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Hip fracture presenting as mechanical low back pain subsequent to a fall: a case study

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This case chronicles the assessment and clinical management of a 54 year old female patient who presented with post traumatic lower back, hip and lower extremity pain, initially attributed to mechanical low back pain but ultimately diagnosed as a hip fracture. This case study illustrates a number of important issues germane to chiropractic care. These are; the importance of using different assessment procedures, combined with clinical experience, in order to differentiate between those patients with clinical conditions that are amenable to conservative care from those that are not; the usefulness of a tuning fork test as a clinical tool in differentiating between hip fracture and mechanical spinal pain syndromes and; the impact of falls and fractures among older Canadian patients.
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KEY WORDS: hip fracture, injury/fall, tuning fork, chiropractic care.

Ce cas relate l'évaluation et le traitement clinique d'une femme de 54 ans qui s'est présentée avec des douleurs post-traumatiques au bas du dos, aux hanches et aux membres inférieurs, attribuées au départ à une douleur provoquée par l'articulation de la colonne lombaire, mais qui s'est avéré plutôt une fracture des hanches. Cette étude de cas illustre un nombre d'enjeux importants propres aux soins chiropratiques. Les voici : l'importance de se servir de différentes procédures d'évaluation, conjuguées à l'expérience clinique, afin de faire la différence entre les patients présentant des conditions cliniques qui relèvent de la médecine traditionnelle de ceux qui ne le sont pas; l'utilité de mettre au diapason les tests comme outil clinique pour faire la différence entre une fracture de la hanche et le syndrome de la douleur chronique à la colonne lombaire; et les impacts des chutes et des fractures chez les patients canadiens âgés.
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MOTS CLÉS : fracture de la hanche, blessure, chute, mettre au diapason, soins chiropratiques.

Introduction

It is very common for patients to present to a chiropractor's office with a chief complaint of spinal pain or disability. Based on recent demographic data, two out of three patients who initially present to a chiropractor have either back pain (41–44%) or neck pain (24–25%).[1,2] The National Board of Chiropractic Examiners (NBCE) reported similar data, with 'subluxation/ joint dysfunction' being the condition most routinely seen in practice (3.9 on a scale of 0–4, with 4 being most commonly seen).[3] Additionally, extremity subluxation/joint dysfunction (3.2/4) and sprain of any joint (3.1/4) were commonly seen.[3] Moreover, according to these studies, the average chiropractic patients were young to middle age adults, although the demographic group most likely to seek chiropractic care was the Baby Boomers,[1,2,3] a cohort group

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who are aging rapidly and causing a profound alteration to traditional pyramid-shaped population pyramids.[4,5,6] This predictable and rapid aging of the population has significant implications to field practitioners as it will greatly influence the proportional frequency of those clinical conditions that preferentially affect older patients encountered in private practice. Among the most common conditions preferentially affecting older persons is injury and disability subsequent to a fall.

One out of every three community dwelling seniors fall once a year,[7,8,9] and this number approaches 50% for those persons over the age of 80 years.[10] The risk of a fall resulting in a serious injury rises proportionately with a person's age, with older persons more likely to suffer a significant injury subsequent to fall compared with a younger person.[10,11] Because of this, although the NBCE analysis reported fracture was 'rarely' encountered (0.9/4) in private practice (see 3), a field practitioner must still be vigilant to the possibility that a seemingly uncomplicated mechanical pain may actually be a much more serious condition, such as fracture, especially if the etiology is traumatic in nature.[12] This necessitates a practitioner use a broad range of clinical tools in order to identify patients who are best suited to receive manual care (soft tissue therapy, mobilization, manipulation).

This case study chronicles the assessment and management of a 54-year-old woman who presented with low back, hip and lower limb pain subsequent to a fall. Her pain was initially attributed to uncomplicated mechanical spinal pain but was ultimately diagnosed as a hip fracture.

Case history

A pleasant fifty-four-year-old Caucasian female presented to a chiropractic clinic with a chief complaint of acute left-sided lower back and left lower extremity pain following a fall down a set of stairs. The patient explained that she had been visiting her daughter and her son-in-law and had returned to her home ten days ago. During a decent down a flight of stairs she slipped and fell and landed on her left side. She immediately felt a severe sharp pain in the area of her left lower back, left hip, lateral thigh and lateral leg. When asked about any treatment sought while away, she indicated that she attended the regional general hospital and was told that, since she was able to ambulate normally, she was most likely experiencing a lower back sprain/strain injury, she did not require an x-ray. She was prescribed anti-inflammatory and analgesic medications (Tylenol) and discharged.

