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Between Necrosis and Recovery: The Long Journey of a Devastating Talar Neck Injury

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ABSTRACT

Introduction: Talar neck fractures represent rare yet significant injuries, accounting for a minor proportion of skeletal fractures. These fractures carry a substantial risk of adverse outcomes, including avascular necrosis (AVN) and post-traumatic osteoarthritis, which demand precise surgical intervention and extended clinical monitoring.

Objective: This case report describes the one-year clinical and radiological results for a 24-year-old male who underwent surgical treatment for a Hawkins type II talar neck fracture accompanied by talonavicular dislocation.

Case Presentation: Following a fall, a 24-year-old male presented with a right ankle injury. Diagnostic imaging revealed a displaced talar neck fracture with associated talonavicular dislocation, classified as Hawkins type II. The patient was treated with open reduction and internal fixation (ORIF) via combined medial and lateral approaches. Over twelve months of follow-up, he achieved full functional recovery and resumed all pre-injury activities without pain. Sequential radiographic assessment confirmed maintained anatomical reduction and absence of AVN or degenerative joint changes.

Conclusion: Favorable outcomes in displaced talar neck fractures depend on anatomical restoration and rigid internal fixation. This case highlights the value of a structured surgical strategy and reinforces the need for sustained postoperative surveillance to identify late complications that may arise long after surgery.

Keywords: Hawkins classification, open reduction internal fixation (ORIF), talar neck, talonavicular dislocation, talus fracture.

INTRODUCTION

Fractures of the talus are relatively uncommon, representing only about 0.1%-2.5% of all fractures and approximately 3%-5% of foot injuries.[1] Their rarity belies their clinical significance, as they are among the most challenging fractures in orthopaedic trauma due to the bone's critical role in weight transmission and its precarious blood supply.[2] The talus, being largely covered by articular cartilage, receives its vascular inflow through a limited set of extraosseous vessels that form delicate intraosseous anastomoses.[3] This unique anatomy makes it highly susceptible to avascular necrosis (AVN), a devastating complication that can lead to collapse, arthritis, and long-term disability.[4]

Talar fractures are most commonly classified by anatomical location: head, neck, and body. Fractures of the talar neck are the most frequent, often resulting from high-energy mechanisms involving hyperdorsiflexion of the ankle, which drives the talar neck against the anterior tibial rim.[5] The seminal classification system proposed by Hawkins in 1970, and later modified by Canale and Kelly, categorizes these fractures based on the degree of displacement and the associated pattern of joint subluxation or dislocation. This system provides a valuable prognostic framework, with the risk of AVN escalating dramatically from Type I (nondisplaced) to Type IV (involving dislocation of the ankle, subtalar, and talonavicular joints).[6]

The management of displaced talar neck fractures is universally surgical, with the goals of achieving anatomical reduction, restoring joint congruity, and providing stable fixation to allow early motion while protecting the tenuous vascular supply. Despite optimal surgical technique, complications remain frequent, and outcomes can be unpredictable. Therefore, prolonged clinical and radiographic surveillance is essential.[7,8]

This case report presents the management and one-year follow-up of a young adult male with a Hawkins type II talar neck fracture accompanied by a talonavicular dislocation. The report illustrates a standardized surgical protocol, highlights key aspects of postoperative rehabilitation, and discusses the rationale for long-term monitoring in the context of existing literature.

CASE PRESENTATION

History and Initial Examination

A 24-year-old male, with no significant past medical history, presented to the orthopaedic trauma polyclinic with chief complaints of severe right ankle pain and an inability to bear weight. The injury occurred seven days prior when he fell into a one-meter-deep construction ditch, landing directly on his feet from a standing height. He described the immediate onset of intense, sharp pain localized to the ankle, followed by rapid swelling. In the ensuing days, the pain persisted unabated, even at rest, and he became reliant on a cane for ambulation. He denied any numbness, tingling, or paraesthesia in the foot.

