CHIROPRACTIC CARE OF A GERIATRIC PATIENT WITH AN ACUTE FRACTURE-SUBLUXATION OF THE EIGHTH THORACIC VERTEBRA

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ABSTRACT

Objective: To describe the chiropractic care of a geriatric patient with complaints of midthoracic and low back pain.

Clinical Features: A 74-year-old woman sought chiropractic care with complaints of thoracic spinal pain following a fall. Palpation findings included hypertonicity and tenderness along with painful muscle spasms in the paraspinal musculature of the thoracolumbar spine. Limited range of thoracolumbar motion was found on extension and lateral flexion, most notably on right lateral flexion, with pain. Radiographic examination revealed a compression fracture at T8, in addition to spinographic listings. Signs of sprain injury were also detected at T8.

Intervention and Outcome: The patient was cared for with contact-specific, high-velocity, low-amplitude adjustments to sites of vertebral subluxations and at the T8 fracture-subluxation. The patient's response to care was positive.

Conclusion: This case report describes the clinical features, care, and results of 1 geriatric patient with a thoracic compression fracture-subluxation treated with specific chiropractic procedures. The patient had an apparent decrease in pain as a result of the treatment. Due to the inherent limitations of a case report, it is inappropriate to generalize this outcome. (J Manipulative Physiol Ther 2004;27:e4)

Key Indexing Terms: *Geriatrics; Chiropractic; Fracture; Throacic Vertebra*

INTRODUCTION

According to government reports, the US population of elderly citizens is increasing dramatically. In the 1900s, people over 65 comprised 4% of the US population. By 1968, this had increased to 12.4%, and by 2032, it is estimated that this proportion will increase to 22%.[1] Foster et al[2] noted that approximately 30% of people aged 65 or older used at least 1 alternative medicine modality in the preceding year. Chiropractic was the most frequent provider accessed at 11%. del Mundo et al[3] have reported that alternative medicine use in rural communities is significant. Seventeen percent of all respondents (all ages) indicated that they used chiropractic services in the past year.

Regardless of whether the patient's complaint is associated with a long-standing illness or recent trauma, the care of the elderly provide unique challenges and considerations for the clinician and to the health care system in general. One aspect of patient care involves the care of the elderly individual with spinal injuries.

Studies have shown that two thirds of accidents among the elderly are due to falls and account for approximately 60% of spinal fractures.[4] Risk factors for falls in the elderly are shown in Table 1. Chiropractors are uniquely trained to care for patients with injuries to the vertebral column. There is now a growing body of evidence that the aging population is gravitating toward chiropractic care for their health care needs.[5] In the case of a geriatric patient who has had trauma, the primary goals are to return function, maximize the

Table 1. *Elderly risk factors for falls*

| Loss of visual acuity |
| Cardiovascular compromise |
| Lower extremity dysfunction |
| Gait and balance disorders |
| Cognitive disorders |
| Neurologic disorders |
| Adverse reactions to medication |

Table 2. *Patient thoracolumbar range of motion following a fall*

	Normal AROM	Patient AROM
Flexion	95	95
Extension	35	25
Rotation		Not performed
Left lateral flexion	40	15
Right lateral flexion	40	5 (with pain)

AROM, Active range of motion.

performance of activities of daily living, and improve quality of life for the individual as well as for potential caregivers.[6]

We present the chiropractic care of an elderly patient with complaints of spinal pain as a result of injuries sustained from a fall.

CASE REPORT

A 74-year-old woman sought chiropractic care from one of us (RAE) for complaints of thoracic spinal pain. Nine days before her visit, while carrying a water-soaked carpet up her basement stairs, she had twisted and fallen against the railings. The patient complained of moderate to severe midback pain that radiated to both sides of her back and chest. Provocative maneuvers included motion of the involved area, lying down, and respiration. Her blood pressure measurement was 138 mm Hg/82 mm Hg. Palpation findings included hypertonicity and painful muscle spasms in the paraspinal musculature of the thoracolumbar spine, most notably at the trapezius muscles (bilaterally), and in the left thoracic and lumbar paraspinals. Tenderness to palpation, motion palpation for spinal fixation-dysfunction,[7] and skin temperature differential analysis[8,9] were positive at the C7-T1, T6-7, T10-11, and L5-S1 motion segments. Active range of motion (AROM) examinations of the thoracolumbar spine are provided in Table 2. Limited global range of motion was found on extension and lateral flexion, most notably in right lateral flexion, with pain.