When asked to point to the pain currently, the patient pointed to her left hip rather than her low back even though her intake form indicated she was experiencing low back pain.

> Authors' note: It is for this reason that it is very important to ask a patient to point to the exact place on his or her body that he or she feels the pain, especially in cases of low back or hip pain, since patients often confuse the two in terms of anatomical location. Since each of these areas of the body have a different set of anatomical structures that can be the generators of pain, it is essential to know what the patient is referring to in order to create an appropriate list of differential diagnoses.

The patient indicated that since she had been home the character of the pain was more of a superficial dull ache, rather than the deep discomfort she had initially experienced after the fall. With reference to a pain intensity scale, she stated that her pain had diminished from a more severe intensity (8/10) to a more mild pain 4.5–5/10 (0 being no pain and 10 being worst pain). The pain was intermittent, aggravated by walking, ascending and descending stairs, getting in and out of a car and sitting. Relief was only afforded by non-weight-bearing positions, especially if she was supine. Although there was no radicular pain, she did report referred pain down the lateral aspect of her thigh and lower leg. She noticed that she had been limping since the fall.

Past medical history revealed that she had been diagnosed with osteoporosis the previous year and that she has a heart murmur. Systems review was essentially unremarkable with the exception of mild constipation, controlled by maintaining a high fiber diet. She stated she takes "nerve pills", but could not recall which ones. She was not taking any botanical medicines, herbs, vitamins or minerals. She was a non-smoker. She did not report any significant family history of other diseases such as diabetes, heart disease, or cancer. She did not report any previous falls, accidents, surgeries or hospitalization, and she did not report any significant or unusual past illnesses or allergies.

Past chiropractic care consisted of care for lower back pain three years ago, which she perceived to be of a similar nature to what she was currently experiencing. She received treatment for three months. At that time, her low back pain began after a 'bumpy' and prolonged car ride. Chiropractic care consisted of soft tissue therapy and spinal manipulative therapy (side-posture manipulation directed to the area of the right hemipelvis), and had a favorable outcome.

Physical examination

The patient was Caucasian, 170 cm in height and 85 kg in weight. Observations of the area of chief complaint did not reveal any unusual moles, lesions or evidence of previous trauma or surgeries**.** Gait analysis demonstrated an antalgic limp, described as mildly painful, with a decreased stance phase on the left. Postural evaluation demonstrated a moderately low left iliac crest and posterior superior iliac spine (PSIS), as well as slight flexion of the left knee and hip in a protective manner to decrease the amount of weight bearing pressure on that side. Because of her antalgic posture and guarded gait, a decision was made to forego standing lumbar orthopedic testing such as ranges of motion, Kemp's or Trendelenburg's sign.

When the patient was asked to lay supine on the treatment table a slight flexion posture of the left hip and knee was observed. Active and passive range of motion (ROM) of the left hip joint was moderately restricted in internal and external rotation and flexion. The greater trochanter of the left femur was tender to palpation. When either a lateral to medial (compression) or anterior to posterior (shearing) force was applied to the lateral aspect of the left greater trochanter (leg straight, support provided to the anterior superior iliac spine), the patient experienced a deep joint hip pain. Because of concerns for the osseous integrity of her femur, FABER-Patrick (figure 4) test, straight leg raise test, Thomas test (see 13), and lower limb muscle strength testing were not performed.

When the patient was asked to assume a prone position, a posterior rotation of her left hemipelvis was observed. Active and passive ranges of motion of the hip in extension were moderately restricted due to pain. Upon soft tissue palpation, tenderness was elicited over the left lumbar paraspinal musculature and gluteal musculature. As was the case with orthopedic testing with the patient in the supine position, Yeoman's test, Hibb's test (see 13), and prone muscle lower limb strength tests were not performed so as to not to further injure the hip joint.

At this point in the physical examination the tuning fork test was performed. The patient was put in the lateral recumbent position with her lying on her right side. A 128 Hz tuning fork was applied to the lateral aspect of the left greater trochanter of the left femur with no vibration. The patient did not report any pain with this maneuver. The tuning fork was then set into vibration and applied to the same area: At this point the patient experienced a deep discomfort into the groin and into the left sacroiliac area.

Diagnosis and report of findings to patient

After pertinent findings from the patient's history and physical examination were reviewed with her, the patient was advised that, in addition to soft tissue strains and sprains of the muscles and ligaments surrounding the hip joint, she may also have sustained a hip fracture, especially since she was in the demographic group most at risk (female, Caucasian, peri-menopausal and osteoporotic). It was therefore recommended that a radiographic examination be conducted to rule out this possibility before commencing with any form of therapy. The patient immediately protested, recalling that the physician in the hospital that she had attended out of town did not feel that x-rays were warranted. She insisted all she required was the same spinal manipulative treatment she had received from her other chiropractor in order to "fix her problem". The patient became somewhat belligerent and adamantly refused to submit to a radiographic examination of her hip.