On physical examination, the patient was alert and hemodynamically stable. Inspection of the right lower extremity revealed significant edema and soft tissue swelling surrounding the ankle and hindfoot. Palpation elicited tenderness over the anterior ankle joint line and the talar neck region. Crepitus was appreciable with gentle passive motion. The skin was warm but intact, with no open wounds or tenting. A careful neurovascular assessment confirmed palpable dorsalis pedis and posterior tibial pulses, with normal capillary refill time. Sensory examination of the superficial peroneal, deep peroneal, tibial, and sural nerve distributions was intact. Motor function was limited by pain but showed no definitive neurological deficit. Range of motion was severely restricted in all planes due to pain.

Standard plain radiographs of the ankle, including anteroposterior (AP), lateral, and mortise views, were obtained (Figure 1). These images revealed a clearly displaced fracture line through the talar neck. Key findings included subluxation of the subtalar joint and a complete dislocation of the talonavicular joint, where the head of the talus was displaced from its articulation with the navicular bone. No associated fractures of the medial or lateral malleoli were noted. There was evident soft tissue swelling and a joint effusion. Based on these findings, the injury was classified as a Hawkins type II talar neck fracture with an associated talonavicular dislocation. Routine preoperative laboratory studies were within normal limits except for a mild leukocytosis (white blood cell count 12.3 x 10^9/L), likely reactive to the local tissue trauma.

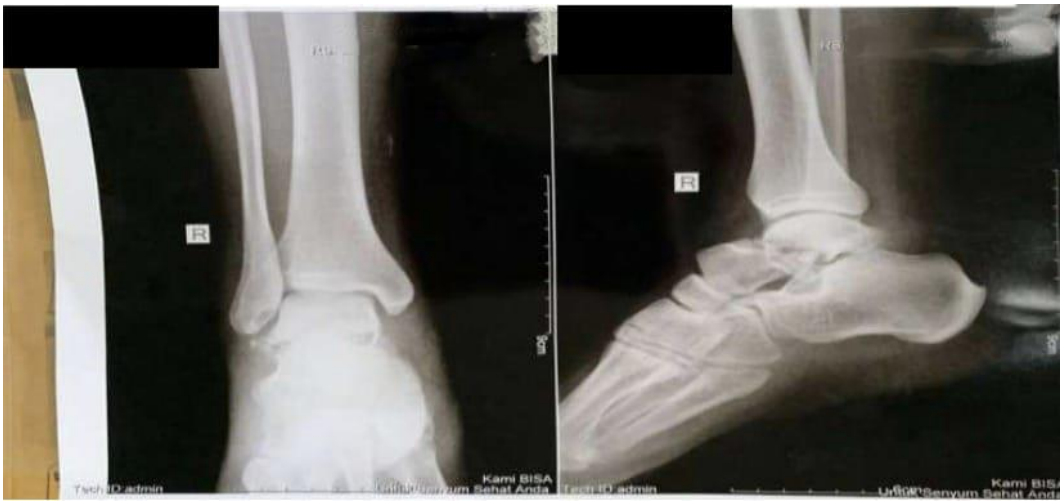

Figure 1. Preoperative Radiographs. (A) Anteroposterior and (B) Lateral views of the right ankle demonstrating a displaced fracture of the talar neck, subluxation of the subtalar joint, and dislocation of the talonavicular joint. Significant soft tissue swelling is present.

Surgical Management

After discussion of risks, benefits, and alternatives, the patient consented to surgical intervention. Surgery was performed on the eighth day post-injury. The patient was placed supine under general anesthesia. The surgical strategy involved a sequential dual-approach to address both the medial talonavicular dislocation and the lateral aspect of the talar neck fracture.

A longitudinal incision was made just anterior to the medial malleolus, centered over the talonavicular joint. The incision was carried down through the subcutaneous tissue, carefully protecting the saphenous nerve and vein. The capsule of the talonavicular joint was incised, revealing the dislocated talar head and fractured talar neck. The fracture hematoma was evacuated. The talar head fragment was then manipulated using a K-wire as a "joystick" to achieve a preliminary reduction of the talonavicular joint.

A second longitudinal incision was made lateral to the extensor digitorum longus tendons, over the sinus tarsi. This provided direct access to the lateral process of the talus and the subtalar joint. Through this approach, the extended of the talar neck fracture on lateral process was visualized.

