

Orthoplastic Reconstruction of Type IIIB Open Tibial Diaphyseal Fractures: Retention of Debrided Devitalized Cortical Bone is Not Associated with Inferior Functional Outcomes

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Purpose: Type IIIB open tibial diaphyseal fractures requiring flap coverage are a unique injury group with specific reconstructive challenges. Orthoplastic reconstruction using mechanically relevant devitalized bone (ORDB) is a technique whereby devitalized cortical segments are retained following debridement, thereby avoiding an iatrogenic segmental defect and multiple potential reconstructive procedures. The study unit has previously shown non-inferior clinical outcomes (deep infection rate and nonunion) utilizing this technique. We aimed to report health-related quality of life and functional outcomes for type IIIB open tibial diaphyseal (AO-42) fractures requiring flap coverage, comparing patients requiring ORDB versus patients who did not require ORDB.

Methods: This was a retrospective cohort study of 74 patients, all of whom sustained a type IIIB open tibial diaphyseal fracture requiring flap coverage, over a 4-year period (2014-2018), presenting to a major trauma center. All patients underwent 2-stage orthoplastic reconstruction (stage 1, debridement, temporary fixation, and VAC (vacuum-assisted closure) therapy; stage 2, re-debridement and single sitting “fix and flap”). Patients were contacted via 3 rounds of postal/ telephone questionnaire at minimum 2-year follow-up. The primary outcome measure was health-related quality of life as reported by the EuroQol 5 Dimensions (EQ-5D) and Short Form 36 (SF-36) measures. These measures assess physical, functional, mental, and social well-being. EQ-5D ranges from 0 (as bad as death) to 1 (full health). SF-36 ranges from 0 to 100.

Results: 30 patients underwent ORDB with the remaining 44 not requiring this. Median age was 46.5 years (interquartile range [IQR] 29), with median follow up of 3.8 years (IQR 1.5) and median number of operations of 2 (IQR 0). Overall median cohort EQ-5D was 0.743 (IQR 0.222); ORDB 0.743 (IQR 0.195) versus non-ORDB 0.748 (IQR 0.285), $P = 0.71$. No significant difference was observed in visual analog scale scores for health (ORDB median 85 [IQR 28.0] vs non-ORDB median 80 [IQR 41.0]; $P = 0.46$) and pain (ORDB median 17 [IQR 38] vs non-ORDB median 10 [IQR 46.75]; $P = 0.66$). Median physical component SF-36 score was 80 (IQR 50); ORDB 80 (IQR 34.5) versus non-ORDB 77.5 (IQR 58.75), $P = 0.72$. Median mental component SF-36 score was 80 (IQR 28); ORDB 80 (IQR 21) versus non-ORDB 80 (IQR 26), $P = 0.29$.

Conclusion: In type IIIB open tibial diaphyseal fractures requiring flap coverage, retention of mechanically relevant debrided and devitalized cortical bone does not appear to be associated with inferior health-related quality of life outcomes. This should be considered within the strict context of the 2-stage orthoplastic reconstructive approach used in this study.