Orthopedic tests were remarkable for the following: Derifield[10] hip positive on the right, Ely's test positive on the right, double leg raise positive bilaterally, leg lowering positive bilaterally, Lindner's sign positive bilaterally, foraminal compression positive on the right, shoulder depressor test positive on the left, and Trendelenburg test positive on the left.[11] The patient's posture in the coronal plane demonstrated a low left shoulder. Percussion was positive bilaterally at the T8 transverse processes.

Full-spine anterior-posterior (AP) and lateral radiographic images are provided in Figures 1 and 2. There was a loss of height of the anterior two thirds of the T8 vertebral body by approximately 5 mm. The posterior vertebral body was unaffected. Small anterior spondylophytes were noted at T8

in conjunction with mild irregularity of the inferior endplate. The disk height was unaffected.

The patient, prior to receiving care for the complaints noted here, received chiropractic care from one of the authors (RAE). Radiographic studies obtained 2 years prior are shown in Figures 3 and 4. There was no evidence of a compression deformity at T8. The vertebral body measured 2 cm at its anterior.

Additionally, spinographic analysis included the following listings: Atlas-AS ($-\theta X$); C7-P-Inf ($-Z,-\theta X$); T5-PLS ($-Z,\theta Y$); T8 PL ($-Z,-\theta Y$); L1-PRI-m ($-Z,+\theta Y,+\theta Z$); L5-PRS ($-Z,+\theta Y,-\theta Z$); Sacrum P-L ($+\theta Y$); Left Ilium-AS$_4$IN$_1$ ($+\theta X,+\theta Y$).[12] The left femur head was found to be 8 mm lower when compared with the right and the lumbosacral angle was measured as 42°.

The patient was reexamined 41/2 weeks following her initial examination and was remarkable for hypertonicity in the upper trapezius muscles (bilaterally) and at the left thoracic and left lumbar paraspinal areas. Comparative radiographs (Figs 5 and 6) demonstrated an increase in the size of the spinal osteophytes, and sclerosis at the inferior vertebral endplate with more pronounced irregularity. There was no significant change in vertebral body height. The disk heights were still well maintained. Spinographic examination findings included the following: T9 PL ($-Z,-\theta Y$); L1-PRI-m ($-Z,+\theta Y,+\theta Z$); L5-PRI-m ($-Z,+\theta Y,+\theta Z$); Sacrum P-L ($+\theta Y$); Left Ilium AS$_3$EX$_5$ ($+\theta X,-\theta Y$). The left femoral head was found to be 7 mm lower than the right and Ferguson's angle was 44°.