Subsequently, a comprehensive reduction was performed. A Steinman pin was inserted into the calcaneus, continued with traction, and reduction of the lateral and medial thallus. The reduction was assessed for anatomical alignment, particularly at the dorsal cortex of the talar neck and the congruity of the subtalar joint.

Once satisfactory reduction was confirmed, definitive internal fixation was performed. Three cannulated screws were placed in a lag-by-technique fashion to compress the fracture. Two screws (3.5 mm and 2.0 mm in diameter) were inserted from anterior to posterior, starting at the talar neck and directed into the body. A third screw (X screw) was placed for additional rotational stability. Final radiographic images in AP, and lateral, and Canale views (foot in maximum plantarflexion and pronation) confirmed anatomical reduction of both the fracture and the talonavicular joint, as well as appropriate screw length and position without intra-articular penetration (Figure 2).

The surgical sites were irrigated copiously. Hemostasis was achieved. The joint capsules and subcutaneous layers were closed with absorbable sutures, and the skin was closed with nylon (Figure 3). A sterile compressive dressing and a well-padded below-knee plaster splint were applied with the ankle in a neutral position.

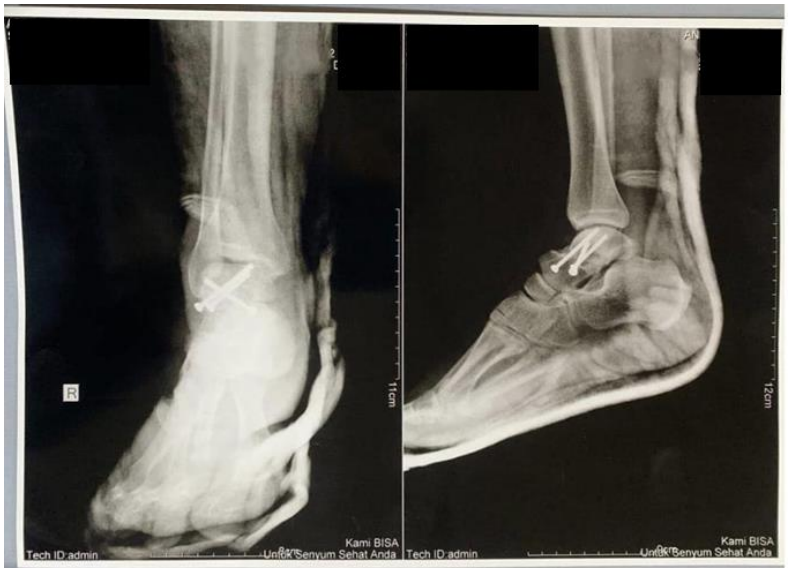

Figure 2. Immediate Postoperative Radiographs. (A) Anteroposterior and (B) Lateral views showing anatomical reduction of the talar neck fracture and talonavicular joint. Three cannulated screws are in satisfactory position, providing stable internal fixation.

