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Original Research Paper

Orthopaedics

FUNCTIONAL OUTCOME OF FRACTURE TALUS: TREATED WITH DIFFERENT MODALITIES

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KEYWORDS :

INTRODUCTION

Talus is a peculiar bone as almost 78% of its total bony surface is intra-articular. It transmits the entire body weight and has hardly any musculo-tendinous attachments [1]. Hence its injuries especially fractures and fracture dislocations, though not common, have posed a great deal of problems to orthopaedic surgeons in the form of open wound, skin necrosis from bony pressure, imperfect reduction and avascular necrosis [2-4]. As more than two third of the talus is intraarticular, very limited surface area is available to provide adequate vascular perforations. Blood vessels enter the talus via capsular and ligamentous attachment. Therefore, it is vulnerable to complication such as osteonecrosis after fracture and dislocation of talus [5].

METHODS

After approval from the institutional ethical committee an observational study with retrospective and prospective evaluation of cases of fracture talus (with or without subluxation or dislocation) were reviewed over a period of 5 years from January 2015 to 2020

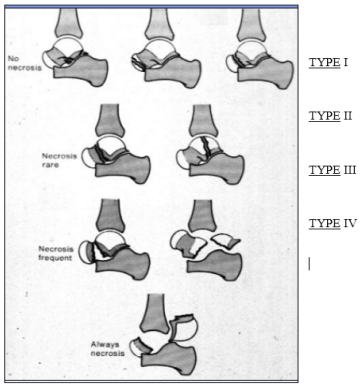
Patients with radiologically proven, isolated talus fracture irrespective of age and sex were included in the study. Patients with talus fracture with associated fractures of foot and ankle and open fractures were excluded from the study.

Demographic characteristics like sex and age; mode of trauma, side of the injury were noted. The talus fractures were classified as per Marti and Weber's classification [6] from the preoperative x-ray of the ankle (anteroposterior, lateral and mortise view) (table 1) (Figure 1)

Table 1. Marti and Weber classification: -

Type	Anatomical location	Circulation	AVN
Type I	Peripheral fracture - Processus fibularies - Processus posterior - Distal neck - Head	Circulation Intact	No necrosis
Type II	Central fracture without displacement - Proximal neck - Body	Circulation Mainly Intact	Seldom Necrosis
Type III	Central fracture with displacement - Proximal neck - Body	Intra-osseous circulation interrupted, Auxiliary circulation intact	Often Necrosis
Type IV	Dislocation fracture - Proximal neck - Body dislocated in the ankle and / or subtalar joint	Intra-osseous and auxiliary circulation interrupted	Nearly Always Necrosis

Figure 1. Marti and Weber classification: -



Information was obtained from case sheets, preoperative and postoperative X-rays, follow up records and personal evaluation of follow up of patients.

All the patients with fracture talus were admitted and evaluated for injuries involving any other system or other limbs and neurovascular injuries; if present was treated on priority basis. All the patients were initially immobilized with below knee plaster slab.

Undisplaced fractures were treated initially by a below knee slab; after the swelling had diminished, a below knee plaster cast was applied for 6 to 8 weeks.

Displaced fractures were reduced anatomically wherever possible in the emergency room.

The reduction of displaced central fracture and dislocated fracture was performed under spinal or general anesthesia with Bohler's technique. The edge of table was padded so that the heel remains free, with full plantar flexion and traction on the heel, attempt was made to re-align the fragment. Additional sideways displacements as well as inversion or eversion were corrected.

Operative methods were adopted when attempted closed reduction failed to achieve satisfactory opposition of fragment.

Fracture fixation was done by one or two 4 mm cancellous screws. Main aim was to achieve an anatomical reduction as much as possible and to insert the screws at right angle to

fracture plane to achieve relative stability. K wires of 1.6 mm thickness were used as a mean of temporary stabilization and as joystick to reduce the fragments.

Primary arthrodesis was done for Weber's type III and IV comminuted fractures.