Care

The patient was adjusted on a hi-lo table with the thoracic section locked. Spinal adjustments were performed with a single-hand contact (ie, pisiform). The T10 (PL) and T6 (PL) vertebral segments were adjusted during the first 2 visits. At the third visit, L2 was adjusted as PR-m and T7 as a PL. Almost 1 week had passed by the fifth visit. On the next visit (sixth), the patient indicated that her "midback pain" was more "stiff and achey" than painful and that she could now turn over in bed with less distress. On subsequent visits (19 visits), the patient was adjusted at T8 as a PL. Cryotherapy was applied at home to the midback for one-half hour on, one-half hour off, 4 to 6 times a day.
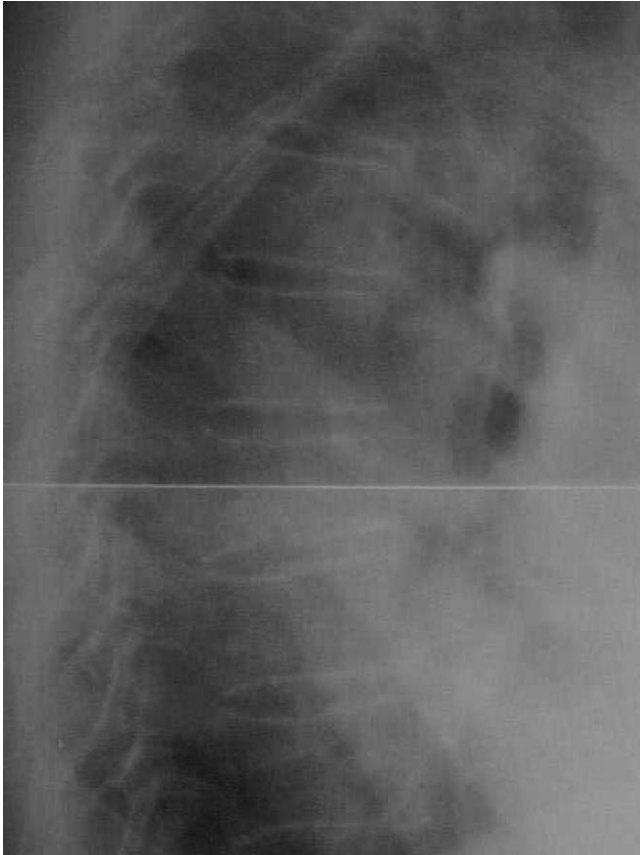
Fig 1. *The compression fracture at T8 from the lateral full-spine.*
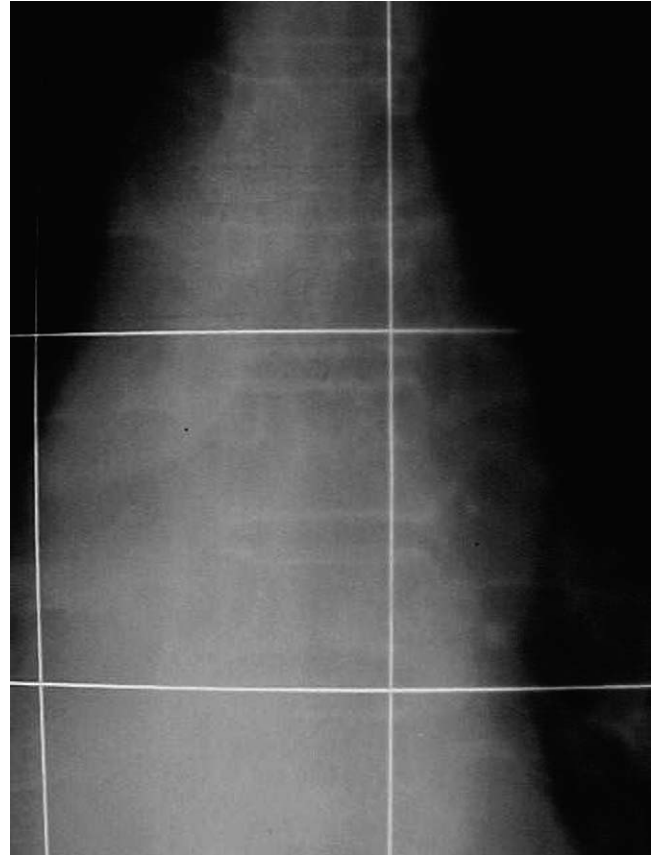
Fig 2. *The compression fracture at T8 from an anteroposterior full-spine.*

Additionally, the patient wore a ''long line'' brassiere during sleep for additional support during the first 2 weeks of care.

In this case, several health promotion activities were suggested by the chiropractor to the patient in addition to ongoing adjustive care:

1. modification of caregiver duties;
2. calcium supplementation;
3. reduction in red meat consumption;
4. daily walking;
5. at home postural maneuvers; and
6. ergonomic and sleeping advice

As reported above, the patient, a widower, was also the primary caregiver for her 90-year-old mother. In an attempt to move her mother, the patient aggravated her spinal condition. She was advised by her chiropractor to hire a home health aide/housekeeper to assist with these duties, as well as the laundry, which was located in the basement down a flight of stairs. She was told to avoid bending and twisting and from operating a vacuum cleaner.

She reported that she was currently sedentary. She was encouraged to minimize driving and to walk every day. In addition to this general exercise advice, she was instructed to do postural maneuvers each day to inhibit progressive kyphotic deformation of her thoracic spine. The procedure is from Applied Spinal Biomechanical Engineering[13] and is called the ''door-jamb maneuver'' (Dr David J Rowe, oral communication, July 1, 2003). The patient stands in a doorway with the hands at shoulder height; the pelvis is tucked, the thoracic cage is extended and lifted, and the head is retracted posteriorly; the patient steps through the doorway and this postural position is held for several seconds to decrease the thoracic kyphosis. The prone sleep position was advised initially to add some extension movement to the thoracic spine and to decrease the compression at the fracture site.

