Primary Ankle Fusion Using Blair Technique for Severely Comminuted Fracture of the Talus

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Key Words

Blair fusion · Fracture of the talus

Abstract

Objective: We report a case of a severely comminuted fracture of the body of the talus treated by primary Blair tibiotalar fusion. **Clinical Presentation and Intervention:** A very severely comminuted open fracture of the body of the talus was treated on the same day of injury by debridement and tibiotalar fusion using the Blair fusion technique. **Conclusion:** Blair fusion may be indicated in cases of severely comminuted fractures of the talar body. It has the advantage of giving a near-normal appearance to the foot, producing less shortening and allowing motion to remain at the talonavicular and anterior subtalar joints.

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Introduction

Fractures and fracture dislocations of the talus are among the most challenging problems facing orthopaedic surgeons. The injuries that pose problems are fractures of the talar neck with dislocations, total dislocations of the body of the talus, and fractures in which there is loss of a portion of the body of the talus.

Fractures of the Body of the Talus

In addition to its articular weight-bearing function, the talar body is a central component of the talotibial and subtalar joints and is therefore of extreme importance for both rotation and hinge movements of the foot [1]. Because of these important functions, fractures of the talar body often result in significant disability, a problem further compounded by the unique vascular supply to the body of the talus that produces an increased risk of avascular necrosis [2]. Osteonecrosis of the talus and arthritis of the ankle and subtalar joint occur frequently and result in disabling pain because of the critical functions of these articulations in gait. There are few reports in the literature describing injury to the body of the talus.

Blair Fusion

In 1943, Blair [3] described a technique of ankle fusion specially designed to treat osteonecrosis of the talus. He recommended excision of the avascular talar body and placement of a sliding corticocancellous graft from the anterior distal tibia into the residual, viable talar head and neck. Morris et al. [4] in 1971 modified this procedure slightly and reported good results in 10 patients.

Dennis and Tullos [5] reviewed 7 cases in 1980 and advocated this procedure as a satisfactory reconstructive measure after severe talar injuries. They emphasized that the Blair fusion retains a normal appearance of the foot, minimizes shortening, and allows retention of some subtalar function. In 1982, Lionberger et al. [6] recom-

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Fig. 1. Severely comminuted fracture of the body of the talus.

mended a modification of the Blair fusion technique that allows compression screw fixation of the fusion site. They reported good results in 5 patients.

There is little literature support for a primary Blair tibiotalar arthrodesis as the proper treatment for a fresh talar fracture. We present a case of an open, severely comminuted fracture dislocation of the body of the talus treated by debridement, excision of the comminuted talus, and primary Blair fusion.

Case Report

A 27-year-old female employed as a housemaid presented to the casualty department. She related that she had fallen from a height. She sustained an unstable fracture of the first lumbar vertebra, closed fracture of the left os calcis, and a grade 2, open, severely comminuted fracture of the right talus. Physical examination revealed the right ankle and hind foot to be swollen and ecchymotic. There was an open wound on the back of the right ankle, about 3 by 2 cm, through which a bone fragment was projecting, but was still attached to the interior by lacerated fibrous bands. The wound did not appear dirty or contaminated. The remainder of the skin of the ankle and foot was intact, and there was no sign of neurovascular impairment distally. An X-ray (fig. 1) revealed a highly comminuted fracture of the body of the right talus; seven fragments could be counted on the X-ray image beside the head and neck intact fragment. All the comminuted fragments of the talus body were displaced; no single fragment was in its appropriate anatomical relation to the distal articular surface of the tibia. The head-neck fragment was intact and not displaced. Six hours after admission, after the patient was stabilized, she was taken to the operating theater. The fracture of the left os calcis was immobilized in a below-knee cast, the spinal and right talus fractures were approached surgically. The unstable fracture of the first lumbar vertebra was treated by surgical decompression, and Harrington rods fixation.

Fig. 2. X-ray after surgery. The comminuted body of the talus is excised and Blair fusion performed. Notice the sliding graft into the slot created in the neck of the talus.

The wound on the posterior aspect of the right ankle was debrided layer by layer. Debris was removed as well as three fragments of the comminuted body of the talus. The wound was thoroughly irrigated with saline solution. A long anterolateral incision was made to explore the ankle joint, the subtalar joint, and the talonavicular joint.

