

MANAGEMENT OF OSTEOPOROTIC VERTEBRAL COMPRESSION FRACTURES: ROLE OF CONSERVATIVE MANAGEMENT IN POST-MENOPAUSAL PATIENTS

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Abstract

Background: Osteoporosis is a silent condition, and often the first sign is back pain caused by a painful vertebral compression fracture (VCF). If left untreated or poorly managed, may lead to significant morbidity and mortality. This study, aimed to assess the effectiveness of conservative treatment for acute VCF in post-menopausal women. **Materials and Methods:** A total of 47 post-menopausal women diagnosed acute VCF were enrolled. All patients underwent dual-energy X-ray absorptiometry (DXA) scan to assess their bone mineral density. They were evaluated clinically, hematologically, and radiologically. Initially, all patients received treatment consisting of bed rest, analgesics, hyper-extension bracing, supervised physical therapy, and education. Additionally, they were prescribed Calcitonin nasal spray for two months, weekly alendronate (70mg) with daily calcium (1000mg), and weekly Vitamin D (60000 unit). Clinical follow-up was conducted for all patients, and their functional outcomes were assessed using the Oswestry Disability Index (ODI). VAS score of 5 or higher after two months of conservative treatment was recorded. **Result:** The results showed that 47 post-menopausal females, with a mean age of 62.9 ± 8.6 years and mean BMD spine of 0.76 ± 0.09 gm/cm². After one year, there was a significant improvement in VAS score ($p < .001$) from 8.7 to 2.1 and ODI ($p < .001$) from 58.8 to 26 compared to baseline. The majority of patients experienced a gradual reduction in VAS and ODI scores at each follow-up, with 72.37% having minimal or moderate disability at the final follow-up. However, nine patients (21.42%) did not respond to conservative treatment. **Conclusion:** Conservative management showed positive results in treating osteoporotic VCF by reducing pain, minimizing deformity risk, and enhancing quality of life. It is recommended to opt for conservative management initially and for a sufficient duration before considering surgical interventions.

INTRODUCTION

Osteoporosis is a systemic skeletal condition characterized by reduced bone mass and deterioration of bone tissue structure, leading to an increased risk of bone fragility and fractures.^[1,2]

Osteoporosis can be classified as primary or secondary. Primary osteoporosis is further divided into Type I postmenopausal and Type II senile osteoporosis.^[3] Postmenopausal osteoporosis in women is caused by estrogen deficiency following menopause, as estrogen plays a crucial role in bone health by regulating osteoclastic activity through estrogen receptors.^[4]

Fractures related to osteoporosis, also known as fragility fractures, typically occur due to minor

trauma. Osteoporosis is often asymptomatic, with back pain from vertebral fractures being a common initial symptom. However, only a third of patients with vertebral fractures experience symptoms.^[5] Vertebral compression fractures are the most common type, and if left untreated or poorly managed, they can lead to significant morbidity and mortality.^[6,7]

Chronic back pain, spinal deformity, and restrictive lung diseases can be the result of this condition.^[5,8] It poses a significant socio-economic burden on both individuals and society. The occurrence of one vertebral fracture increases the chances of a second fracture by four times, and a subsequent second fracture raises the risk of another fracture by 12 times.^[9]

The optimal treatment for acute VCF is still a matter of debate. It can be managed through percutaneous augmentation, conservative methods, or surgery. Vertebroplasty,^[10] and Kyphoplasty,^[11] are commonly used treatments to restore vertebral height and alleviate pain, but they come with notable complications. Surgical intervention is recommended for patients experiencing chronic back pain due to spinal instability, spinal deformity, and neurological deficits.^[12] We believe that a structured conservative treatment approach can effectively relieve pain and aid in rehabilitation for acute painful VCF.

The present study assessed the effectiveness of conservative treatment for osteoporotic Vertebral Fractures in post-menopausal females. This study result may provide valuable evidence supporting conservative treatment of acute VCF in post-menopausal females.

MATERIALS AND METHODS

This prospective study was conducted at Nalanda Medical College and Hospital, Patna. The study received approval from the institutional research and ethical committee. Prior to the start of the study, all participating subjects provided informed and written consent.

