

FRACTURES OF THE NECK OF THE TALUS

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One hundred and twenty-three patients with fracture of the neck of the talus were followed up over an average of 22 months. Fifty-four fractures were undisplaced, 53 associated with subtalar dislocation, and 16 associated with dislocation of the talus in both ankle joint and subtalar joint. Of the total 123 patients, 21 per cent (26/123) developed avascular necrosis, 31 per cent (38/123) developed talo-crural and 47 per cent (58/123) subtalar osteoarthritis. Fifteen per cent (18/123) of the fractures united with considerable deformity, and four per cent (5/123) exhibited non-union of the neck. Out of 63 patients with isolated fracture of the neck of the talus, 65 per cent (41/63) reported moderate or severe complaints, and 52 per cent (33/63) complained of functional disability often resulting in a change to lighter work. Even among the 54 undisplaced cases there were unexpected numbers of late sequelae, such as osteoarthritis, subjective complaints and disablement.

Key words: fracture of the neck of talus; avascular necrosis; osteoarthritis; prognosis

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Fracture of the talus is relatively rare. This may be due to the rather deep location of the bone, the absence of tendon and muscle attachment, and the strength of the bone. A consequence of this is that most reports on this type of fracture have been based on relatively few cases (Table 1).

The most common type of talar fracture is that of the neck which makes up about 50 per cent of all major talar injuries (Coltart 1952, Pennal 1963, Hawkins 1970, Kenwright & Taylor 1970). This type of fracture often entails secondary complications, especially subtalar and talo-crural osteoarthritis and necrosis of the body, and its prognosis has generally been considered serious (Symes 1848, Stealy 1909, McKeever

1963, Kenwright & Taylor 1970, Hawkins 1970, Peterson 1974). However, a number of problems relating to fracture of the neck of the talus still remain insufficiently investigated. This particularly applies to the assessment of the prognosis in relation to the various morphological types of this fracture, and also to the prognostic aspects relevant to the occurrence of osteonecrosis and osteoarthritis.

It is the object of this paper to evaluate a relatively large number of cases of fractures of the neck of the talus, with a sufficiently long follow-up, to allow an assessment of the prognosis and the complication rates relation to the different types of fracture.

Table 1. Incidence of avascular necrosis in fractures of the neck of the talus in previous series.

| | Fracture of neck of talus No. | Avascular necrosis No. |
|---------------------------|-------------------------------|------------------------|
| McKeever 1943 | 17 | 12 (71%) |
| Coltart 1952 | 106 * | 26 (25%) |
| Sullivan & Jackson 1958 | 29 ** | 7 (24%) |
| Hawkins 1970 | 52 | 30 (58%) |
| Pantazopoulos et al. 1974 | 20 | 9 (45%) |
| Lorentzen et al. 1976 | 123 | 26 (21%) |

* Nearly all due to flying accidents during the Second World War.

** Fourteen of the patients were children under 16 years. Material not consecutive.

PATIENTS AND METHODS

The material for the study has been obtained from the Danish Health Insurance Authority which received, during the period 1945-1972, reports on 218 patients with injuries to the talus, including 123 with fractures through the neck.

For all 123 patients a final specialist report was available, comprising a clinical and a radiological evaluation. These specialist reports, together with the case records and X-ray films formed the basis of the present study.

The follow-up period, from the time of accident to the final examination, ranged from 7 to 73 months, mean 22 months.

The patient material is representative except for a male predominance, as housewives are generally not insured. Out of the 123 patients, 107 were males and 16 females. The age range was between 9 and 70 years, mean 39 years. Table 2 gives the causes of the injuries.

