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Original Research Article

Assessment of incidence of occurrence of fractures of posteriors malleolus region: a retrospective analysis

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ABSTRACT

Background: Fracture of ankle joint involving posterior malleolus easily causes traumatic arthritis and prognosis of this fracture is poor. There are a number of controversies regarding the indications for fixation of fragments of posterior malleolus. Some studies report that if the articular surface at the distal end of the tibia accounts for more than twenty five percent, then fixation of posterior malleolus fragments should be done. In this retrospective study we evaluated the treatment effect of ankle joint fractures involving the posterior malleolus and analyzed the impact of different posterior malleolus fragment sizes on the treatment effect.
Methods: A total of 52 subjects, including 23 males and 29 females, were selected for the present study. Patients with a definitive diagnosis of ankle joint fracture with involvement of the posterior malleolus and undergoing open reduction internal fixation surgery for the same were included in the present study. Mean age of the patients was 41.3 years.
Results: Significant results were observed with respect to posterior malleolus fragment size and arthritis score of two groups. Non- significant results were observed with respect to difference in the American Orthopedic Foot and Ankle Society (AOFAS) score, Visual analogue scale (VAS) rating under various conditions and patient satisfaction rating.
Conclusions: Treatment effect on all 52 cases of ankle joint fractures involving posterior malleolus fractures were satisfactorily.

Keywords: Fractures, Malleous, Posterior

INTRODUCTION

Fractures of the ankle joint are one of the common fractures seen clinically and of all the fractures sustained in the entire body, they account for 3.92%.[1] Posterior malleolus fractures which are rarely seen alone, are commonly accompanied with ankle joint fractures (7% to 44%).[2-4] Some studies have reported that fracture of ankle joint involving posterior malleolus easily causes traumatic arthritis and prognosis of this fracture is poor.[3,5] Other scholars have reported that after posterior malleolus fracture, articular surface area at the distal end of tibia is changed which leads to change in the stress distribution on articular surface that triggers arthritis.[6,7] There are a number of controversies regarding the indications for fixation of fragments of posterior malleolus. Some studies report that if the articular surface at the distal end of the tibia accounts for >25%, then fixation of posterior malleolus fragments should be done.[8-10] Study by Langenhuijsen et al. reported that surgical fixation of the fragments of posterior malleolus should be done when the fragment is >10% and even after internal fixation of the medial and lateral malleolus, the articular surface at the distal end of the tibia is uneven.[11] In this retrospective study we evaluated the treatment effect of ankle joint fractures involving the

posterior malleolus and analyzed the impact of different posterior malleolus fragment sizes on the treatment effect.

METHODS

For the study, we included patients with a definitive diagnosis of ankle joint fracture with involvement of the posterior malleolus and undergoing open reduction internal fixation surgery for the same. A total of 52 subjects including 23 males and 29 females were selected for the study. The patients had mean age of 41.3 years (15-75 years). Causes of injury included were 6 cases of traffic injury, 17 cases of sprain, 21 cases of fall-down injury, 7 cases of crash injury and one case of falling injury.

Trauma Association (AO/OTA) fracture classification system, fractures were divided into different types: 2 cases of Type A, 36 cases of Type B, and 14 cases of type C. Evenness of the articular surface was checked after reduction of the posterior malleolus fragment. At level of <1 mm the surface was considered even and at level >1 mm the surface was considered uneven.[11]

Fracture cases were also divided based on posterior malleolus fragment size into 3 groups, fracture cases with fragment size of <10%, fragment size of 10% to 15% and fragment size of >25%. The number of cases with fragment size of <10% was 7, with fragment size of >25% was 14 and with fragment size of 10% to 25% was 31. Ankle-Hindfoot Scale of the American Orthopedic Foot and Ankle Society [AOFAS scale] score (excellent, >90; good, 75-89; acceptable, 50-74; poor, <50); fracture pain during rest, active movement, and weight bearing walking based on a visual analogue scale (VAS) (from 0 for pain-free upto 10 for the most unbearable pain) and ankle joint mobility (angle of dorsiflexion, plantar flexion, varus, and valgus during follow up) were some of the evaluation indices used in the study.[12]

Statistical significance of the data was checked with the help of SPSS 15.0 for windows and paired t-test. Statistical significant difference was represented by a p-value of <0.05.

