Injury, Int. J. Care Injured (2007) **38S3**, S40–S48

ELSEVIER

INJURY
INTERNATIONAL JOURNAL OF THE CARE OF THE INJURED

www.elsevier.com/locate/injury

Nonoperative management of osteoporotic vertebral compression fractures

Heidi Prather[1], John O Watson[1], Louis A Gilula[2]

[1] *Section, Physical Medicine and Rehabilitation, Department of Orthopedic Surgery, Washington University School of Medicine, Saint Louis, Missouri, USA*
[2] *Mallinckrodt Institute of Radiology, Washington University School of Medicine, St. Louis, Missouri, USA*

KEYWORDS:
Vertebral compression fracture, conservative pain control, vertebroplasty, kyphoplasty, rehabilitation, vertebral augmentation.

Summary[1] As the population ages, vertebral compression fractures are an increasing source of pain and dysfunction. The immobilisation that often occurs with fractures can lead to multiple medical complications and their management can be complex as care may require multiple treatment modalities. Each individual responds to pain differently and a treatment plan must be tailored to the individual's pain, functional limitations and goals. The likely first choice for managing stable osteoporotic vertebral compression fractures is conservative management. Treatment options usually involve a combination of medications, bracing and physical therapy. If radicular pain is a component of the pain syndrome, epidural steroid injections may be beneficial. In addition, some patients may benefit from vertebral augmentation. This paper reviews current recommendations for managing vertebral compression fractures. Treatment options including vertebral augmentation are reviewed, including indications and complications.

Epidemiology and natural history

Recent US Census Bureau findings show that in July 2004 there were 36.3 million people in the US over the age of 65, which accounts for 12% of the total population. In the year 2050, it is estimated that this number will rise to 86.7 million, comprising 21% of the total population, which is a 147% increase over half a century [17]. Accompanying this increasing age will be the health risks already affecting our elderly population. The National Osteoporosis Foundation has reported that osteoporosis already affects 10 million people, with another 34 million at increased risk. It is the silent disease of osteoporosis that will predispose this aging population to fractures, with vertebral fractures being the most commonly encountered (700,000 vertebral fractures out of 1.5 million annual fractures) [17].

Data collected a decade ago reported that the direct medical cost of vertebral compression fractures in the US had reached over $746 million. This number will only continue to rise [40]. Both the physical and emotional consequences that accompany a vertebral compression fracture can be devastating. Many vertebral compression fractures are asymptomatic and therefore the process often remains silent or is attributed to "back strain". Only 23–33% of fractures become clinically evident [45]. In those that are symptomatic, the first symptom is usually back pain, which can sometimes be ignored as a muscle strain or arthritis. Some compression fractures progress, and regular surveillance is important to treat current symptoms and prevent future complications. Compression fractures that cause intractable pain may result in immobilisation. In addition, acute complications can occur such as transient ileus, urinary retention and occasionally spinal cord compression [16, 24]. Chronic effects include kyphosis with occasional breathing difficulties, deconditioning, insomnia and depression. Because osteoporosis

[1] Abstracts in German, French, Italian, Spanish, Japanese, and Russian are printed at the end of this supplement.

0020–1383/$—see front matter
doi:10.1016/j.injury.2007.08.010

remains a silent disease process, a painful vertebral compression fracture may be the first time the diagnosis of osteoporosis is made. Every such patient should be referred for evaluation of bone mineral health with appropriate medical intervention for the treatment.

Surgical management is reserved for those cases with severe spinal instability or neurological compromise. For the remainder of cases, conservative management should be a structured and ongoing attempt to treat symptoms, monitor for neurological injury and further vertebral body collapse and to restore function.

Acute fracture management

Diagnostics

Obtaining the proper x-rays is the first step in evaluating vertebral compression fracture(s). X-rays of the lumbar or thoracic spine should include both AP and lateral views and flexion and extension views if instability is suspected.

The initial plain film evaluation includes properly locating the vertebral body. Appropriate naming of the level of the fracture can be misguided when anomalies such as sacralisation, lumbarisation or hypoplastic ribs are present. The approximate height loss should be documented, expressed as a percentage. A decrease in height of 20% or more, or a decrease of at least 4 mm compared with baseline height has been used to confirm a compression fracture [38]. However, definite fractures with less collapse may be seen that are confirmed by MRI. Documenting the type of fracture(s) by height loss of the anterior vertebral body, biconcave or plana and the estimated amount of height loss is helpful in managing future problems. Previous reference radiographical hip examinations can help distinguish between progression of a previous fracture or the site of a new fracture. Evaluating the posterior vertebral line is also very important as retropulsion can be a devastating complication of vertebral compression fractures. When retropulsion is suspected, it is essential to obtain either an MRI or CT scan. It is often difficult to determine the age of a compression fracture, especially when a specific trauma or fall has not occurred. This difficulty becomes even more of an issue when multiple compression fractures are found. Bone scan or MRI will help localise more active compression fractures although there are limitations to both technologies. Bone scan may not be positive for up to 10 days post fracture, therefore leading to false negatives if obtained within this time frame after an acute fracture. With MRI, the compression fracture will usually show decreased signal on T1 and marrow oedema on T2 fat saturation sequences. There will be an adequate canal evaluation if retropulsion is a concern, and there will a closer evaluation of the vertebral discs and nerve roots, which may concurrently be irritated or compressed. The MRI combined with the physical examination can help treat the patient effectively as not all the patients' pain may be related to an obvious fracture. Pain related to degenerative processes, neurogenic pain and pain related to deformity may be concomitant or isolated sources in this patient population. One scenario that can occur is neural foraminal narrowing at the level of the compression fracture, which may refer pain down the respective nerve root's dermatomal distribution.

Another more recent observation is the dynamic mobility of these compression fractures. McKiernan et al [36] first reported that 35% of the fractures they evaluated were mobile, which was assessed by obtaining a supine cross table lateral x-ray centred on the fractured vertebra. Some patients used a foam bolster to help facilitate this spinal extension, which has led some investigators [9] to use postural reduction of a fracture prior to performing a vertebral augmentation procedure. The results are encouraging and may offer a valuable new technique to a conservative management plan.

Medications

Adequate pain control following a vertebral compression fracture is crucial. Narcotics can relieve pain well but need to be regulated in timing and frequency. Side effects, especially in the elderly population, can be debilitating. Cognitive impairment, nausea and constipation can be especially problematic. Patient and family education is essential for safe administration. Not all pain responds to narcotic medication. Disorders related to inflammation often respond inadequately to narcotics. Patients with compression fractures may have pain related to inflammation within the periosteum and soft tissue changes as a result of the fracture that may cause an unrelenting cycle of pain and muscle spasm that is difficult to relieve. As a result, patients with recent fractures may respond to nonsteroidal anti-inflammatory medications. Again, gastrointestinal side effects such as nausea, gastritis and ulcers can be problematic. Cox-2 inhibitors may be the drug of choice to help avoid some of these effects. If local inflammatory