Non-comminuted type I and type II fractures were started with ankle range of motion exercises as soon as post- operative swelling subsided but were kept strictly nonwieght bearing for 6 to 8 weeks. Type III and type IV were kept on non-weight bearing cast for the duration of 12 to 14 weeks.

All the patients underwent a standardized clinical follow up examination. Patients were asked about the persistent complaints related to the trauma and the effects on their professional careers. Radiographs of the ankle joint were done in two projections, anteroposterior and lateral view.

Evaluation was done by Hawkin's score based on pain, presence of limping and range of motion at ankle and subtalar joint was used for the final assessment of the treatment [7]. Each patient was a given a numerical rating in these four categories and sum of ratings was used as quantitative measure of the clinical result.

Hawkin's score; -

1. Pain: -

No pain	-	6 points.
Pain only after fatigue	-	3 points.
Pain on walking	-	0 point.

2. Presence of limping;

No limping	-	3 points.
Limping	-	0 point.

3. Range of motion of ankle and subtalar joint;-

Full motion	-	3 points.
Partial motion	-	2 points.
Fusion	-	1 point.
Fixed deformity	-	0 point.

The quantitative sum of all above was made and results interpreted as

score

a.	Very good	13 to 15
b.	Good	10 to 12
c.	Fair	7 to 9
d.	Poor	6 or less.

RESULTS

28 patients sustained talus fracture in the study period. The average period of follow-up was 9 months with range between 6 to 18 months. The age group of the patients ranged from 15 to 56 years with 75 % of the patients were between 25 to 44 years of age. 86% of patients sustaining talus fractures were males. Weber's Type II and Type III constituted the major fracture type (35% each) with type I fracture being the least common type (4%). Road traffic accident was the most common cause of trauma (60%) followed by fall from height. 82% of the fractures were closed.

The functional outcome was assessed by Hawkins score. Table no 2 shows the distribution of functional score according to the fracture types. Type I fractures had 'very good' outcome in 100% of cases whereas 42% of type IV fractures had poor outcome.

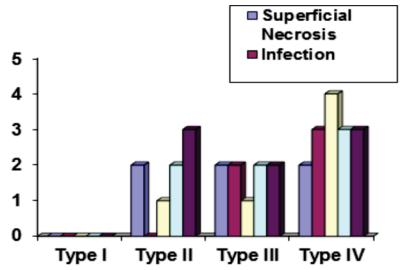
Table 2: Functional outcome (Hawkins score) with respect to type of fracture.

	Very good	Good	Fair	Poor	Total
Type I	1 (100%)	-	-	-	01
Type II	2 (20%)	4 (40%)	3 (30%)	1 (10%)	10
Type III	1 (10%)	3 (30%)	5 (50%)	1 (10%)	10
Type IV	1 (15%)	1 (15%)	2 (28%)	3 (42%)	07

No significant correlation was found between the functional outcome and time lag between injury and surgery.

Functional outcome of talar fractures is dependent on development of complications. Early complications such as skin necrosis (22%), infection (18%) and late complications such as osteonecrosis (22%), post traumatic arthritis (53%) have occurred in our study (Figure 2).

Figure 2: Complications according to fracture types of talar fractures.



DISCUSSION

High energy nature of majority of talar factures produce not only fracture displacement but also Comminution. Treatment strategies have evolved from closed reduction and immobilization to open reduction and internal fixation. Surgery for displaced fractures consists of anatomically correct reconstruction to avoid articular surface incongruence and angular deformity as well as preservation and rapid restoration of talar blood supply [2-4].

Marti Weber type I and type II fractures of the talus generally have a good prognosis. They are usually treated conservatively. However, undisplaced talar neck fractures can also be treated with percutaneous screw fixation. Osteosynthesis permits early mobilization of the joint. The results of the fractures of type III and type IV are often unpredictable because of incidence of osteonecrosis which range from 40 to 50 % [2-4]. In our study, we found overall prevalence of osteonecrosis to be 22%. The low rates of secondary talar necrosis are probably due to majority of cases in our study were treated operatively to achieve and maintain anatomical reduction. However, as the numbers in present study were small, it is difficult to derive a conclusion.

