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**Title**

Osseointegration Outcomes following Amputee Lengthening

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**Summary**

This article is the first to directly address the outcomes, and management of osseointegration prosthesis following a limb lengthening procedure for individuals unable to use traditional socket prosthesis due to short stump.

**Introduction/ basics**

Percutaneous EndoProsthetic Osseointegration for Limbs (PEPOL) facilitates improved quality of life (QOL) and objective mobility for most amputees discontent with their traditional socket prosthesis (TSP) experience. Some amputees desiring PEPOL have residual bone much shorter than the currently marketed press-fit implant lengths of 14-16 cm, potentially a risk for failure to integrate. We report on the techniques used, complications experienced, the management of those complications, and the overall mobility outcomes of seven patients who had femur distraction osteogenesis (DO) with a Freedom nail followed by PEPOL.

**Material method; implementation/ process**

Retrospective evaluation of a prospectively maintained database identified seven patients (3 males) who had transfemoral DO in preparation for PEPOL with two years of follow-up after PEPOL. Five patients had traumatic causes of amputation, one had perinatal complications and one was performed to manage necrotizing fasciitis.

**Results**

The average age at which DO commenced was  $39.8 \pm 15.8$  years, and five patients had their amputation more than ten years prior (average  $23.1 \pm 20.6$  years). The residual femurs on average started at  $97.6 \pm 42.7$  mm and were lengthened  $49.0 \pm 16.3$  mm,  $98 \pm 45\%$  of goal ( $99 \pm 161\%$  of the original bone length). Four patients (57%) had a complication requiring additional surgery: four events of inadequate regenerate were managed with continued

lengthening to desired goal followed by autograft placement harvested from contralateral femur reaming; one patient had the cerclage wires break which required operative replacement. All patients had osseointegration performed, at  $382\pm 83$  days after the initial lengthening nail surgery. One patient withdrew from study, declining follow-up evaluation. Whereas one patient had K-level  $>2$  before DO, at a mean of  $3.4\pm 0.6$  (2.6-4.4) years following osseointegration all six remaining patients had K-level  $>2$ . The 6 Minute Walk Test remained unchanged ( $244\pm 95$  vs  $237 \pm 95$  meters). Patient self-rating of prosthesis function, problems, and amputee situation did not significantly change from before DO to after osseointegration. Six patients required additional surgery following osseointegration: six to remove fixation plates placed to maintain distraction osteogenesis length at osseointegration; three required irritation and debridement for infection, including one patient whose implant was removed due to infection which led him to withdraw from further participation.

### **Discussion/ conclusion; conclusion for the practice**

Extremely short residual femurs which make TSP use troublesome can be lengthening with externally controlled telescoping nails, and successfully achieve osseointegration. However, it is imperative to counsel patients that additional surgery to address inadequate regenerate or to remove painful hardware used to maintain fixation may be necessary. This may improve the amputee's expectations before beginning on a potentially arduous process.

### **References**

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