

A New Tool for Bifocal All-Internal Segmental Bone Transport as Modular Add-On to Motorized Lengthening Nails

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Purpose: A new modular device (magicTube) has been developed as a modular add-on module for motorized bone lengthening nails, which allows bifocal segmental bone transport and doubles the transport rate.

Methods: The force from the moving transport cylinder of the lengthening nail is transferred with a cable system in push and pull forces, which move the transport segments from proximal and distal into the defect until they have contact. With this construct, a typical stroke of 1 mm from the lengthening nail per day allows for 2 mm bone transport per day in total (Fig. 1). The custom-made device consists of a slotted tube with locking holes, which is connected to a commercially available bone lengthening nail. Other components that are added are a cable jammer tip and a glider tip. The bone is stabilized with the motorized nail and the slotted attached modular tube. The tibia is osteotomized proximally and distally (drill hole osteotomy). A cable system connects the osteotomized bone segments with the transport nail (glider and jammer tip). A 39-year-old patient with a 17-cm bone defect after a AO42-3B fracture covered with a free flap was stabilized with the new modular device and a motorized nail (stroke 10 cm). After bifocal osteotomy, the length of the proximal main segment was only 3 cm, the length of the distal main segment was 6.5 cm.

Results: The system could be installed successfully with its components. The transport was started after a week with an external magnetic device (controller), which was activated 4 times per day. The cable push and pull system worked properly. Bone formation was assessed on follow-up radiographs and in ultrasound controls. Surgical revisions included stabilization of the short proximal main segment and readjustment of the pulley system. The patient was partially weight-bearing. There were no signs of infection and the patient had normal neurovascular function.

Conclusion: This is to our knowledge the first case of an all-internal bifocal bone transport. The double osteotomy can help to reduce transport time and duration of treatment. More cases are needed to get more experience.