

Taylor Spatial Frame Stacked Transport for Tibial Infected Nonunions with Bone Loss: Long-Term Functional Outcomes

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Purpose: Infected nonunions with bones loss are a limb-threatening problem. The purpose of this study was to analyze the long-term functional outcomes in patients with posttraumatic infected tibial nonunions undergoing bone transport using a Taylor Spatial Frame (TSF). Additionally, we analyzed patients’ functional outcomes over time.

Methods: Seventy patients were treated for infected nonunions with bone loss using stacked TSF transport by a single surgeon at a Level I trauma center. All patients who were identified as candidates for the study were mailed a Short Musculoskeletal Function Assessment (SMFA) survey. At a mean follow-up of 59 months, 38 patients completed the SMFA questionnaire. The SMFA is a functional outcome instrument with scores ranging from 0 to 100, with lower scores indicating better function. Parameters measured included age, gender, diabetes, smoking, use of a free flap, bone defect size, length in frame, external fixation index, direction of lengthening, and use of adjunctive stabilization. We defined adjunctive stabilization as use of intramedullary nail, plate fixation, or reapplication of TSF to aid in healing of docking or regenerate site. SMFA scores from a previous study of the same patient population allowed for a comparison of functional outcomes over time.

Results: The mean SMFA score for the entire group was 27.1. The average patient age was 46.8 ± 12.7 years, 28 patients (74%) were male, 3 (8%) were diabetic, and 11 (29%) were smokers. 17 patients (45%) had soft-tissue defects that required a free flap performed by plastic surgery. The mean size of the defect was 5.1 cm. The mean length in frame was 9.3 months and mean external fixator index was 1.9 month/cm. Age, gender, and presence of diabetes demonstrated no effect on functional outcomes. Smoking had higher degrees of

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	SMFA score
Men	27 ± 16
Women	27 ± 17
Free Flap	29 ± 17
No Free Flap	25 ± 15
Smoker *	39 ± 16
Non-Smoker *	22 ± 14
Diabetic	27 ± 13
Non-Diabetic	27 ± 17
Adjunctive Stability [∞]	33 ± 17
Absence of Adjunctive Stability [∞]	22 ± 15

p<0.05: *smokers vs non-smokers; [∞]adjunctive stability vs absence of adjunctive stability

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.

disability, as measured by the MFA, compared to nonsmokers (39 ± 16 vs 22 ± 14 , $P = 0.011$). Patients who were managed with adjunct stabilization after removal of the external fixator reported higher degrees of disability, as measured by the MFA, compared to those who did not receive adjunctive stabilization (33 ± 17 versus 22 ± 15 , $P = 0.049$). We also assessed functional outcome scores over time. 16 patients returned two SMFA surveys at different time points after completion of bone transport. Initial average SMFA score was 26.5 at a mean of 25.3 months after frame removal, while the second average MFA score was 19.4 at a mean of 98.8 months after frame removal.

Conclusion: The SMFA scores suggest that TSF is a good technique for bone transport for infected nonunion of the tibia with bone loss. However, the most important finding in this population was the improved outcome of SMFA scores from 2 years to 8 years, indicating that over time, these patients are approaching levels of the normal population allowing for integration back into society. Limb salvage with TSF transport appears to be justified but may take years before the beneficial results are fully appreciated.