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Retrograde femoral nailing in elderly patients with supracondylar fracture femur; is it the answer for a clinical problem?

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Abstract *Background:* Supracondylar fractures of femur constitute 7% of all femoral fractures. In elderly patients, they are invariably low-energy fractures predisposed to by osteoporosis. Treatment of these fractures in the elderly is a challenging task for most orthopaedic surgeons. There is no consensus on what would be the ideal treatment for such cases. This study looks at the results of retrograde femoral nailing as a treatment option for this vulnerable group of patients. *Patients and methods:* This retrospective study looks at 23 elderly patients with supracondylar fractures of the femur treated by retrograde femoral nailing. Patients had an average age of 75 years (range between 65 years and 97 years). All patients were assessed with regard to operative time, blood loss, hospital stay, and postoperative complications. All patients were assessed clinically and radiologically every 6 weeks for average period of 14 months (range 12 to 18 months). *Results:* two patients died a few weeks postoperatively. Average operative time 70 minutes, average blood loss 350ml. Radiologically all cases united, 39.2% had angular malalignment. There were no cases of implant or fixation failure. *Conclusion:* Retrograde femoral nailing is a surgically limited and reliable procedure for elderly patients with supracondylar fractures of the femur without intra-articular extension. Although it has a high incidence of angular malalignment, the overall functional demands of this age group are perhaps not affected much by that particular complication.

Résumé *Background:* Les fractures supra condyliennes du fémur constituent 7% de toutes les fractures fémorales.

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Chez les patients âgés l'ostéoporose prédispose à ce type de fractures. Le traitement de ces fractures chez les patients âgés est difficile. Il n'y a pas de consensus sur le traitement idéal. Le but de cette étude est d'étudier les résultats sur l'enclouage fémoral rétrograde. *Patients et méthode:* les résultats d'une étude rétrospective de 23 patients présentant une fracture supra condylienne du col fémoral traitée par enclouage fémoral rétrograde ont été évalués. Les patients avaient un âge moyen de 75 ans (de 65 à 97) à l'intervention. Tous les patients ont été évalués en termes de temps opératoire, de perte sanguine, de durée moyenne de séjour et de complications postopératoires. Tous les patients ont été évalués cliniquement et radiologiquement toutes les 6 semaines sur une période de 14 mois (12 à 18 mois). *Résultats:* 2 patients sont décédés deux semaines après l'intervention. La durée moyenne opératoire a été de 70 minutes, les pertes sanguines moyennes de 350 ml. Radiologiquement tous les cas ont consolidé mais 39,2% avaient un cal vicieux. Il y n'y avait qu'un cas de faillite de l'implant. *En conclusion:* l'enclouage fémoral rétrograde est une technique sûre chez les patients âgés, présentant une fracture supra condylienne du fémur. Cependant il existe une fréquence relativement importante du cal vicieux mais la demande fonctionnelle des patients de cet âge n'entraîne pas de handicap particulier.

Introduction

Supracondylar fracture of the femur constitutes 7% of all femoral fractures [1]. In elderly patients, they are invariably low-energy fractures predisposed to by osteoporosis.

Treatment of these fractures in elderly patients is a challenging and difficult task for most orthopaedic surgeons, as the bone stock is usually poor and healing can be problematical. Treatment options vary from conservative to operative. Operative management has become the favourite option, as several studies have confirmed the superior results of surgical treatment compared to conservative management [4, 13]. However, operative treatment in-

volves using different implants—e.g. plating, nailing and (LISS)—with variable reported results.

It is not clear whether one implant is more reliable than another in achieving consistently good results in this vulnerable age group; there is no consensus on the ideal implant yet.

In this retrospective study, we look at the clinical and radiological outcome of using retrograde femoral nails to manage these fractures in the elderly population. We also compare this with the published results of other techniques used to fix this category of fractures.

Patients and methods

Between 1998 & 2002, 23 elderly patients with supracondylar fractures of the femur were treated using retrograde femoral nails at our hospital.

The average age was 75 years (range from 65 to 97 years) and included 16 females and seven males. Out of the 23 patients, 11 patients were independently mobile, ten patients were mobile with frame and two patients were immobile.

Three patients were on long-term steroid medication, one for rheumatoid arthritis and two for scleroderma. All fractures were closed, and none were pathological fractures. Fractures were classified according to AO/OTA, and included 18 A₁, 2 A₂, and 3 A₃.

All patients received three doses of prophylactic antibiotics (IV cefuroxime 1.5 g at induction, 750 mg at 8 and 16 hours postoperatively). All patients received anti-DVT prophylaxis in the form of low molecular weight heparin for an average of 10 days until they were fairly mobile.

All patients had closed nailing done through a limited medial parapatellar approach in the supine position. Biomet retrograde femoral nails (Biomet Merck Ltd, Bridgend, South Wales, UK) was used in all of them; all nails were size 11 or 12 mm.

In all patients, the nails were locked distally with two screws from lateral to medial and proximally with a single antero-posterior screw. In all patients the nail length was selected so that the proximal end of the nail would be opposite the lesser trochanter. No bone grafting was used in any of these patients.

All patients started passive followed by active range of knee movement at 48–72 hours postoperatively. Partial weight-bearing was permitted in all patients except one for the initial 6–8 weeks, followed by full weight-bearing thereafter. All patients but one had no external protection of the fixation in this study.

All patients were assessed with regard to operative time, blood loss, period of hospital stay and postoperative complications. Patients were followed up clinically and radiologically at 6 weeks and 12 weeks, then every 3 months for an average period of 14 months (range from 12 to 18 months).