Table 2. Cause of injury.

| | Fracture of neck of talus No. |
|---------------------------|-------------------------------|
| Fall | 47 (39%) |
| Direct trauma to the foot | 34 (28%) |
| Distortion | 10 (8%) |
| Traffic accident | 31 (25%) |
| Total | 123(100%) |

Classification

In accordance with the conventional classification (Coltart 1952, Watson-Jones 1962, Pennal 1963, Hawkins 1970, Kenwright & Taylor 1970,

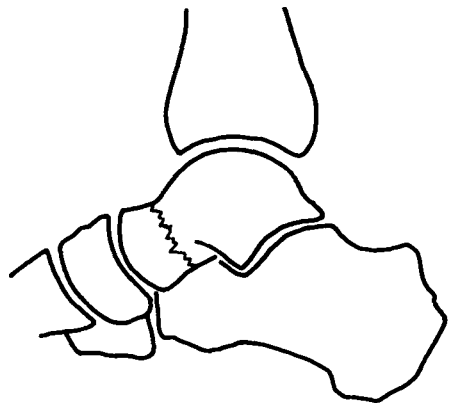


Figure 1. Group 1 fractures: Undisplaced fracture through the neck of the talus. Ankle joint and subtalar joint not involved.

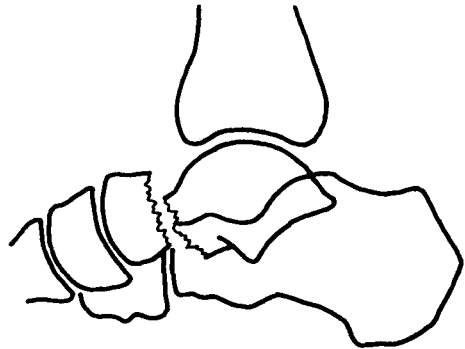


Figure 2. Group 2 fractures: Displaced fracture through the neck of the talus. The subtalar joint is subluxated or completely dislocated. Trochlea in position in the ankle joint.

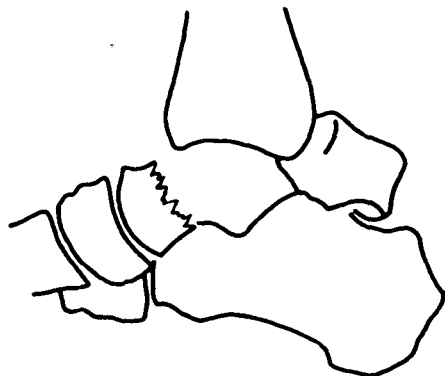


Figure 3. Group 3 fractures: Displaced fracture through the neck of the talus. Talar body dislocated in both ankle and subtalar joint.

Pantazopoulos et al. 1974), the 123 fractures of the neck of the talus were radiologically divided into three groups:

Group 1 comprised undisplaced fractures through the neck of the talus, not involving the ankle joint or subtalar joint (Figure 1).

Group 2 comprised displaced fractures through the neck of the talus with subluxation or dislocation of the subtalar joint, but with the trochlea in position in the ankle joint (Figure 2).

Group 3 comprised displaced fractures through the neck of the talus with dislocation of the ankle joint as well as the subtalar joint (Figure 3).

The 123 patients were divided into the three groups as follows: 54 (44 per cent) in group 1; 53 (43 per cent) in group 2; and 16 (13 per cent) in group 3. All 16 patients of group 3 had posterior dislocation of the trochlea.

Simultaneous injuries of the other tarsal and metatarsal bones and of the malleoli are common, as well as fractures of other limbs. Sixty patients had other injuries besides fracture of the talus, 35 of these had malleolar fracture and 13 calcaneal fracture. Thus, the fracture of the neck of the talus was an isolated injury in only 63 patients (51 per cent).

Table 3. Incidence of avascular necrosis.

| Morphol. group | Fracture of neck of talus No. | Avascular necrosis No. |
|----------------|-------------------------------|------------------------|
| Group 1 | 54 (100%) | 2 (4%) |
| Group 2 | 53 (100%) | 13 (24%) |
| Group 3 | 16 (100%) | 11 (69%) |
| Total | 123 (100%) | 26 (21%) |

Initial treatment

All patients of group 1 received conservative treatment: seven were treated with weight re-

lease for 6 to 8 weeks, while the remaining 47 had a plaster cast with no weight-bearing for 6 to 14 weeks. All group 1 fractures united.