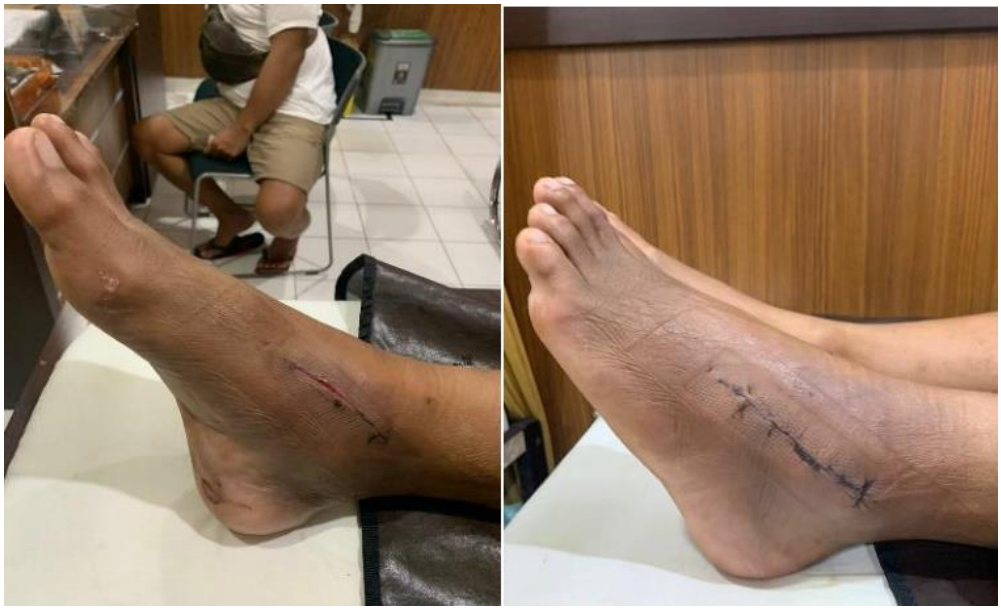

Figure 3. Immediate Postoperative Clinical Photograph. Image taken on the day of surgery following open reduction and internal fixation. The right ankle shows well-approximated surgical incisions via medial and lateral approaches

Postoperative Course and Rehabilitation

The patient received 24 hours of intravenous antibiotics (cefuroxime 2x1 gr IV), and appropriate analgesia (fentanyl drip). On the first postoperative day, he was instructed on strict non-weight-bearing status and began isometric exercises for the calf and thigh muscles. The surgical wounds healed without signs of infection, erythema, or discharge. He was discharged home on the third postoperative day with a rehabilitation plan and scheduled next follow-up at 3 months.

Follow-Up and Outcomes

The patient was evaluated clinically and radiographically at regular intervals: 3 months, 6 months, and 12 months postoperatively.

Pain, as measured by the Visual Analog Scale (VAS), decreased from a preoperative score of 6/10 to 0/10 at rest at third day post-operative. At the one-year final follow-

up, the patient reported no pain, stiffness, or instability. He had returned to his pre-injury level of occupation and recreational activities without any pain. The ankle range of motion was symmetrical to the contralateral side. The surgical scars were well-healed, with keloid scar on medial and lateral side of ankle. There were no signs of complex regional pain syndrome or nerve injury.

Serial radiographs were scrutinized for signs of healing, malunion, AVN, and post-traumatic arthritis. The 12-month follow-up radiographs (Figure 4) demonstrated, complete fracture union with maintained anatomical alignment, no evidence of AVN the talar dome maintained normal bone density without subchondral collapse, sclerosis, or cyst formation, and mo signs of post-traumatic osteoarthritis, with the tibiotalar, subtalar, and talonavicular joint spaces were preserved, with no juxta-articular osteophytes or subchondral sclerosis. The clinical assessment shows a normal anatomical appearance, only with soft tissue healing with keloid scars (Figure 5).

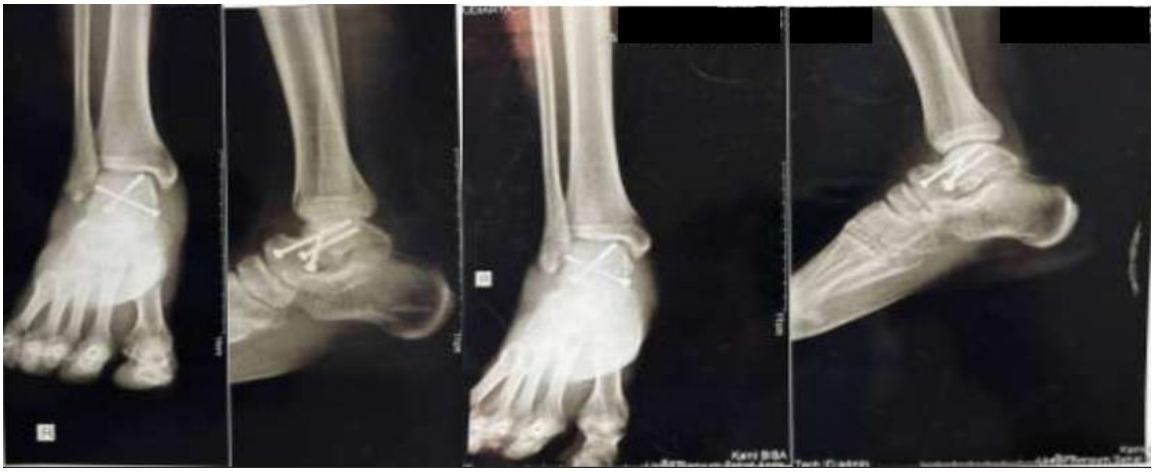

Figure 4. One-Year Follow-Up Radiographs. (A) Anteroposterior and (B) Lateral views at 12 months post-surgery. The talar neck fracture is fully united. The talar dome shows uniform density without signs of collapse or sclerosis. All peri-talar joint spaces are well-maintained, indicating no radiographic osteoarthritis.

