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Technical note — The reamed unlocked 316L stainless steel femoral Küntscher nail is breakage resistant

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Much controversy exists about the reliability of cheap implants, often the only ones affordable in low income countries. Between August 1, 2021, and August 1, 2023, 110 patients were treated with a reamed unlocked 316L stainless steel Küntscher nail for a fracture of the femoral shaft in Mutoyi Hospital, Mutoyi (Gitega), Burundi. Not a single breakage occurred. Minimal bending (9°) without the need of a reoperation occurred in 2 cases (1,8%). Migration necessitated a small reintervention for a single nail (0,9%).

Keywords: Fractures of the femoral shaft, reamed unlocked 316L stainless steel intramedullary Küntscher nail, resistance to breakage.

INTRODUCTION

Küntscher[1] in 1940 promoted a stainless steel hollow slotted nail, cloverleaf shaped on cross-section (Fig.1, inset). He admitted that bending and breakage were possible, mainly if a too thin nail had been used[2]. This is why he insisted on reaming.

The authors exclusively focused on the mechanical reliability of this affordable nail, in order to evaluate its utility in low income countries.

METHODS

The inclusion criteria were: closed fracture of the femoral shaft, open fracture Gustilo-Anderson type I or II, age above 16, and a minimum follow-up of 6 months. The exclusion criteria were: open femoral shaft fractures Gustilo-Anderson III, pathologic fractures and polytrauma.

Open nailing was the technique used (Fig.1). The proximal and the distal fragment were progressively reamed, if possible up to 13 mm. A classical 316L stainless-steel Küntscher nail (Narang Medical, New Delhi), 1 to 2 mm thinner than the maximal reaming diameter, was driven in a retrograde way through the proximal fragment and a small skin incision. Subsequently the nail was driven into the distal fragment. A guide pin was not used. Mobilization was started as soon as possible within pain limits.

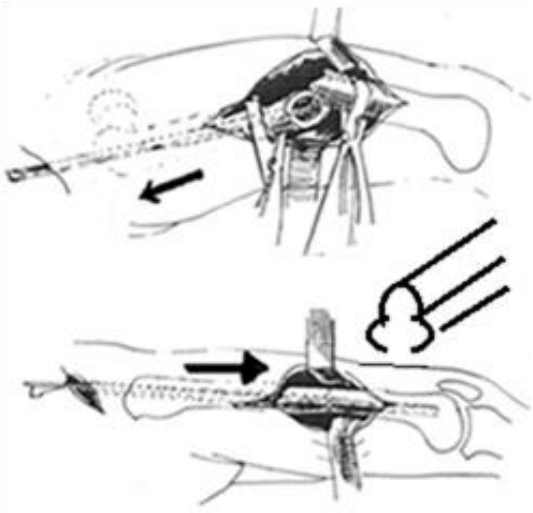

Fig. 1 — Open nailing technique. Inset: slotted clover-leaf nail. Courtesy Prof. J.C. and Prof. M. Mulier.

All 110 patients were seen back after 6 to 30 months. The functional results were evaluated according to the score of Klemm and Börner[3].

RESULTS

A total of 110 patients with a mean age of 39,42 years (range: 17 to 73 years) met the study criteria. There

