Many had nothing to offer and were treated without charge. Sam would not ask for payment but simply say, "God bless you." He believed one of the reasons chiropractic prospered in that area was because its first two practitioners, Robbins and Lemon, were MDs as well as DCs, muting medical opposition.

Sam and his wife, May Wright, traveled extensively, visiting chiropractors across Canada, from Victoria, BC to Charlottetown, PEI. They also journeyed into the United States as far south as Key West, Florida, and in Europe to Ireland, Scotland, Germany, Switzerland, Italy and France, where they attended the European Chiropractic convention in Paris. In 1957, Sam semi-retired, moving his office from the Imperial Bank Building at Spring and Queen Streets, to 183 Albert Street, where he continued to practice until 1980. Sam died on January 4, 1986.

The Canadian Memorial Chiropractic College

During his career, Sam steered a number of young men and women into the profession and worked in the background, helping to establish the Canadian Memorial Chiropractic College (CMCC). In 1944, during a convention of what would become the Canadian Chiropractic Association (CCA), Sam held a meeting in his rooms at the Royal York Hotel in Toronto, to discuss plans for purchasing the Meadonia Hotel, on Bloor Street West. During the meeting he convinced several of those attending to help fund this project, which would cost $55,000. [West SH. History of chiropractic in Canada, Jan. 19, 1970. Unpublished.]

Figure 6 *Dr. John A. Clubine, c. 1925.*

Figure 7 *May and Sam West, 50th Wedding Anniversary, 1977.*

Three of CMCC's initial leaders were educated at the RCI or CCC. As noted, Dr. Henderson graduated from the RCI in 1911, assisted in starting the CCC in 1914, canvassed Ontario chiropractors for donations and in 1945 became CMCC's first Registrar and Business Administrator. Samuel F. Sommacal, DC, lived in Archie West's home during his training in the Sault and graduated from the RCI in 1912. Dr. Sommacal worked on CMCC's Organization Committee and was its third President from 1947–51. John S. Clubine, DC, has been called the "Father of CMCC." Graduating from the CCC in 1919, he cofounded the Toronto Chiropractic College in 1920, and served as its President until it closed in 1926. Dr. Clubine became CMCC's first Dean and President in 1945, doing "more than any other individual, in services and financial donations in the early years, towards the establishment of CMCC."[10]

Stephen E. West, DC: A Grandson of the Founder

Samuel West married May Wright, in the Sault, on September 21, 1927. Their first child Stephen, was born, on June 24, 1928, followed by their daughter, Phyllis, February 12, 1931. During childhood, Stephen seldom saw his father, because Sam worked almost every day of the week and made house calls at night. This made Stephen wary of emulating his father. A precocious lad, Stephen

Figure 8 *Robbins Chiropractic Institute, 2nd home, 314–316 Queen St. E.*

skipped two grades in primary school. By 1944, age 16, he was in his last year of high school and a member of the drama club. On Friday evenings club members would read scripts they had prepared, over CJIC Radio, Sault Ste. Marie. Following Stephen's high school graduation, this expanded into a part-time job until 1945, when he was replaced by a returning World War II veteran who had previously held this position.

Shortly after his departure from CJIC he was named News Editor at CKPR in Fort William and was developing a promising career until his father came to town to encourage him to enroll in the recently opened CMCC in Toronto. Stephen said that he was "quite happy following his own path," but his father asked him to try college life for a few months to see if he liked it. Stephen relented, somewhat reluctantly, and began classes in September 1946. One day he was relaxing in his room in the CMCC dormitory, on the third floor of the College, listening to CHUM Radio, when the idea occurred that he could do a much better job than the present announcer and sent a letter of application to Larry Mann, the Station Manager.

