

First humerus lengthening osteotomy with a magnet-operated intramedullary nail in Switzerland – a preliminary case report

Ghafoor H, Krieg AH, Gehmert S
Department of Orthopedic Surgery
University Children's Hospital of Basel

Introduction

Distraction osteogenesis is an appreciated technique to correct limb shortening of various etiologies. An external fixator is commonly used to ensure 3D dimensional correction and lengthening. Indications for the upper limb include length discrepancy >5 cm, congenital humeral varus deformity, post-infections growth arrest, posttraumatic growth disturbances or formation of bone cysts, achondroplasia and neoplasms. However, intramedullary devices have been showing similarly good results over the last decade providing a more comfortable distraction procedure with reduced risk of infection at the same time. We provide evidence for the first case of humerus distraction by off-label use of an intramedullary femoral lengthening nail in Switzerland.

Purpose

To present the first case of humeral lengthening and operative technique using a magnet-operated intramedullary nail in Switzerland.

Methods

A 13-year-old girl with humeral shortening of 5 cm resulting from traumatic upper plexus palsy of the right arm during birth was treated with humeral osteotomy and implantation of a motorized intramedullary nail (PRECICE®, Ellipse Technologies, Irvine, CA, USA) for gradual lengthening. Individualized lengthening was performed using varying distraction rate with regard to nervous tissue.

Surgical technique

A lateral trans-deltoid approach was used to visualize the humeral head with the lateral insertion of the rotator cuff. The anticipated entry point for the nail was identified with a K-wire under fluoroscopy. Reaming was performed with increments of 0.5 mm until reaching a diameter of 10.5 mm at the planned level of the osteotomy 6 cm distal to the humeral head. Steinmann pins were placed distal and proximal to the side of osteotomy and used for rotational correction for both mobile fragments. A lateral incision was used to perform the multiple drill hole osteotomy which was completed with a 10 mm chisel. The reaming of the medullary cavity distal to the osteotomy was accomplished to the desired diameter of 10.5 mm. The nail was inserted below the planned depth due to the significantly reduced lateral cortex. One of the proximal interlocking screw provided by the manufacturer was replaced by a T2 5.0 mm fully threaded femoral locking screw (Stryker, Kalamazoo, MI, USA) for better stability. Intraoperative lengthening of the nail for 1 mm under fluoroscopy assured appropriate function of the implant.

Results

The humeral lengthening of 5.2 cm was successfully achieved after 77 days without complications. The range of motion for the elbow and shoulder joint did not decrease during the lengthening or the current follow-ups. Implant removal will be performed after consolidation. Subtotal consolidation was achieved 5.5 months after implantation and 3 months after end of distraction.

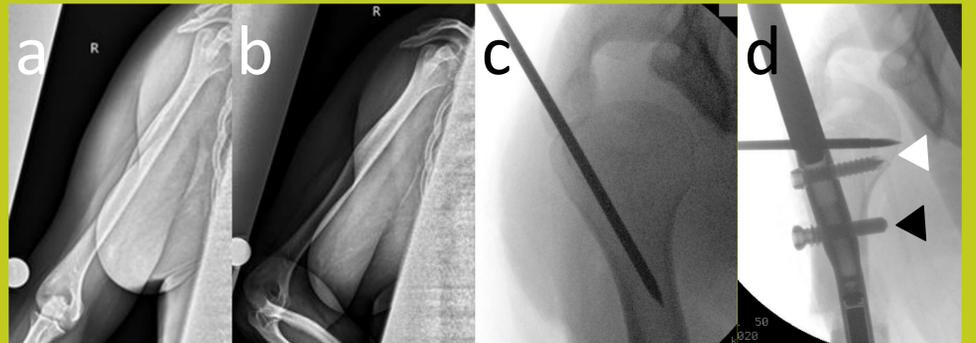


Fig. 1: AP and lateral radiographs before surgery (a,b). Entry point was identified under fluoroscopy using a lateral trans-deltoid approach (c), followed by reaming, drill hole osteotomy and nail insertion (d). A T2 5.0 mm fully threaded femoral locking screw (▲) was used instead of nail system provided screw (▲) due to lack of stability.

Discussion

Short-term results for humeral lengthening using the PRECICE nail are promising, even though it is currently used off-label. Major advantages over external fixator are the comfortable distraction procedure due to the intramedullary nail position and absent risk for pin infection accompanied by soft-tissue tethering and broad scars. However, intramedullary devices have their own specific complications such as nail fracture, premature ossification and failure in distraction (“runaway nail”) requiring an additional surgery.

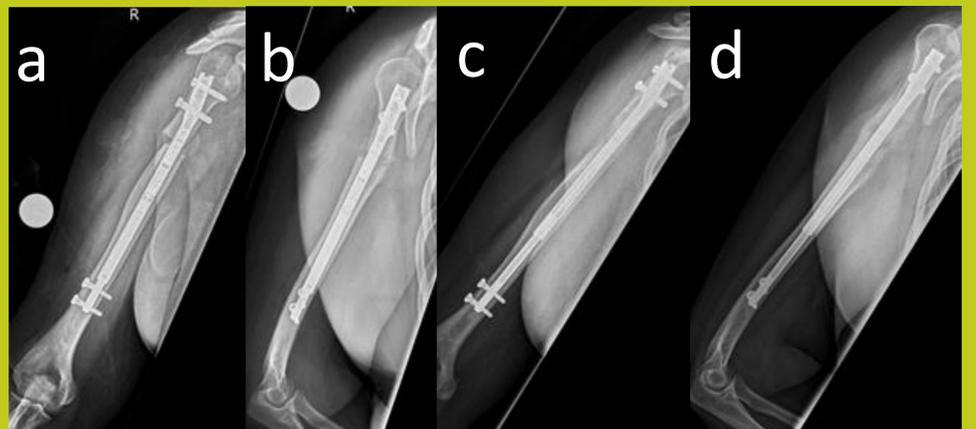


Fig. 2: AP and lateral radiographs after surgery (a,b). Radiographs in AP and lateral view after distraction demonstrate a successful lengthening of 5cm and consolidation after 5.5 months (c, d).

Conclusions

This is the first case of an intramedullary motorized femoral nail which was used for humeral lengthening in Switzerland. No intra- or postoperative complications occurred and the patient could perform lengthening in an out-patient clinical setting. Intramedullary lengthening of the humerus with a motorized nail might be an appropriate alternative to external fixators.

References

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