

ORIGINAL RESEARCH

Assessment of effect of Alendronic acid on fracture healing

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ABSTRACT

Background: The most often prescribed medication among bisphosphonates, alendronic acid, is used extensively in the treatment of osteoporosis. The present study was conducted to assess the effect of Alendronic acid on fracture healing.

Materials & Methods: 98 extraarticular or minimal articular fractures of the distal radius of both genders were divided into 2 groups of 49 each. Group I received Alendronic acid 70 mg once weekly and group II did not receive any medication. Parameters such as Disabilities of the Arm Shoulder and Hand (DASH) questionnaire, range of wrist movement and grip strength, pain and analgesia requirements, and the rate of malunion was recorded

Results: Group I had 29 males and 20 females and group II had 30 males and 19 females. The right-sided fracture was seen in 12 and 18, displaced fracture in 10 and 12, extraarticular fracture in 5 and 6, partial articular fracture in 3 and 4, complete articular fracture in 10 and 5 and comminuted fracture in 9 and 4 patients in group I and II respectively. Comorbidities reported were COPD in 5 and 3 patients, chronic liver disease in 4 and 2, diabetes in 1 and 6, cardiovascular diseases in 7 and 3, previous malignancy in 2 and 1 patient. Fracture management consisted of cast in 35 and 32, MUA and K-wires in 7 and 6 patients, ORIF in 4 and 6, and external fixation in 3 and 5 patients respectively. The difference was significant ($P < 0.05$). Adverse events were carpal malalignment seen in 5 and 8 and malunion in 3 and 4 patients in group I and II respectively.

Conclusion: In patients with a distal radius fracture, early administration of alendronic acid does not adversely affect fracture union or clinical outcome.

Keywords: Alendronic acid, bisphosphonates, carpal malalignment

Introduction

The most often prescribed medication among bisphosphonates, alendronic acid, is used extensively in the treatment of osteoporosis. Strong inhibitory effects of bisphosphonates are seen in bone remodeling, a process that is essential for the healing of fractures.¹ Because of this, there is a theoretical worry that bisphosphonates could prevent union and have a negative impact on other post-fracture outcomes. In patients receiving bisphosphonates, observational studies have shown delayed fracture union.²

Many clinicians are hesitant to begin bisphosphonate therapy right away after a fracture because they are unsure of how the medication will affect fracture healing. They are worried that this could negatively impact the clinical outcome, so they would rather wait until the fracture has healed before starting treatment. There is little solid data regarding bisphosphonates' impact on fracture healing.^{3,4} This holds significance for clinical practice, since the prevention of a recurrent fracture would begin to act sooner if bisphosphonate medication could be administered almost immediately after a fracture, as opposed to waiting six to eight weeks for treatment to take action. This is very important because following an incident fracture, there is a significant increase in the chance of another fracture.⁵ The present study was conducted to assess the effect of Alendronic acid on fracture healing.

Materials & Methods

The present study consisted of 98 extraarticular or minimal articular fractures of the distal radius of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Patients were divided into 2 groups of 49 each. Group I received Alendronic acid 70 mg once weekly and group II did not receive any medication. Parameters such as Disabilities of the Arm Shoulder and Hand (DASH) questionnaire, range of wrist movement and grip strength,

pain and analgesia requirements, and the rate of malunion was recorded. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table: I Distribution of patients

Groups	Group I	Group II
Method	Alendronic acid 70 mg	Placebo
M:F	29:20	30:19

Table I shows that group I had 29 males and 20 females and group II had 30 males and 19 females.

Table: II Assessment of parameters

Parameters	Variables	Group I	Group II	P value
Fracture characteristics	Right-sided fracture	12	18	0.92
	Displaced fracture	10	12	
	Extraarticular fracture	5	6	
	Partial articular fracture	3	4	
	Complete articular fracture	10	5	
	Comminuted fracture	9	4	
Comorbidities	COPD	5	3	0.15
	Chronic liver disease	4	2	
	Diabetes	1	6	
	Cardiovascular disease	7	3	
	Previous malignancy	2	1	
Fracture management	Cast	35	32	0.01
	MUA and K-wires	7	6	
	ORIF	4	6	
	External fixation	3	5	

Table II shows that right-sided fracture was seen in 12 and 18, displaced fracture in 10 and 12, extraarticular fracture in 5 and 6, partial articular fracture in 3 and 4, complete articular fracture in 10 and 5 and comminuted fracture in 9 and 4 patients in group I and II respectively. Comorbidities reported were COPD in 5 and 3 patients, chronic liver disease in 4 and 2, diabetes in 1 and 6, cardiovascular diseases in 7 and 3, previous malignancy in 2 and 1 patient. Fracture management consisted of cast in 35 and 32, MUA and K-wires in 7 and 6 patients, ORIF in 4 and 6, and external fixation in 3 and 5 patients respectively. The difference was significant (P< 0.05).