In terms of dietary advice, she was instructed to increase her supplementation of calcium to 2400 mg daily and to minimize consumption of red meat. It has been shown that diets high in animal protein may be correlated with more bone loss and greater risk for fracture.[14,15] Whether a high dietary protein (animal or vegetable source), in general, is associated with more bone loss is controversial. For example, osteoporotic women have loss of the protein bone matrix as well as bone calcium. Osteoporotic women appear not to have consumed more than the recommended daily allowance (RDA) of protein; the loss of bone calcium
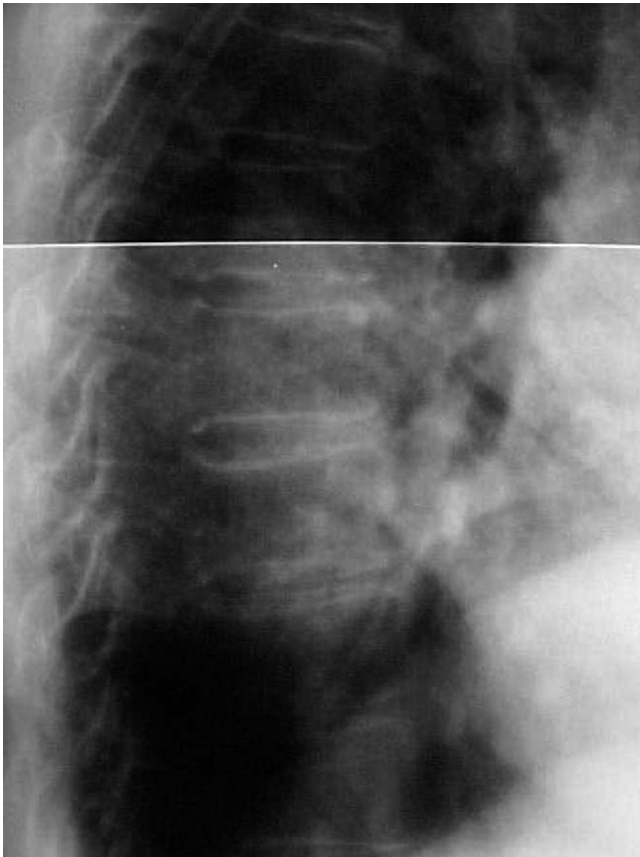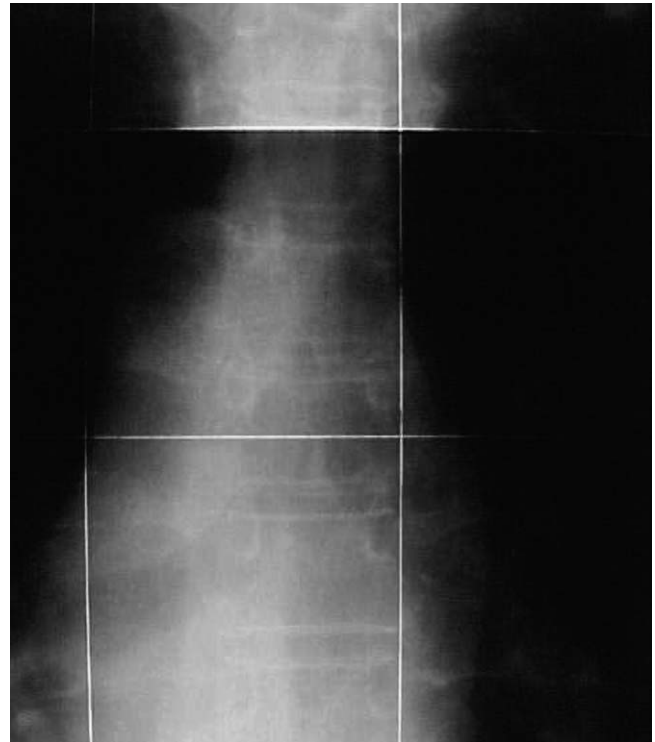
Fig 3. *Anteroposterior full-spine radiographic study of the patient 2 years prior to current care episode.*

Fig 4. *Lateral full-spine radiographic study of the patient 2 years prior to her current episode of care.*

and protein matrix are accelerated by high levels of hormones such as cortisol, glucagon, thyroxin, and parathyroid hormone and by low levels of vitamin D, calcitonin, estrogens, and dehydroepiandroestrone (DHEA) (an estrogen and androgen precursor).

Outcome

The patient's spinal pain abated but her midback remained "tight" or "stiff." As stated above, the patient had been cared for prior to the current injury for complaints of low back pain and right sciatic pain. This pain returned on several occasions during the 19 visits but resolved with continued care. The visit frequency was 3 times a week for 6 weeks, 2 times a week for 6 weeks, and once a week for 6 weeks. The patient was adjusted a total of 25 times between the preradiographic and comparative radiographic examinations. At the time of the second radiographic examination, the patient reported only mild thoracic and low back pain.

The patient continues to be a patient. Four years past the date of her initial visit due to complaints associated with the T8 compression fracture-subluxation, she exacerbated her low back pain after lifting her 90-year-old mother. The

patient indicates that she does not have any complaints of long-term consequence associated with the compression fracture at T8.

