Press-fit Osseointegration for Patients with Short Residual Bone

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INTRODUCTION:
Press-fit titanium transcutaneous osseointegration nails (TiTON) have been proven reliable in improving amputee quality of life and mobility. However, the minimum necessary length of bone or the minimum implant length to achieve stable TiTON is not established. The aim of this study was to compare the adverse event experience of patients with short residual limbs versus patients with longer residual limbs. 8 cm was chosen as the definition of “short” because the standard length for traditional models is 8 cm, and the fully textured portion for standard current models is 8 cm long.
METHODS: Medical records were evaluated of femur and tibial osseointegration patients. Patients were excluded if they had less than one year follow up or if they had osseointegration with an implant design other than TiTON. Both femoral and tibial patient cohorts were separated into Short (<8 cm) or Long (>8 cm) cohorts based on implant length. Chart review included demographics and whether additional surgery occurred to manage infection, noninfected loosening, periprosthetic fracture, and skin refashioning.
RESULTS:
144 limbs were evaluated. There were no statistically significant differences in the rate of any adverse event category.
The data for 81 femurs is presented as short vs long, 8 (10%) vs 74 (91%); the shortest was 40 mm. Debridement was performed for 1/8=12.5% vs 12/73=16%, p=1.000. Periprosthetic fractures occurred for 2/8=25% vs 7/73=9%, p=.211; all regained ambulation with implant retention. Skin refashioning was performed for 0 vs 13/73=18%, p=.344. Implant removal for infection was performed for 0 vs 2/73=3%, p=1.000.
The data for 63 tibias is presented as short vs long, 16 (25%) vs 46 (73%), the shortest was 45 mm. Debridement was performed for 0 vs 3/46=7%, p=.562. Implant removal for non-infectious loosening was 1/16=6% vs 1/46=2%, p=.453. Skin refashioning was performed for 1/16=6% vs 0, p=.258. Removal for infection was 0 vs 1/46=2%, p=.453. Implant removal for implant fracture was 0 vs 1/46=2%, p=.453).
DISCUSSION AND CONCLUSION:
While this study is limited by the total number of short implants, the current data suggests that short TiTON implants do not have an apparent risk for adverse events versus longer implants. This is remarkably notable for concerns such as loosening and removal. Larger numbers of patients are needed to more confidently assess potential limitations of short implants, but currently, patients with residual bones as short as 4 cm seem safe to provide TiTON rehabilitation.

	Total	Short TiTON: <=8 cm	Long TiTON >8 cm	P*
FEMUR				
Irrigation and debridement	13 (15.9%)	1 (12.5%)	12 (16.2%)	1
Fracture	9 (11%)	2 (25%)	7 (9.5%)	0.2114
Skin Refashioning	13 (15.9%)	0 (0%)	13 (17.6%)	0.5822
Noninfected loosening	0 (0%)	0 (0%)	0 (0%)	1
Infection Requiring Removal	2 (2.4%)	0 (0%)	2 (2.7%)	1
Trauma Requiring Removal	1 (1.2%)	0 (0%)	1 (1.4%)	1
TIBIA				
Irrigation and debridement	3 (4.8%)	0 (0%)	3 (6.4%)	0.5645
Fracture	0 (0%)	0 (0%)	0 (0%)	1
Skin Refashioning	1 (1.6%)	1 (6.3%)	0 (0%)	0.254
Noninfected loosening	2 (3.2%)	1 (6.3%)	1 (2.1%)	0.4465
Infection Requiring Removal	1 (1.6%)	0 (0%)	1 (2.1%)	1
Trauma Requiring Removal	1 (1.6%)	0 (0%)	1 (2.1%)	1