The study took place from April 2020 to March 2022. As part of the standard procedure, a thorough history was taken from all patients admitted to the wards. This included information on diseases as well as the onset of disease. Additionally, the history included details on other diseases and drugs taking including prolonged use of steroids.

A total of 47 post-menopausal women (aged 50-75 years) visited our outpatient and emergency department with confirmed acute VCF were enrolled in our research.

All individuals underwent bone mineral density evaluation using dual-energy X-ray absorptiometry (DXA) scan. The DXA scan results were analyzed based on T scores following the guidelines of the World Health Organization (WHO).^[13] Patients with chronic hepato-renal disorders, endocrine disorders, thyroid issues, hyperparathyroidism, or cancer were not included in the study. Additionally, individuals with a history of previous surgeries, pathological fractures due to primary or metastatic tumors, infections, or arthritis affecting the hip or knee joints leading to spinal deformities were excluded. Clinical, hematological, and radiological assessments were conducted on all participants, with a neurological examination performed upon admission. Patients with any neurological impairments were not considered for the study.

The assessment of back pain involved the use of the visual analog scale (VAS),^[14] while disability was evaluated using the Oswestry Disability Index (ODI).^[15] Upon admission, a routine hematological investigation was conducted, which included a complete blood hemogram, liver function test, kidney function test, serum calcium, serum PTH, serum

alkaline phosphatase, serum 25(OH) Vit D level, and thyroid profile. Additionally, all cases underwent x-rays of the dorsal and lumbar spine as part of the radiological investigation. In selective cases, computed tomography (CT) and magnetic resonance imaging (MRI) were performed as necessary. The x-rays were used to assess the fracture location, morphology, and any coronal and sagittal plane deformities. The classification of the patient's fracture was determined according to Sugita et al.'s classification.^[16]

Initially, all patients received bed rest and analgesics for their treatment. This was followed by the use of hyper-extension bracing. Additionally, a supervised physical therapy program was implemented, along with education on fracture management and prevention. The duration of bed rest varied depending on the individual patient's pain threshold, lasting between two to five days. Early mobilization was encouraged to promote recovery. NSAIDs were administered initially, and if there was no response, opioids were prescribed for a short period of time. To prevent hyperflexion at the fracture site, patients were advised to wear a Hyper-extension Anterior Spinal Extension (ASHE) brace for a period of four to six weeks. All patients underwent supervised rehabilitation to strengthen their core back muscles. As part of the pharmacotherapy, patients were prescribed Calcitonin nasal spray with a metered-dose of 200 IU, to be used alternately in each nostril, for a duration of two months. Additionally, patients were given weekly doses of alendronate (70mg), daily calcium (1000mg), and weekly Vitamin D (60000 unit). Clinical follow-ups were conducted, and the functional outcome was assessed using the Oswestry Disability Index (ODI). Treatment failure was defined as a VAS score of 5 or higher after two months of conservative treatment. Initially, patients were followed up at four-week intervals for three months, and then at three-month intervals to monitor for any long-term complications.

Statistical analysis was conducted utilizing the SPSS software for Windows program. The dichotomous variables were displayed in number/frequency and were assessed using either the Chi-square test or Fisher's exact test when necessary. Continuous variables were examined through mean (standard deviation) or range value. Student's t-test was employed for comparing means between the two groups. A p-value of less than 0.05 or 0.001 was considered significant.

RESULTS

A total of 47 post-menopausal women, with an average age of 62.9 ± 8.6 years and an average BMD spine of 0.76 ± 0.09 gm/cm², were monitored for at least one year. The average time since menopause was 14.2 ± 3.5 years. Radiographically, the majority of patients experienced a lumbar spine fracture (67%), with L1 being the most common (33%)

followed by T12 (22%) in the thoracic spine. According to the classification by Sugita et al., the majority of patients in our study (44%) exhibited a concave type fracture pattern, followed by bow-shaped (23%). There was a significant increase in height collapse observed at the final follow-up ($p < .001$), which was positively correlated with age. After one year, the final follow-up revealed a significant improvement in the VAS score ($p < .001$) from 8.7 to 2.1 and ODI ($p < .001$) from 58.8 to 26 compared to the baseline. The majority of patients, except for nine, experienced a gradual reduction in both VAS and ODI scores during successive follow-ups. At the end of the study, 72.37% of patients reported minimal or moderate disability. However, nine patients (21.42%) did not respond to conservative treatment. Factors such as old age, obesity, non-compliance with pharmacotherapy and physiotherapy were found to be associated with treatment failure. Additionally, two patients were lost to follow-up, and three patients passed away due to other comorbidities.