DISCUSSION

The consequences of aging include a variety of disorders (ie, cancer, stroke, osteoarthritis, osteoporosis, incontinence, visual and hearing impairments, and dementia) that not only are primary morbidities in their own right but also place the geriatric individual at greater risk for falls.[16] According to a recent publication, individuals aged 65 years or older have a 10-fold increased risk for falls, and this is the most common cause of orthopedic injury.[17,18] Although the hip and wrist are often affected, vertebral fractures, particularly for the woman with reduced bone mineral density, also occur.

Melton et al[19] found a prevalence (age-stratified random sample) of compression fractures of 26% in Rochester, Minnesota (1981-1983) in women aged 50 years and over. The corresponding radiographic incidence of vertebral fractures rose from 5 per 1000 person-years in women aged 50 to 54 years to 29.6 per 1000 person-years in women aged 85 years or older. Most of these radiographic changes were, however, asymptomatic. In an extensive population sample of Finnish men and women, the prevalence rates of 0.75% in men and
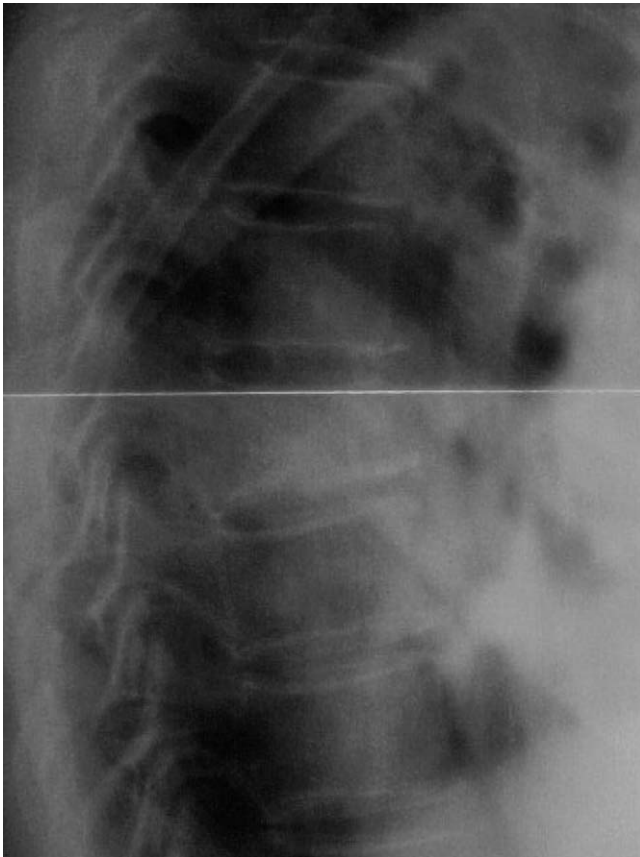
Fig 5. *View from comparative lateral full-spine radiographs taken after 25 chiropractic visits.*
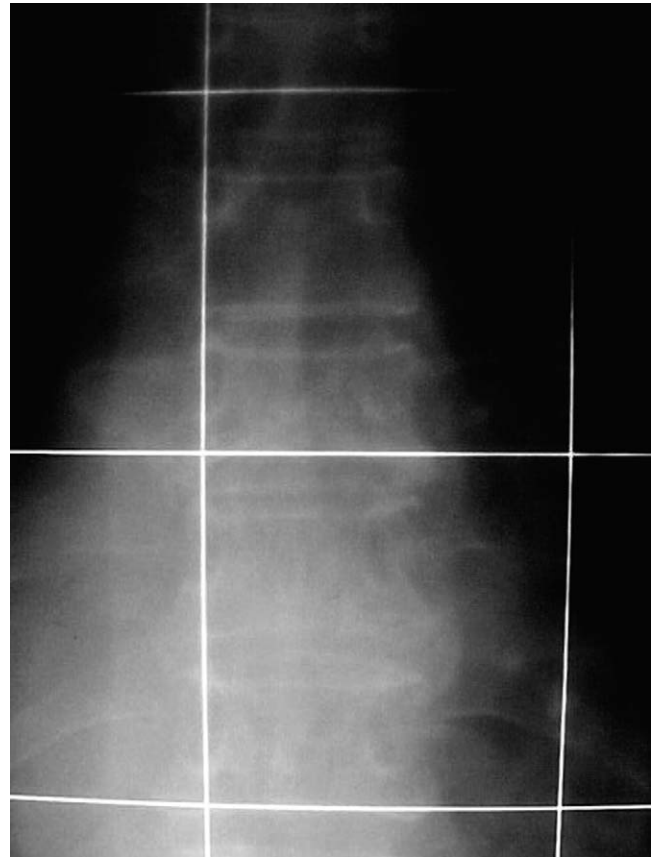
Fig 6. *View from comparative anteroposterior full-spine radiographs taken after 25 chiropractic visits.*