Plan of management

A compromised plan of management was agreed upon. The practitioner informed the patient that he refused to provide spinal manipulation in the absence of radiographic confirmation that a hip fracture was not present, but agreed to provide a low-force form of therapy intended for symptom relief. The patient consented to the proposed plan of management. The care plan involved using interferential current surrounding the left hip for pain control, and low amplitude, non-compressive soft tissue therapy directed to the hypertonic and tender myofascial tissues of the pelvis and lumbar spine. Neither spinal manipulative therapy nor mobilizations were provided to the patient, despite her continued insistence to the contrary.

The patient reported that she was comfortable during the treatment provided and did experience some symptomatic relief afterwards. After the treatment was completed, the practitioner emphasized his clinical opinion of the necessity for radiographic examination of the left hip. The patient eventually acquiesced, but did not permit the practitioner to schedule an appointment with a radiological facility at that time.

Follow-up

Initially, subsequent attempts to follow-up with the patient proved unsuccessful. A week after her initial appointment she was successfully contacted. She explained that she had gone to a hospital where a radiographic examination of the left hip had confirmed a fracture, and that a surgical intervention was recommended. She declined this recommended plan of medical management and subsequently discharged herself from the hospital, against the advice of her medical physician. The risks of such an unwise decision were explained to her. The patient, although stating her gratitude for the practitioner's care, did not acknowledge that she understood the potential risks of leaving a hip fracture untreated. The patient was lost to follow-up, following several unsuccessful attempts to contact her.

Discussion

Falls and fractures

Falls and fractures represent one of the most potentially devastating events in an older person's life. Among senior patients, falls and fractures represent the leading cause of death due to injury, and the sixth leading cause of death overall.[8] The most debilitating event associated with falls is hip fracture, especially among older patient with osteoporosis, with estimates of the number of hip fracture approaching 250,000 in the United States annually.[8,10] One study estimated that 14,000 deaths and 22 million patient visits to hospitals and physician offices were directly attributed to a person falling.[14]

Among older people, ninety percent (90%) of all hip, forearm and wrist fractures are the result of fall injuries.[8] While only 5% of all falls result in a fracture (and only 1% of falls result in hip fractures), 25% of all falls result in serious injury.[11] This represents a relative risk of hospitalization being 10 times more likely and risk of dying 8 times higher among seniors compared to children who fall.[10] Mortality rates at 6 months post-fall approach 20%, with 50% of patients suffering a serious decline in the Activities of Daily Living (ADLs), including those seniors who limit their activities to prevent the likelihood of falling (fear of falling).[15] Only one third of senior patients who fall regain their pre-fracture level of independence,[16] and as many of one third require institutionalization into a long term care facility.[17] The net effects of these findings indicate that seniors who fall are more likely to suffer restricted mobility, declines in both their ADLs and Instrumental Activities of Daily Living (IADLs), increase in nursing home placement and loss of independence.[11,18] Estimates of the economic burden this causes range from $13 billion to as high as $20 billion, with estimates of costs in the next decade of $45 billion.[15,19] However, if direct and indirect costs associated with care of a person who have sustained a fracture are factored in, the cost to the American health care delivery system has been estimated at $100 billion in 1995.[20]

These statistics are expected to increase over the next decade. With the 'rectangularizing' effect the Baby Boomers have on population pyramids, coupled with an increased longevity of that population cohort, the number of hip fractures is predicted to exceed 650,000 by the year 2050 in the United States.[6,11,15] Hip fracture rates are not limited to the continental United States. The World Health Organization estimated the number of hip fractures worldwide to be 1.7 million in 1990[21] and, based on a number of European studies, this number is predicted to exceed 6.25 million by 2050.[11,15]

Persons at most risk of falling including patients with any form of arthritide, depressive symptoms, orthostasis, impairment in vision, hearing, sensation (especially of the feet), balance, gait, muscle strength and patients consuming four or more medications, including botanical medicines, herbs and over-the-counter remedies.[11,18] Recently, the Public Health Agency of Canada published its findings in a document entitled *Report on Senior's falls in Canada.*[22] In it, the investigators reported seniors most likely to experience an injurious fall were women, over the age of 80 years old, widowed, separated or divorced, possess a post-secondary education but living on an average annual income of $15,000 or less. This report also listed the biological/medical risk factors (table 1), behavior risk factors (table 2), and environmental risk factors (table 3) most associated with senior's who fall.[22]

