

Posterior Bone Grafting for Tibial Nonunions

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Purpose: There is substantial controversy regarding the management of tibial shaft fracture nonunions. The Harmon posterolateral approach for tibial bone grafting dates from the Second World War, but has been neglected in the literature since that time. Our hypothesis was that posterolateral grafting of tibial shaft nonunions would have a high union rate with a low deep infection rate.

Methods: The study design was a retrospective case series of all patients treated with posterolateral (Harmon) bone grafting to treat tibial shaft fracture nonunion at a single statewide referral trauma center from 2004-2013. Procedures were typically done prone. Cultures were taken in the majority of the cases to assess for occult infection. A burr was used in each case to "dimple" decorticate the posterior tibia and medial and posterior fibula and then graft was applied in the tibiofibular interval and along the posterior face of the tibia. Graft choice and the use of bone morphogenetic protein (BMP) was at the discretion of the treating surgeon. Tibial bone defect length prior to grafting was measured across the points where the defect was the smallest. Our primary outcome variable was clinical union and our secondary outcome variables were any complication associated with the approach as well as infection requiring return to the operating room. Patients had at least 1 year of follow-up or until union.

Results: 59 patients met inclusion criteria with an average follow-up time of 23.5 months. The study group included patients who already had a history of deep surgical site infection prior to bone grafting (n = 17), established nonunions (n = 42), as well as impending nonunions associated with open fractures and bone gaps (n = 17). Overall, 44 patients (75%, 95% confidence interval [CI]: 63-86%) achieved clinical union with no further surgery. The mean interval to union was 9.9 months (range, 3-22). The mean bone defect size was 2.0 cm (range, 0.1-11 cm). 17 of 23 patients (74%) with defects larger than 2 cm, including defects up to 5.4 cm without infection, were successfully treated. Additionally two patients achieved union who were grafted at least 10 years following their initial injury. There were no complications noted to be associated with the approach and specifically no incidences of wound breakdown, vascular injury, or tendon injury. Eight patients (14%) had surgical site infection after the bone grafting procedure. Of the deep surgical site infections, seven of eight were in patients with prior infection or positive intraoperative cultures, so only one of 54 patients (1.9%) without history of infection had surgical site infection. Using intragroup comparisons or Fisher exact tests, the original fixation strategy (plate vs nail vs external fixation), fracture location, or defect size affected eventual union rates. Use of BMP showed a trend towards higher union rates despite a likely bias of using it in situations where the surgeon thought union was less likely (82% union, P = 0.14). A postoperative wound infection had a substantial negative effect on successful union without further surgery (infected: 25% union vs not infected: 82% union, P = 0.002).

Conclusion: Even in this relatively difficult patient cohort that included large bone gaps and patients with history of infection, union was achieved at a relatively high rate with one

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.

posterolateral bone graft procedure. The approach appears to be safe as there were no known complications specifically associated with the approach, and it appears to significantly reduce the risk of surgical site infection in the absence of prior infection. The approach seems to be a viable alternative for bone grafting of tibia fractures.