Stephen worked at CHUM for the next three years, after classes, on weekends and holidays. He performed with future stars such as Monte Hall, Phil Stone and Johnny Lombardi and created his own "Stephen West Show," featuring music and celebrity interviews. This was an exciting era for Stephen, so when he graduated in 1950 it was difficult for him to decide whether to stay with broadcasting or go back to the Sault to practice with his father. Returning to the Sault, he soon realized he had made the right decision, although he was doing the nightly 10 o'clock news on CJIC-TV until 1951, when his practice became too busy for him to continue. Stephen remained in the Queen Street office until 1966, then moved into a new clinic constructed at 66 March Street, through the collaborative efforts of Stephen and his wife Daphne, whom he had married in 1951. [Stephen West interview by Brown, May 22, 2008]

Stephen's Professional Career

In the early 1950s the Canadian Council of Chiropractic Roentgenology (CCCR) was formed by Howard Whatmough, DC, Donald MacMillan, DC, William Sundy, DC, and Colin Greenshields, DC, to fill a need for more sophisticated chiropractic X-ray studies and Stephen became a founding member. The CCCR began holding seminars which became the largest conventions in Canadian chiropractic. Stephen served as Publicity Director and later President of its Ontario division and was instrumental in having CCCR Diplomate Status recognized by the CCA.[11]

The Ontario Government had created the Board of Directors of Chiropractic (BDC) in 1952. It was chiropractic's first independent regulatory body in this province. Stephen was elected to the Ontario Chiropractic Association (OCA) Board in 1964 and in 1966 was appointed as a member to the BDC. This year the Ontario Government formed the Committee on the Healing Arts (CHA) to study all Ontario health care providers and report on how legislation affecting the healing arts could be protected and improved. July 1, 1970, chiropractic services were included under the Ontario Health Insurance Plan (OHIP), thanks primarily to concerted lobbying by the OCA, and the support of Thomas Wells, MPP, the current Minister of Health. This added a new dimension to BDC responsibilities as it struggled to cooperate with OHIP in the regulation and adjudication of chiropractic claims for approved services.

Stephen became Chair of the BDC in 1974, when the first six parts of the Health Disciplines Act (HDA), covering dentistry, medicine, nursing, optometry and pharmacy, were passed into legislation. The Ministry of Health (MOH) then struck a committee to make recommendations for professions not yet included; specifically,

Figure 9 *Robbins Chiropractic Institute, 1st Graduation Class, 1910.*

chiropractors, optometrists, chiropodists and osteopaths (COCO). In 1975 a Chiropractic Liaison group was established to meet with senior MOH officials to discuss the chiropractic part of the HDA. From then until he stepped down as Chair in 1984, Stephen and Frederick Barnes, DC, BDC Vice-Chair 1976–84, Chair 1984–86, "worked long and hard with OCA reps Drs. Leo Rosenberg and Lloyd Taylor, and CMCC reps Drs. Donald Sutherland and Herbert Vear, to negotiate with the Ministry of Health for new chiropractic legislation." [Interview, Stephen West by Brown, May 22, 2008] Dr. Barnes remembers attending 35 meetings, to no avail. "Negotiations were difficult because those of us representing the chiropractic profession were determined that the scope of practice include diagnosis, the right to use X-ray and treatment of the nervous system. They were also complex because in1982 the MOH had established the Health Professions Legislative Review (HPLR) to examine all of the 21 health professions not included in HDA legislation of 1974, rather than just four." [Interview, Fred Barnes by

Figure 10 *Stephen presents Samuel West Life Membership Award, 1972.*

Brown, Jan. 29, 2009]. Robert Wingfield, DC, BDC Director 1980–88, Chair 1986–88, recalls that, "Many meetings were held over a span of 18 years. It was like a great waltz. The government played the music while we danced on and on. We were getting nowhere but didn't want to stop the discussions." [Robert Wingfield interview by Brown, July 10, 2008]

Stephen stepped down as BDC Chair in 1984, and was invited to join the Board's Education Committee, headed by Bertram L. Brandon, DC. This Committee evaluated graduates applying for licensure in Ontario, primarily on their clinical skills. Initially four candidates at a time were brought into a CMCC classroom, to sit around a table and answer questions for about 40 minutes. Stephen can't remember anyone failing this oral exam. In 1985 a more comprehensive system was created and Dr. Wingfield joined Dr. Brandon and Stephen on the Committee. These exams were held first at CMCC, then Osgood Hall, and finally the Mount Sinai Hospital Rehabilitation Centre. The system involved testing nine candidates at a time, but in separate rooms, by nine examiners and nine patient-actors who simulated the same specific condition. Each room contained video-tape equipment and an adjusting table and the candidate was given a scenario to be played by the patient-actor. The candidate was expected to conduct a consultation and examination, and after arriving at a diagnosis to simulate an adjustment and/or provide appropriate advice regarding, nutrition, exercise, home remedies and future treatment. All proceedings were video-taped and the candidates graded by the attending examiners. Afterward, the examiners themselves were evaluated on the appropriateness of their findings. Although more thorough, the system was complicated, time-consuming and expensive.

