

Combined ipsilateral calcaneal and bimalleolar ankle fractures treated by open reduction and internal fixation

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Abstract

Introduction

Developing a surgical strategy that allows easy access to the combined injuries to foot and ankle joints can be challenging because of the poor state of the surrounding soft tissues and overall fracture configuration. We report a case of combined ipsilateral calcaneal and bimalleolar ankle fractures that were surgically fixed by a single incision, along with a review of the literature.

Case Report

To date, very few studies have been published in relation to combined ipsilateral calcaneal and ankle fractures. None have reported a case where ipsilateral calcaneal and ankle fractures were fixed by a single extensile incision for the calcaneus and fibula simultaneously. Therefore we demonstrate the versatility of this extensile L-shaped lateral approach and why it should be kept as an option when similar cases are considered for operative fixation.

Conclusion

Our patient did very well post-operatively with a foot and ankle disability index score of 72%; he was completely mobile at three months and discharged from follow-up at 18 with no major complications and able to resume his previous job as a heavy goods vehicle driver.

Introduction

Combined injuries to the foot and ankle joints are uncommon and usually result from high-energy mechanisms.

Developing a surgical strategy that allows easy access to the combined fractures can be challenging and complex because of the poor state of the surrounding soft tissues as well as overall fracture configuration. We report a case of combined ipsilateral calcaneal and bimalleolar ankle fractures that were surgically fixed by a single incision, along with a review of the literature.

Case report

A 47-year-old male heavy goods vehicle (HGV) driver presented with a closed calcaneal and ipsilateral Weber C bimalleolar ankle fracture. He was previously a fit smoker who fell from his motorbike and presented with deformed, swollen and painful left leg along with an inability to bear weight. There were no other associated injuries, and he was neurovascularly intact with no open wounds.

He was completely assessed and stabilised in the accident and emergency department according to the advanced trauma life support protocol, and he subsequently underwent full trauma X-rays and computed tomography (CT) scans that ruled out any life-threatening injuries. Plain radiographs (Figure 1a, b) and CT scan confirmed the presence of a Weber C bimalleolar fracture of the left ankle as well as ipsilateral calcaneal fracture (Sanders type IV).

He had a closed reduction of the ankle fracture and application of a below knee plaster backslab under sedation, and he remained neurovascularly intact after the procedure. The patient was admitted to the ward for elevation, analgesia, deep venous thrombosis (DVT) prophylaxis and frequent observations for compartment syndrome. Nine days later, when the

soft tissue swelling had settled down, he was operated for open reduction and internal fixation of his injuries.

The patient was positioned supine, with a sandbag under the ipsilateral buttock to internally rotate his leg and foot, and the calcaneus was approached through an extensile L-shaped incision; a flap was raised, haemostasis secured and the lateral wall was reflected. The subtalar joint was reconstructed, calcaneal height and calcaneocuboid joint restored, followed by correction of the valgus. A lag screw was used to hold the articular fragment after reduction, followed by application of a calcaneal plate that was secured with screws. Subsequently, through the same wound, a retrograde nail was inserted into the fibula, and a diastasis screw was inserted through the nail. There was no need of changing the patient's position during these procedures.

The sandbag was subsequently removed from underneath the patient's buttock to allow the foot to externally rotate, and a separate incision was made over the medial malleolus

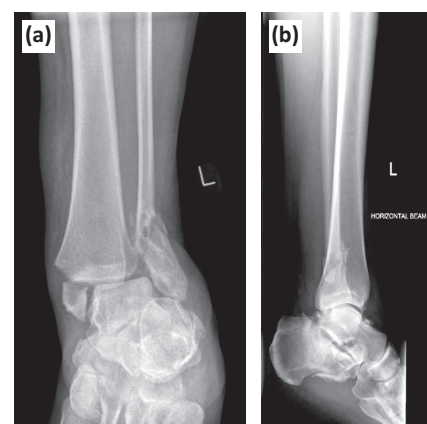


Figure 1: Initial AP and lateral X-rays showing combined ipsilateral calcaneal and ankle fractures.

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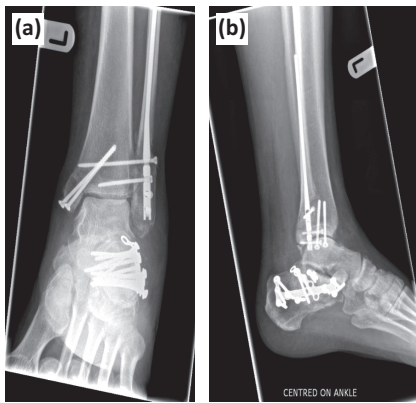


Figure 2: AP and lateral X-rays six weeks post-operatively showing the calcaneum plate and fibula nail.

fracture, soft tissues were cleaned and debrided from the fracture site, and the fracture was reduced and fixed with two parallel lag screws. All fixations were found to be satisfactory using intra-operative X-ray image intensifier (Figure 2a, b). Both wounds were washed out and closed in layers. This was followed by the application of OpSite Wound dressing, velband and a below knee plaster. The patient had three doses of intravenous Augmentin every 8 hours, starting from the time of induction, and was advised to continue elevation, DVT prophylaxis, and non-weight-bearing for six weeks.

His post-operative recovery was satisfactory, and two days later, he was discharged on crutches and recommended subcutaneous Tinzaparin injections daily for six weeks. He was seen two weeks post-operatively for wound review, removal of sutures and change of plaster to a below knee light-weight cast for another four weeks. At six weeks follow-up, he was doing well, and review of X-rays showed satisfactory alignment and signs of fracture healing, with no metal work failure. He was subsequently allowed to mobilise partial weight bearing in air cast boots for six more weeks.

