

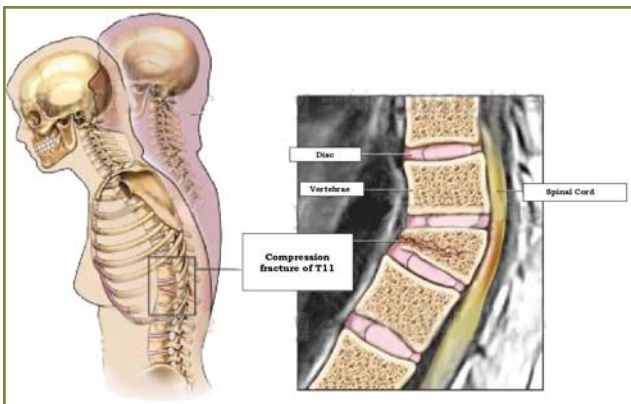
Spine Manifestations of Osteoporosis

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Vertebral compression fracture in the setting of osteoporosis is a frequently encountered clinical problem that is becoming even more common with an aging population. Osteoporosis is characterized by decreased bone density and increased susceptibility to fractures. According to the World Health Organization osteoporosis is defined as diminished bone density measuring 2.5 standard deviations below the mean bone density of healthy 25-year old same sex members of the population evaluated with a bone density study. Based upon this definition, an estimated 25% of postmenopausal women and 35% of women over the age of 65 in the United States suffer from osteoporosis.

The risk of hip, wrist, and shoulder fractures is significantly increased in postmenopausal women though vertebral compression fractures are the most common. The number of osteoporotic fractures of the spine is greater than 500,000 per year in the United States with women being affected twice as often as men. One quarter of women reaching menopause can expect to suffer one or more vertebral compression fractures in their lifetime. In the United States, 25% of women over the age of 70 years and

50% of women over the age of 80 years have x-ray evidence of vertebral compression fractures.



Vertebral compression fractures can be classified into three types: wedge, biconcave, or crush. Wedge fractures are the most common and the severity of the deformity seems to be directly related to the bone mineral density. Wedge type fractures cause increased kyphosis, or the rounding of the back we see in little old ladies, as well as decreased spinal column height making one shorter in height. Biconcave or codfish

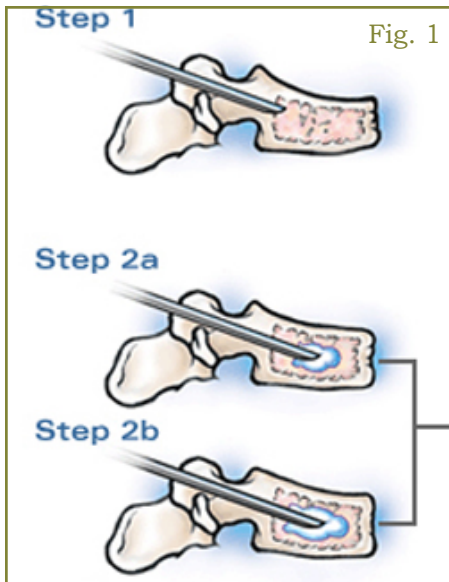
fractures occur mainly in the lumbar spine and can

result in loss of lordosis and decreased spinal column height. Crush fractures are associated with greater than 50% loss of height and may occur in both the thoracic and lumbar spine. These fractures may have fragments of bone into the spinal canal, which can lead to neurologic deficits or leg pain.

The deformity associated with each of these fracture types may lead to loss of height and thoracic hyperkyphosis (dowager's hump), abdominal protuberance, and loss of lumbar lordosis. The loss of height may lead to abdominal compression resulting in loss of appetite, early fullness, and weight loss. Thoracic hyperkyphosis leads to compression of the lungs resulting in decreased lung function and an increased risk of dying. One thoracic vertebra fracture increases the risk of pneumonia and lung disease. Neurologic involvement is not usual although not rare and late neurologic involvement can be seen up to 18 months after a fracture. Aside from the various physical effects vertebral compression fractures also have a negative effect on the psyche with higher than average rate of depression and loss

of self-esteem in addition to a deteriorating quality of life. Lastly the overall rate of mortality is increased 5-fold compared to the general population and is comparable to survival rates after hip fracture.

