

Management of Spinal Fractures

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Received: July 01, 2019; Published: July 12, 2019

Abstract

Introduction: Vertebral compression fractures (VCFs) are considered to be the commonest complication following a diagnosis of osteoporosis. They affect more than seven hundred thousand American patient every year. The risk of Vertebral compression fractures elevates with older age, with four in ten Caucasian females older than fifty years suffering from a spine, a hip or a vertebral fracture throughout their life. Vertebral compression fractures could possibly cause disfigurement, chronic pain, height loss, dysfunctional everyday activities, higher risk of developing pressure sores, pneumonia, and psychological stress. Patients who have an acute Vertebral compression fractures might present as developing sudden onset of back pain which is associated with position changes, sneezing, coughing, or lifting. Physi-cal examination is not important as findings are usually normal but could sometimes show kyphosis and/or midline tenderness of the spine. More than two-thirds of Vertebral compression fractures patients are usually asymptomatic and are diagnosed accidentally while doing a plain radiography.

Aim of Work: In this review, we will discuss management of spinal fractures.

Methodology: We did a systematic search for management of spinal fractures using PubMed search engine (<http://www.ncbi.nlm.nih.gov/>) and Google Scholar search engine (<https://scholar.google.com>). All relevant studies were retrieved and discussed. We only included full articles.

Conclusions: Vertebral compression fractures (VCFs) are considered to be the commonest complication following a diagnosis of osteoporosis. They affect more than seven hundred thousand American patient every year. The risk of Vertebral compression fractures elevates with older age, with four in ten Caucasian females older than fifty years suffering from a spine, a hip or a vertebral fracture throughout their life. physical examination of patients with suspected Vertebral compression fractures must include a complete neurologic evaluation. Vertebral compression fractures are classically diag-nosed using lateral radiography of the vertebral column, with or without antero-posterior views. Radiographic criteria for diagnosing Vertebral compression fractures include a reduction in the height of the vertebral body of at least twenty percent or a four-millimeter decrease from the baseline height. Percutaneous vertebral augmentation, which include verte-broplasty or kyphoplasty, could be considered for use in patients who have insufficient pain relief from non-surgical care, or when chronic persistent pain significantly impacts the patient's quality of life. Achieving early mobility must be encouraged as early as possible in patients who can tolerate this. Bed rest is recommended sometimes as an important part of the initial treatment management in cases where the pain is severe and intolerable, but it can cause a significant loss of the mass of the bone and the strength of the muscles. It can also be associated with the development of pressure sores, and deep venous thrombosis.

Keywords: Management of Spinal Fractures; Vertebral Fractures; Risk Factors; Surgeries

Introduction

Vertebral compression fractures (VCFs) are considered to be the commonest complication following a diagnosis of osteoporosis. They affect more than seven hundred thousand American patient every year. The risk of Vertebral compression fractures elevates with older age, with four in ten Caucasian females older than fifty years suffering from a spine, a hip or a vertebral fracture throughout their life.

Vertebral compression fractures could possibly cause disfigurement, chronic pain, height loss, dysfunctional everyday activities, higher risk of developing pressure sores, pneumonia, and psychological stress. Patients who have an acute Vertebral compression fractures might present as developing sudden onset of back pain which is associated with position changes, sneezing, coughing, or lifting. Physical examination is not important as findings are usually normal but could sometimes show kyphosis and/or midline tenderness of the spine. More than two-thirds of Vertebral compression fractures patients are usually asymptomatic and are diagnosed accidentally while doing a plain radiography.

Acute Vertebral compression fractures could be managed with the use of analgesics including paracetamol, NSAIDs, narcotics, and calcitonin. Practitioners should keep in mind the adverse effects of these pharmacological agents in older individuals. Other conservative management options can include decreased bed rest, physical therapy, bracing, nerve root blocks, and epidural injections.

Percutaneous vertebral augmentation, which include vertebroplasty and kyphoplasty, is still debatable, but could still be considered for the management of patients who have insufficient pain relief following non-surgical care or when the presence of chronic persistent pain significantly impacts the quality of life of the patient. General practitioners could aid in avoiding the development of Vertebral compression fractures by applying proper treatment and management of predisposing factors and by sufficient treatment of patients with osteoporosis.

