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Mid-term outcomes after intramedullary fixation of peritrochanteric femoral fractures using the new proximal femoral nail antirotation (PFNA)

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ABSTRACT

Background: Controversy persists concerning the preferred treatment of peritrochanteric femoral fractures. The purpose of the present study was to evaluate the mid-term outcomes of the newly developed implants – proximal femoral nail antirotation (PFNA) for the stabilisation of this type of fracture.

Methods: Between April 2006 and March 2008, 169 patients with peritrochanteric femoral fractures were treated with PFNA. As many as 26 patients were excluded from the study. According to the Orthopaedic Trauma Association (OTA) classification system, the remaining 143 fractures were classified as 19 cases of AO/OTA 31A1 fractures, 83 cases of 31A2 fractures, 28 cases of 31A3 fractures and 13 cases of 31A combined with proximal 32 fracture or separate proximal 32 fracture. The mean age of these patients was 67 years (range, 20–93 years). The operative time, the overall fluoroscopy time, the duration of hospitalisation and the surgical complications were noted. Patients were followed up for a mean of 21 months (range, 12–36 months). Functional outcomes were assessed according to the Harris hip scoring system.

Results: Fifteen patients (10%) required open reduction. The mean duration of surgery (from the beginning of close reduction to wound closure) was 72 min with a range between 45 and 170 min. The mean fluoroscopy time was 164 s with a range between 92 and 396 s. The mean time of hospital stay was 15 days. Postoperative X-rays showed a good or acceptable reduction in 134 cases (94%), and an ideal implant position in 131 cases (92%). There were 12 (8%) postoperative complications. All patients except one healed their fractures without any implant-specific complication (bending, breaking of the implant, cut out of the PFNA blade, femoral head penetration of the blade or ipsilateral fractures of the femoral shaft at the tip of the implant). The average time to bone healing was 16 weeks (range, 12–25 weeks). At the time of the latest follow-up, 106 patients (74%) were restored to their preoperative mobility. The mean Harris hip score was 84 points (range, 46–100 points). A total of 106 patients (74%) had an excellent or good outcome. According to the patients and/or their caregivers, outcome was described as satisfactory in 120(84%) of the 143 patients, and 36(90%) of the 40 patients, who were more than 80 years old.

Conclusion: The results suggest that PFNA is a very effective and safe method in the treatment of different patterns of peritrochanteric femoral fractures. The fixation is adequate to maintain reduction over time even in osteoporotic bones.

Rigid internal fixation combined with early mobilisation is considered as standard treatment for peritrochanteric femoral fractures. Although a wide range of techniques has been used, the functional results are sometimes unsatisfactory because of failure to heal or failure of fixation. The poor results are attributable, in part, to the implants used. Sliding hip screws, as well as blade-plates, dynamic condylar screws and the formerly used intramedullary devices are found to be problematic.[1,2,7,8,11–14,16,18,21,25,28,31] The preferred implant to stabilise peritrochanteric femoral fractures is still a matter of debate.

In June 2004, proximal femoral nail antirotation (PFNA) was put into clinic use for the first time in the world. To our knowledge, few published reports in the literature systematically assessed the role of the newly developed PFNA in the stabilisation of peritrochanteric femoral fractures on the basis of a study in a relatively large series. A retrospective clinical review of 143 cases of peritrochanteric femoral fractures treated with the PFNA was performed to define the results associated with its use.

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Materials and methods

Between April 2006 and March 2008, 169 patients with peritrochanteric femoral fractures who were treated at the Affiliated Hospital to Nantong University were enrolled in this study. This group was a subset of a consecutive series of 201 peritrochanteric femoral fractures treated by the authors, of which 27 were stabilised by the dynamic hip screw (DHS) and five were treated non-operatively. Indications for the PFNA stabilisation included AO/OTA 31A fractures, AO/OTA 31A combined with 32 fractures and separate proximal 32 fractures. Of the 169 fractures stabilised with PFNA, 18 were lost to follow-up. Eight patients died within 12 months because of different causes, which were unrelated to the implant. The remaining 143 patients made up the study group.

There were 70 men and 73 women. As many as 75 injuries involved the left side, and 68 involved the right side. The mean age of the patients was 67 years (range, 20–93 years). A total of 101 injuries were caused by a fall from a height; 23 by a fall from a greater height; and 19 by a motor-vehicle accident. As many as 21 patients sustained at least one additional injury; these associated injuries included two pelvic fractures, five closed head injuries, nine chest injuries and 12 other injuries involving an upper extremity.

