

Management of Pain in Patients with Osteoporotic Fractures

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Abstract:- Our study explores the demographic profile, pain characteristics and treatment outcomes of a cohort 80 patients with clinically diagnosed osteoporosis (Mean age: 69.2 years). Eighty-eight point eight percent of individuals were female and the majority used anti-osteoporotic treatment (86.2%). Pain therapy: bisphosphonates, denosumab and teriparatide; 28.7% of patients with vertebral fractures were analyzed. Further it was revealed that significant differences between pain detection and symptom evaluation with deep discrepancies in the assessment of thoracic vs. lumbar pain according to statistical analysis (pain detection $p < 0.0001$, symptoms assessing $p = 0.005$) was present. Trends in the evolution of Numerical Rating Scale (NRS) scores for resting and moving pain were assessed. The results showed a slow decrease in pain intensity in both the resting and movement states. There was a statistically significant difference between rest and movement pain scores at the time of paired t-test (mean diff = 3.0375, t-value =14.1972, p value <0.0001).

Keywords:- Osteoporosis, Pain Management, Vertebral Fractures, Numerical Rating Scale (NRS), Thoracic vs. Lumbar Pain.

I. INTRODUCTION

The condition, also known as OVF, usually seen in the elderly population and which compromised functionality is often demonstrated by chronic low back point of pain and abnormal body positioning [1–5]. Some fractures of this kind play an important role in pushing the elderly generation for long-term care in Japan as well [6]. Such high costs of nursing care demand the importance and necessity to prevent severe osteoporosis with related fractures, which have a significant impact on public health as well as economy [2, 7]. With the exception of burst fractures, conservative orthotic therapy is often used in new osteoporotic vertebral fractures [8, 9, 10]. In the hospital, patients who need outpatient follow-up are hospitalized for pain control but have to wear a brace and do rehabilitation in order not to prevent muscle wasting. The time of keeping the patient in all depends on a number of factors: from the amount and type of activities performed to external social situations. These criteria often involve the diminution in low back pain, and demonstrated ability to walk alone. The measurement scales used to evaluate the intensity of pain are typical, such as a NRS, VAS and VRS Scale. However, the utility of such methods to individuals with cognitive impairment is likely limited as these persons have difficulty

in accurately reporting their pain perceptions [11–17]. While it is recommended that techniques of verbal communication be used for individuals with early cognitive loss [4], the potential efficacy would likely decrease in more advanced dementia stages. Observational assessment methods are increasingly acknowledged as a possible solution for patients that may find self-reported pain assessments difficult [18-23].

However, it is still unclear whether these interventions work in people with acute symptoms and also the best way to measure this [24]. Being a hospital predominately serving the elderly, with many of our patients having variable degrees of cognitive decline. Any pain assessment instrument that is used in a specific population must be developed to target every main dimension of spinal fracture pain [12, 14] and especially those dimensions relevant to recovering from the experience of an osteoporotic fractures in the vertebral column. This study aimed to prospectively validate observational assessment methods. Methods in the present study analyze an evaluation of pain symptoms in individuals admitted to hospital with acute phase vertebral fractures. For pain, the researchers evaluated both the resting group and the mobile movement group with the Abbey patient-specific scale for patients without the ability to describe them about how much discomfort they experienced (Abbey-J) [25, 26] and NRS which are a form of self-administered questionnaire. The researchers conducted a repeated-measures analysis to evaluate the temporal variations in and associations with scores, as well as an associational study between pain instruments used for each of activities of ADLs and ambulatory status.

II. MATERIAL AND METHODS

The present study included cohorts of 80 individuals whose records were received and who had been hospitalized with symptoms of spinal pain due to osteoporosis. Patients were recruited based on a clinical diagnosis of osteoporosis confirmed by radiological imaging and corresponding to moderate-severe pain in the vertebral region area at spine. All patients were subjected to a systematic treatment approach encompassing medication interventions including bisphosphonates and other drugs for osteoporosis, physiotherapy and lifestyle modifications. The patients were analyzed during further appointments where they would check-in on how my pain levels and functionality were doing in order to evaluate whether the intervention was effective or required any modification.

III. RESULTS

Table 1: Demography of the Patient Profile (N=80):

Variable	Total (n = 80)
Age (years)	69.2 ± 8.9
Female sex number	71 (88.8%)
Male sex number	9 (11.2%)
Pain medication application	20 (25%)
Anti-osteoporotic therapy	69 (86.2%)
Bisphosphonates intake in the patients after prescription from a doctor	22 (27.5%)
Denosumab intake in the patients after prescription from a doctor	36 (45%)
Teriparatide intake in the patients after prescription from a doctor	11 (13.8%)
Vertebral fracture number in the patients admitted to the hospital	23 (28.7%)

Table 2: Comparison of Pain Score and Detection in Patients Suffering from Thoracic and Lumbar Pain Due to Osteoporosis:

Variable	Test	P-Value	Conclusion
Analysis of pain detection in the patient	Student's t-test	<0.0001	Significant difference between Thoracic and Lumbar
Assessment of pain signs and symptoms	Mann-Whitney U test	0.005	Significant difference between Thoracic and Lumbar

Table 3: Time of Hospitalization in Weeks of the Different Patients with the Numerical Rating Scale Analysis During the Resting Stage and During the Movement Stage after Suffering from Vertebral Column Pain Due to Osteoporosis:

