OPERATIVE MANAGEMENT AND EVALUATION OF FRACTURE NECK OF TALUS
Rajat Charan1, Tushar Chaurasia2, Pankaj Kumar Verma3

1Assistant Professor, Department of Orthopaedics, Nalanda Medical College and Hospital, Patna, Bihar.
2Junior Resident, Department of Orthopaedics, Nalanda Medical College and Hospital, Patna, Bihar.
3Junior Resident, Department of Orthopaedics, Nalanda Medical College and Hospital, Patna, Bihar.

ABSTRACT

BACKGROUND
Fractures and dislocations of the talus are a challenging injury. Fractures of the talus are generally thought to be relatively uncommon. However, the talus is the second most commonly fractured tarsal bone. The purpose of this study is to evaluate clinical and radiological outcomes of operatively treated displaced talus fracture.

MATERIALS AND METHODS
The study is a prospective study of twelve cases of displaced fracture neck of talus evaluated and treated at the department of orthopaedics, Nalanda Medical College and Hospital, Patna from 20 August 2015 to 18 August 2017.

RESULTS
Reduction was anatomical in six cases (50%), nearly anatomical in 3 cases (25%) and poor in 3 cases (25%). Two patients (16.66%) developed an early superficial infection and required surgical irrigation and debridement and appropriate antibiotic treatment. Using the AOFAS ankle-hindfoot scale, the average functional score was 75.17 points. There was excellent result in four patients, good result in three cases, fair in three and poor result was found in two cases.

CONCLUSION
Fracture neck of talus (Hawkins type 2 and 3) treated with anatomical reduction and near anatomical reduction had a satisfactory clinical and functional outcome, whereas (Hawkins type 4) had fair to poor outcome with complications like AVN, arthritis and malunion due to poor initial reduction.

KEYWORDS
Talar neck fractures, Avascular necrosis, AOFAS ankle-hindfoot scale, Hawkins type of fracture.

Exclusion Criteria
Exclusion criteria were fracture through body of talus, lateral or posterior process and osteochondral fractures, Hawkin’s type I fractures and open fractures.

First primary treatment was given to all patients in form of below knee elevation to reduce edema after confirming with X-rays and 3D CT scan. After all pre-operative evaluation, patients with fracture dislocation were operated immediately to avoid neurovascular complications.

Clinical Evaluation
All patients with fracture neck of talus were presented with symptoms of severe pain and swelling of hind and mid foot, marked restriction of movement of ankle joint. Gross deformity may be present, depending on the degree of displacement of the fracture.

Radiological Evaluation
- Anteroposterior (AP) view,
- Lateral view,
- Oblique view of foot and ankle.

The above view helps to classify the fracture and to assess associated injuries.

Canale and Kelly view
This special oblique view for talus provides better evaluation of talus neck angulations and shortening, which is not appreciable on routine radiographs.5

Figure 1

Figure 2

Canale and Kelly view
This special oblique view for talus provides better evaluation of talus neck angulations and shortening, which is not appreciable on routine radiographs.5

Computed Tomography (CT Scan)
CT scan is used to assess fracture pattern, degree of comminution, and the presence of loose fragments in sinus tarsi and associated head or body fracture.

Treatment
Open reduction and internal fixation were recommended for displaced fracture neck of talus.

The goal of treatment of fracture neck of talus was anatomical reduction, which was achieved by maintaining proper rotation, length, and angulation of the neck fracture.

Surgical Approach
With the medial approach it is easy to access the talus neck hence was commonly used. 5 patients were treated with medial approach (3 patients had medial malleolus fracture) and 4 patients were treated with combined antero-lateral and antero-medial approach (having lateral malleolus fracture) and 3 patients were treated with posterolateral approach.

Fixation
Once the fracture has been reduced, it is provisionally stabilized with Kirschner wires and fixed with two or three 4mm cancellous screws. Associated fracture of lateral and medial malleolus or osteotomy was treated with malleolar screw, TB wiring or lateral plating.

CASE 1

Figure 3

CASE 2

Figure 4

Post-operative Care
All patients were immobilized in below knee slab with elevation till stitches removal followed by below knee non-weight bearing cast in neutral alignment up to 2 months. After 2 months cast was removed, and physiotherapy started with non-weight bearing mobilization. After 3 months, repeat x-ray is done and progressive weight bearing combined with joint mobilization exercises started.