Conventional teaching suggests talus fractures to be treated urgently to reduce the risk of osteonecrosis because urgent reduction of dislocation may help to preserve any remaining blood supply. However, no correlation was found between timing of surgery and functional outcome of fracture. Delay in surgery does not necessarily result in adverse outcome. Also in some cases internal fixation cannot be safely undertaken on urgent basis because of life threatening trauma or because of severe soft tissue damage and swelling of ankle and foot. Surgical delay will allow improvement in associated soft tissue injury and will decrease rates of wound complications and infections.

Weber et al recommended primary arthrodesis for all talus fractures with dislocations, which sacrifices the ankle and subtalar joints [9] but in our study, 2 cases were primarily treated with arthrodesis (1 case with type III comminuted, 1 case with type IV). Both had fair to good functional outcome during follow up study. Though the number of cases in our study is small, it can be recommended that primary arthrodesis can be done in severely communicated fractures which preclude acceptable internal fixation of fracture fragments.

Hawkins (1970) in his initial study of 57 talar neck fractures, reported an overall prevalence of osteonecrosis of 53% [7]. Canale and Kelly (1978) in study of 71 talar neck fractures reported 52% prevalence of osteonecrosis [8]. Penny and Devis (1980) reported 48% prevalence of osteonecrosis [2]. Grob et al reported 16% osteonecrosis rate in a series in which 28 of 41 talar fractures were fixed surgically within 8 hours after injury [10]. They have attributed the low osteonecrosis rates to early fixation. Although they noted that the degree of osteonecrosis was not related to a delay in fracture fixation, they still recommended early fixation. In our study, prevalence of osteonecrosis was 22% (4% in type II, 4% in type III and 14% in type IV). As the severity of fractures increased, rate of osteonecrosis increased. The rate of osteonecrosis was not related to timing of fixation; but rather to the initial degree of fracture displacement.

Szyszkowitz et al (1985) reported prevalence of subtalar arthritis 74% and ankle arthritis 52% [11]. Grob et al reported 37% of prevalence of post traumatic arthritis [10]. Elgafy et al (2000) found 53% prevalence of subtalar arthritis [12]. In our study, prevalence of overall post traumatic arthritis was 53% (ankle arthritis 25%, subtalar arthritis 28%). The observations in recent studies more closely parallel the finding in our study, in which post traumatic arthritis was twice as common as osteonecrosis. Functional outcomes were worse when talar body fractures were followed by development of arthritis or osteonecrosis with collapse.

Closed radiological follow up of all talar fractures is important to detect the subtle intensity changes manifested by those fractures with normal healing and those undergoing avascular necrosis. It is necessary to follow serial anteroposterior and lateral X-rays of talar dome monthly for at least 3 – 4 months and to be compared with normal contralateral side. Subchondral atrophy of the dome, appearing usually 6 – 8 weeks following fracture dislocation (Hawkins sign) indicates intact blood supply to fragment, which is usually sufficient to prevent avascular necrosis.

As compared to K wire fixation, interfragmentary compression with lag screws increases the stability and allows early motion. Although there is no correlation between timing of fixation after injury and functional outcome in talar fractures, immediate reduction of fracture reduction is recommended to preserve talar blood supply and avoid secondary soft tissue oedema. Primary arthrodesis can be acceptable mode of treatment in severely comminuted fracture of talus which preclude anatomical reduction and internal fixation of fracture fragments.

CONCLUSION

Functional outcome of talus fractures is mainly dependent on development of early and late complications. As in intra-articular fractures of major weight bearing joints, optimal treatment for fracture talus follows the same basic principle of restoration of normal anatomy to prevent avascular necrosis and secondary arthritis. The anatomical restoration may be obtained by closed methods, but often it displaces. Most precise method of restoring and maintaining the anatomy of talus fracture is open reduction and internal fixation to allow early motion. Surgery for displaced fractures consists of anatomically correct reconstruction to avoid articular surface incongruence and angular deformity as well as preservation and rapid restoration of talar blood supply. This will ensure early mobilization and satisfactory outcome.

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