

Case report

Intramedullary magnetically actuated limb lengthening in a patient with congenital humeral limb shortening[☆]



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ARTICLE INFO

Article history:
Accepted 17 April 2016

Keywords:
Leg length discrepancy
Automatic lengthening
PRECICE[®] nail
Humeral lengthening

ABSTRACT

The treatment of leg length discrepancy has become a common procedure in orthopaedic surgery. However, lengthening of humeral deformities is still infrequent.

The purpose of this case report was to present humeral lengthening with a new intramedullary lengthening device (PRECICE[®] P2 for tibia) in a 32 year old female patient with congenital shortening.

Hereby the telescopic device presents a promising tool for humeral limb lengthening with excellent outcome at short-term in this case.

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Background

Lengthening of humeral shortening is an infrequent procedure compared to lengthening of the lower extremity. This might be caused by the fact that minor humeral shortening rarely creates either a functional or cosmetic handicap. However, there have been case reports showing that unilateral upper limb shortening can cause severe problems to the patient, like persisting pain e.g. and even dramatically influencing patient's quality of life.

The most common causes for humeral shortening are osteomyelitis or growth plate arrest caused by a tumour disease [1–3]. Benefits of humeral lengthening include improvement of life quality, of sports and daily activities and even a better self-image. However, complications with humeral lengthening are reported in literature including radial nerve palsy, limitation of joint movement and pin infections, e.g. [4]. Although the humeral bone is surrounded by neurovascular structures, the procedure is described in literature as a satisfactory option with only temporary minor complications [4].

The method of lengthening changed over time from using external fixators like the Ilizarov frame [5] to intramedullary lengthening with the Fitbone[®] Nail presented by Kold [6].

The magnet-driven internal lengthening device is a novel technology and literature regarding its safety, efficacy, reliability, patient satisfaction and complication rates is rare [7,8]. To the best of our knowledge this is one of the first cases of humeral lengthening been presented in literature with a magnet-driven internal lengthening device.

Case report

We are reporting the case of a 32 years old female patient with congenital shortening of the left humerus. Initially the patient presented with a limb length discrepancy of 5 cm at our outpatient deformity clinic in May 2015. The patient complained of discomfort as well as of restriction of daily activity caused by the limb shortening. We therefore decided to implant a telescopic tibial nail for lengthening.

The surgical approach was as done like in typical antegrade humeral nailing for fractures using the standard anterolateral transdeltoid approach. The supraspinatus tendon was split in line with the fibres to preserve rotator cuff function. The entry point of the nail was marked under fluoroscopy. Reaming was done stepwise in 0.5 mm increments up to the size of 11 mm. Then the osteotomy was predrilled through a minimal lateral approach at the border of the proximal to the middle third of the humerus and the osteotomy was completed with a chisel avoiding rotation. Next the PRECICE[®] tibial nail (8.5/195 mm) was inserted and interlocked (2 proximal and 2 distal bolts). In addition bone graft harvested from the reamer heads was placed at the osteotomy site.

[☆] Investigation performed at the Department of Trauma Surgery, Medical University of Vienna, Vienna General Hospital, Vienna, Austria.

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Fig. 1. Radiographs of lengthening over time.

Intraoperatively the nail was lengthened for 2 mm under fluoroscopy to prove function of the lengthening mechanism (Fig. 1). The surgery was completed without postoperative complications.

Lengthening was further continued at day 5 (at a maximum rate of 1 mm per day/2 times 0.5 mm) and evaluated by X-rays twice before patient's discharge. The patient performed lengthening procedure by herself with the external remote controller after instruction. After discharge the patient was followed-up weekly during the distraction phase.

After reaching the lengthening goal the follow-up visits were scheduled every two weeks according to the new callus formation and latter every four weeks till complete bone healing is seen. The patient was instructed to do physiotherapy shortly after nail implantation to regain normal shoulder function.

Three weeks after nail implantation X-rays showed stopping of the distraction. Immediately a lengthening of 2 mm was performed at our department under radiological control proving the intact nail function. The patient was again instructed how to perform the lengthening process and the area of the magnet was marked under fluoroscopy on her skin. The lengthening process was further completed without any complications.

