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From the Orthopaedic Hospital, Aarhus (Head: Professor Eivind Thomasen, M.D.)
and Department K of the Municipal Hospital, Aarhus
(Head: Professor V. Aalkjær, M.D.).

FRACTURE OF THE LATERAL PROCESS OF THE TALUS

Supination-Dorsal Flexion Fracture

By

O. FJELDBORG

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While I was working at the Orthopaedic Hospital, Aarhus, Professor Thomasen asked me, in connection with an analysis of his club-foot material, to investigate the mechanical features of the normal foot. Only one detail of this complex kinetic system will be described here.

During supination, the calcaneous turns in relation to the talus on an axis proceeding dorso-medially from the neck of the talus downwards and postero-laterally to the lateral surface of the tuberosity of the calcaneus (Figures 1 and 2).

This axis has been described by *Dönitz* (1903), *Brockman* (1930), *Thomasen* (1941), and others. In this movement the calcaneous performs plantar flexion, adduction, and varus rotation as the angle between the talus and calcaneus is reduced.

If small windows are cut into the joint capsule, it may be seen that during maximum supination there is no congruence between the joint surfaces in the talo-calcaneal joint—as shown in Figure 2 and sketched in a somewhat exaggerated way in Figure 3. This phenomenon has previously been described by *Dönitz* (1903) who observed it using an entirely different technique.

Thus, a fracture of the lateral process of the talus may arise from a fall on the dorsally flexed, supinated foot (Figure 3).

It might be anticipated that such a fracture would occur in three stages: fissure (Figure 6), displaced fracture (Figure 7), and fracture with a supination dislocation in the talo-calcaneal joint, the calcaneus being pushed forward in relation to the talus (Figure 8). Figures 4

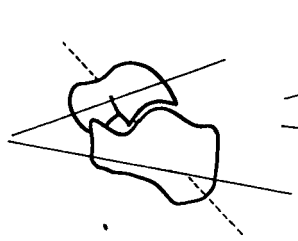


Figure 1.

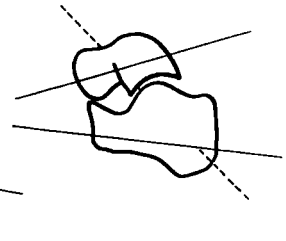


Figure 2.

Figure 1. Normal position of the talus and calcaneus. Congruence between the joint surfaces.

Figure 2. Supination in which the joint space gapes a bit posteriorly, there being contact only at the site of the lateral process of the talus.

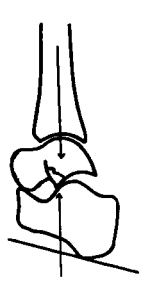


Figure 3.

Figure 4.

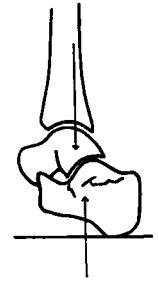


Figure 5.

Figure 3. Fracture mechanism in the dorsal-flexed, supinated hindfoot. To facilitate understanding, the incongruence in the talo-calcaneal joint is exaggerated. The weak spot of the system is the lateral process of the talus.

Figure 4. A similar fall injury on a dorsally flexed foot, but with the talo-calcaneal joint in the normal position in which the joint surfaces are congruent. The weak spot is the neck of the talus.

Figure 5. A fall injury on a foot in the normal anatomical position. In this position, the anterior edge of the tibia does not play any role. There is congruence between the joint surfaces in the talo-calcaneal joint. The weak area is the body of the calcaneus.

and 5 illustrate the relationship to two other types of fracture of the hindfoot.

All this was still theory without confirming examples. Later, while I was in the Department of General Surgery of the Municipal Hospital, Aarhus, I checked the X-rays of all foot injuries for more than a year before discovering the first case (Figure 6):

A housewife, aged 57, had falled 1½ m and landed on a stone step.

Figure 6. *Figure 7.* *Figure 8.*

Figure 6. Fracture of the lateral process of the talus, stage 1 (fissure).

Figure 7. Fracture of the lateral process of the talus, stage 2 (fracture with displacement of the lateral process of the talus).

Figure 8. Fracture of the lateral process of the talus, stage 3 (with subtalar dislocation).

On admission she had swelling of the ankle region, but no tenderness of the malleoli. Passive movements in the subtalar joint gave rise to severe pain anterior to the lateral malleolus. X-rays of the right ankle joint, supplemented by tomography, revealed a fracture line, without displacement, through the lateral process of the talus (Stage 1) (Figures 9 and 10).

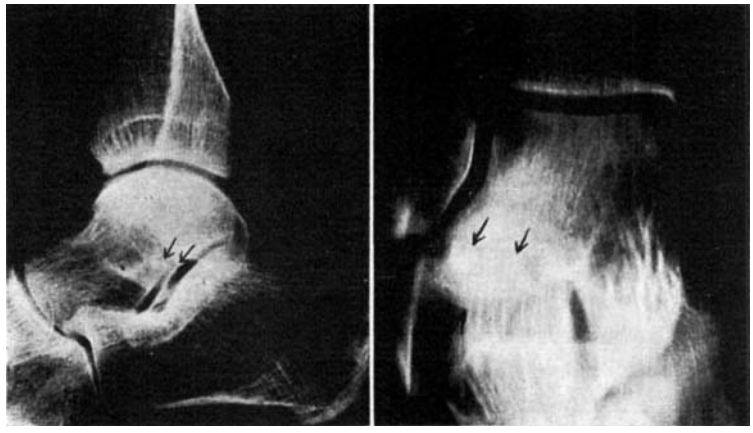


Figure 9. *Figure 10.*

Figure 9. Fracture of the lateral process of the talus, stage 1.