According to the OTA classification system,[9] fractures were classified as 19 cases of AO/OTA 31A1 fracture, 83 cases of 31A2 fracture, 28 cases of 31A3 fracture, eight cases of 31A combined with 32 fracture and five cases of separate proximal 32 fracture. A1 fractures are simple, two-part fractures, whereas A2 fractures have multiple fragments. A3 fractures include reversed oblique and transverse fracture patterns. The distinctive characteristic of A3 fractures is a fracture line that extends through the lateral femoral cortex distal to the vastus ridge of the great trochanter.[27] With regard to co-morbidities, according to the American Society of Anesthesiologists (ASA) scale, 56 patients were classified as ASA 1, 61 patients were classified as ASA 2 and 26 patients were classified as ASA 3.[4]

All patients were evaluated preoperatively with use of two standard plain radiographs, an anterior–posterior radiograph and a medial–lateral radiograph. The operative time, the overall fluoroscopy time, the duration of hospitalisation and the surgical complications were recorded. The overall time from injury to surgery averaged 3 days (range, 1–11 days). Prophylactic antibiotic treatment was not used preoperatively and intra-operatively. Surgical treatment was performed as soon as the patient's general medical condition allowed. The intra-operative time was recorded from the time that the close reduction was started to the time that the wound was sutured closed.

Surgical techniques

The patient was positioned supine on an extension table. The unaffected leg was abducted as far as possible and placed on a leg support, so that it allowed free fluoroscopic examinations. Adducting the affected leg by 10–15° favours the access to the medullary cavity. Closed reduction was performed under image intensifier control. In the majority of these cases, good reduction could be obtained by both adducting and internally rotating the affected leg under traction. Once the result was satisfactory, a 5-cm incision was made approximately 5-cm proximal from the tip of the greater trochanter.

The correct entry point and angle were essential for a successful result. The guide wire should be inserted on the tip or slightly laterally of the greater trochanter at an angle of 6° to the intended extension of the medullary. Occasionally, this procedure was rather difficult when there was a 'floating' greater trochanter or the reduction could only be maintained with the affected leg abducted. The femur was opened by power tool at high speed or carefully by hand. To prevent dislocating the fracture fragments, lateral movements or excessive compression forces were avoided. After mounting the nail on the radiolucent insertion device, the nail could be introduced manually into the femoral shaft. It was not a problem when there was a fracture line at the entry point, but sometimes the fracture fragments dislocated after nail insertion, mainly due to the incorrect entry point. Via the aiming arm, the guide wire for the PFNA blade was introduced into the femoral neck in such a way that the PFNA blade would be placed into the lower half of the neck on the AP view and centrally on a lateral view. Care should be taken to avoid the fracture line on the lateral aspect of subtrochanteric area during the guide wire insertion. Unlike the insertion of the hip screws of PFN, the PFNA blade was inserted by hammering. Simmermacher et al.[30] did not think reaming of the femoral neck was necessary in osteoporotic bone. Nevertheless, we advise to ream the femoral neck in every case, otherwise dissociation of the fragments may occur during the helical blade insertion (Fig. 1). After reaming of the femoral neck, the guide wire for the helical blade was sometimes pulled out along with the reamer. It was necessary to reassure the position of the reinserted guide wire under image intensifier (Fig. 2). Distal

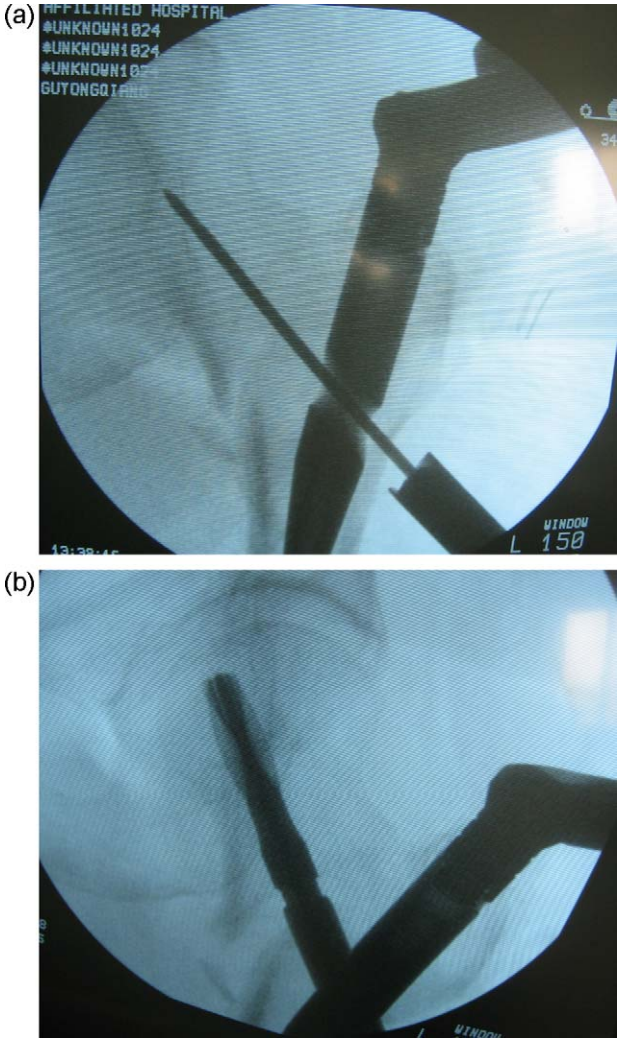

Fig. 1. A 72-year-old patient sustained a type 31A2 fracture. The PFNA blade was inserted without reaming of the femoral neck. (a) Insertion of the guide wire for the PFNA blade. Note the fracture was anatomically reduced. (b) The PFNA blade had been inserted into the femoral head and caused dissociation of the fragments.