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## The Masquelet technique in an extruded talus injury after open peri-talar dislocation—A case report

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### ABSTRACT

Extruded talus is a rare injury pattern that occurs following a high velocity injury loading on a supinated and plantar flexed foot. Treatment for such rare presentation varies from talectomy to arthrodesis. Reimplantation than excision has been favoured in literature, but it carries its own subset of issues to tackle from avascular necrosis to infection. Masquelet technique has been a saviour for open injuries most of the time in tackling both bone defects and infections. We present a case of open ankle injury with talar extrusion and associated talar bone loss along with calcaneum fracture, treated by masquelet technique.

### Introduction

Extruded talus is usually due to a high-velocity injury loading on a supinated and plantar flexed foot. Such injuries are commonly associated with soft tissue damage and surrounding bony injuries posing high risk of complications [1]. There is lack of congruent evidence to successfully manage such injuries. Primary reimplantation and arthrodesis had many complications ranging from infection to avascular necrosis, osteoarthritis or even bone resorption [2]. Few cases of talar reimplantation following complete extrusion reported had favourable prognosis than talectomy with tibio-calcaneal arthrodesis [3,4]. Masquelet technique has been a saviour for open injuries most of the time in tackling both bone defects and infections [5,6]. We present a case of open ankle injury with talar extrusion and associated talar bone loss along with calcaneum fracture, treated by masquelet technique.

### Case report

A 40 year old male patient presented to us with a Gustilo-Anderson grade 3B open injury to ankle with talar extrusion and bone loss distal to talar neck along with calcaneum fracture following a high velocity road traffic accident [Fig. 1]. He had an associated contralateral side petrochanteric fracture without any other systemic injuries. The patient had intact sensation on the whole foot with intact posterior tibial pulsations and damaged dorsalis pedis artery. Heel Pad was intact along with lateral soft tissue sleeve. Soft tissue defect on anterior aspect, medial side lacerated wound along with talar and calcaneal bone loss was noted. The tibial nerve was in continuity trifurcating just below the wound, which explains the intact sensation of the sole of the foot. The Mangled extremity severity score (MESS) was noted to be 7.

In view of the intact talar dome and bone defect from neck of talus and associated soft tissue defects, we have planned for triple

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Fig. 1. Open injury to ankle showing talar extrusion with bony defect at talar neck region.

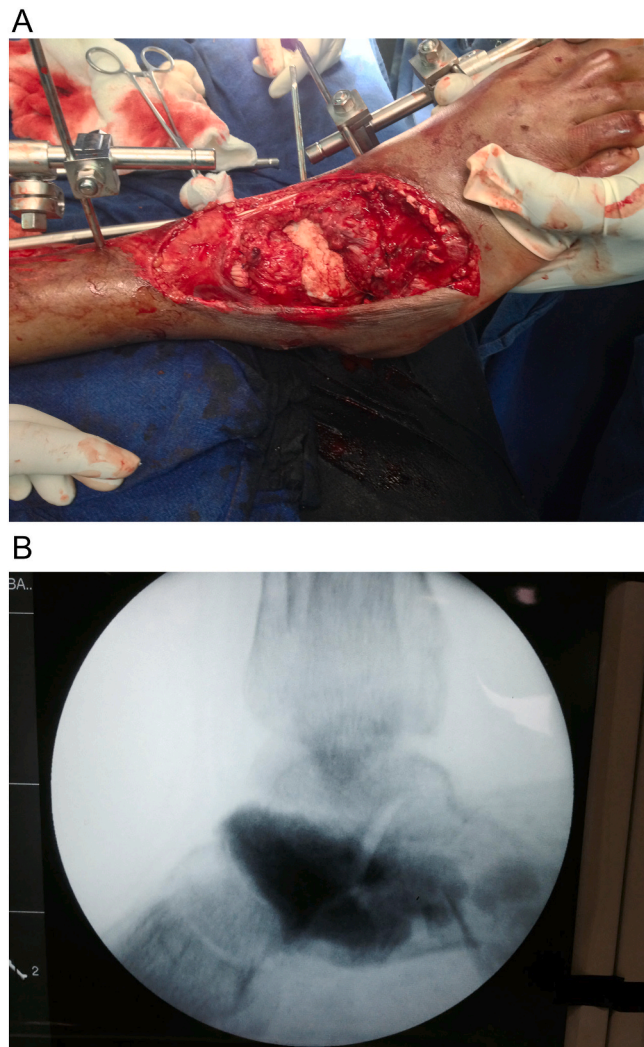
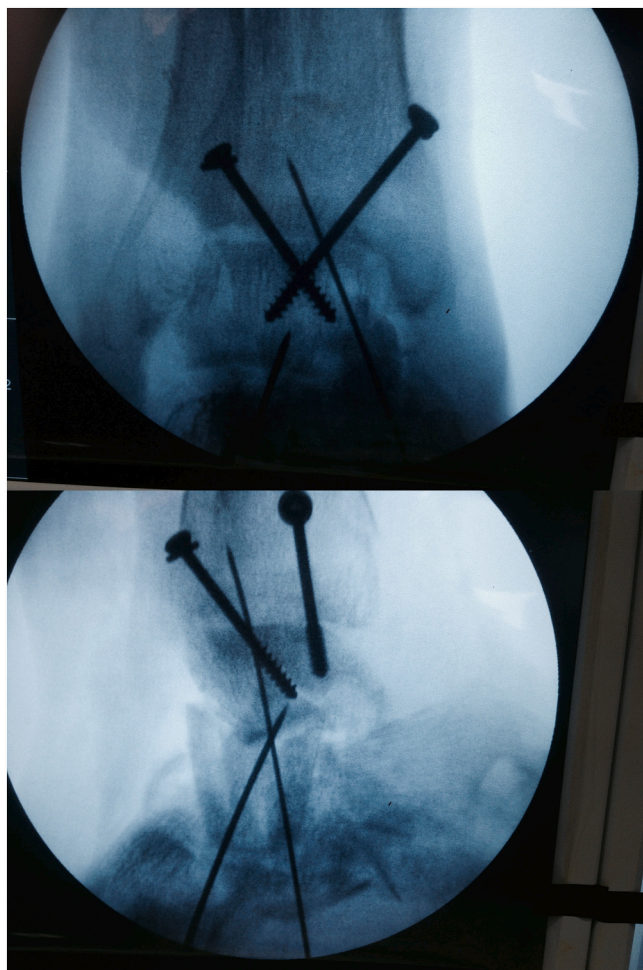