Vertebral compression fractures (VCFs) are considered to be the commonest complication following a diagnosis of osteoporosis. They affect more than seven hundred thousand American patients every year [1]. Patients who have Vertebral compression fractures account for more than sixty-six thousand visits to physician offices and up to seventy thousand hospitalizations annually, with half of them eventually needing the care of a skilled nursing facility [2]. The risk of fractures elevates with older age; in the US [3], out of ten Caucasian females who are older than fifty years will suffer from a spine, a hip or a vertebral fracture at least once during their life. females with one or more Vertebral compression fractures have a 1.2-fold higher age-adjusted mortality rates when compared to females who do not have Vertebral compression fractures, with mortality risk becoming higher as the number of Vertebral compression fractures increases [4]. Fracture-related mortalities occur following the fracture, usually following the development of pulmonary diseases or malignancies. in addition, patients with Vertebral compression fractures usually report a significantly decrease quality of life at twelve and twenty-four months following the development of Vertebral compression fractures. The estimated direct yearly health care cost of treating osteoporotic hip and spine fractures is ten billion dollars to fifteen billion dollars [5].

In this review of literature, we will discuss the most recent evidence regarding management of spinal fractures.

Methodology

We did a systematic search for management of spinal fractures using PubMed search engine (<http://www.ncbi.nlm.nih.gov/>) and Google Scholar search engine (<https://scholar.google.com>). All relevant studies were retrieved and discussed. We only included full articles.

The terms used in the search were: management, of spinal fractures, vertebral fractures, risk factors, surgeries.

Predisposing factors

predisposing factors for Vertebral compression fractures are many and can include the presence of osteopenia, the presence of osteoporosis, older age of the individual, the presence of a history of Vertebral compression fractures or falls, decreased physical activity, the chronic use of corticosteroids (more than five milligrams per day for at least 3 months) or other pharmacological agents, weight that is less than 117 lb (53.1 kg), female gender, the consumption of two or more alcoholic drinks daily in females or three or more alcoholic drinks in males, history of smoking, history of vitamin D deficiency, and a history of depression.

Clinical presentation

At least two-thirds of patients who have Vertebral compression fractures are usually asymptomatic, and the diagnosis is made accidentally [6]. Patients who have symptoms might manifest with the development of back pain. A fracture will be demonstrated on

plain radiography, most commonly in T8 and/or L4 vertebrae [7]. Patients who have an acute fracture might report sudden onset of pain that is associated with positional changes, sneezing, coughing, or lifting [8].

Performing physical examination is not always essential as findings are usually normal. However, some patients might show kyphosis and midline tenderness of the spine on physical examination. Chronic Vertebral compression fractures might manifest with a progressive loss of height in addition to the development of kyphosis. Complications of Vertebral compression fractures usually include loss of bone tissue, weakness of muscles, the development of pressure sores, the development of ileus, urinary retention, respiratory dysfunction, the development of venous thromboembolism, and compression of the spinal cord [9].

The differential diagnosis of Vertebral compression fractures can include musculoskeletal pain, spinal stenosis, osteoarthritis, metastatic cancers, multiple myeloma, hyperparathyroidism, primary bone tumors, osteomalacia, infiltrative tumors, hematological conditions, traumatic injuries, and osteomyelitis.

Evaluation

physical examination of patients with suspected Vertebral compression fractures must include a complete neurologic evaluation. Vertebral compression fractures are classically diagnosed using lateral radiography of the vertebral column, with or without antero-posterior views [10]. Radiographic criteria for diagnosing Vertebral compression fractures include a reduction in the height of the vertebral body of at least twenty percent or a four-millimeter decrease from the baseline height. The typical radiographic findings are the presence of an anterior wedge fracture.

Magnetic resonance imaging (MRI) could aid in distinguishing benign fractures from malignant fractures and assess the specific timing of the fracture, as recent fractures show edema. MRI or computed tomography could both be beneficial for the detection of possible retropulsion, fractures that extend to the posterior column, and the involvement of the spinal. CT or MRI must also be considered for use in patients who do not show significant improvements with conservative care and in those who have continuously progressive signs and symptoms.

Dual-energy x-ray absorptiometry must be done soon following the diagnosis of a Vertebral compression fractures to assess for the underlying presence of osteoporosis and detect the severity of the disease. In cases where secondary osteoporosis is suspected (like in a relatively young patient or in a patient who has clinical manifestations of hypercalcemia and/or anemia), laboratory investigations might include a complete blood count; complete metabolic panel with liver function testing; along with a measurement of erythrocyte sedimentation rate and thyroid-stimulating hormone, 25-hydroxyvitamin D, parathyroid hormone, and C-reactive protein concentrations. Blood cultures are generally recommended when the presence of a possible underlying infection is suspected. Serum and urine protein electrophoresis must be performed in cases where an underlying multiple myeloma is suspected. There is a relatively high prevalence of low testosterone concentrations in younger males who have osteoporosis and low-trauma fractures and measurement of the testosterone concentrations could, thus, be considered among these patients [11].