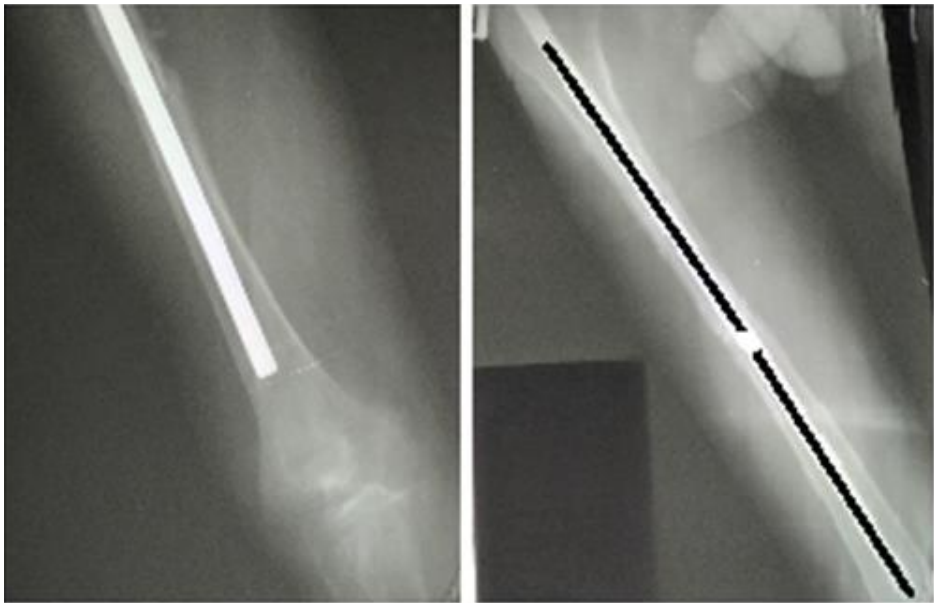

Fig. 2 — Left: healed fracture. Right : slightly bent nail: 9°.

were 65 men and 45 women (M/F: 1,44/1). A road accident was the cause in 76 cases (69%) and a fall from a height in 34 cases (31%).The majority of the fractures was closed: 105 or 95,45%; 5 or 4,54% were open fractures Gustilo type I or II. Ten or 9,1% of the fractures were situated in the proximal third of the femur, 88 or 80% in the middle third, and 12 or 10,9% in the distal third. The 88 fractures in the middle third were distributed as follows: Winquist type I: 30%; type II: 30%; type III: 39,4%; type IV: 0,6%.

All patients were treated with a reamed 316L stainless steel Küntscher nail from the same factory. Its diameter was 9mm in 10 patients, 10mm in 15 patients, 11mm in 60 patients, and 12mm in 25 patients. The operation took 45 minutes in 90% of the cases, and 60 minutes in 10%. Postoperatively mobilization was started, at first with crutches; with weight-bearing as soon as tolerated. All patients were checked clinically and radiologically at regular intervals with a minimum final follow-up of 6 months.

Consolidation of the fracture occurred in 109 out of 110 cases or 99% (Fig. 2, left.). No shortening was noted in 106 cases (96,4%), and a shortening of 1 to 5 cm in 4 cases (3,6%). Infection was a problem in 8%; it led to chronic osteomyelitis in 7%. Not a single nail broke. Two nails or 1,8% got minimally bent (Fig. 2, right); healing occurred without replacement of the nails. One nail migrated proximally and was reduced through a small skin incision. At final follow-up the Klemm and Börner[3] score was excellent in 65% of the cases, good in 22%, and poor in 13%.

DISCUSSION

Zero breakage was noted, a finding which confirms that affordable materials can be trustworthy. Slight bending (9°) occurred in only 2 cases or 1,8%; they healed without replacement of the nail, which would have been the classical approach. Proximal migration of the nail occurred in a single case or 0,9%; the nail was reduced through a small incision without further problems.

The union rate was 99%. The infection rate was 8%, leading to chronic osteomyelitis in 7%, an unacceptable rate. This was probably due to the inclusion of patients with abrasions of the skin, a warning for the future. Shortening from 1 to 5cm occurred in 4 cases or 3,6%. These patients were treated with a shoe raise.

This study has several limitations: 1. fractures of the proximal and distal third of the femur were no good indications for an unlocked Küntscher nail, because it has a limited grip on the endosteum at these levels. However, the sophisticated locked implants for these levels are not always payable in a developing country; 2. the inclusion of Gustilo-Anderson I and II open fractures was risky; 3. the study was neither comparative nor randomized. This study also has an important strength: it proves that an affordable femoral intramedullary nail can be very efficient in a low income country.

CONCLUSION

The current study shows that a payable 316L stainless steel reamed unlocked Küntscher nail proved to be

perfectly reliable for the treatment of femoral shaft fractures.

Conflict of interest: The authors declare that they have no competing interests related to this work.

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