

PURPOSE

The management of exposed hardware in patients with lower extremity fractures must achieve multiple complex goals, which include the achievement of bony union, the eradication of infection, and the durable coverage of soft tissue defects with well-vascularized tissues. Ultimately it is hoped to salvage of the extremity while preventing unnecessary deformities and allowing for early rehabilitation. Here, we report on several cases of exposed hardware in patients who had previously sustained lower extremity fractures, and discuss how to handle hardware exposure and soft tissue coverage

METHODS

A total of 11 cases of hardware exposure from 10 patients who had previously been managed for lower extremity fractures required surgical debridement, revised surgery by the orthopedic surgical team and reconstruction with perforator flaps. A retrospective chart review was performed.

The management of an exposed hardware by our service depended upon the presence of bony union and loosened hardware. If bony union had been achieved, we removed the hardware and covered the defect using a perforator flap. If the bony union had not yet been achieved and the hardware was loose, we exchanged the hardware. If the hardware was not loose, it was preserved.



Figure 1. (A, B) The hardware was exposed through a 1.5×1.5 cm skin and soft tissue defect on the medial malleolus. (C) After a meticulous debridement, we left the hardware intact and covered the defect with a posterior tibial artery perforator-based propeller flap. (D) The surgical site remained closed and asymptomatic 6 months after the surgery.

RESULTS

Of the 11 cases included, four were open fractures at the time of the initial injury, and seven were closed. There were nine wound infections and two cases of osteomyelitis. The management of the exposed hardware was determined after examining the bony union status and device loosening. We kept the hardware intact in eight cases and changed the hardware in three cases. Anterolateral thigh free flap, posterior tibial artery perforator-based propeller flap, and peroneal artery perforator-based propeller flap were performed.

All flaps survived without major complications. There were three cases of persistent infections with chronic osteomyelitis that required the removal of the hardware, repeated debridement and antibiotic therapy. All three cases involved hardware that had been exchanged during the flap surgery because of loosening. Bony union was achieved in all cases, and the time until bony union was ranged from 11 to 72 weeks from the initial injury (average, 37.1 weeks).



Figure 2. (A) The hardware was exposed through a 3×3 cm skin and soft tissue defect on the dorsum of the foot. (B) We left the hardware intact and covered the defect with a free anterolateral thigh fasciocutaneous flap. (C) The surgical site remained closed and asymptomatic 6 months after surgery.

CONCLUSION

We achieved positive results by treating exposed hardware with perforator flaps and maintaining the original hardware, except in the cases where it had loosened.

Based on our findings, we believe that there are several factors that need to be considered when deciding how to manage exposed hardware following lower extremity fracture management. The surgeon must decide whether to leave the hardware intact, or to remove or exchange it according to the presence of bony union and intact hardware. If a meticulous debridement is performed, in general wound infection does not appear to be an important factor in the long term management of exposed hardware. Proper antibiotics should be administered after confirming the presence of an infection or osteomyelitis. Finally, the soft tissue defect must be covered with a durable flap. Further randomized controlled trials with a larger sample size are needed to achieve a definitive conclusion.