Treatment

Aims of management and treatment include achieving sufficient pain relief, restoring functions, and preventing the development of future fractures. Management of Vertebral compression fractures must start with discussing patient's targets and risks, and the possible benefits of conservative care versus per-cutaneous vertebral augmentation. Patients who want to pursue conservative treatment will have more than a fifty percent possibility of achieving sufficient pain relief, most of which occurs by 3 months following initiation of treatment. A previous study of more than 250 patients who have Vertebral compression fractures demonstrated that patients who had pain relief and decreased disability with 3 weeks of conservative therapy had a ninety-five percent chance of maintaining this level of improvements for up to twelve months [12].

Conservative care

Achieving early mobility must be encouraged as early as possible in patients who can tolerate this. Bed rest is recommended sometimes as an important part of the initial treatment management in cases where the pain is severe and intolerable, but it can cause a significant loss of the mass of the bone and the strength of the muscles. It can also be associated with the development of pressure sores, and deep venous thrombosis. The American Academy of Orthopedic Surgeons (AAOS) concluded the absence of conclusive solid evidence as regards the benefits of bed rest in the management of Vertebral compression fractures [13].

Pharmacological treatment: Nonsteroidal anti-inflammatory drugs, paracetamol, narcotics, lidocaine patches, and muscle relaxants are usually used to achieve relief of the pain. pharmacological agents facilitate the patients' mobility and the performance of physical therapy, but must be ceased gradually as status of the pain improves. The AAOS concluded the absence of conclusive solid evidence to support the use of certain specific analgesics for acute Vertebral compression fractures pain. In patients who are neurologically intact but have Vertebral compression fractures, calcitonin can significantly decrease the feeling of pain and facilitate relatively earlier mobilization for up to 4 weeks [14]. Practitioners must always keep in mind the possible adverse effects and complications of certain pharmacological agents especially when used in the elderly.

Bracing: Although bracing is usually prescribed for 6 - 8 weeks following the development of a Vertebral compression fractures, solid evidence supporting this practice is not present. A small study on the use of thoraco-lumbar bracing showed improvements in posture, strength, and quality of life. In another study, disability scores were calculated and they were not found to be significantly better in patients who used a rigid brace or soft brace when compared to patients who did not use a brace.

Possible benefits of pain reductions must be balanced against the risks of developing atrophy of the muscles and complications of the skin.

Physical therapy and exercise: Physical therapy is generally useful in patients with Vertebral compression fractures and accompanying osteoporosis [15]. Home exercise protocols have a less solid evidence base, with some small studies showing pain improvement, better balance, and higher levels of quality of life. Back extensor strengthening could potentially improve the strength of muscles and the density of bones and decrease the risk of developing future Vertebral compression fractures. Exercise is considered to be beneficial for almost all patients who have osteoporosis.

Nerve root blocks: The AAOS guidelines give a weak recommendation to use of L2 nerve blocks to relieve temporary pain in patients who have Vertebral compression fractures. Patients undergoing L2 selective nerve blocks have decreased pain for up to 2 weeks, with effects dissipating by 1 month. Patients with radicular pain might also benefit from nerve root blocks or epidural injections. general practitioners must discuss with patients to weigh the benefits of temporary pain reduction against the possible risks of the procedure itself.

Vertebroplasty and kyphoplasty

Percutaneous vertebral augmentation, which include vertebroplasty or kyphoplasty, could be considered for use in patients who have insufficient pain relief from non-surgical care, or when chronic persistent pain significantly impacts the patient's quality of life; on the other hand, more recent studies have re-assessed their efficacy. Vertebroplasty entails injecting liquid cement into a collapsed vertebral body using a needle-inserted trans-pedicularly. Kyphoplasty usually involves percutaneously injecting a balloon to the vertebral body, with inflating it to restore the height of the vertebrae, and injecting cement to decreased the pain. Complications of this procedure include extravasation of cement (usually more common along with vertebroplasty), embolism, neurological injury, hemorrhage, hematoma, infections, and a higher risk of developing another Vertebral compression fractures at other levels.

In the year 2010, the AAOS strongly recommended in their guidelines against the use of vertebroplasty in neurologically intact patients with Vertebral compression fractures. Two randomized trials were conducted to compare the use of vertebroplasty with a placebo procedure in patients who have either acute or chronic Vertebral compression fractures concluded that no significant benefits were present regarding pain relief, improved functions, or quality of life. on the other hand, a meta-analysis that was published in 2013 and included 6 randomized trials (including those that concluded the absence of benefits) demonstrated that vertebroplasty achieved improved pain reduction, functionality, and quality of life when compared to conservative care at twelve weeks, 6 months, and twelve months.

Several studies have shown better quality of life and improved physical abilities and decreased back pain and disability among patients who have kyphoplasty when compared to the use of conservative therapy at 1 month. Benefits in pain relief and better quality of life might persist for up to one year following kyphoplasty.