Figure 5
**Post-operative Evaluation**

The reduction of fracture was assessed on the basis of post-operative radiographs, in the AP and lateral views according to the following criteria proposed by Lindvallet al.6

- An anatomical reduction was defined as there was no step-off at the neck or body and no frontal angulation.
- A nearly anatomical reduction meant that a 1 mm to 3 mm step-off of any fracture fragment or slight varus angulations (<5°)
- A poor reduction was defined as an articular or neck mismatch, a step-off or gap of >3 mm, or neck angulations of >5°

Assessment of the subtalar joint was also used to rate the quality of the reduction. Radiographs of the foot and ankle were done at approximately six and twelve-month intervals postoperatively to assess union, secondary displacement and avascular necrosis.

**Post-traumatic Osteoarthritis**

Post-traumatic osteoarthritis was defined as any loss of joint space, development of subchondral sclerosis or cysts or formation of osteophytes. The joints affected by osteoarthritis (subtalar, tibiotalar, talonavicular joint) were noted.

At final follow-up, American orthopaedic foot and ankle society (AOFAS) ankle-hindfoot score was determined. This scoring system classified the evaluated items into three major categories: pain, function and alignment. In this scale, 50 points were assigned to function, 40 points to the pain, and 10 points to the alignment.7,8

The scoring system is divided as following:

- Excellent: 90 and 100
- Good: 75-89
- Fair: 50-74
- Poor: <50

Result of the study were presented in Mean ± SD or percentage. The values were entered in MS Excel and statistical values were calculated.

**RESULTS**

In this study minimum follow up was done for 24 months with an average follow-up of 36 months. Anatomical reduction was achieved in 6 cases (50%), nearly anatomical in 4 cases (33.33%) and poor in 2 cases (16.66%). Superficial infection developed in two patients (16.66%), which required surgical irrigation and debridement and appropriate antibiotic treatment.

Avascular necrosis (AVN) of talus was developed in two patients (16.6%) with type IV talus neck fracture with poor initial reduction (Table 1).

<table>
<thead>
<tr>
<th>Pt. No</th>
<th>Age/Sex</th>
<th>Hawkins Type of Fracture</th>
<th>Initial Reduction</th>
<th>Early Complication</th>
<th>Indication of Sec. Surgery</th>
<th>Secondary Surgery</th>
<th>AOFAS Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M/35</td>
<td>III</td>
<td>Near anatomical</td>
<td></td>
<td></td>
<td></td>
<td>71</td>
</tr>
<tr>
<td>2</td>
<td>F/38</td>
<td>IV</td>
<td>Poor</td>
<td>Initial lack of reduction</td>
<td>AVN</td>
<td>TT arthrodesis</td>
<td>42</td>
</tr>
<tr>
<td>3</td>
<td>M/56</td>
<td>II</td>
<td>Anatomical</td>
<td></td>
<td></td>
<td></td>
<td>76</td>
</tr>
<tr>
<td>4</td>
<td>M/34</td>
<td>III</td>
<td>Anatomical</td>
<td></td>
<td></td>
<td></td>
<td>92</td>
</tr>
<tr>
<td>5</td>
<td>F/44</td>
<td>IV</td>
<td>Near anatomical</td>
<td></td>
<td>Stiffness</td>
<td>Arthrolysis</td>
<td>70</td>
</tr>
<tr>
<td>6</td>
<td>M45</td>
<td>III</td>
<td>Anatomical</td>
<td></td>
<td></td>
<td></td>
<td>90</td>
</tr>
<tr>
<td>7</td>
<td>F/36</td>
<td>III</td>
<td>Near anatomical</td>
<td></td>
<td>Superficial infection</td>
<td></td>
<td>92</td>
</tr>
<tr>
<td>8</td>
<td>M/54</td>
<td>II</td>
<td>Anatomical</td>
<td></td>
<td></td>
<td></td>
<td>76</td>
</tr>
<tr>
<td>9</td>
<td>M/40</td>
<td>IV</td>
<td>Poor</td>
<td>Initial lack of reduction</td>
<td>AVN</td>
<td>TT arthrodesis</td>
<td>46</td>
</tr>
<tr>
<td>10</td>
<td>F/46</td>
<td>III</td>
<td>Anatomical</td>
<td></td>
<td></td>
<td></td>
<td>90</td>
</tr>
<tr>
<td>11</td>
<td>M/35</td>
<td>II</td>
<td>Anatomical</td>
<td></td>
<td></td>
<td></td>
<td>78</td>
</tr>
<tr>
<td>12</td>
<td>M/50</td>
<td>III</td>
<td>Near anatomical</td>
<td></td>
<td>Superficial infection</td>
<td></td>
<td>72</td>
</tr>
</tbody>
</table>