Figure 10. Anteroposterior tomography of the same fracture as shown in Figure 9.

After two months of treatment in a plaster cast the fracture united. At follow-up 18 months later, the X-ray appearances were normal, and the patient had no complaints.

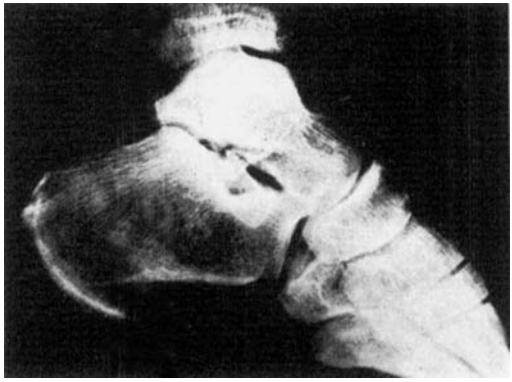


Figure 11. Fracture of the lateral process of the talus, stage 2.

A fortnight after the first case, Case 2 arrived: A 60-year-old labourer had fallen 4 m after the ladder, on which he had been standing, broke. There was swelling of the ankle region and distinct tenderness anterior to the lateral malleolus. No tenderness of the malleoli. X-rays revealed a displaced fracture of the lateral process of the talus (Stage 2) (Figure 11).

The completely detached fragment of the process was removed surgically, followed by immobilization in plaster for 8 weeks.

At follow-up 18 months later, the patient was working, but had slight osteoarthritic complaints. Movements in the ankle joint and subtalar joint were slightly restricted, and X-rays showed, apart from the missing lateral process of the talus, some narrowing of the joint space in the talo-calcaneal joint. About 1 year after the first two patients, Case 3 was admitted:

A 63-year-old psychotic man had jumped out of a first-floor window. There was considerable swelling of the ankle region with severe tenderness of the malleoli and dorsum of the foot. The foot was in a position of slight varus. X-rays revealed subtalar dislocation with separation of the lateral process of the talus (Stage 3) (Figures 8 and 12). After reduction of the dislocation, the nature of the injury was easier to assess.

In the last two cases (Figures 11 and 12), the anterior process of the calcaneus, acting as a buffer, caused a compression fracture of the cuboid bone.

The patient was immobilized in a plaster cast for 8 weeks. Six months later he still had some pain when walking. X-rays showed

Figure 12. Fracture of the lateral process of the talus, stage 3.

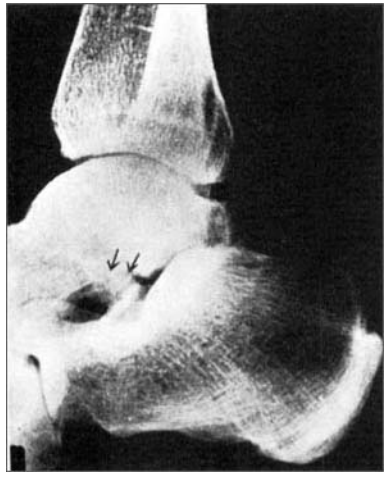
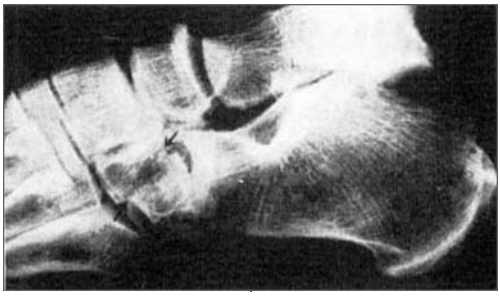


Figure 13. Same foot as in Figure 12, after reduction of the dislocation.



union of the fracture, but severe osteoporosis of the entire region. Since then, it has proved impossible to get in touch with this patient.

In each of these cases, the fracture was produced by a fall, the patient landing on the injured foot, but none of the patients could describe the details of the event.

At about the time that we saw Case 3, this type of fracture was reported in a single case by *Haage* (1961), who did not enter into its mechanism, and by *Dimon* (1961) who reported 3 cases, 2 of which had been overlooked for 6 weeks. *Dimon* advanced various theories to explain the fracture mechanism, all of which differ from that described above. He believed that the most likely cause was a forced pronation. *Dimon* referred to *Bonin* (1950) who described this fracture and also felt that it was due to a pronation trauma. Previous publications have not described stages in this type of fracture.

The conditions which occasion a fracture of this type are presumably rare. Like *Dimon* I believe that the fracture may be easily overlooked, and that an overlooked fracture may, just like other intra-articular hind-foot fractures, result in serious consequences to the mechanical function of the foot.

SUMMARY

In the author's opinion a fracture of the lateral process of the talus is due to a supination-dorsal flexion trauma. Three cases, representing three different stages of this fracture, are reported.

RESUME

De l'avis de l'auteur, une fracture d'une tubérosité du talon est due à un trauma de flexion de supination dorsale. Trois cas représentant trois différentes phases de cette fracture sont rapportés.

ZUSAMMENFASSUNG

Der Verfasser ist der Meinung dass der Bruch des Processus lateralis tali auf ein Trauma mit Supination und Dorsalflexion zurückzuführen ist. Drei Fälle, die drei verschiedene Stadien diese Bruches darstellen, werden berichtet.

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