The syndesmosis screw was subsequently removed under local

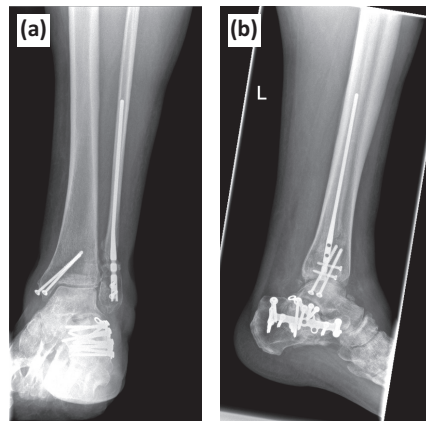


Figure 3: Follow-up AP and lateral X-rays 1 year post-operatively.

anaesthesia after approximately three months, and he was allowed to mobilise full weight bearing. However, he developed a superficial wound infection over the lateral wound after screw removal, which was successfully treated with oral co-amoxiclav (Augmentin) for two weeks. He received an intensive course of physiotherapy, focusing on range of movement and strengthening exercises of the foot and ankle muscles. His X-rays at one year revealed satisfactory bony union (Figure 3a, b) and well-healed scars both medially and laterally.

At the end of the follow-up period (18 months), his foot and ankle disability index (FADI) score was 74/104 (72%) for the injured left leg compared with 104/104 (100%) for the right leg. However, his subtalar joint movements in the injured left leg were 10°–15° of inversion and 5°–10° of eversion compared with 30° of inversion and 15° of eversion in the right leg. However, this did not affect his overall functions, walking as well as professional life, and he was able to resume his previous job as an HGV driver. He was discharged to the care of his general practitioner.

Discussion

Calcaneal fractures are usually approached and fixed by lateral incision.

The skin incision for this approach is L-shaped and involves two limbs, with the distal limb starting at the base of the fifth metatarsal and posteriorly extending, following the junction between the smooth skin of the dorsum of the foot and wrinkled skin of the sole¹. A second incision is usually made starting about 6–8 cm above the skin of the heel, midway between the posterior surface of the fibula and lateral part of the Achilles tendon. This second incision is then inferiorly extended to meet the first incision overlying the lateral surface of the calcaneus, and the dissection is carefully continued down to the bone on the calcaneal surface¹.

The two limbs of the incision can be proximally or distally extended to achieve an extensile approach, while protecting the peroneal tendons by retracting them as well as the sural nerve². This extensile approach was used in our patient to approach both the calcaneus and ipsilateral distal fibula, which were both fixed without the need for a second incision over the lateral aspect of the fibula, thus minimising the risk of wound-healing problems and infection. In addition, the surgery was completed with the patient being in the same position, without a need for re-positioning during the procedure, therefore allowing for proper optimisation and monitoring of vital signs by an anaesthetist intra-operatively.

A retrograde intramedullary fibula nail was used rather than the conventional plate, because it requires minimal dissection, gives better rotational and biomechanical stability to the fracture, and provides easy access by one incision to both the calcaneus and fibula. This technique has been associated with good radiological and functional outcomes as well as few post-operative complications³. Percutaneous intramedullary fibula nailing has also been previously used in diabetic patients to reduce wound-healing problems and risk of infection⁴.

Very few studies have been published in relation to combined ipsilateral calcaneal and ankle fractures. Yu et al. (2010) reported on five calcaneal fractures combined with trimalleolar ankle fractures, but they did not describe the use of a single incision to fix both the calcaneal and fibula fractures simultaneously⁵. Eastwood et al. (1993) also described four similar cases. Two of these cases were misdiagnosed, but all four subsequently had operative fixation of their fractures using different incisions⁶.

Similar injuries have also been previously described in a small cohort of eight patients with a combination of different injuries⁷. Other authors have reported on ipsilateral pilon and calcaneal fractures², calcaneal fracture with talonavicular dislocation, subluxation of the ankle joint⁸ and lateral subtalar dislocation associated with bimalleolar fracture⁹. However, no studies have reported a case of ipsilateral calcaneal and ankle fractures fixed using a single incision for the calcaneus and fibula simultaneously¹⁰.

Our patient had a reasonable FADI score of 72% in view of the significant amount of injury sustained. The FADI score has 26 items, each of which is scored from zero (unable to perform) to four (no difficulty in performing at all). The four pain items are scored from zero (none) to four (unbearable). This gives a total FADI score of 104 points, which is converted to a percentage value, with 100% representing no dysfunction. This has been validated for various foot and ankle problems including chronic instability as well as severe foot and ankle trauma, after a period of rehabilitation¹¹.

Conclusion

Our case demonstrates the versatility of the extensile L-shaped lateral approach to the calcaneus and ankle joint simultaneously and should be kept as an option when similar cases

are considered for operative fixation. In addition, there was no need to change the patient's position to conduct this approach. Our patient did very well post-operatively (FADI score of 72%), was fully mobile at three months and discharged from follow-up after 18 months with no major complications. He was also able to resume his previous job as an HGV driver.

Abbreviations list

DVT, deep venous thrombosis; FADI, foot and ankle disability index; HGV, heavy goods vehicle.

Consent

Written informed consent was obtained from the patient for publication of this case study and accompanying images. A copy of written consent is available for review by the Editor-in-Chief of this journal.

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All authors contributed to the preparation of this manuscript. NAT performed the operation and clinical management of the patient and was involved in the write-up; IHA made the initial review of the case, patient counselling and consenting, writing of the manuscript as well as literature review; and PVG was involved in reviewing the manuscript to improve the quality of write-up and presentation.

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