**Table 1. Patients Data**

The radiographic follow up was done to find out the development of osteonecrosis within first six month after injury in 2 patients (16.66%), no sign of revascularization were seen, and these patients needed secondary surgery in form of tibio-talar arthrodesis (Table 1). Arthrolysis of ankle joint was done in one patient (8.33%) at 10 months due to stiffness of joint.

According to AOFAS ankle-hindfoot scale, the average functional score was 75.17 points (range 54-90 points). There was excellent result in one patient, good result in three patients, fair in eight patients and no poor result was found.
In this study, fracture neck of talus (Hawkins type II and III) treated with anatomical reduction and near anatomical reduction was having satisfactory clinical and functional outcome, wherever (Hawkins type IV) was having fair to poor outcome with complication like AVN, arthritis due to poor initial reduction.

REFERENCES


### DISCUSSION

The fracture neck of talus usually occurs during high energy trauma to the lower extremities such as road traffic accident or fall from height.\(^9\) The most commonly described mechanism for the fracture neck of talus are an excessive ankle dorsiflexion with a cantilever effect and an axial compressive load for the body of talus fracture.\(^9,10\) Due to high complication rate, only undisplaced fracture of neck or body of talus are treated conservatively, while all displaced fracture neck of talus are treated with open reduction and internal fixation.\(^11\)

In this study, displaced fracture neck of talus, to avoid wound complication, risk of AVN and better reduction of fracture, operative treatment was preferred. However, two cases of AVN (16.66%) and only 50% of anatomical reduction were achieved. To achieve better reduction dual anteromedial and anterolateral approach is recommended. Which provides better visualization of the talus but having high risk of skin necrosis or infection.\(^12,13\)

Fracture neck of talus is highly prone for development of AVN. According to recent studies, the rate of osteonecrosis is variable from 11-50% and which depends on initial degree of fracture displacement.\(^6,9,14\) To avoid the risk of AVN, most authors recommended urgent fracture reduction and stabilization without any delay.

Most of the talus surface is covered by articular cartilage. It explains that the fracture of talus is more prone to develop osteoarthritis of ankle and subtalar joints.\(^15\)

### CONCLUSION

The fracture neck of talus is a complex injury, resulting from high velocity trauma which can lead to severe soft tissue damage and damage to its precarious blood supply. The fracture neck of talus is highly prone to develop complications like osteonecrosis, infection, skin necrosis, mal-union, nonunion and posttraumatic arthritis. If it is present with significant displacement or dislocation, it needs urgent reduction and fixation for best outcome.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number/Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>42.75±7.32</td>
</tr>
<tr>
<td>Sex</td>
<td>Males 8 (66.66%) Females 4 (33.33%)</td>
</tr>
<tr>
<td>Hawkins Classification</td>
<td>Hawkins I 0 Hawkins II 3 (25%) Hawkins III 6 (50%) Hawkins IV 3 (25%)</td>
</tr>
<tr>
<td>Quality of Reduction</td>
<td>Anatomical reduction 6 (50%) Nearly anatomical reduction 4 (33.33%) Poor reduction 2 (16.66%)</td>
</tr>
<tr>
<td>Postoperative AOFAS Score and Classification</td>
<td>Excellent 4(33.33%) Good 3(25%) Fair 3 (25%) Poor 2 (16.66%)</td>
</tr>
</tbody>
</table>

**Table 2. Statistical Description of Patients (n=12)**