0.44% in women were found in the whole Finnish population aged 15 years or older. In men, the prevalence and incidence increased gradually with age, whereas in women an abrupt rise was found after the age of 65, reflecting differences in patterns of age-related osteoporosis between the sexes.[20]

The pain associated with compression fractures has been characterized as intense and deep, as well as specific to the fracture site.[21] It may be intermittent or chronic, relieved by rest and immobilization, and aggravated by motion of the involved segments (ie, bending, activities of daily living). The pain may not abate during the first 7 to 10 days, and according to 1 study of hospitalized patients, their spinal pain had decreased by only 22% at day 7 and by only 33% at day 14.[22] Long-term studies are few, but there are indications that spinal pain can persist for longer than 6 months. Lyritis et al[23] dichotomized the clinical presentation and natural history of patients with compression fractures based on their study of 210 cases of osteoporotic women with acute pain and radiological evidence of spinal fractures. In type 1 cases (n = 121), the patients are characterized as having acute, severe pain that improved gradually. Radiographically, the vertebral wedging was obvious from the beginning and

remained unchanged during the course of care. The average duration of the patients' complaints exceeded 4 to 8 weeks. In type 2 cases (n = 89), pain intensity was less and of shorter duration, but after 6 to 16 weeks, a new attack of acute pain was present with repeating episodes within 6 to 18 months. Radiologically, the fracture was not clear during the first attack but wedging gradually developed during the next few months. According to Lyritis et al,[23] the findings suggest that these patients are heterogeneous with respect to their clinical presentations.

Leidig et al[24] investigated the relationship between vertebral deformation and clinical symptoms in 70 patients with osteoporosis. Clinical data like pain, functional limitations, and parameters of mood were examined by a standardized questionnaire. Their results underline a relationship between the degree of vertebral deformation and the reduction in these outcome measures. Such studies suggest that clinical measures of vertebral body height loss and, to a lesser extent, acute pain are sensitive indicators of new vertebral body compression fractures with moderate to severe deformity. However, one should also keep in mind that not all radiographically diagnosed vertebral compression fractures are symptomatic and clinically diagnosed. For

example, in a study by Cooper et al[25] to examine the health impact of vertebral fractures in osteoporotic women in Rochester, Minnesota, initial radiologic diagnosis of vertebral fractures between 1985 and 1989 revealed that 16% of the radiographically diagnosed vertebral compression fractures were made incidentally. The patient who is the subject of this case report suffered both a compression fracture as well as sprain injury (ie, subluxation) of the associated motion sgement. The pain experienced by this patient is likely due to a combination of ligamentous and periosteal nociception. Her positive symptomatic response to care appeared to exceed that which would be expected from reviewing the literature on the natural history of geriatric patients with acute symptomatic compression fractures.

The long-term consequences of compression fractures may include thoracic hyperkyphosis and lumbar hyperlordosis due to diminished rib cage motion and stooped (antalgic) posture. The increased thoracic kyphosis may impair function of the spinal cord.[26] Furthermore, associated cosmetic changes may create adverse psychosocial outcomes such as distorted body image, poor posture, and low measures of well-being and general health.[27] Chronic back pain may result due to failure of the clinician to address the structural changes of the spine (ie, subluxations) or the osteoarthritic changes.

Annual direct medical costs of osteoporosis incurred by American women aged 45 and older were estimated at $5.2 billion in 1986. The cost components were inpatient care, $2.8 billion; nursing home care, $2.1 billion; and outpatient care, $0.2 billion. The study results suggest that considerable future cost savings may be possible with osteoporosis prevention and abatement.[28] The cost of care for patients with vertebral compression fractures has been estimated for white females hospitalized in California at $13.2 million for 1984.[21]

Chiropractors, with their traditional emphasis on holistic practice, health promotion, and wellness, play prominent roles in the care of individuals 65 years or older. The role of the chiropractor in caring for elderly patients may be examined on 2 fronts. One involves the chiropractor addressing the immediate needs of the patient with respect to his or her complaint. Another considers the long-term care of the elderly individual in promoting health and wellness.

As with any patient, the chiropractor's approach to the elderly patient must be one of great attention to a detailed history, a thorough physical examination, and proper use of imaging studies. The patient's age (ie, age greater than 65 years), a history of trauma, and clinical findings of subluxation (eg, edema, fixation-dysfunction, etc.) warrant plain film assessment. One aspect of the spinographic analysis, to be discussed in more detail below, ensures that the major injuring vector (ie, flexion-compression) is not recreated during the application of the adjustment. In this patient, the T8 segment was classified as a fracture-subluxation.