By 1988 Stephen believed passage of the Regulated Health Professions Act (RHPA) was imminent. "The inadequacies of the outdated Drugless Practitioners Act have made it difficult for past Boards of Directors of Chiropractic to effectively regulate chiropractic in the best interest of the public and the profession. After 15 years of negotiation; the past five with the HPLR, it appears that resolution of major issues has been accomplished and should result in chiropractic joining the legislative mainstream in health care in this province."[12] However, it wasn't until November 25, 1991, that the RHPA, containing the Chiropractic Act, was proclaimed. This gave Ontario chiropractors a defined scope of practice that included diagnosis and the right to use the title "doctor."[13] Stephen knew that once chiropractic was included within the RHPA, the BDC as it existed, would be replaced by a new body. That occurred in March 1994, when the College of Chiropractors of Ontario (CCO) held its inaugural meeting. Finally, in 1999 the Education Committee was disbanded, ending Stephen's 33 year involvement with this regulatory body. On October 29 that year, Stephen sold his clinic and retired from practice.

Reflections

Stephen understood that, "Our biggest problems with the BDC revolved around inconsistencies in the DPA. The laws were vague, not specific and the Ministry of Health lacked enforcement. We were pretty well on our own and had to make up regulations as we went along. Fortunately our lawyers, John Pallett and Donald Brown, provided excellent assistance with appeals to our decisions." Donald J. Brown, QC, admired Stephen's capabilities. "I wanted to write you personally to indicate how impressed I have been with your handling of the hearings, your knowledge of proper procedure and your obvious concern as a health care professional. The Province of Ontario and your profession have indeed been well served by your time on the Board." [Letter, DJ Brown to West, Feb. 10, 1984]

Barnes found that, "Steve was a conscientious worker, witty and pleasant to be with during these contentious,

occasionally abusive deliberations. Our biggest problem was protecting what we had while developing the new act. The scope the Ministry of Health repeatedly offered us was inappropriate to our needs, however we were adamant and refused to back down."

Wingfield's early impressions of Stephen go back prior to 1970, when he was on the OCA Board. He remembers Stephen was the spokesman for the BDC, even before he was Chair and led all the meetings at Queen's Park and the resource sessions from 1966, as Vice-Chair of the BDC until he stepped down as Chair in 1984. "Steve was always thoroughly prepared, had a grasp of the issues and recognized the necessity of developing a scope of practice for chiropractic under the new legislation." Because joint meetings of our professional organizations were "multifaceted, there was difficulty developing consensus in order to present a unified front to government representatives. Steve was able to express his views in a logical, reasonable, non-confrontational manner. He understood what was appropriate and achievable and had a degree of erudition greater than many. Steve's well-grounded sense of fairness and duty enabled him to stand firmly for what he believed would be in the best interests of the public and the profession."

James W. Ellison, DC, was appointed Secretary-Treasurer of the BDC in 1952, remaining in that capacity until his retirement in 1980. Dr. Ellison writes: "I have been struggling to find the words that will express to you my feelings about your chairmanship of the BDC ... You have been the best chairman this Board has ever had, with your skills in communicating, your reliability, your dependability and your honesty in addressing the problems and situations that seem to come in an unending stream to the Board." [Letter, Ellison to West, Jan. 22, 1984]

In 1995 Stephen was asked to describe his greatest professional satisfaction. "He thought for a while and said that after attending the (1995) centennial celebrations he felt that our policies and our future are in good hands and that he was proud to have been a part of the process."

Recognition

On December 9, 1995, the OCA named Dr. Stephen E. West, Chiropractor of the Year. In presenting the award, Silvano A. Mior, DC, declared: "It is befitting that in this, our Centennial Year, we acknowledge an individual who has made a tremendous contribution to this profession." Dr. Mior reminded us that Dr. West had been intimately involved with chiropractic organizations since his graduation in 1950, and 45 years later, "at the young age of 67, continues to practice four days a week ... and continues to be committed to excellence."[14] In 2000, CMCC made Stephen a Life Member and in 2006 the OCA presented him with an Honorary Membership.