Of the 53 patients in group 2, four were treated by open reduction, 30 by closed reduction followed by plaster cast and no weight-bearing. The remaining 19 patients were treated by plaster cast without reduction. The period of plaster fixation and weight release averaged 8 to 12 weeks. Seven of the 53 fractures were open.

In group 3, 11 of the 16 patients were treated by open reduction, one by primary excision of the trochlea, one by primary subtalar arthrodesis, and three by closed reduction. Six of the fractures in this group were open.

RESULTS

The long-term prognosis is mainly determined by the occurrence of necrosis of the body of the talus, osteoarthritis, and union with deformity or non-union.

Osteonecrosis: The avascular necrosis of the body of the talus was graded into four groups:

In grade 1 there was a condensation of the bone, but no deformity; in grade 2 there was a healed condensed corpus with mild to moderate deformity; in grade 3 there was a healed condensed corpus with severe deformity; and in grade 4 there was sequestration of the trochlea, i.e. no healing.

Twenty-six of the 123 patients (21 per cent) developed avascular necrosis of the trochlea (Table 3). Seven were of grade 1, 16 of grade 2, two of grade 3, and one of grade 4. It was surprising to find two

Table 4. Occurrence of osteoarthritis, mal-union and non-union.

| Morphol. group | Fracture of neck No. | Talo-crural osteoarthritis No. | Subtalar osteoarthritis No. | Mal-union No. | Non-union No. |
|----------------|----------------------|--------------------------------|-----------------------------|---------------|---------------|
| Group 1 | 54 (100%) | 8 (15%) | 13 (24%) | 0 (0%) | 0 (0%) |
| Group 2 | 53 (100%) | 19 (36%) | 35 (66%) | 15 (28%) | 3 (6%) |
| Group 3 | 16 (100%) | 11 (69%) | 10 (63%) | 3 (18%) | 2 (12%) |
| Total | 123 (100%) | 38 (31%) | 58 (47%) | 18 (15%) | 5 (4%) |

Table 5. Subjective complaints in 63 patients with isolated fracture of the neck of the talus.

| Morphol. group | Fracture of neck of talus No. | No complaints No. | Moderate complaints No. | Severe complaints No. |
|----------------|-------------------------------|-------------------|-------------------------|-----------------------|
| Group 1 | 26 (100%) | 14 (54%) | 10 (38%) | 2 (8%) |
| Group 2 | 31 (100%) | 7 (23%) | 11 (35%) | 13 (42%) |
| Group 3 | 6 (100%) | 1 (17%) | 3 (50%) | 2 (33%) |
| Total | 63 (100%) | 22 (35%) | 24 (38%) | 17 (27%) |

Moderate complaints: Light to moderate painful gait, walking ability normal or slightly impaired.

Severe complaints: Severely painful gait with severely impaired walking ability.

Table 6. Rehabilitation in 63 patients with isolated fracture of the neck of the talus.

| Morphol. group | Fracture of neck of talus No. | Same work No. | Lighter work No. | Not working No. |
|----------------|-------------------------------|---------------|------------------|-----------------|
| Group 1 | 26 (100%) | 16 (62%) | 8 (30%) | 2 (8%) |
| Group 2 | 31 (100%) | 14 (45%) | 14 (45%) | 3 (10%) |
| Group 3 | 6 (100%) | 0 (0%) | 5 (83%) | 1 (17%) |
| Total | 63 (100%) | 30 (48%) | 27 (43%) | 6 (9%) |

Table 7. Degree of disablement in 63 patients with isolated fracture of the neck of the talus.

| Morphol. group | Fracture of neck of talus No. | 0 % No. | 5-8 % No. | 10-18 % No. | 20-50 % No. |
|----------------|-------------------------------|---------|-----------|-------------|-------------|
| Group 1 | 26 | 5 | 11 | 8 | 2 |
| Group 2 | 31 | 1 | 5 | 16 | 9 |
| Group 3 | 6 | 0 | 1 | 3 | 2 |
| Total | 63 | 6 | 17 | 27 | 13 |

cases of osteonecrosis in the group of undisplaced fractures; both were grade 2.