In elderly patients with vertebral compression injuries, several clinical considerations must be made. One of these involve the determination of the true underlying cause of the patient's complaints. Although not an exhaustive list, vertebral collapse may be possibly due to multiple myeloma, primary bone tumors, infection, trauma, or osteoporosis. It is critical for proper care that the chiropractor makes a prompt referral to share the responsibility of patient care in cases involving, for example, neoplasm. Vertebral compression fractures in the elderly commonly occur at the T6-8 region due to axial loading of the anterior column at the apex of the thoracic kyphosis.[29] According to Patel et al,[30] T8, as well as T12, L1, and L4, are more likely to fracture.

Acute pain at the fracture site is intense due to irritation of the periosteum and soft tissue structures with nociceptors. Local bleeding causes the release of cytokines and mediators of inflammation, which can cause muscle spasm. Barring complications (ie, neurological, ileus, urinary complications), acute care in the way of relief through chiropractic adjustments to sites of subluxations may be addressed. Preliminary studies have shown that spinal adjustments may provide an analgesic effect and may decrease muscle spasm.[31-34] Sandoz[35] hypothesizes that this can also occur in patients with compression fractures who receive chiropractic adjustive care. A preliminary study has shown that the thoracic kyphosis may decrease in geriatric patients who receive posterior-to-anterior adjustments.[36]

It is of paramount importance that the clinician not reproduce the major injuring vector (ie, flexion-compression) during the examination or with patient positioning. It is unlikely that a posterior-to-anterior adjustment is capable of causing a compression fracture,[35] because the spine is not being vertically compressed during the procedure.

According to Rowe,[37] in a patient without fracture, the focus of chiropractic care with respect to weighting particular examination findings of subluxation should place more emphasis on the fixation-dysfunction component. However, due to the nature of the patient with a fracture-subluxation, greater weighting is given to the radiological manifestations of the major injuring vector (ie, malalignment) and the associated neurological component.[37]

Bergmann and Larson[38] state that chiropractic adjustive technique should be modified in an older person such that contacts are more broad (less specific), multiple thrusts are preferable to a single quick thrust, and sustained pressure is also preferable to a high-velocity thrust. These recommendations have been recommended in chapters of 2 recently published geriatric textbooks.[39,40] We would disagree with this approach to geriatric adjustive care in general but more so in a patient who has sustained an acute compression fracture. During the 1990s, the patient demographics at the Gonstead clinic (Mount Horeb, Wis) was such that the majority of patients were over age 65 (Schultz N, oral communication, June 16, 2001). Most of these patients receive segmentally specific, high-velocity adjustments.

Although the magnitude of the force is substantially modified in different patient presentations and for the most part also is the depth (or work: W = F × D), contacting multiple segments is not done or advised for others utilizing this adjustive procedure. Others have stated that the adjustment in the geriatric patient needs to be precise and based on a multiparameter examination.[41] Bergmann and Larson[38] also advise a multiparameter examination approach, but we disagree with the authors' ''nonspecific'' adjustive recommendations. In relation to geriatric patients with fracture (not specifically defined), Bergmann and Larson[38] advise medical referral. However, they also state that, . . .''it does not preclude the patient from receiving manipulative therapy to unaffected areas or, in some cases, to the areas of pathology for symptomatic relief.''

A consequence of the vertebral collapse and sprain of the soft tissue elements is the alteration of the articulations of the involved motion segment (ie, physiological, positional, kinesiological, etc.), causing an accelerated degenerative process (ie, degenerative joint disease), as well as contributing to possible chronic pain. Note that the comparative radiographs demonstrated the course of the degenerative process. To what extent the role of chiropractic adjustments may have in retarding this process in patients with subluxation or fracture-subluxation is unknown. Adjustments are thought to stimulate the process of imbibition whereby the involved segments receive nutrients and eliminate metabolic waste products, leading to enhanced recovery and healing. Mobility of the motion segment is central to this process. Also of importance is that although the degenerative process has taken place at the involved segment (ie, T8), the patient received substantial symptomatic relief of her complaints. This is consistent with studies that have found that radiographic studies do not necessarily positively correlate with the patient's clinical presentation, although the literature is somewhat mixed on this subject.[42-46]