Graph :IAssessment of parameters

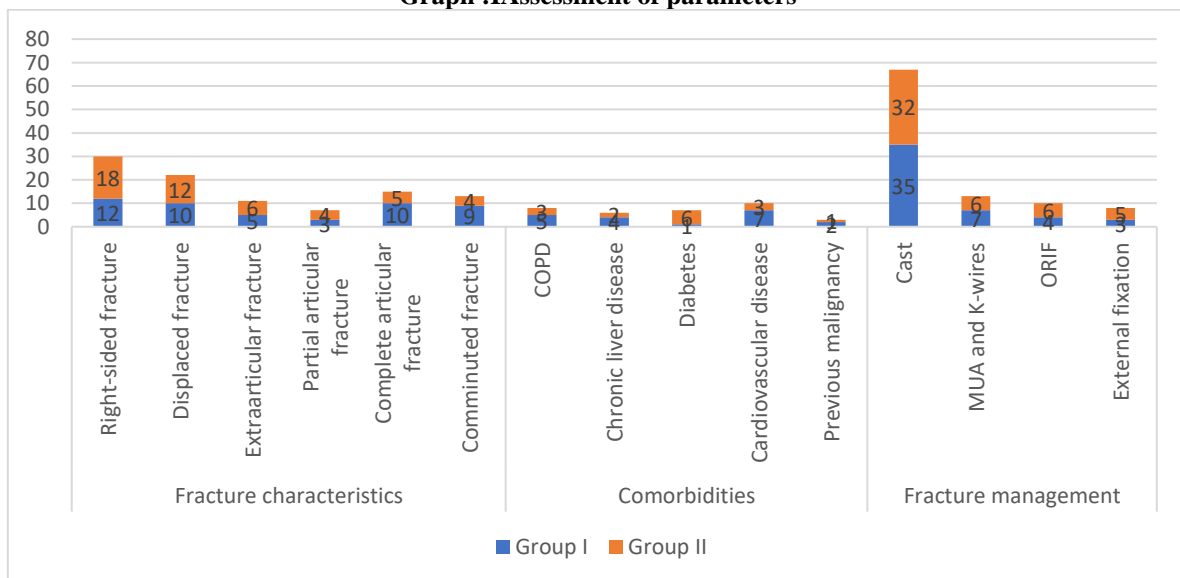
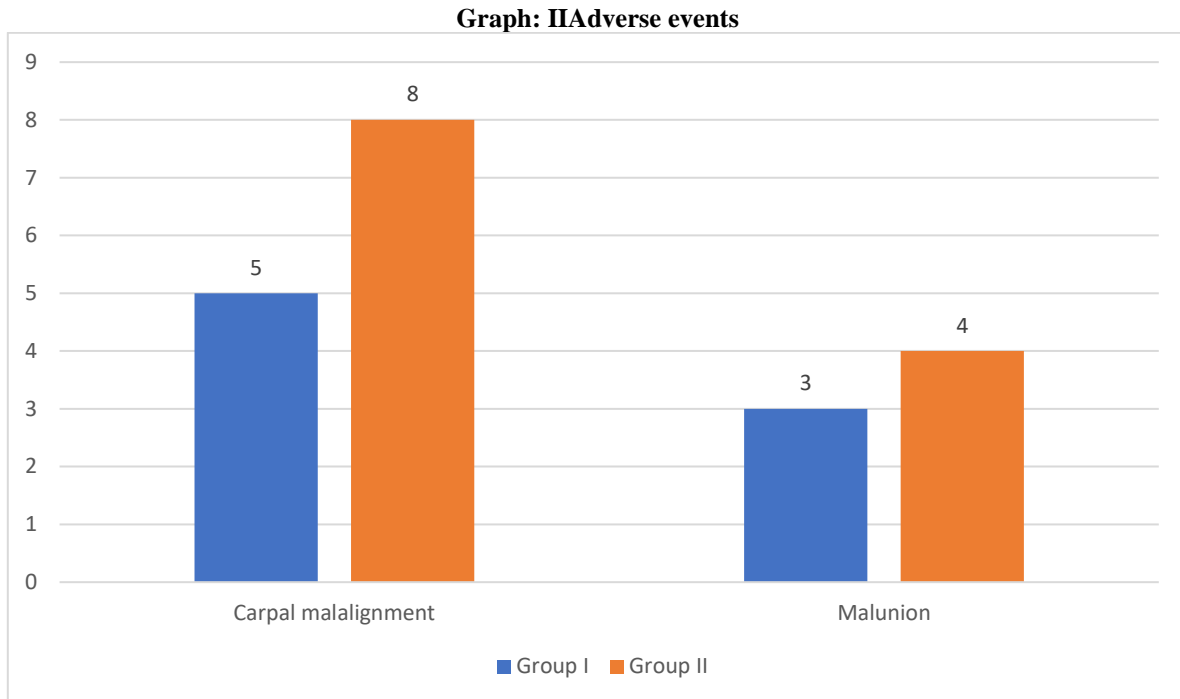