Time Since Hospitalization (Weeks)	NRS Score – Resting State of the Patients Admitted	NRS Score – Movement State of the Patients Admitted
0.5	2.0	7.0
1.0	2.0	5.5
1.5	1.8	4.8
2.0	1.5	4.5
2.5	1.0	3.8
3.0	1.0	3.5
3.5	0.8	2.5
4.0	0.5	2.0

Table 4: Paired T-Test Results for the Time of Hospitalization and NRS Scores in Patients Suffering from Vertebrae Pain due to the Condition of Osteoporosis:

Variables Compared	Mean Difference	T-Statistic (T)	Degrees of Freedom (df)	P-Value
NRS Score - Rest vs. Movement	3.0375	14.1972	7	< 0.0001

IV. DISCUSSION

Bisphosphonates (BP) are often used in the treatment of osteoporosis increasing bone mass, by blocking osteoclast cell function that controls resorption [27]. BPs impedes bone remodeling via their binding to hydroxyapatite sites on osteoclast cells [28]. However, none of these on the inhibitory actions in bone remodeling might have its impact toward impairing fracture healing in osteoporotic fractures and probably for functional [29]. The nitrogen containing group of BPs, which include alendronate [31], risedronate [32][35][36] ibandronateranelic acid [30], and zoledronic acid [(ZOL)] [33], are well established to increase BMD in postmenopausal women with a diagnosis of osteoporosis.

Research published between 2005 and 2019 was subjected to in-depth analysis with the overarching conclusion that nitrogen-containing BPs had a positive effect on preventing spinal fractures compared to placebos [32,33]. Alendronate, risedronate and zoledronic acid have already been proven to be effective for preventing hip fractures as well non-vertebral fractures [32,34].

Studies in animals have also reported beneficial effects of these bioactive compounds (BPs) on bone, such as increased new callus formation and rate by 35% with accelerated radius fracture healing time [36]. Although BPs may increase BMD they also inhibit the process of bone remodelling required for callus shape modulation [36]. In

addition, a short term use of BPs after hip surgery may increase BMD and reduce mortality [37]. Alendronate work published in 2019 showed that weekly alendronates for 14 days after healing of distal radius fractures can be used with any type (surgical or conservative) without affecting the union and clinical outcome [38]. However, a different study revealed the converse and posted greater odds for non-union at three months post-surgery in HBPA-treated surgically repaired inter-trochanteric fracture patients [39]. Anti-catabolic effects have been separately reported in fracture models, where an increased callus volume and bone mineralization with increased peri-implant contact has been seen during the endochondral phase of osseous integration mimicking the clinical picture in osteoporotic patients. Nonetheless, one has to be aware that BPs can also compromise callus remodeling and therefore disturb the healing process in total [40 – 43].

Another drug, denosumab (a potent osteoclast inhibitor), increases bone callus volume at the fracture site while suppressing remodeling [41]. Denosumab has been shown, in studies conducted on animals in advance of human clinical trials, to bind with RANKL so that the molecule is unable to activate receptors for this factor found on osteoclast surfaces. This association is indispensable for osteo-clastogenesis and remodeling. Denosumab was not found to have a statistically significant effect on fracture healing in patients with ongoing osteoporosis anti-resorptive medication [43]. Nevertheless, the roles of denosumab in delayed/non-union fractures are still controversial, thus additional evidences from their clinical studies should be required.

Hanley and colleagues [44] thoroughly described the role of denosumab in anabolic versus antiresorptive therapy, along with its accompanying molecular pathways and targets. Their high specificity causes denosumab to have an extraordinary affinity with RANKL, hereby preventing its activation of the RANK receptor that appears on osteoclast surfaces. Therefore AGE usefully inhibits bone resorption osteoclastogenesis and maintains the number of bones [45]. This feature makes denosumab an attractive choice for the prophylaxis of vertebral, non-vertebral and hip fractures [46]. Unlike bisphosphonates, denosumab has no affinity to the bone matrix but sequesters within the bone. Denosumab (a human-derived monoclonal antibody with a high binding affinity to RANKL) results in substantial suppression of bone resorption marker CTX following single dose administration of 60 mg [42]. However, this could be reversed although it requires retreatment every 9 months [47]. Many long-term trials support the beneficial effects two times a year denosumab compared to alendronate on cortical BMD and microarchitecture [48]. In June 2019, Fang et al. analyzed a recent systematic review and meta-analysis which focused on evaluating the cardiac and vascular effects of denosumab and romosozumab in patients with osteoporosis. With, 17 randomized clinical studies-including 11 of denosumab and six from romosozumab. Over a follow-up of 12–36 months in persons who were treated with the study drug (median, 15-20 months), there was no improvement with either medication on any

component or composite cardiovascular endpoint. There was no observed increase of composite endpoints such as 3-point major CVD events (CV mortality, myocardial infarction and stroke), however the use of romosozumab treatment may induce a potential risk in respect to major cardiovascular event followed by heart failure [49].

V. CONCLUSION

Finally, the present study demonstrates a significant impact of osteoporosis on pain management, particularly showing more severe thoracic than lumbar pains. A significant reduction in NRS scale marks over time was observed in the resting state and also during physical activity without other incentives, indicates a progressive improvement of pain intensity with long-term therapeutic interventions. Though the participants rated pain more highly during movement on average, these additional data suggest that satisfactory dynamic pain control remains a key hurdle. These data highlight the importance of tailoring pain management strategies and ensuring continued monitoring to optimize patient outcomes in clinical osteoporosis care.

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