Table 1 Biological risk factors most associated with falls among older persons

- Muscle weakness and reduced physical fitness (includes loss of muscle strength, Balance, flexibility and coordination).
- Impaired control of gait or balance
- Visual changes
- Chronic illnesses (such as diabetes, Parkinson's, multiple sclerosis)
- Physical disability of any kind (diminished sensation of touch in feet, hearing loss, dizziness).
- Acute illness
- Cognitive impairments (dementia, delirium, depression)

Table 2 Behavioral risk factors most associated with falls among older persons

- History of previous falls
- Risk taking behaviors (climbing, reaching)
- Medications and multiple prescriptions (polypharmacy)
- Excessive alcohol use
- Poor footwear
- Inactivity or inadequate diet
- Fear of falling

Table 3 Environmental risk factors most associated with falls among older persons

- Stair climbing
- Factors in and around the home (rugs, showers, night light use, kitchen hazards, furniture, garden paths, family pet)
- Public environments (sidewalks)
- Inappropriate use of assistive devices

Many chiropractors have conflicting opinions with respect to the relative importance of a wellness paradigm within the profession (see 23, 24). Regardless of these perspectives, chiropractors are well situated, as portal of entry health care providers, to take an active role in offering their patients preventive advice shown to have a positive effect on a person's health. In the case of falls and fractures, evidence-based preventive initiatives include: suggestions for an older person to safety-proof his or her home;[25,26] use of hip protectors for those individuals most at risk;[27] recommendations for exercise such as walking, cycling, mild aerobic or other endurance training;[28] Tai Chi;[29] strength training[30] and adoption of risk-abatement behaviors.[19] For example, several recent studies have reported that a multi-factorial approach, using several of the aforementioned strategies concurrently (for example, risk-abatement, cognitive behavior and environmental focus) was more effective than implementing any of these strategies individually.[19,31] A recent study reported that high-intensity strength training can safely and effectively strengthen lower limb muscles among balance-impaired seniors, resulting in a significant improvement in functional balance and decreased risk of fall.[32] Another study by Hawk et al.[33] collected data on risk factors associated with falling and methods of balance assessment among community-dwelling patients aged 65 years and older.

Tuning fork test

It is imperative for a practitioner to be able to properly evaluate a patient suspected of having a hip fracture, as this may necessitate prompt referral for medical management. Complications that can arise from a fracture not properly managed or not detected include: failure to heal (nonunion); healing in a poor position; shock from blood loss and; fat embolus from the injury site.[34] Of these possible serious sequelae to femoral fracture, the most common are development of fat embolus to the lungs or brain, or obstruction of nearby arteries.[34] Similar to athletic trainers[35] chiropractors in the field may be faced with a daunting diagnostic challenge since there is limited research on the efficacy of field testing for suspected fracture.

To assist practitioners, several tests have been suggested for the detection of fractures in the absence of radiographic imaging. These tests have been described as the percussion test with auscultation,[36] the percussion test without auscultation[35,37,38,39,40] the tuning fork test with auscultation[35,40,41] the tuning fork test without auscultation[39,40,42] the compression test[35,37,39,40] and the distraction test.[39,40]

The clinical utility of these tests is based on the neuro-

physiology response to vibration sense. Nerve fibers conducting vibration sense (along with fine touch, two-point discrimination and proprioception) pass through afferent nerve fibers to the ascending tracts of the dorsal column of the spinal cord.[43] The fasciculus gracilis conducts these sensory modalities from the lower half of the body and the fasciculus cuneatus conducts these sensory modalities from the upper half of the body. From the posterior columns, these nerve fibers synapse at the level of the dorsal column nuclei entering the medial lemniscus. From here, they ascend to the level of the thalamus where they again synapse to eventually terminate at the sensory cortex.[43]

Many uses for tuning forks have been described in the literature, including several applications in chiropractic practice. For example, the vibratory stimuli emitted by tuning forks are used in the assessment of auditory acuity in differentiating between conductive and sensorineural hearing loss, using the Weber and Rhinne test (see 44). In addition, tuning forks are also a key component of a neurological examination. Vibratory sense is usually the first sensory modality to be compromised among diabetic patients or in persons experiencing toxic peripheral neuropathies, as well as being the first sensory modality lost as the result of posterior column disease.[44]

