Concurrent fibular fractures at the same level of distal tibia open fractures are of concern regarding the critical soft tissue condition and related complications, including skin necrosis, wound dehiscence, and superficial or deep infection, especially when the fibular shaft fractures require fixation by means of open reduction and internal fixation with a plate. The purpose of this study is to evaluate the usefulness of the percutaneous bridge plating of distal fibular fractures classified as 4F2(c) combined with distal tibia type III open fractures.

Materials and Methods

During the period from January 2012 to December 2018, the authors retrospectively collected data from orthopedic trauma databases. A consecutive series of 34 patients with concurrent distal fibular fractures with distal tibia type III open fractures who underwent the percutaneous bridge plating for the fibula fractures were enrolled in this study. The inclusion criteria were acute distal fibular fractures (4F2a, 4F2b, and 4F2c according to the AO/OTA classification) combined with distal tibia type III open fractures according to Gustilo-Anderson classification. Patients with fibular fracture-associated ankle fractures (44A, 44B, and 44C according to the AO/OTA classification), fibular open fractures, distal tibia intra-articular fracture (43B and 43C), high fibular fractures (4F2a and 4F2b, according to the AO/OTA classification), and previous fibular fractures were excluded.

In terms of the distal tibia fractures, 23 patient fractures were classified as 42A(c) or 42B(c) or 42C(c), and 11 were classified as 43A according to the AO/OTA classification system. All fibular fractures were classified according to the AO/OTA classification: 15 patient fractures were classified as type 4F2a(c), and 19 were classified as type 4F2b(c).

All distal tibia open fractures were temporarily stabilized with a spanning external fixator, and concurrent fibular fractures were fixed with the percutaneous bridge plating simultaneously. Fibular fractures were stabilized with either a 2.7/3.5-mm distal fibula plate or 3.5-mm locking compression plate (Synthes GmbH, Switzerland).

Results

The mean time from injury to fibular plating was 0.3 ± 0.6 days (range, 0 to 5 days), and the average period to definitive surgery of the tibia was 6.4 ± 6.0 days (range, 5–21). Fracture union in the fibula was obtained in all patients at an average of 20.7 ± 6.3 weeks (range, 16–35). There were 6 cases of tibia nonunion classified into necrotic or oligotrophic avascular nonunion. Nineteen tibia open fracture had a bone defect caused by discarding the bone fragment during initial debridement. The bone defect was packed with the antibiotic cement spacer when a definitive fixation of tibia was performed. The bone graft (autogenous bone with/without allograft bone and bone substitute) was done after the soft tissue had been settled down usually at 4 to 8 weeks after the surgery of soft tissue coverage (Fig. 3).

The average proportional length difference of the fibula was 0.492 ± 0.732% (range, 0.73 to 1.42%). The mean operation time for fibular fractures was 46.8 ± 5.6 minutes (range, 35–71), and the mean fluoroscopic time was 40.5 ± 25.1 seconds (range, 16–92). The mean LEFS score was 74.0 ± 3.70 points (range, 57–80) at the final follow-up.

Two patients had superficial wound dehiscence in the distal window of the fibula. Superficial skin necrosis on the skin bridge between the open wound of the tibia fracture and incision of the fibula developed in 3 patients. Twenty-nine patients underwent a soft tissue coverage operation for open tibia fracture, including a random-pattern flap, a distally based sural artery fasciocutaneous flap or an anterolateral thigh free flap (Fig. 4). Nineteen LCP distal fibula plates were removed due to plate prominence and discomfort at the final follow-up.

Conclusion

With the perspective of minimizing soft tissue problems due to high-energy trauma, the application of percutaneous bridge plating for the treatment of distal fibular fractures can be an alternative to conventional treatment methods.