Wingfield has described Stephen "as a natural communicator with a flair for humour whose skills had been honed while working as a radio broadcaster." October 1, 1972, Stephen combined this talent with his personal knowledge of the origins of chiropractic in Ontario, while presenting Life Memberships to 12 Ontario pioneers who had been in practice 40 years or more and were able to attend the OCA's annual meeting.[15]

Stephen mentioned "the political, professional and societal ostracism the early chiropractors faced" while introducing "a new philosophy to this Province – a philosophy which brought health to thousands of people who had no alternative until that time."

Then he briefly reviewed the history of chiropractic in Ontario, citing some of the giants of our profession, and reminding us of the gratitude we owe our predecessors, not just for the indignities they endured in the past, but for "the position of respect and increasing influence in the health delivery system" we enjoy today, because of their devotion.

Stephen closed with these thoughts: "For those who are alive and who do remain here to-day, might I say to you that in no way are these certificates to be considered a reward. The accomplishments of four or more decades in practice, the contributions to the public and the profession, and hopefully your satisfaction in the legacy you have helped to foster are reward enough. And so these certificates are only in a small way evidence of the OCA's recognition of a span of service and dedication and sacrifice that few, if any of us, can ever hope to match."

Fittingly, the last certificate Stephen handed out that day was to his father, Samuel H. West.

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Letters to the Editor

To the Editor:

Chiropractors at McMaster University: The formation and direction of a university-based multidisciplinary chiropractic working group. J Can Chiropr Assoc. 2010;54:10–12.

There is an inaccuracy in the otherwise interesting and informative paper by Passmore, Riva and Goldsmith.[1] In their paper, which discusses the creation of a chiropractic working group at McMaster University, the authors make the following statement: "Within chiropractic educational facilities there are no formal programs cultivating chiropractic clinician researcher development" and they cite a 2006 paper by Haas and colleagues.[2] This is factually incorrect. For the past 5 years Palmer College of Chiropractic has offered a master's of science degree in clinical research through the Palmer Center for Chiropractic Research. This program, which was initially funded as part of K30 award from the National Center for Complementary and Alternative Medicine at the US National Institutes of Health, provides training in clinical research to the graduate fellows who matriculate into the program. Those fellows are, without exception, chiropractors who wish to obtain additional training in order to develop a career that involves the conduct of clinical research. Our fellows have included both new graduate chiropractors and those with many years of practice experience, as well as two dual degree participants (MD/DC and DC/PhD), as well as several faculty clinicians at Palmer College of Chiropractic. Information about the program can be seen at the program website: http://www.palmer.edu/pcc_current2.aspx?id=5290. I simply wish to set the record straight on this issue, but commend the authors for their informative work, which bodes well for the future of chiropractic research and education.

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To the Editor in reply:

We would like to thank Dr. Lawrence and Palmer Chiropractic College for making us aware of their clinical research program.[1]

In our article we simply made an attempt to cite the most recent peer reviewed literature pertaining to the topic of chiropractic clinician researcher development which is why we cited the Haas, Bronfort, and Evans (2006) paper.[2,3] In the generation of our article it was not our intention to complete a systematic analysis of programs existing at chiropractic colleges worldwide, although in light of Dr. Lawrence's comments and exciting program such a paper could be timely.

Another chiropractic college (New York Chiropractic College), has had a "Fellowship" program in place since 2002. Their Fellowship program aids in the training of clinician researchers at mainstream research intensive academic institutions.[4]

Both of these programs (and other similar programs that may exist) should be applauded for their innovation in encouraging and supporting those who have already completed health professional degrees to explore research training.

Unfortunately to this author's knowledge there are presently no entry level programs from an undergraduate degree leading to combined terminal clinical and research (DC/PhD) credentials, where all tuition fees are reimbursed or waived, and the student is provided with a stipend on which to live for the duration of both degrees. The debt load accrued by tuition payments for the clinical student is seen as a disincentive for the development of clinician scientists.[5] Programs have emerged in other disciplines to decrease financial barriers in developing the clinical research leaders of the next generation.[6] Funding this type of opportunity seems like a logical future goal for the chiropractic profession.