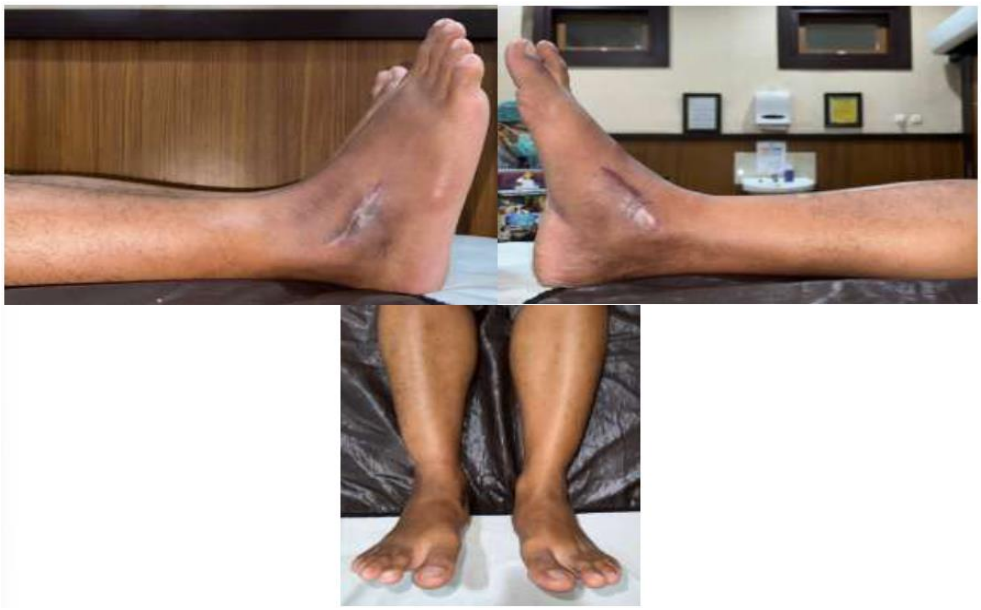

Figure 5. One-Year Postoperative Clinical Result. The right ankle exhibits excellent soft tissue healing with keloid scars and a normal anatomical appearance

DISCUSSION

The management of a Hawkins type II talar neck fracture with an associated talonavicular dislocation, as presented in this case, involves navigating several critical challenges to optimize patient outcomes. The presence of displacement and joint dislocation (subtalar and talonavicular) in this injury mandates surgical treatment. Improper management for such fractures leads predictably to malunion, accelerated joint degeneration, and poor functional results.[9] The primary surgical objectives are anatomical reduction, stable fixation, and the preservation of remaining blood supply. The dual medial and lateral approach used in this case is a well-described and effective strategy. The medial approach is essential for direct visualization and reduction of the talonavicular dislocation, which if left unreduced, would severely compromise midfoot mechanics. The lateral approach via the sinus tarsi provides excellent exposure of the lateral talar neck and the subtalar joint, facilitating control of the main fracture fragments. This approach avoids the more extensile exposures that can further devascularize the talus.[9] The use of a joystick K-wire and calcaneal traction are valuable technical aids for achieving reduction without excessive soft tissue stripping.[10]

This report describes a favorable one-year outcome following open reduction and internal fixation (ORIF) of a Hawkins type II talar neck fracture with talonavicular dislocation. The patient regained full function without evidence of AVN or early degenerative change. This outcome aligns with core principles of anatomic reduction and stable fixation. Comparison with recent literature further informs surgical strategy and prognosis.