RESULTS

The clinically evident union of fracture fragments was seen in all the patients and follow up for patients was done up-to 7 to 97 months (average, 29 months). Groups with the fixed and unfixed posterior malleolus fragments were compared. No. of cases in the fixed group was 23 and the average size of fragment in this group was 27% (12.5% - 55%).

Number of cases in unfixed group was 29 and the average size of fragment in this group was 13% (2%- 22.4%). Statistical significant results were observed with respect to posterior malleolus fragment size and arthritis score of two groups, whereas non-statistical significant results were observed with respect to difference in the AOFAS score, VAS rating under various conditions and patient satisfaction rating (Table 1).

Table 1: Comparison between fixed and unfixed posterior malleolus fragment groups.

	Fixed (n = 23)	Unfixed (n = 29)	P value
Size of posterior malleolus fragment (%)	27+8.3	13+5.6	0.000
AOFAS scale	92.6+5.4	94.4+4.3	0.321
VAS during rest	0.18+0.40	0.17+0.55	0.946
VAS during active movement	0.42+0.72	0.31+0.86	0.627
VAS during weight-bearing	0.81+1.58	0.72+1.66	0.841
Patient satisfaction	9.35+0.72	9.57+0.51	0.387
Arthritis scale	1 (0-2)	0 (0-2)	0.000

Table 2: Comparison between patients with even and uneven articular surfaces after reduction.

	Even (n = 13)	Uneven (n = 39)	P value
Age of patients	42.6+15.3	47.3+14.8	0.124
Size of posterior malleolus fragment (%)	16.9+9.7	24.2+12.8	0.039
AOFAS scale	97.2+5.3	91.8+7.9	0.018
VAS during rest	0.06+0.23	0.42+0.86	0.173
VAS during active movement	0.19+0.46	0.80+1.74	0.094
VAS during weight-bearing	0.67+1.34	0.92+1.34	0.312
Patient satisfaction	9.63+0.37	9.54+0.71	0.041
Arthritis scale	0 (0-1)	1 (0-2)	0.000

It is observed from the results that larger posterior malleolus fragment size has greater potential for successful surgical fixation because the average surgically fixed posterior malleolus fragment size was larger as compared to the average unfixed posterior malleolus fragment size. No statistical difference in the effect of treatment between the fixed and unfixed posterior malleolus fragment groups was shown by comparison of AOFAS score, VAS rating, and patient satisfaction. Based on the evenness of the articular surface after reduction, all the cases of posterior malleolus fractures were divided into two groups for the comparison of posterior malleolus fragment size, AOFAS score, VAS score, patient satisfaction, and arthritis score. Distinct differences were observed with respect to posterior malleolus fragment size, AOFAS score, arthritis score and patient satisfaction whereas in case of VAS score under three conditions no statistical difference was observed (Table 2). So, this can be inferred from these results that the prognosis of the posterior malleolus fracture is affected by the level of articular surface reduction and articular surface evenness is influenced by the posterior malleolus fragment size.

DISCUSSION

In the present study, on comparing fixed and unfixed posterior malleolus groups, we observed significantly larger posterior malleolus fragment size in the fixed group than that in the unfixed group. Significant difference was seen in the arthritis score, but non-significant differences were seen in AOFAS and VAS scores. Studies have reported that between fixed and unfixed posterior malleolus fragments, there was significant difference in the fragment sizes but no statistical difference was seen in functional and VAS score.[9-11]

The analysis of relationship between articular surface evenness and prognosis of posterior malleolus fracture was also done. It was seen that in comparison to uneven articular surface, an even articular surface has better AOFAS score, patient satisfaction, and arthritis score and it is more commonly accompanied by smaller fragment. So, this can be established that there is an association of the size of posterior malleolus fragment for achieving anatomical reduction of articular surface. With increase in the size of posterior malleolus fragment, the level of damaging force also increases which leads to increase in the difficulty for achieving articular surface reduction.