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To the Editor:

Chiropractic care of patients with asthma: a systematic review of the literature. J Can Chiropr Assoc. 2010;54(1):24–32.

We read with great interest the manuscript by Kaminskyj et al.[1] Their use of the Downs and Black[2] scoring system provides another perspective to assessing the methodological quality and evidence of studies on SMT and asthma. Hondras et al[3] and Ernst[4] also performed a similar undertaking using the Jadad Scoring.[5] All determined the clinical trials on asthma of high methodological quality and reflective of the level of evidence from their findings. However, as pointed out by Brouwers et al,[6] incorporating quality assessment into systematic reviews finds both favor and dissent in the scientific literature. In this context, Kaminskyj et al[1] failed to consider the basic research design issues in designing placebo-controlled trials on SMT and hence the potentially misleading results of their findings.[7] None of the sham SMTs employed in the clinical trials on asthma have been validated as appropriate for a placebo-controlled trial. We found no support from the studies cited[8,9] by Nielsen et al[10] and Bronfort et al[11] to justify the appropriateness of their sham SMT. The study by Balon et al,[12] considered the clinical trial of highest methodological quality, describe a "simulated therapy" that is arguably another type of manual therapy. Additionally, the incorporation of massage into their simulated protocol negates any assumed inert effect on asthma[13] and the assumption on the part of Balon et al[12] that the audible release following SMT is the differentiating factor for active versus sham SMT was ill conceived.[14] Kaminskyj et al[1] also failed to address the limitations of spirometry in their examination of the evidence. Wifhaber et al[15] demonstrated that spirometry variables (i.e., FEV1, FCV, etc.) do not sufficiently correlate with asthma severity or control as determined via symptom scoring. Schneider et al[16] found the diagnostic accuracy of spirometry on asthma as questionable with sensitivity at 29% (95% CI 21–39); specificity at 90% (95% CI 81–95), positive predictive value at 77% (95% CI 60–88) and negative predictive value at 53% (95% CI 45–61). As such, any interpretations based on the spirometry in the clinical trials on asthma must be examined with caution.

Arguably, the SMT clinical trials on asthma are randomized comparison trials (rather than RCTs) with subjects in both SMT groups experiencing decreased asthma symptoms, decreased medication use and improved overall quality of life. More research is needed to determine the specific versus non-specific effects of a particular SMT prior to use in RCTs.

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To The Editor in Reply:

Thank you for the opportunity to respond to the Letter to the Editor by Drs. Joel Alcantara, Joey Alcantara and Junjoe Alcantara to our systematic review.[1] As we read their letter, the Drs. Alcantara seem to have three primary concerns: (i) what the 'C' in RCTs stands for ('clinical', 'controlled', 'comparative' or something else altogether); (ii) the appropriateness of the sham procedure used in some of the studies we described, such as the one by Balon *et al*[2] and; (iii) the use of spirometry to measure pulmonary function for patients with asthma.

(i) RCTs

In the peer-reviewed literature, RCTs may refer to Randomized Controlled Trials, Randomized Clinical Trials (which are either controlled or comparative), and Randomized Comparative Trials. Conventionally, albeit perhaps unfortunately, all of these are referred to in the peer-reviewed literature by the "RCT" acronym and the only way to know which type of trial was used in this or that study is to review the study's 'methods' section. Thus, our usage of the acronym RCT is appropriate.

Moreover, we must remind the Drs. Alcantara that the studies described in our systematic review survived the peer review and editorial process of several prestigious journals (Manual Medicine, JMPT, New England Journal of Medicine). These journals were satisfied to characterize these trials as RCTs. If the Drs. Alcantara take umbrage with the decision to characterize these trials as RCTs, we respectfully submit those concerns should be directed towards the respective publishing journal.

(ii) Sham 'manipulation' used in many RCTs

Drs. Alcantara cite an article from 1994[3] that they purport supports their assertion that the sham SMT used in many RCTs have not been validated. We again remind these authors that the aforementioned journals were satisfied with the sham manipulation procedure used in each study we cited in our systematic review. Again, any concerns they have with respect to the methodologies used in any particular study should be raised with either the authors of each study or the editorial board of the journal that published it.