Table: III Adverse events

Adverse events	Group I	Group II	P value
Carpal malalignment	5	8	0.11
Malunion	3	4	0.27

Table III, graph II shows that adverse events were carpal malalignment seen in 5 and 8 and malunion in 3 and 4 patients in group I and II respectively.



Discussion

Alendronic acid is a medication commonly prescribed to treat osteoporosis, a condition characterized by weakened bones that are more prone to fracture.⁶ It belongs to a class of drugs known as bisphosphonates, which work by inhibiting the breakdown of bone tissue, thus helping to maintain or increase bone density.^{7,8} When considering the effect of alendronic acid on fracture healing, it's essential to understand its mechanism of action.^{9,10} Alendronic acid suppresses bone resorption by targeting osteoclasts, cells responsible for breaking down bone tissue. By reducing bone turnover, it may theoretically slow down the remodeling process, which is crucial for fracture healing.^{11,12} The present study was conducted to assess the effect of Alendronic acid on fracture healing. We found that group I had 29 males and 20 females and group II had 30 males and 19 females. Duckworth et al¹³ examined the impact of early bisphosphonate treatment on the recovery from fractures and functional outcome after a distal radius fracture. Within 14 days of the fracture, 421 50-year-old patients who had not taken bisphosphonates before and had a distal radius fracture confirmed by radiography were enrolled. They were then randomly assigned in a 1:1 ratio to receive either a placebo (n = 206) or 70 mg of alendronic acid once weekly (n = 215). The percentage of fractures that had radiologically united at 4 weeks, as determined by an observer who was blind to the treatment allocation, was the main outcome measure. The Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire, grip strength and range of motion, analgesic needs, pain, and malunion rate were examples of secondary outcomes. 362 (86%) of the participants had a mean age of 63 8.5 years. At 4 weeks, 52 of 187 (27.8%) fractures in the placebo group had joined, whereas 48 of 202 (23.8%) fractures in the alendronic acid group had done so. Based on imputed data, the absolute proportion difference between the groups was 4.5%. The percentage of fractures that united at any other time point did not change significantly, and neither did the DASH score, pain at the fracture site, grip strength, or any other clinical outcome. We observed that right-sided fracture was seen in 12 and 18, displaced fracture in 10 and 12, extraarticular fracture in 5 and 6, partial articular fracture in 3 and 4, complete articular fracture in 10 and 5 and comminuted fracture in 9 and 4 patients in group I and II respectively. Comorbidities reported were COPD in 5 and 3 patients, chronic liver disease in 4 and 2, diabetes in 1 and 6, cardiovascular diseases in 7 and 3, previous malignancy in 2 and 1 patient. Fracture management consisted of cast in 35 and 32, MUA and K-wires in 7 and 6 patients, ORIF in 4 and 6, and external fixation in 3 and 5 patients respectively.

We found that adverse events were carpal malalignment seen in 5 and 8 and malunion in 3 and 4 patients in group I and II respectively. Van der et al¹⁴ in their study thirty-seven women with a recent fracture of the distal forearm and low bone mineral density (BMD) of the lumbar spine were randomized to receive either 10 mg alendronate daily or placebo. BMD of both forearms was measured at baseline and after 3, 6, and 12 months. The results of four women who developed reflex sympathetic dystrophy were not included in the analysis. In the placebo group, there was a significant reduction at 3 months and 6 months in BMD of total radius ($p < 0.01$), one-third distal radius ($p < 0.01$), middistal radius ($p < 0.05$), and ultradistal radius ($p < 0.01$) on the fractured side. The loss in BMD at one-third distal radius remained significant at month 12 ($p < \text{or} = 0.001$). In the alendronate group BMD of total distal radius, one-third distal radius, and middistal radius at the fractured side remained unchanged. BMD of ultradistal radius increased significantly at months 3, 6, and 12, compared with baseline. The difference between the two treatment groups was significant at 3 months and 6 months and borderline significant after 1 year in total distal radius. In ultradistal radius the differences were significant at all time points. The limitation of the study is the small sample size.

Conclusion

Authors found that in patients with a distal radius fracture, early administration of alendronic acid does not adversely affect fracture union or clinical outcome.

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