Osteoarthritis: About one third of the 123 patients developed talo-crural osteoarthritis, whereas one half developed subtalar osteoarthritis (Table 4). Twenty-nine patients (24 per cent) had talo-crural as well as subtalar osteoarthritis. The incidence of talo-crural osteoarthritis evenly increased in groups 1 and 3, whereas subtalar osteoarthritis was almost unchanged in groups 2 and 3 (Table 4).

All patients with avascular necrosis developed osteoarthritis. Of the seven patients with grade 1 necrosis, six developed osteoarthritis of the talo-crural as well as subtalar joint. All 19 patients with grade 2-4 necrosis developed severe talo-crural and subtalar osteoarthritis.

Deformity and non-union: Eighteen fractures, all from groups 2 and 3, united with appreciable deformity of the neck (Table 4). A poor subjective result of moderate or severe complaints was obtained from 17 of these 18 patients.

Five patients exhibited non-union of the neck. One also had avascular necrosis of the body. All ended up with severe complaints.

Subjective and objective results: In order to assess the prognosis of fractures of the neck of the talus as regards subjective complaints and rehabilitation, we analyzed the 63 patients in whom the talar fracture was an isolated injury.

Table 5 presents the subjective results. It is striking that so many patients with undisplaced fractures had moderate or severe complaints (46 per cent). However, this is in accordance with the large frequency of osteoarthritis in these patients.

Rehabilitation is shown in Table 6. It should be noted that among the patients with undisplaced fractures, 10 (38 per cent) were unable to continue in their former occupation. We have also included the degree of disablement assessed by the Health Insurance Authorities (Table 7).

DISCUSSION

So far, the prognosis of undisplaced fracture of the neck of the talus (group 1) has been considered favourable (Coltart 1952, Hawkins 1970, Pantazopoulos et al. 1974). However, the 54 undisplaced fractures (group 1) in the present material were associated with a considerable incidence of complications, comprising two cases of avascular necrosis, eight of talo-crural osteoarthritis, and 13 of subtalar osteoarthritis. Forty-six per cent had moderate or severe complaints, and only 62 per cent could continue in their previous work.

It is well known that the prognosis of displaced fractures of the neck (groups 2 and 3) is poor, but this has been attributed to the occurrence of avascular necrosis. Our material shows that even those patients with displaced fractures of the neck who avoid necrosis of the body

run a considerable risk of developing osteoarthritis—especially in the subtalar joint. Of the 45 patients without necrosis of the body, 21 (47 per cent) developed subtalar osteoarthritis.

It is interesting to find a high incidence of talo-crural osteoarthritis in groups 1 and 2 in which the fracture does not involve the ankle joint. It is evident that talo-crural osteoarthritis may occur when the body is necrotic. When subtracting the cases with osteonecrosis, we find the same percentage of cases with talo-crural osteoarthritis (13 per cent) in the three morphological groups, indicating that regardless of which type of fracture of the neck it causes, the trauma exerts violent force upon the ankle joint in which it gives rise to cartilaginous and ligamentous damage. This assumption is supported by the finding that 35 (28 per cent) of the fractures of the neck of the talus were associated with malleolar fractures.

In the literature, the incidence of avascular necrosis following fracture of the neck of the talus has been reported to be from 24 to 71 per cent (Table 1). The high incidence has been reported particularly by authors using small numbers of patients. However, these studies have been predominated by rather severe fractures of the neck and included only a few undisplaced group 1 fractures in which necrosis is rare.

In our material, group 1 fractures made up 44 per cent, and the incidence of avascular necrosis proved to be 21 per cent. This agrees with the only large series reported so far (Coltart 1952).

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