The treatment of the patient with osteoporotic compression fractures is twofold: pain management and prevention of instability or neurologic deterioration. Certainly to be complete in the workup it is important to understand the cause of the fracture. A medical workup is needed to determine the cause of the underlying osteoporosis to ensure that an occult cancer is not being overlooked. Laboratory studies including a CBC, and other blood studies should be completed.



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Imaging studies include plain x-rays, CAT scans as well as MRI scans. MRI is quite helpful in distinguishing an acute fracture from a subacute or chronic fracture. MRI is also helpful in differentiating a benign fracture from a fracture as a result of a tumor.

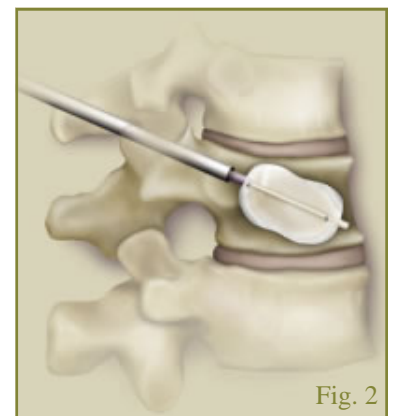
Pain management consists of non-narcotic pain relievers, muscle relaxants for muscle spasm, and narcotic pain relievers. Typically the severe pain resolves over a period of 6-8 weeks. Often times it can be difficult for elderly patients to tolerate these medications due to the side effects of confusion, constipation, increased fall risk, and potential for addiction.

Bracing is the treatment of choice for most fractures. A short period of bed rest may help to relieve severe pain but is contraindicated beyond a few days. Bracing is typically necessary the first 6-8 weeks or until the acute pain resolves. The type of brace is dependant on the location of the fracture. Most patients do not like the brace initially because it is somewhat constraining. Bracing may provide comfort however with activities of daily living or with prolonged standing or car rides at a later point.

Although most patients will recover from the acute pain associated with a new vertebral compression fracture, some will not and do continue to experience chronic persistent or recurrent pain. These patients may benefit from surgical intervention. The surgical treatment of vertebral compression fractures is challenging because of the deficient mechanical properties of osteoporotic bone.

The surgical treatment for vertebral compression fractures ideally should address the pain associated with the fracture and the kyphotic deformity. Vertebroplasty and kyphoplasty are two techniques that address the pain but kyphoplasty also addresses the deformity. These operations utilize x-ray guidance to inject bone cement into the fractured vertebral body.

Vertebroplasty (see Fig. 1) was first described in 1987 in Europe and in the U.S. in 1993. The pain relief brought about by vertebroplasty is probably secondary to the fracture being solidified. The injected cement hardens and stabilizes micromotion at the fracture site. Ideally the patient with unimproving pain and less than 60% compressed is a candidate. If there is more compression it becomes difficult to do the procedure. Risks associated with the procedure include cement extending into the spinal



canal, nerve root compression, or death. Additionally a new fracture is a relatively frequent occurrence. There is about a 50%chace for a new fracture within several years.

Kyphoplasty (see Fig. 2) is a similar technique that uses a balloon that is expanded within the vertebral body. It has several advantages: lower risk of cement squirting out, and better restoration of vertebral body height. By creating a cavity with the balloon the process of cement injection becomes safer as it is creating a low-pressure cavity into which the cement will preferentially flow. It can be used for any progressive or painful osteoporotic compression fracture. The technique is similar to that of vertebroplasty and in addition the inflatable balloon tamp is expanded under x-ray guidance until maximum fracture reduction is achieved. The patient is discharged usually the following or same day without a brace.

Certainly early management of osteoporosis by prevention affords the least morbidity possible. However with a continually aging population and increasing incidence of vertebral compression fractures surgical reconstruction of the spine will be of significant interest. The development of new procedures such as vertebroplasty and kyphoplasty offer advancement in the field and newer techniques for open treatment will continue to evolve.

The Physical Impact of Multiple Compression Fractures



Age 50



Age 75