Results

Out of 23 patients, two died a few weeks postoperatively from causes unrelated to their original injuries, leaving 21 patients for follow-up.

Perioperative results

Average operative time was found to be 70 minutes (range from 50 to 105 min). Average blood loss was 350 ml (range from 200 to 500 ml), and the average period of hospital stay was 14 days (range from 10 to 22 days).

Clinical results

Ten percent of patients had mild knee pain that was related to the surgical procedure. The average range of knee joint flexion at 6 weeks was 100° (range from 90° to 120°). General mobility remained the same as the preoperative level for all the patients. 30.4% of patients had average shortening of 1.2 cm (range from 1 to 1.5 cm). Mortality rate was 8% in the first year.

Radiological results

All cases united apart from the two who died a few weeks postoperatively. 60.8% of patients were fixed in normal alignment, whilst 39.2% had angular malalignment. Out of those with angular malalignment, 33% were in varus which had an average of 7° (range from 5° to 12°), and 66% were valgus which had an average of 5° (range from 3° to 10°).

There was no implant failure seen in this series. No fractures developed above the nail in any of the patients and there was no failure of fixation.

Post operative complications

One case developed a superficial wound infection which resolved with antibiotic treatment after 10 days.

Discussion

Elderly patients with supracondylar fractures of the femur constitute a challenging group for the treating trauma surgeon in relation to compromised general health, poor bone stock and poor tissue healing. Schatzker and Lambert in 1979 concluded that the older patient with osteoporotic comminuted bone presents a surgical challenge which is difficult to overcome, and in some cases clearly beyond the surgeon's capability [11].

Karpman and Del Mar in 1995 reviewed the functional outcome of 112 elderly patients with supracondylar fractured femur, and concluded "the optimal treatment for this type of patient remains elusive", even suggesting primary

above-knee amputation could be the preferred management for the severely affected cases [6].

Open reduction and internal fixation using extramedullary implants has been the standard treatment for supracondylar fractures, irrespective of age group, over the last three decades, with high complication rates including non-union rates of 7% and 19% [9, 16] and infection rates reported around 5% [9]. Also a stress-shielding and re-fracture rate of 10% was reported as a biomechanical disadvantage of extramedullary implants in this type of fracture [3]. Although the quoted papers did not ascribe these complications to elderly patients, it seems logical to assume that the complication rates will be the same if not higher in elderly patients.

The well-known biological and mechanical advantages of nailing as a technique of fixation in femoral fractures are ideally suited to this vulnerable age group, who are compromised because of their bone quality and their healing capacity.

Wu et al. looked at the results of antegrade intramedullary nailing in extra-articular distal femoral fractures, and compared it to plating, and found a superior union rate (90% compared to 79% for plating) and better range of knee movement [15]. However, Leung et al. concluded that in the most distal fractures the standard antegrade nails would not be able to provide adequate control [8]. In elderly patients there may be the additional problem of having an ipsilateral arthritic hip joint or hip implant, which would make antegrade nailing technically difficult as suggested by Kumar et al. [7].

The less invasive stabilisation system (LISS) developed over the last few years has been used for fixation of distal femoral fractures, in the hope that it will avoid all the usual complications associated with plating, based on its hypothetical biological and mechanical advantages.

In a review article about LISS that looked at results in several published studies, Schutz et al. in 2003 quoted an infection rate that ranged from zero to 4%, a delayed union rate ranged from 2.4 to 6.1%, and an implant failure rate that was up to 7% [12].

Schandelmaier et al., in an article about distal femoral fractures and LISS, concluded that the fatigue failure of the osteoporotic implant–bone construction is a problem in elderly patients [10].

Bong et al. conducted a biomechanical study on human cadavers to compare LISS and retrograde femoral nailing for fixation of a periprosthetic distal femur fracture proximal to a total knee arthroplasty. They concluded that the retrograde-inserted nail may provide greater stability for the management of periprosthetic supracondylar femur fractures [2].

Looking at our own results (in terms of low wound complication rate, 100% union after a maximum period of 3 to 6 months, and no fixation or implant failure), we compare favourably to other series that used extramedullary implants including the new LISS.

The short operative time, limited perioperative blood loss, and ability to mobilise patients early in this study are clear advantages which are of utmost importance in elderly

patients. Most of the studies using extramedullary implants in such fractures avoid commenting on these issues in detail.

In their study comparing DCS to retrograde nailing (RIN) in elderly patients with supracondylar fractures, Christodoulou et al. concluded that RIN is preferable to DCS in terms of lower blood loss and shorter operating time [5].

In our study we had a high incidence of angular malalignment (39.2%) compared with other reports using the same technique, such as Watanabe et al. [14], who had 12.5% incidence of angular malalignment. It is, however, noteworthy that patients involved in that particular report were younger than 60 years, and would therefore have a normally shaped inner medullary canal including the distal femoral metaphysis. The wide inner medullary canal and the barrel-shaped distal femoral metaphysis, typical of the osteoporotic elderly patients in this study, could account for this difference.

The main principles of fracture surgery in the elderly are limited and reliable surgical procedures, early mobilisation, early weight-bearing and restoration of pre-morbid level of patient mobility. Based on these principles, we believe that retrograde femoral nailing is perhaps the safest option for fixation of Type A supracondylar fractures of the femur in elderly patients.

Conclusion

Retrograde femoral nailing is a reliable and surgically limited procedure for elderly patients with supracondylar fractures of the femur that without intra-articular extension.

Although the technique has a high incidence of angular malalignment, the overall functional demands of this age group are not greatly affected by this disadvantage.

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