Fig. 2. A: Antibiotic cement spacer in talar defect following skeletal stabilization with external fixator and k wires.  
B: Intra Operative C arm image of lateral view of ankle showing antibiotic cement spacer.



**Fig. 3.** Intra operative AP and Lateral views of C-arm showing autologous bone grafting after removal of cement spacer and stabilization with k wires and CC screws.

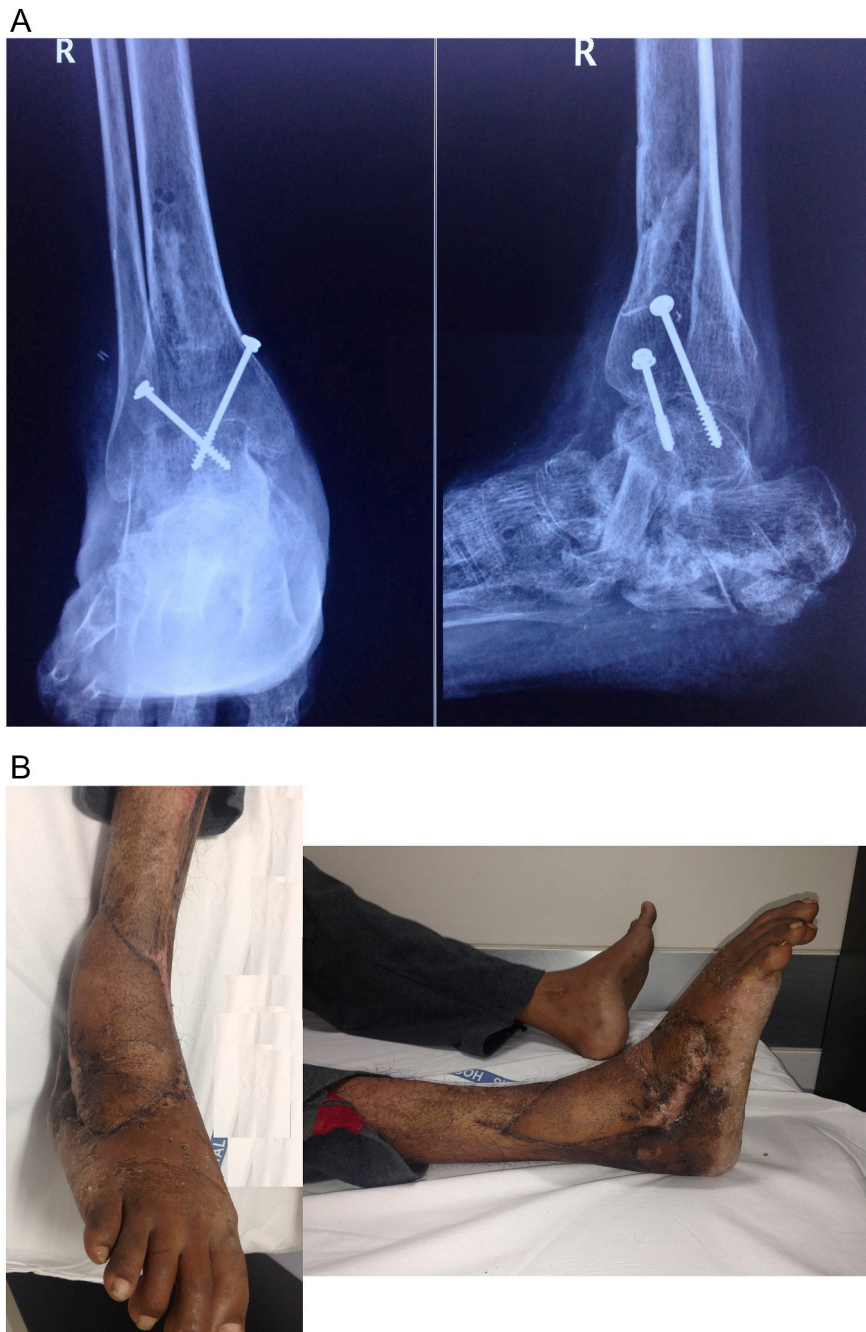
arthrodesis combined with Masquelet technique to stabilize the joints and reconstructing the bone defect. In the preparation of reconstruction of bony defect, wound was thoroughly debrided, antibiotic bone cement was used as spacer [Fig. 2] and the joints stabilized with k wires and spanning external fixator. Soft tissue defects were reconstructed with free flap cover.

