Double Internal Bone Transport: A New Method to Reduce Treatment Time After Major Bone Loss

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Purpose: We demonstrate a new technique to solve large bone defects (10 cm and up) with internal distraction osteogenesis, using 2 lengthening nails aligned in a tube, supported by a plate. A case that seamlessly produced 17-cm bone in 3.5 months is used as an example.

Methods: A 17-cm bone defect occurred after resection of a diaphyseal malignant tumor in the femur. To reduce treatment time, a trifocal bone transport was planned, using computer simulation, a 3-dimensional- printed Sawbones model, and a custom-made holster to accommodate 2 internal lengthening nails. Thus, the setup became a double bone transport nail, maintaining normal length of the femur, throughout the procedure.

Results: The 2 lengthening nails pulled a bone segment from each end of the femur, at a rate of 0.75 to 1.0 mm/day, simultaneously—thus conducting bone transport at approximately twice normal speed. With a mid-term rewinding procedure and a docking procedure, the 17-cm defect was covered in 3.5 months, and the patient was allowed weightbearing as tolerated. At 12 months, healing was sufficient to allow for exchange nailing and full weightbearing.

Conclusion: Trifocal bone transport with a double lengthening nail may be seen as a showcase for further developments of devices for complex and large bone loss and lengthenings. Internal bone transport reduces soft-tissue stress, and improves patient comfort compared to frames. Additional length can be added after docking to fine-tune alignment and avoid length discrepancy. Treatment time may be very long in large bone defects, leading to absenteeism and exclusion from the work force, social, and educational life. Thus measures to reduce treatment time are important in posttraumatic, post-infectious, or post-malignant bone loss.