Decision on Preserving Ankle Joint Function in Neglected Neck Talus Fracture Hawkins Type IV

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ABSTRACT

Introduction: Talus fractures are rare injuries to the hindfoot that still challenging in treatment. Accounting for <1% of foot and ankle fractures, and approximately 50% of them occur at the level of the neck. The anastomotic ring of blood supply is likely to be damaged in neck talus fractures, which disrupt the blood flow and cause significant problems affecting fracture healing and its complication.

Case Illustration: We follow the progress of the illness from a 47 years old female complain pain on her left ankle after falling down 6 months before outpatient. Patient diagnosed as neglected close fracture left neck talus Hawkins type IV. Then patient undergo an ankle arthroscopy to evaluate the ankle joint in decision to preserve the tibiotalar joint, while arthrodesis performed in subtalar and talonavicular joints in this patient. This procedure achieved a good result in preserve ankle alignment, stability and soft tissue damage reduction. Improvement of VAS and AOFAS Score from 5 and 39 preoperative to 0 and 81 in follow-up of 3 months after surgery with good compliance of the patient.

Discussion: Arthroscopy is safe procedure obtaining anatomical joint surface and reduce tissue damage. Therefore, a clear articular surface must be found during arthroscopy in deciding to preserve the joint function. While subtalar arthrodesis also another option that can enhance blood supply to encourage union, although loss of some ankle motion has significant effect on ambulation.

Keywords: Arthroscopy, arthrodesis, fracture, neglected, talus.

I. INTRODUCTION

Talus fractures are rare but disabling injuries to the hindfoot and remain challenging to treat, despite recent advances in management. Multiple articulations, tenuous blood supply, and complex structure create particular difficulty in achieving acceptable outcomes even with optimal treatment [1].

The talus is 60% to 70% covered in articular cartilage, but has no muscular attachments, and articulates with adjacent bony structures via capsuleoligamentous restraints. It is anatomically divided into 3 main structures: the body, the neck, and the head, as well as the lateral and posterior (along which runs the flexor hallucis longus tendon) processes [2].

Talus fractures accounting for <1% of foot and ankle fractures, and approximately 50% of them occur at the level of the neck. They are usually related to high-energy trauma and associated injuries to the foot or another region of the homolateral lower extremity are frequent, making their treatment a greater challenge. This bone plays a fundamental role in the biomechanics of the foot and ankle. It lacks tendon and muscular insertions, and two-thirds of its surface are covered by articular cartilage leaving only the neck area and the posterior process for the contribution of periosteal irrigation. This comes from the anastomotic network formed by the posterior tibial, anterior tibial, and fibular arteries. The arteries of the tarsal canal and sinus are primarily responsible for the irrigation of the neck and body. The anterior tibial artery provides irrigation to the head and dorsal area of the neck. Through the deltoid ligament, the branches of the posterior tibial artery nourish the postero medial portion of the body. These are some factors determine high rate of complications in these injuries [2], [3].

Neck talus fractures are likely to damage the anastomotic ring, resulting in disruption of blood supply to the talus body which leads to significant problems in fracture healing and integrity. This leads to osteonecrosis of the talus which may lead to collapse also. Anatomical reduction of a neck talus fracture is often achieved through an open approach with direct visualization of the fracture site [4], [5].

II. CASE ILLUSTRATION

A 47 years old female presented to the orthopedic outpatient with chief complaint of pain on her left ankle after falling down 6 weeks before the outpatient consultation. She had a history slipped when she climbing up the stairs with the left ankle flexed inward. On physical examination, the affected ankle was swelling and inward/varus deformed. Tenderness felt over the talus with normal perfusion and neurovascular examination. Active range of movement on the left ankle was 20° dorsiflexion and 50° plantarflexion.

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Ankle x-ray shows displace fracture with dislocation of neck talus, bone lost, erosive lesion on navicular, and few callus formations suggest a neglected fracture (Fig. 1). CT confirm the neck talus fracture with displacement, dislocation of subtalar joint, talonavicular joint, and subluxation of tibiotalar joint involved (Fig. 2 and 3). The patient then diagnosed with neglected close fracture left neck talus Hawkins type IV.