More importantly, we can do no better than to defer to a recently published comprehensive and extensive review of the literature by Drs. Bronfort, Haas, Evans, Leiniger and Triano.[4] Each of these reviewers has extensive experience with conducting systematic reviews and we are content to bow our collective heads to their expertise. Their review article assessed the effectiveness of manual therapies for musculoskeletal and nonmusculoskeletal conditions. In their review, they concluded:

> *"There is moderate quality evidence that spinal manipulation is not effective (similar to sham manipulation) for the treatment of asthma in children and adults on lung function and system severity".*[4p53]

In other words, these experienced reviewers were not only satisfied to characterize the study by Balon[2] and others as RCTs, they mentioned the 'sham manipulations' used in each study without any commentary and their conclusions were much more critical than others with respect to the effectiveness of SMT for patients with asthma.

(iii) Use of spirometry for patients with asthma

With respect to the article by Schneider et al[5] cited, the positive predictive value (number of positive spirometry results that are defined via the gold standard as true, divided by the total number of times the spirometry result was positive, or the percentage of time a positive spirometry result is correct) is 77%. That is a relatively high value and since it is common practice to use spirometry in general practice the study reflects general practice.

In summary, while we thank the Drs. Alcantara for their views, we contend that our use of the term RCT was appropriate, the sham manipulations used in the studies we cited have been assessed and critiqued by others before us to their satisfaction and the use of spirometry to measure pulmonary function for patients with asthma seems to be justified.

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Essential Dance Medicine
Bracilović, A
Humana Press, 2009, 178 pp., Soft Cover, US $79.95, CAN $83.95
ISBN: 9781934115671

Ana Bracilović combines her dance experience with a medical specialty in physical medicine and rehabilitation in this review of dance injuries. It is organized into eight chapters: the first seven outline injuries divided by anatomical region and the last is an illustrated glossary of dance terms.

Each injury is presented with a case, diagnosis, epidemiology, pathophysiology, clinical and diagnostic information, and treatment (brief outlines of both conservative and surgical options). As indicated in the foreword, this text is not meant to serve as a complete reference for the management of injured dancers; the reader must therefore rely upon the best available literature and clinical experience to create a treatment plan.

Relevant differential diagnoses are outlined and differences in presentation are contrasted to the general population. Crucial considerations, such as the effects of the female athlete triad and common dance technique errors, are described as they pertain to injury mechanism.

Despite the strengths of this text, there are weaknesses. It is only moderately referenced and there are a number of spelling and spacing errors that detract from the overall readability. As well, the classification of spondylolisthesis described incompletely and it is inaccurately stated that increased dorsiflexion increases susceptibility to ankle inversion injury.

This text is a helpful reference for those beginning to treat dancers. It is not extensive enough to serve as a resource for all aspects of diagnosis or management, but achieves its aim of highlighting the unique needs of a specialized population.

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Sports Nutrition: Energy Metabolism and Exercise
I. Wolinsky and J. Driskell, 2008
288 pages, Hard cover, US $124.95/Can $124.95/£79.99
ISBN-10:9780849379505

This book was written as part of a series of sport nutrition texts designed to aid health and nutritional professionals. The goal of the book is to offer the latest knowledge and research in energy metabolism and exercise. Contributions for the book come from over twenty sports nutrition professionals including medical doctors, dietitians, and academic researchers.

The simple layout contains nine chapters divided into three sections: energy yielding nutrients, estimation of energy requirements, and physiological aspects of energy metabolism. Individual chapters focus on carbohydrate, fat, and protein energy production, laboratory and field assessment of energy expenditure, and sex, age, and body weight differences in energy needs. Information throughout is often presented at a sophisticated level. A thorough knowledge of biochemistry is required for many equations and diagrams. What few illustrations there are can be found in black and white. The addition of some colorful conceptual figures would aid in making this book a more pleasurable read. The quality of information written is impressive, with numerous references made to important historical and recent studies within each chapter. References are listed at the end of the chapter and are current up until 2007. An index can also be found at the back of the book to aid the reader in locating important concepts that may occur within multiple chapters.

This book does an incredible job of providing well researched, athlete focused, nutritional information. It would serve as an excellent resource to any health care professional involved with athletic populations.

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