DISCUSSION

The optimal treatment for osteoporotic vertebral compression fractures (VCF) remains controversial due to the lack of standardized protocol and treatment modalities. The debate revolves around whether conservative treatment or operative intervention is more effective.^[10,11,17] Implementing adequate conservative treatment is crucial to avoid surgical complications and reduce costs. Previous studies have raised doubts about the effectiveness of percutaneous vertebroplasty and have shown that augmentation procedures are not necessarily better than conservative management.^[18-20] However, recent studies have demonstrated the pain-relieving benefits of augmentation procedures and have found them to be superior to conservative treatment.^[10,11,21] This ongoing debate leaves clinicians with a treatment dilemma - whether to conserve or augment VCF, and if augmentation is chosen, when is the optimal timing for it.

This study focused on a prospective cohort of post-menopausal females who experienced acute vertebral compression fractures (VCF). The findings revealed a 78% success rate when utilizing conservative management techniques. It is important to note that post-menopausal females, due to estrogen deficiency, are at a higher risk of developing osteoporotic VCF. While the prevalence of osteoporotic VCF is generally higher in women compared to men, some studies have shown an equal distribution or even a higher occurrence in males.^[22-24]

Conservative management for VCF involves various approaches such as pain management, rehabilitation, and education to prevent future fractures. Pain relief can be achieved through the administration of analgesic drugs for a period of 6 to 12 weeks. The choice of medication, whether non-steroidal anti-

inflammatory (NSAID) or opioids, depends on the individual patient's response.

In our study, a significant number of patients responded positively to NSAIDs, Calcitonin, and experienced a decrease in Visual Analog Scale (VAS) scores below four after eight weeks of treatment (63.5% of patients). Subsequent follow-up showed further improvement in VAS scores, with 68% of patients having scores below 3 at four months of follow-up.

In their research, Shah et al,^[25] found that there was a gradual improvement in VAS score during follow-up, with a reported 49% improvement from baseline at the final follow-up. Venmans et al,^[26] on the other hand, noted that 60% of patients with VCF had $VAS \leq 3$ after one year of conservative management in their study of 95 patients. Diamond HT et al,^[27] observed a decrease in VAS score to 61% after six weeks of conservative management for VCF, which further improved to 71% at six to 12 months. Disability resulting from vertebral fracture was assessed using ODI, with our study showing that most patients had minimal or moderate disability (72.37%) at the final follow-up, indicating a significant improvement in ODI score. This improvement was attributed to effective rehabilitation, including supervised physiotherapy and patient education, as well as a standardized muscle strengthening program involving back extensors muscle strengthening by a trained physiotherapist.

Initially, patients were provided with information regarding the natural progression of osteoporotic vertebral compression fractures (VCF), strategies to prevent falls and subsequent fractures, and the significance of exercises in preventing deformities. In a study conducted by Shah et al,^[25] it was observed that there was a 47.23% improvement in the ODI score during the final follow-up. Additionally, 56.67% of patients experienced minimal disability, while 36.67% had moderate disability.

However, our study does have a few limitations. Since it was a single center, prospective observational analysis, the results cannot be generalized to the entire population. Furthermore, we did not have a control group to establish the superiority of conservative management. Additionally, our study only included female participants, despite the fact that osteoporosis is prevalent in both males and females. To obtain more robust evidence supporting the efficacy of conservative management, future multicenter studies should include both male and female subjects and follow a standardized conservative treatment protocol.

CONCLUSION

Our findings demonstrate positive outcomes when utilizing conservative management for osteoporotic vertebral compression fractures (VCF). This

approach effectively alleviates pain, minimizes the risk of deformity, and ultimately enhances the overall quality of life. Our treatment protocol focuses on pain relief, administering anti-osteoporotic medications, implementing a hyperextension brace, providing rehabilitation, and educating the patient. This straightforward and efficient protocol proves to be an excellent option for managing post-menopausal VCF. We strongly advocate for attempting conservative management as the initial course of action, allowing for a sufficient duration before considering surgical interventions.

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