A relevant comparative case by Jadib et al. (2024) presented a more severe Hawkins type III fracture with associated bimalleolar fractures, also treated with dual-approach ORIF. Despite the higher-grade injury and greater theoretical AVN risk, their patient achieved a good functional result (AOFAS 85) at two years. This supports the principle that meticulous anatomic reduction can yield positive outcomes even in complex injuries.[11]

An alternative technique is presented by Fernandez et al. (2011), who reported on closed reduction and percutaneous screw fixation for talar neck fractures (Hawkins I-III). Their rationale was to minimize soft-tissue dissection to preserve talar blood supply. In their series of six patients, they reported a 17% AVN rate and a 50% rate of subtalar arthritis at about 20 months.[12] This percutaneous approach is less invasive but depends on achieving an acceptable closed reduction, which may not be feasible in fractures with joint dislocation, such as the talonavicular dislocation in our case. This highlights the need to individualize surgical approach based on fracture pattern and reducibility.[13]

A more advanced minimally invasive option is demonstrated by Wagener et al. (2018), who utilized arthroscopically assisted reduction and percutaneous fixation for Hawkins type II fractures. In their series of seven patients, arthroscopy allowed direct visualization for reduction and management of concomitant injuries. They reported no AVN and no radiographic subtalar arthritis at a mean 31-month follow-up, with all reductions confirmed as anatomic by CT. This technique merges the benefits of direct visualization with minimal soft-tissue disruption. The excellent outcomes in both their series and our case suggest that the quality of anatomic reduction may be a more critical determinant of mid-term success than the specific type of surgical exposure.[14]

Several consistent themes emerge from this comparison. First, achieving anatomic reduction is paramount across all techniques, crucial for joint function and potentially for preserving vascularity. Second, there is a clear trend toward minimally invasive surgery (percutaneous, arthroscopic) to reduce soft-tissue injury, though the choice must be tailored to fracture characteristics. Third, despite good

early results, long-term surveillance is necessary due to the persistent risk of delayed AVN and post-traumatic arthritis.

Stable internal fixation is important to allow early protected motion while maintaining reduction until union. Multiple partially threaded cannulated screws placed in a lag configuration provide interfragmentary compression across the fracture site. The anterior-to-posterior screw direction, as utilized here, is biomechanically sound for neutralizing forces across the talar neck. The addition of a third screw enhances rotational stability. The literature supports the use of low-profile, headless compression screws as an alternative, potentially reducing soft tissue irritation,[15] but standard cannulated screws remain a reliable and accessible option with excellent outcomes.[16]

The staged rehabilitation protocol with initial immobilization and non-weight-bearing for 6-8 week is designed to protect the healing fracture and the vulnerable talar vasculature from compressive forces.[17] Early joint motion, once soft tissues permit, is encouraged to prevent stiffness and promote cartilage health.[18] The patient's excellent functional recovery at one year, with full range of motion and return to activity, aligns with studies reporting good outcomes following ORIF for displaced talar neck fractures when anatomical reduction is achieved.[19]

Despite the favorable outcome in this case, the patient remains at a lifelong increased risk for post-traumatic arthritis in the subtalar and/or tibiotalar joints due to the initial cartilage injury and the surgical insult. This underscores the importance of patient education and the potential need for very long-term, albeit less frequent, follow-up.[20]

This case report had limitations, which inherently limits the generalizability of the findings. The one-year follow-up, while demonstrating an excellent result, is not sufficient to definitively rule out the very late onset of degenerative changes. Longer-term studies are needed to understand the ultimate natural history of such injuries even after successful initial treatment. The outcome also may be influenced by the surgeon's skill and experience, as well as the specific characteristics of the patient, which may not be representative of all individuals with talar neck fractures.

CONCLUSION

This case report illustrates the successful management of a complex Hawkins type II talar neck fracture with talonavicular dislocation in a young adult. A systematic approach involving timely surgical intervention via dual incisions, anatomical reduction, and stable internal fixation with cannulated screws resulted in an excellent clinical and radiographic outcome at one-year follow-up, with no evidence of avascular necrosis or early osteoarthritis. The case highlights several key principles in talus trauma which is the imperative of anatomical reduction, the utility of a strategic surgical approach to minimize soft tissue damage, and the necessity of a structured, patient-specific rehabilitation program. Most importantly, it reinforces that these injuries demand committed long-term surveillance to identify and manage delayed complications that may impact the patient's functional prognosis years after the initial event.

Declaration by Authors

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