A 2014 consensus statement from several US and Canadian neurosurgical and radiologic societies supported providing vertebroplasty and kyphoplasty to patients who are receiving medical therapy and who are unable to ambulate following twenty-four hours of management, who have severe pain that is intense to prevent the participation in normal physical therapy, or who those have adverse events following the use of analgesics. Potential benefits should be assessed against the failure of percutaneous vertebral augmentation to improve mortality or major clinical outcomes and the elevated utilization of health care services and complications which are associated with the procedures. Mortality benefits that were reported in studies of percutaneous vertebral augmentation might be associated with the presence of selection bias that is caused by the exclusion of patients who are high risk of developing severe complications.

Based on the present evidence, most patients with Vertebral compression fractures are not recommended to undergo percutaneous vertebral augmentation except for patients who present with an acute MRI-confirmed fracture that is associated with severe pain or significant functional dysfunction despite the application of sufficient conservative therapy for at least 3 weeks.

Prevention

Ideal management of patients with Vertebral compression fractures includes mainly the prevention of developing additional fractures and the treatment of underlying osteoporosis. General practitioners could encourage weight-bearing and muscle-strengthening exercise, smoking cessation, and avoidance of excessive alcohol consumption; and evaluate the risk of falls.

Screening for underlying osteoporosis could detect the patients who are likely to benefit from the treatment to decrease the likelihood of Vertebral compression fractures. The Institute of Medicine recommended sufficient consumption of calcium (1,000 mg daily for males fifty to seventy years old, and 1,200 mg daily for females fifty-one years old or older and males seventy-one years old or older) and vitamin D (600 IU daily up to seventy years old, 800 IU daily following seventy years old). On the other hand, the U.S. Preventive Services Task Force did not find sufficient evidence to recommend the use of more than 400 IU daily of supplemental vitamin D or more than one thousand milligrams daily of calcium for the primary prevention of Vertebral compression fractures in non-institutionalized postmenopausal females, and they, thus, recommend against supplementation with lower doses because of the proven absence of benefit [16].

Patients who have Vertebral compression fractures have a 5-fold higher risk of developing later Vertebral compression fractures and a 2- to 3-fold higher risk of developing fractures at other sites.⁶ Those with a hip fracture or Vertebral compression fractures must be assessed for osteoporosis. Patients with a T-score of -2.5 or lower at the femoral neck, total hip, or lumbar spine; a T-score of -1 to -2.4 at the femoral neck or lumbar spine; a ten-year probability of hip fracture of three percent or more; or a ten-year probability of a major osteoporosis-related fracture (clinical vertebral, hip, forearm, or proximal humerus fracture) of twenty percent or more must receive proper treatment.

Pharmacological agents which are approved by the U.S. Food and Drug Administration for the management, treatment and prevention of osteoporosis include bisphosphonates, calcitonin, estrogen, selective estrogen receptor modulators, parathyroid hormone, and receptor activator of nuclear factor kappa-B ligand inhibitors. Multiple bisphosphonates are approved for use in cases with primary and secondary prevention of Vertebral compression fractures. Although estrogen treatment has been approved for the use for the prevention of osteoporosis, it must be considered only after non-estrogen modalities have been attempted. The anabolic agent teriparatide (Forteo) decreases the risk of later Vertebral compression fractures, although it is expensive and should be administered by daily subcutaneous injection. Additionally, denosumab (Prolia) leads to a relative decrease in new Vertebral compression fractures when compared to placebo among postmenopausal females who have osteoporosis. Denosumab could be used as an alternative to other therapies for the primary prevention of Vertebral compression fractures in postmenopausal females with osteoporosis [17].

Conclusions

Vertebral compression fractures (VCFs) are considered to be the commonest complication following a diagnosis of osteoporosis. They affect more than seven hundred thousand American patient every year. The risk of Vertebral compression fractures elevates with older age, with four in ten Caucasian females older than fifty years suffering from a spine, a hip or a vertebral fracture throughout their life. Physical examination of patients with suspected Vertebral compression fractures must include a complete neurologic evaluation. Vertebral compression fractures are classically diagnosed using lateral radiography of the vertebral column, with or without antero-posterior views. Radiographic criteria for diagnosing Vertebral compression fractures include a reduction in the height of the vertebral body of at least twenty percent or a four-millimeter decrease from the baseline height. Percutaneous vertebral augmentation, which include vertebroplasty or kyphoplasty, could be considered for use in patients who have insufficient pain relief from non-surgical care, or when chronic persistent pain significantly impacts the patient's quality of life. Achieving early mobility must be encouraged as early as possible in patients who can tolerate this. Bed rest is recommended sometimes as an important part of the initial treatment management in cases where the pain is severe and intolerable, but it can cause a significant loss of the mass of the bone and the strength of the muscles. It can also be associated with the development of pressure sores, and deep venous thrombosis.

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Volume 15 Issue 8 August 2019

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