After 5 months full callus formation was seen in three cortices (Figs. 2 and 3a,b), the patient's shoulder movement was comparable to the movement prior to surgery (Fig. 4a–d) and final full weight bearing was possible without pain (Fig. 5a–c). The patient was extremely satisfied with her clinical result and presented with an improved outcome according to the pre and post operative evaluated SF36 (Table 1). Only in one item, the

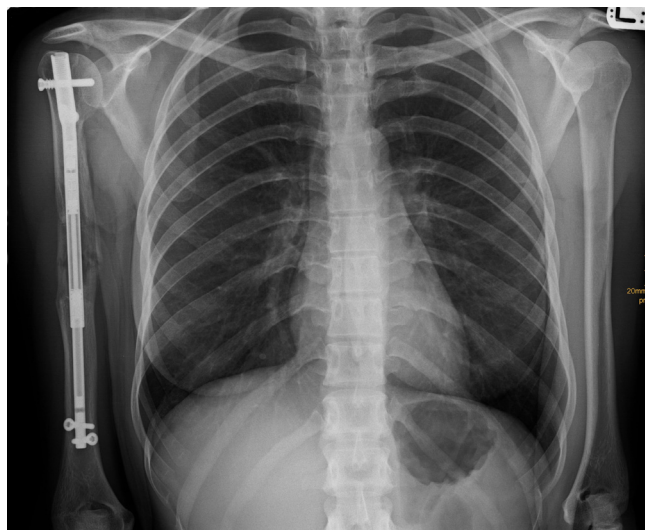


Fig. 2. Radiographs in a/p view with bony healing after complete lengthening.

role physical index, the score decreased compared to the pre operative level.

Discussion

Lengthening of humeral length discrepancies is still infrequent. However this newly developed telescopic intramedullary implant has made this lengthening procedure fairly simple.

Today, to the best of our knowledge, there are only few case reports on lengthening for humeral shortening. The largest existing case series used traditional circular external fixation devices with many problems and complications [5,9]. These included pin tract infection in nearly all patients and radial nerve palsy [9]. In another study by Cattaneo et al. there were seven fractures in six patients

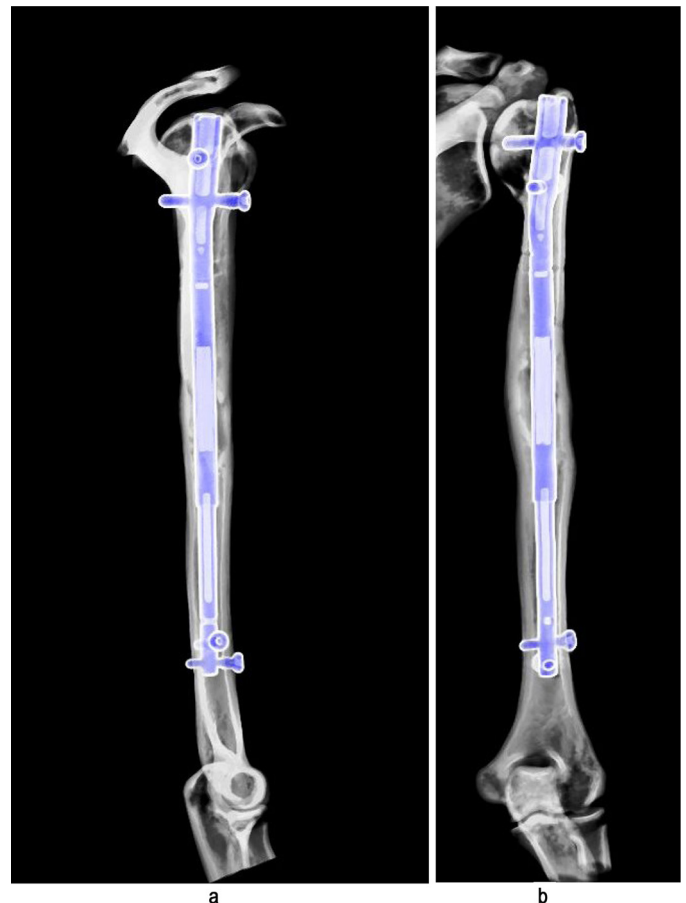


Fig. 3. (a) Shows 3D-CT in ap view with complete bony healing 9 months postoperatively. (b) Shows 3D-CT in lateral view with complete bony healing 9 months postoperatively.

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