Bosworth fracture-dislocation of the ankle: a case report

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ABSTRACT

Bosworth fracture-dislocation of the ankle is a rare injury in which the proximal fibular fragment is entrapped behind the tibia. Closed reduction is extremely difficult to achieve. Early open reduction and internal fixation enables a better outcome by minimising soft-tissue damage. If treatment is delayed, mal-union and severe post-traumatic arthritis may arise. We report a 36-year-old man who underwent open reduction and internal fixation for a Bosworth fracture-dislocation of the ankle complicated by severe soft-tissue swelling and an impending risk of skin necrosis after failed closed reduction.

Key words: ankle injuries; ankle joint; edema; soft tissue injuries; treatment outcome

INTRODUCTION

Bosworth fracture-dislocation of the ankle is a rare injury in which the proximal fibular fragment is entrapped behind the tibia. Closed reduction is extremely difficult to achieve. Early open reduction and internal fixation enables a better outcome by minimising soft-tissue damage. If treatment is delayed, mal-union and severe post-traumatic arthritis may arise. We report a 36-year-old man who underwent open reduction and internal fixation for a Bosworth fracture-dislocation of the ankle complicated by severe soft-tissue swelling and an impending risk of skin necrosis after failed closed reduction.

CASE REPORT

In March 2011, a 36-year-old man presented to the emergency department after sustaining a right ankle injury while playing soccer. He fell while pivoting his right foot on the ground and twisted the ankle in external rotation. Clinical examination revealed a severe deformity of the right ankle with tenting of the skin on the anteromedial aspect of the ankle. The neurovascular status of the injured limb was not compromised. Closed reduction was attempted under intravenous conscious sedation, and a backslab
was applied.

Post-reduction radiographs showed a Weber type B lateral malleolar fracture and inadequacy of reduction with posterolateral displacement of the talus in relation to the tibia (Fig. 1). The proximal fibula was lying posteriorly to the tibia (Fig. 1).

The patient was admitted to the orthopaedic ward, with the right leg elevated. The next morning, in view of the tented skin on the anteromedial aspect of the ankle and an impending risk of skin necrosis, open reduction and internal fixation via the lateral approach was performed. The proximal fibula was levered off the tibia with Hoffman retractors, after which the fibular fracture was anatomically reduced and stabilised with a locking one-third tubular plate. A syndesmotic screw was inserted (Fig. 2). The deltoid ligaments were not explored, as the ankle mortise was anatomically restored after fixation of the lateral malleolus; the deltoid fibres were not interpositioned.

The medial soft tissue was swollen and there was skin tenting over the medial malleolus as a result of the dislocation; an additional exploratory incision may have risked further wound complications.

After internal fixation, the wound was not closed owing to severe soft-tissue swelling. Instead, the periosteum was closed over the plate, and the

**Figure 1 (a)** A short oblique fracture of the lateral malleolus and posterolateral subluxation of the talus, and **(b)** entrapment of the proximal fibula behind the tibia.

**Figure 2** Radiography and axial computed tomography of the right ankle joint after open reduction and internal fixation.

**Figure 3** Good healing of the ankle wound with split-thickness skin grafting.
wound was partially tagged by prolene suture to avoid soft-tissue breakdown and compartment syndrome. A negative pressure dressing was applied over the wound. Computed tomography of the ankle confirmed anatomic reduction of the syndesmosis. A split-thickness skin graft was laid down onto the wound when the wound condition became favourable after 10 days. Two weeks later, the skin graft had completely taken, with good healing of the ankle wound (Fig. 3). At postoperative week 16, the syndesmotic screw was removed. At month 3, the patient had recovered well with no complaints and had returned to work. His ankle dorsiflexion was 15º and plantar flexion was 40º.

**DISCUSSION**

Closed reduction for Bosworth fracture-dislocation of the ankle is often unsuccessful, owing to the tight pulling of the intact interosseous membrane and the posterior entrapment of the proximal fibula behind the posterior tibia tubercle. Eight cases of successful closed reduction have been reported: 3 had an intact fibula and 5 had a fibular fracture. Diagnosis of Bosworth fracture-dislocation of the ankle is often delayed or missed, owing to its rare occurrence. The associated soft-tissue injuries involve the syndesmosis (anterior and posterior inferior tibiofibular ligaments, interosseous membrane, anterior and posterior talofibular ligaments, and deltoid ligament) and may cause a compartment syndrome.

From 2000 to 2012, 15 cases of Bosworth fracture-dislocation of the ankle have been reported (Table). Closed reduction was not successful in 13 cases in which it was attempted. In the remaining 2 cases, closed reduction was not attempted, and open reduction and internal fixation was performed on...
the day of injury.\textsuperscript{1,2} The outcome in these 2 cases was excellent, with pain-free, full range of ankle motion. One other patient who underwent surgery on the day of the injury after failed closed reduction also achieved an excellent outcome, with only a 5\textdegree{} deficit of plantar flexion and dorsiflexion of the ankle.\textsuperscript{1} Early open reduction and internal fixation minimised soft-tissue trauma and obviates the need for closed reduction.

Delayed open reduction and internal fixation does not necessarily lead to a poor outcome. In 3 patients who had delayed surgery, an excellent outcome was achieved and there was minimal or no limitation in ankle range of motion.\textsuperscript{1,4} This is likely due to the careful management of soft-tissue swelling. The use of skeletal traction by calcaneal pin insertion enabled immobilisation and time for soft-tissue swelling to subside before proceeding to open reduction and internal fixation.\textsuperscript{4}

Failure to restore the congruity of the ankle joint may contribute to a poor outcome. Open reduction and internal fixation is the treatment of choice for Bosworth fracture-dislocation of the ankle, because it enables reduction of the entrapped fibula by levering it off the tibia and restoring the congruity of the ankle mortise, as well as assessment of the injury to the syndesmosis and repair when necessary. When ankle joint congruity is not restored, severe osteoarthritis and subsequent arthrodesis may follow, as reported in one patient who refused surgery.\textsuperscript{1} Computed tomography enables accurate assessment of the ankle joint for preoperative planning and postoperative confirmation.\textsuperscript{3}

Delayed closed reduction (4 days after the injury) in 2 patients resulted in painful stiffness of the ankle and a marked decrease in ankle range of motion, owing to post-traumatic adhesive capsulitis.\textsuperscript{2} This complication could be caused by neglected soft-tissue care of the dislocated ankle.

Compartment syndrome can occur after the injury or after surgery.\textsuperscript{4,7} One such case occurred in the anterior, lateral, and deep posterior compartments 12 hours after injury.\textsuperscript{9} Another case occurred in the anterior compartment after open reduction and internal fixation.\textsuperscript{7} Therefore, patients with Bosworth fracture-dislocation of the ankle should be monitored in an in-patient setting.

In our patient, in view of the impending risk of skin necrosis on the anteromedial aspect of the ankle, surgery was performed despite soft-tissue swelling. If there is no immediate danger to the soft tissue, surgery should be delayed to allow the soft-tissue condition to improve in order to avoid soft-tissue breakdown. If primary wound closure is not feasible, negative pressure dressings are a good adjunct for temporary wound cover while planning for delayed closure or skin grafting.

DISCLOSURE

No conflicts of interest were declared by the authors.

REFERENCES