Another consideration is stability at the fracture site. An application of forces through spinal adjustments to unstable spinal segments that reproduces the major injuring vector is contraindicated.[47] According to White and Panjabi,[48] fracture stability must account for both mechanical and neurological instability. They define it as, '' the loss of the ability of the spine under physiologic loads to maintain relationships between vertebrae in such a way that there is neither damage nor subsequent irritation to the spinal cord or nerve roots, and in addition there is no development of incapacitating deformity or pain.'' According to Rockwood et al,[49] if neurological injury is present, the segment(s) are considered mechanically unstable due to their failure to protect the neurological structures. According to the Denis[50] model of spinal stability, an anterior compression fracture represents damage only to the anterior column and is therefore stable.[49]

Attention to possible neurologic dysfunction as a result of the fracture must be addressed. This may interfere with axonal flow, as well as spinal vascular disruption. Rockwood et al[49] found that neurologic dysfunction may possibly occur with loss of 50% vertebral body height or angulation of the thoracolumbar junction of 20°. With respect to spinal canal compromise, less than 30% canal compromise may not be clinically relevant. This patient did not experience a spinal cord injury associated with the fracture-subluxation.

A review of the Medline indexed literature (1966 to 2001) using the subject headings *chiropractic* and *fracture* revealed 3 citations related to compression fractures. Haldeman and Rubenstein[51] presented 4 cases in which patients were noted to have compression fractures following chiropractic adjustments. In each of the cases, they raised questions concerning the relationship between the adjustment and the occurrence of fracture. They further commented that failure to diagnose a compression fracture, together with the application of an adjustment into the area of fracture, can increase symptoms and prolong disability. They recommended that patients with osteoporosis who have suffered a fall or injury be evaluated radiographically before treatment is given. Plaugher,[52] in response to this article, questioned 1 of the authors' conclusions that an adjustment caused a spinal compression fracture in the patients.

Kreitz et al[53] discussed 5 cases of L5 vertebral body compression fracture, illustrating the epidemiology, clinical presentation, and radiographic appearance of the fracture at this uncommon site. One 83-year-old patient was ''manipulated'' over a 4-month period with only short-term symptomatic relief. She was then evaluated radiographically and the L5 compression fracture was diagnosed. Another geriatric patient (78 years old) was manipulated for 6 treatments without effective results. The patient was subsequently evaluated radiographically and the fracture was diagnosed. The other 3 patients had a radiographic assessment prior to receiving chiropractic care. Although a rare fracture location, it seems unwarranted for a plethora of reasons (including disease prevalence) to proceed with high-velocity adjustive interventions in geriatric patients without first obtaining a detailed radiographic assessment. In a review of 1000 case files by Winterstein[54] of his chiropractic practice (average age of 62.8 years), he found that over 50% had signs of degenerative joint disease. Fifty percent of this group also had osteoporosis. In these patients, about 13.6 % exhibited signs of compression fracture in the thoracolumbar spine. About 4% were chronic and 9% were acute or recent fractures.

The unique training of chiropractors places them as appropriate primary care providers for the needs of the elderly.[54] Recently, Rupert[55] investigated the primary care health promotion activities associated with what has historically been called ''maintenance care'' (MC) as used in the practice of chiropractic in the United States. The response from their survey suggested that the level of primary care, health promotion, and prevention activities of chiropractors

surpasses that of other physicians. Hawk and Dusio[56] assessed chiropractors' attitudes toward training in prevention and found that although prevention training seems to be increasing among chiropractic colleges, the need exists for emphasis on preventive care. When Hawk and Dusio[57] performed a survey study to determine the scope of chiropractic practice as it relates to primary care and prevention, they found that among the 753 chiropractors surveyed, the respondents demonstrated a number of practice characteristics associated with primary care and prevention practices related to musculoskeletal problems. Rupert et al[5] published information regarding multiple health issues of patients aged 65 years and over who have had a long-term regimen of chiropractic health promotion and preventive care. In addition to an average 1.9 manual procedures used per patient, it was common to recommend stretching exercises (68.2%), aerobic exercises (55.6%), dietary advice (45.3%), and a host of other prevention strategies, including vitamins and relaxation. The patients investigated in this study reported making only half the annual number of visits to medical providers (4.76 visits per year) compared with the national average (9 visits per year) for individuals aged 65 years and over.

CONCLUSION

We presented the chiropractic care of a geriatric patient with complaints of spinal pain following a fall. Subsequent physical examination revealed a compression fracture at T8, which also demonstrated attributes of sprain injury (ie, subluxation). The chiropractor addressed the patient's complaints through the application of spinal adjustments to the sites of subluxation and at the fracture-subluxation of T8. The result of the care this patient received was an apparent reduction in symptomatology associated with the soft and hard tissue components of the injury. However, it is inappropriate to generalize the apparent results reported in this case study.

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