The research thus far conducted in assessing the usefulness of tuning forks in the detection of suspected fracture is equivocal. A study by Misurya et al.[41] involved 50 patients who had suffered from either a fracture of the neck of the femur, the shaft of the femur or the tibia. A child's stethoscope and a tuning fork with a vibration frequency of 128 Hz was used. Each case was investigated clinically to ascertain whether or not a fracture was present. Following that, the tuning fork test with auscultation was administered. The tuning fork was placed distal to the suspected fracture site, while the bell of the stethoscope was placed proximal to the fracture. The tuning fork was set in vibration and the ability of the clinician to hear the vibration of the tuning fork was noted. If the vibration of the tuning fork was absent or decreased when compared with the control limb, a fracture was said to have been present. The results showed that the tuning fork test was correct in 94% of the cases while the clinical diagnosis was correct in 88% of the cases. It was also suggested that this test had a higher sensitivity when lower frequency tuning forks were used, as higher frequency tuning forks emit more kinetic energy and would more easily be propagated across the fracture site.

Lesho[42] conducted a study that included 52 patients with history and physical examination findings suggestive of a stress fracture of the tibia. The tuning fork test without auscultation was performed on each patient, using a tuning fork with a vibration frequency of 128 Hz. The tuning fork test was considered a positive test if the patient experienced a marked exacerbation or reproduction of the shin pain in a localized area of the tibia. All patients were then examined with nuclear scintigraphy to confirm the presence of a stress fracture of the tibia. This study concluded that the sensitivity and specificity of the tuning fork test was 75% and 67% respectively.

Peltier published an article discussing the percussion with auscultation test to assess for the presence of fractures of the femur, hip, pubic rami or dislocations of the hip.[36] In his article he described how a stethoscope was firmly held over the symphysis pubis and the examiner's fingertip tapped each patella. Any obstruction of the percussive sound picked up by the examiner using the stethoscope, when compared with the control side, indicated a fracture of the femur, hip, and symphysis pubis or hip dislocation. His article also stated that the percussive sound is enhanced across ankylosed joints. Although Peltier opined that this test was simple and accurate, his study did not include any data to substantiate his claims.[36]

Moore conducted a study to compare the relationship of the tuning fork test with auscultation, percussion test with no auscultation and the compression test to plain film radiography.[35] Osseous structures examined were the phalanges of the hand and foot, fibula, tibia, metacarpals, metatarsals, ulna, radius, humerus and the clavicle. Moore found that the tuning fork test with auscultation was correct 89% of the time in the detection of fractures when compared with plain file radiography, while the percussion test with no auscultation and the compression test were only correct 67.6% and 64.9% respectively.[35]

Kazemi published a thorough literature review of the utilization of the tuning fork test for the detection of fractures.[40] This review yielded twenty-six articles from 1981 to 1997 and emphasized the importance of these tests to health care professionals in assessing acute sports related injuries on the field where diagnostic radiographic tests are not available. Since that review was conducted, three

studies have cited the importance of the tuning fork test in the assessment of athletic injuries, and one doctoral thesis further examined the use of the tuning fork in the assessment of possible fractures in collegiate athletes and adults.[35]

Relying on clinical judgment

Private practitioners are essentially operating a small health care business. It is certainly good business practice to maintain a strong rapport and amicable relationship with patients. Moreover, successful clinical encounters often strive to avoid a patriarchal relationship that only invests the practitioner with all of the clinical decision making powers. Several studies have suggested better patient outcomes are realized if the patient is an active participant in the development of his or her care plan.[45] However, as this case study illustrates, patients may demand a form of care that the practitioner considers unnecessary, unethical or unwise to provide. In such circumstances, the practitioner should be ultimately governed by appropriate ethical and clinical practice guidelines and should not feel compelled to provide any form of care he or she believes may imperil the patient's wellbeing. This concept is often embodied by the concept of *primum no nocere* (Latin for 'first do no harm', a sentiment inaccurately attributed to Hippocrates or Galen).[46] Moreover, the 'syntegration' of sound clinical judgement, clinical experience and 'best practice' guidelines is being recognized more and more as an under-appreciated yet essential component of both diagnostic acumen and therapeutic delivery.[47,48,49]

Summary

This case study illustrates several important features germane to the care of older patients. While the patient's demographic information and radiography are among the most useful tests used to identify a fracture, the tuning fork test appears to be clinically valuable as well, especially in cases were x-rays are not readily obtainable. This case study also underscores the importance of being vigilant to the possibility that a seemingly uncomplicated case of low back pain may be an undiagnosed hip fracture, especially in cases of trauma, and that the literature indicates that falls and fractures may have a potentially devastating effects on an older person's wellbeing and overall health.

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