During intraoperative the patient placed in a supine position. Diagnostic arthroscopy was performed through the anterolateral and anteromedial portals to get direct view of the tibiotalar joint cartilage and clear view to the talus bone. It was found the articular surface of the tibiotalar joint was still intact without osteophyte formation and no defects were found that necessary still can be preserve (Fig. 4).

In the other side, an arthodesis on subtalar and tibial-navicular joint are required to correct its alignment due to
bone lost and articular surface damage on the anterior and posterior of the neck talus. The approach was done by an anterolateral and lateral incision then reduction and arthrodesis were performed in subtalar joint using 2 cannulated screws 7.3 mm from the calcaneus-talus direction. A defect in the neck of the talus then filled by iliac bone graft, continued with fixation using 3 cancellous screws 50mm full threaded in tibial-navicular joint.

Outpatients with periodically clinical and radiological evaluations are carried out. After 2 weeks wound heals without signs of infection. X-ray after 6 weeks performed shows a stable ankle alignment with soft callus formation (Fig. 5). An improvement of VAS and AOFAS Ankle-Hindfoot Score from 5 and 39 preoperative to 0 and 81 in follow-up of 3 months after surgery. This procedure achieved an excellent result to preserve tibiotalar joint, maintain ankle alignment, stability and soft tissue management.

Fig. 5. 6 Weeks Postoperative Left Ankle X-ray Evaluation: AP View (left), Lateral View (right).

III. DISCUSSION

The talus is covered by articular cartilage on more than half of its surface and lacks any muscle attachments. The talus is divided into three sections: the head, neck, and body. As a result, the talus acts as the centerpiece in multiple complex articulations with the navicular anteriorly (talonavicular joint), the tibia superiorly (tibiotalar joint), and the calcaneus inferiorly (subtalar joint) [1]. In terms of structure, it transmits weight from the tibia to the rest of the foot. The talus's extraosseous blood supply is a combination of contributions from the anterior tibial artery, posterior tibial artery, and perforating peroneal artery, with the posterior tibial artery being the major contributor through its branch to the tarsal canal. The dorsalis pedis and the artery of the tarsal sinus both provide support to the head talus. The posterior tibial artery provides the majority of the blood flow to the body talus and dome, with supplementary contributions coming from the peroneal artery, which anastomoses with the posterior tibial artery in the subtalar joint (branch of the peroneal artery) [2].

Studies have reported multiple damage pathways for talus fractures, which are typically high-energy occurrences. The most frequent mechanism of injury in several retrospective studies of neck talus and body fractures was motor vehicle collision, which was followed by falls from a height, being hit by a car as a pedestrian, crush injuries, and athletic injuries [2]. They are caused by a sudden dorsiflexion of the ankle, which resulting in a fracture of the neck talus. Another cause of neck talus fracture is excessive force applied to the neck talus by the medial malleolus during a forceful ankle inversion [3]. In a review of 102 patients by [4] found a 6.9% incidence of delayed presentation and/or undiagnosed injuries to the neck/body talus. These injuries most frequently occurred in lower-energy situations, such as falls from 1 meter, rotational injuries during the loading phase of rock climbing, and rotational injuries during community ambulation [4].

In 1970, Hawkins published his classification for neck fractures which remains, to this day, the most widely used. Group I injuries are non-displacement fractures, group II injuries represent displaced fractures with a dislocated or subluxated subtalar joint, and group III injuries present a dislocation of the subtalar and tibiotalar joints. In 1978, Canale and Kelly added group IV to the classification, which are those fractures with subluxation or dislocation of the talonavicular joint [5]. An early diagnosis and rapid treatment can considerably lower the risk of these complications. Talus fractures are frequently overlooked during the initial assessment, either as a result of a poor clinical examination or inadequate radiological findings [6]. Anteroposterior (AP), oblique, and lateral foot images, as well as ankle series, Canale and Kelly or mortise view, should all be conducted as appropriate radio imaging to determine the type of injury [7], [8]. If a fracture is diagnosed, a thorough examination using computed tomography (CT) or magnetic resonance imaging (MRI) should be carried out since each fracture has a considerable risk of complications, such as avascular necrosis (AVN), collapse, malunion, and secondary osteoarthritis [3].