The area was irrigated with saline, and two more fragments of the talus were removed. A small medial incision was made to remove the remaining two pieces of the talus body. Several smaller fragments, which did not appear in the X-ray image, were washed out in the saline irrigation.

A rectangular sliding corticocancellous graft about 2.5 by 4 centimeters was cut from the anterior distal tibia and inserted into a slot created through the neck of the talus. The proximal portion of the sliding graft was fixed by a cancellous screw to the tibia and by a Kuntscher wire inserted through the talonavicular joint for better stabilization (fig. 2).

Wounds were closed over Radiavacs and a below-knee cast was applied. The postoperative period was uneventful and the wounds healed nicely. The skin over the ankle and foot appeared viable and healthy.

Four weeks after surgery, the Kuntscher wire was removed, and an X-ray revealed good progress of healing of the graft (fig. 3). Eight weeks later, the cancellous screw was removed, and the patient was able to walk (non-weight-bearing).

Fourteen weeks after surgery, the cast was removed and the patient started active and assisted exercises of the foot. Partial weight bearing with floor contact, using a pair of crutches, was started 20 weeks after the injury.

At 10 months after the injury, the fusion was complete (fig. 4). The patient was walking independently, the flexion/extension arc of the foot was 15°, and she was almost pain-free. She was able to walk with a slight limp for about 50 m in the corridors of the hospital without feeling pain. There was no significant local deformity, and there was no pain at rest. She did not return to her job as a housemaid because she desired to return to her home country.

Fig. 3. The K-wire is removed. Notice the healing of the graft.

Fig. 4. The screw is removed. The fusion is healed.

Discussion

The anatomy of the talus is complex. Sixty to seventy percent is articular cartilage, giving rise to seven talar articulations [7]. The talus is typically divided into three anatomic parts: head, body, and neck. The blood supply of the talus consists of an extraosseous and intraosseous circulation. The extraosseous vessels include branches of the anterior tibial, perforating peroneal, and posterior tibial arteries. The anastomotic sling, consisting of the artery of the tarsal canal, the tarsal sinus and the medial periosteal vessels, is considered the most important blood supply to the talus. The intraosseous blood supply to the talus is based on a varying number of vessel anastomoses supplying the head, neck, and body. These anastomoses are complete in approximately 60% of the cases. Incomplete intraosseous anastomotic blood supply may explain the variable incidence of avascular necrosis of the talar body with talar neck fractures [8]. Sneppen et al. [1] found a high complication rate in their review of 31 patients with fractures of the talar body. Most of these patients had been treated by closed reduction and prolonged casting. They concluded that more aggressive treatment was indicated for displaced fractures and recommended exact reduction and stable fixation whenever possible. Open reduction should be performed for persistently displaced fragments that are large enough to accept fixation pins or screws. Some severe crush fractures may not be amenable to this technique.

Prognosis logically correlates with the magnitude of the injury in whole-body fractures, especially crush injuries, which have the worst prognosis [9]. Posttraumatic hind

foot arthrosis has been reported to occur in more than 90% of patients with displaced talus fractures. Salvage can be difficult and often necessitates extended arthrodesis procedures [10].

The body of the talus carries the body weight during walking and is the main component of the most important joints of the foot. Because of its pivotal functions, fractures of the talar body are associated with disabling symptoms. This is often made worse by the development of avascular necrosis due to disruption of the talar blood supply, and/or degenerative arthritis. The risk of degenerative arthritis is minimized by anatomical reduction of the fracture. Avascular necrosis is less likely if an accurate, prompt reduction of any displaced fragment is securely held by internal fixation.

Those patients with severely comminuted fractures of the talar body should have immediate excision of the extruded body since avascular necrosis occurs in a very high percentage of these injuries. In open injuries of this type, there is even greater need for primary excision of the body because of the likelihood of infection. The Blair fusion can be a good salvage procedure after excision of the comminuted body.

There has been no mention in the literature of primary Blair fusion as treatment for fractures of the talus. In open injuries, with significant contamination or delay, it may be wiser to wait 4–6 weeks after excision of the body, and perform the Blair fusion if the soft tissues have healed and no infection is present.

Conclusion

This case suggests that Blair fusion can be a good salvage procedure in cases of severely comminuted fracture of the talar body as well as in cases of avascular necrosis of

the body of the talus following severe fractures. It has an advantage over tibiocalcaneal arthrodesis of giving a more normal appearance to the foot, producing less shortening, and allowing motion to remain at the talonavicular and anterior subtalar joints.

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