Studies conducted by Lindsjo and Broos and Bisschop have stated that for patients with large fragments the treatment effect is poor.[8,13] De Veries was unable to find any connectivity between fragment size and long-term prognosis and believes that above results may have been due to insufficient sample size.[9] The relationship between articular surface evenness and prognosis with different fragment sizes was further investigated in the present study. It was seen that patients with even articular surfaces had poorer arthritis score as compared to patients with uneven articular surfaces. The indication for fixation of posterior malleolus fragment has always been disputed. Raaasch et al and Fitzpatrick et al reported that as long as intact medial and lateral malleolus are present or the position of facture is firmly fixed the reduction of posterior malleolus fragments can be done stably under general conditions without fixation; if the fracture fragments of posterior malleolus fracture are poorly reduced in the first phase and are not fixed, they will subsequently undergo a natural reduction process; if the fixation is performed in poorer positions the chance for natural correction is lost.[14,15]

Boraiah S et al assessed the associations between fracture patterns are important and can ensure proper diagnosis and guide treatment. Occult posterior malleolus fractures associated with distal spiral tibia fractures often are underrecognized and the morbidity of a missed posterior malleolus injury can be substantial. They determined the association between the two injuries and evaluated the ability of a new protocol to improve management of these associated fractures. Of 62 consecutive patients with fractures of the distal third of the tibia, we retrospectively evaluated the first 39 patients and prospectively used a diagnostic protocol including computed tomography of the ankle in the subsequent 23 patients. The minimum followup was 3 months (mean, 25 months; range, 3-68 months). Twenty-four patients (39%) had fractures of the posterior malleolus. Before initiation of the protocol, intraarticular fractures were recognized in 33% (with one delayed diagnosis and one missed diagnosis), and after institution of the protocol, the detection rate was 48% with no known missed injuries and complete follow-up; however, with the limited power the detection rates were similar without and with the protocol. A spiral distal tibial shaft fracture with a proximal fibula fracture should alert the surgeon to investigate an occult ankle injury, particularly of the posterior malleolus. A protocol including computed tomography of the ankle may detect more injuries in a larger study.[16]

Hou Z et al assessed the incidence of posterior malleolus fractures. A total of 288 tibial shaft fractures were studied to analyze posterior malleolar in the third hospital of Hebei medical university between January 2005 and June 2007. From June 2007, computed tomography (CT) scan or magnetic resonance imaging (MRI) was routinely performed in the ankle region, whereas the distal third spiral tibial fracture was found in the primary plain X-ray films. The posterior malleolus fracture was found in 28 cases (9.7% of 288 cases). Only nine cases were observed preoperatively in plain X-ray films, four cases were detected intraoperatively, and 15 cases were not detected at all during the treatment. In the retrospective study, three posterior malleolus fracture of 34 tibial shaft spiral fractures was detected in plain films, 23 posterior malleolus fractures detected by CT, and 4 posterior malleolus fractures detected by MRI. In four cases, there was no posterior malleolus fractures. Spiral fractures of

the distal tibia commonly have an associated occult posterior malleolus fracture. Even the careful radiographic examination of the ankle joint, that is mandatory before surgery, may not detect this injury. CT scan or MRI may be a compensative method to detect these injuries. CT scan should be routinely performed in clinical practice.[17]

CONCLUSION

From the above results, the authors concluded that the treatment effect on all 52 cases of ankle joint fractures involving posterior malleolus fractures were satisfactorily. Therefore, future studies are recommended.

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