The most frequent and dangerous consequence following neck talus fractures is osteonecrosis. Fixation of Talus neck fractures is absolutely necessary to reduce the overall risk of osteonecrosis. The development of osteonecrosis was unaffected by any delay in talus neck fracture fixation following a successful reduction. Studies have revealed that factors related to the severity of the initial injury, such as the initial displacement, comminution, and open fracture, are more significantly related to the development of osteonecrosis [1], [6]. The present recommendation is to wait until the soft tissue envelope is susceptible to definitive fixation as long as the damage is reduced. This helps decrease postoperative problems such wound dehiscence, skin necrosis, and infection, which can still occur in up to 10% of cases despite this temperate approach [1]. Subtalar arthritis is the second most frequent consequence. Reference [9] found a 53.3% subtalar arthritis and a 25% tibiotalar arthritis association with talus fractures. The consequences of failing to prevent these problems include other operations, prolonged pain, and disability [6], [10]. Surgery may be used to treat osteonecrosis with persistent symptoms. Three main types of procedures are available: joint-sparing (core decompression and vascularized bone grafting), joint-sacrificing (talus replacement), and salvage (arthrodesis) [8].

The patient in this case was misdiagnosed initially. The patient presented with swelling and a displaced neck talus fractures on the radiograph, with good soft-tissue component,
Despite that the patient developed osteonecrosis. In our case, subtalar arthrodesis and iliac crest cancellous graft was used which showed an excellent alignment and ankle stabilization. These advantages are provided by an arthroscopic procedure. The smaller incisions decrease the probability of AVN and reduce the injury to the surrounding tissue. While the use of arthroscopy in the treatment of ankle fractures has been thoroughly discussed in the literature, reported about its use and benefits in the treatment of talus fractures, especially neck talus fractures. In a study by [11] it was found that arthroscopically controlled reduction of neck talus fractures is secure in achieving anatomical bone surface, the management of soft tissues, and patient satisfaction.

Most surgeons treat patients with neck talus fractures are concerned about the development of degenerative abnormalities in the subtalar joint [11]. Specific hindfoot pathologies in adults can be treated with subtalar arthrodesis using a sinus tarsi approach and cannulated screw fixation [12]. A treatment option for severely comminuted talus fractures is primary ankle arthrodesis. Using the traditional anterolateral, posterolateral, and related portals with the patient in the lateral decubitus position, Tasto first described arthroscopic subtalar arthrodesis in 1992 [13]. The vascularization and proprioception of the calcaneus and talus are respected during arthroscopic arthrodesis, which is associated with less soft tissue damage and may promote union. The reduction of ankle motion has a substantial impact on ambulation, even if this treatment can theoretically improve blood flow to the talus body and reduce the risk of posttraumatic ankle arthritis [12]. Options for fixation include large cannulated screws, staples, and even implants designed specifically for subtalar arthrodesis. For fixation, large cannulated screws are most frequently mentioned. The ideal screw count (1, 2, or 3), screw direction (parallel or divergent), and screw type (head or headless, completely threaded or partially threaded) for supporting the fusion site have all been debatable [12]. In the study by Paulo N. Ferrao et al., two cannulated 7.5 mm fully threaded conical headless compression screws are inserted from the heel's posterior side [14]. Having stated that, any compression screw with a big diameter (>6.5 mm) is effective in supporting the fusion site. One screw is placed into the talus's body, and the other into its neck, in a diverging pattern. In terms of stability, recent study discovered that divergent screws outperformed parallel screws [10], [15].

IV. CONCLUSION

Base on this case report, ankle arthroscopy and arthrodesis have a good outcome and can be a selection in management of a neglected neck talus fracture.

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CONFICT OF INTEREST

Authors declare that they do not have any conflict of interest in writing this article.

REFERENCES