After 8 weeks of time, ensuring the free flap healing, the flap was dissected carefully along the medial margin. The bone cement spacers were removed to be substituted with allografts underneath the biomembrane and stabilized with k wires, cannulated cancellous screws [Fig. 3]. At 20 weeks following initial injury, graft incorporation with successful fusion of joints was noted and patient was mobilized independent of support. At 7 year follow up, patient continued all his activities with no evidence of infection [Fig. 4]. He continued to have mild pain on plantar aspect of heel due to calcaneum bony architecture, which he manages with soft cushioned foot wear and it did not subjectively effect function.

### Discussion

Open peritalar dislocations associated with talar extrusion is a rare devastating injury. There is no common consensus reported in literature on how to manage such injuries due to the diversity they present from soft tissue damage to associated bony defects. Talectomy followed by primary tibio calcaneal arthrodesis showed shortening of the limb from 1 to 3 cm [7]. Alternatively, talectomy followed by primary grafting with arthrodesis is an alternative, but has high chances infection owing to open injuries with contamination and severe soft tissue defects [8].

Salvage procedures such as reimplantation of extruded talus and managing soft tissue defects is relatively safe and effective procedure, but has its own subset of complications ranging from avascular necrosis to osteoarthritis due to damage of talar blood supply [9]. Literature favours management by salvage than excision as the former gives an opportunity to provide bone stock when



**Fig. 4.** A: Post-operative radiograph at 7 years follow up showing healed ankle arthrodesis.  
B: Clinical pictures of ankle at 7 years follow up.

talus collapses due to avascular necrosis. Either excision or salvage, the principles of debridement and adequate soft tissue defect along with skeletal stabilization forms the mainstay of treatment in such peritalar dislocations associated with extrusion.

Total talar replacement by a 3D printed prosthesis was performed in a 51 year old by Ruatti et al. with a favourable outcome by second year of follow up [10]. However, long term outcome would only reveal the fate of prosthetic replacements of Talus.

Masquelet technique has dual advantage in tackling bone defects and defending infections in contaminated wounds with soft tissue defects. In our case, we used the principles of Masquelet technique in addressing bony defect of talus after reimplanting the talar dome. The bony defect of talus was filled with antibiotic spacer which helps in structural support as well as prophylactic antibiotic in defending infections arising out of open injury contamination. At 8 weeks of time, as the flap matured, we have grafted the defect after removing the cement spacer and arthrodesed the talo-navicular joint and subtalar joint. Tibiotalar fusion was also done by cannulated

cancellous screws. Masquelet technique had an advantage of addressing the bony defects of talus when compared to primary arthrodesis alone. Abdulazim et al. [11] reported the first case of tibiototalcalcaneal arthrodesis following talectomy using masquelet technique in 2019 for an extruded talus. Although ours is second case, we retained the major native talar dome following extrusion and addressed the defective area by masquelet achieving good outcome. Maintaining subtalar and talo navicular space is very essential to restore foot arch and ankle biomechanics, which can be achieved by above described method, compared to total talectomy.

## Conclusion

Talar extrusion associated with bony and soft tissue defect management can be achieved by following masquelet technique principles. Combined use of reimplanted talar dome and antibiotic bone cement as a spacer in defective area of talus together aid for arthrodesis maintaining the length of native subtalar space.

## Declaration of competing interest

None.

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