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Original article

The Asia proximal femoral nail antirotation versus the standard proximal femoral antirotation nail for unstable intertrochanteric fractures in elderly Chinese patients



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ABSTRACT

Background: The best options of internal fixation for unstable intertrochanteric fractures in elderly Chinese patients remain controversial. The Asia proximal femoral nail antirotation (PFNA-II) was specifically designed for Asian patients, which could be more effective than the regular proximal femoral nail antirotation (PFNA). Compared to PFNA, whether PFNA-II is associated with shorter operative time and lower rates of complications is unknown.

Hypothesis: The rate of complications using PFNA-II is lower than PFNA for the treatment of unstable intertrochanteric fractures in elderly Chinese patients, and the operation using PFNA-II is quicker.

Materials and methods: Between June 2008 and December 2011, 188 patients with unstable intertrochanteric fractures treated with the PFNA-II ($n = 118$) or PFNA ($n = 70$) were retrospectively evaluated. Follow-up evaluations were performed at 1, 3, 6, 9 and 12 months, and every year thereafter. According to residual valgus-varus deformation, the quality of the fracture reduction was graded as poor ($>10^\circ$ deformation), acceptable (5° to 10° deformation), or good ($<5^\circ$ deformation). The operative time, intraoperative blood loss, overall time of fluoroscopy, blood transfusion volume, postoperative drainage, length of hospital stay and postoperative complications were recorded.

Results: The mean operative time in the PFNA-II group was significantly shorter than that in the PFNA group (66.25 ± 13.15 vs 79.50 ± 21.12 minutes; $P < 0.05$), intraoperative blood loss was smaller (131.86 ± 69.16 vs 162.14 ± 66.18 mL; $P < 0.05$), and fewer local complications were observed (25% vs 46%; $P < 0.05$). There was no significant difference in the postoperative blood transfusions, overall time of fluoroscopy, postoperative drainage, length of hospital stay, fracture reduction, the position of the implant and tip apex distance between the two groups. At follow-up, no significant difference was found between the two groups in Harris hip score (HHS) (86.19 ± 6.53 vs 85.27 ± 5.47 ; $P > 0.05$), visual analogue scale (VAS) (0.87 ± 0.85 vs 0.97 ± 0.87 ; $P > 0.05$).

Discussion: Due to its special design for the Asian population, PFNA-II offers a better match with the Chinese people's proximal femur anatomic structure. This study showed that the rate of complications using PFNA-II is lower than PFNA for the treatment of unstable intertrochanteric fractures in elderly Chinese patients, and the operation time is shorter.

Level of evidence: Level III, case control study.

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1. Introduction

Intertrochanteric fractures are relatively common among the elderly, 90% of such fractures occurring in persons aged over 65 years [1]. Most elderly patients with intertrochanteric

fractures have osteoporosis [2]. This type of geriatric fracture has a relatively high mortality and causes severe impairment of function [3]. Common treatment options for Chinese patients include intramedullary nailing with either the proximal femoral nail antirotation or Asia proximal femoral nail antirotation, both of which represent the most commonly used implants for the treatment of unstable intertrochanteric fractures [4–8].

The proximal femoral nail antirotation (PFNA) was used in clinic for the first time in 2004. It is an original intramedullary device which contain a helical blade inserted by impaction to result in bone

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compaction around the blade to retard rotation and varus collapse [9]. Several studies showed few complications and positive results with PFNA for unstable intertrochanteric fractures [10–12]. However, the proximal end of the nail was not matched with the specific anatomy of some short elderly patients. Further modifications of the nail are necessary for the elderly Chinese population, intra- and postoperative complications, such as difficulty inserting it, pain in the hip and thigh, lateral blade migration, femoral shaft fracture, and lateral cortex splitting intraoperatively, have been reported since it began being used in Asian patients [4,13]. In response to these concerns, AO/ASIF developed the Asia proximal femoral nail antirotation (PFNA-II) specifically for Asian patients. Although both nails have been reported to have good clinical outcomes, no study has compared the outcomes of the PFNA and PFNA-II. Therefore, we conducted a case control study to assess if the PFNA-II was associated with shorter operative time and lower rates of complications. We hypothesized that the rate of complications using PFNA-II is lower than PFNA for the treatment of unstable intertrochanteric fractures in elderly Chinese patients, and the operation using PFNA-II is quicker.

2. Patients and methods

2.1. Patients

From June 2008 to December 2011, all patients with unstable intertrochanteric fractures were treated with a PFNA or a PFNA-II (Synthes GmbH, Oberdorf, Switzerland) in our hospital. The study was approved by the Ethics Committee of The Second Hospital of Anhui Medical University. All patients have provided their written informed consent to participate in this study. We did not conduct our clinical investigations outside of our country of residence.

The PFNA or PFNA-II was chosen according to surgeon preference and availability of the device. Patients eligible for the study were at least 60 years of age. Exclusion criteria included pathological intertrochanteric fractures, open fractures, multiple fractures, presence of degenerative osteoarthritis/arthritis in the injured hip and severe concomitant medical condition (grade V on the American Society of Anesthesiologists [ASA] scale) [14]. All the patients' records, including gender, age, body mass index (BMI), ASA class rating and fracture type according to AO/OTA classification, were complete.

2.2. Surgery and rehabilitation

Surgery was carried out under general anaesthesia. A fracture table and image intensifier were used in all cases. The PFNA was inserted without diaphyseal reaming, which was a solid titanium nail 170, 200 or 240 mm in length and 10 or 11 mm in diameter. The helical blade which attached to a particular inserter was introduced over the guide wire with hammer. While the introduction was finished, the helical blade could be fixed to prevent rotation. The PFNA could be distally fixed either statically or dynamically. Somewhat differently, the PFNA-II nail used in the study is a solid titanium nail that is 170 or 200 mm long and 9, 10, or 11 mm in diameter. The surgical procedure was the same as the one used for the standard PFNA [6,10].

Postoperatively, analgesic care and diet were related to local standards and equal for both groups. Antithrombotic prophylaxis was administered using low-molecular-weight heparin (Lovenox 40 mg) for 3–5 days, and all patients received prophylactic antibiotics (Cefotiam 4.0 g) for 3 days. As the importance of rehabilitation, patients were encouraged to move the hip, knee and ankle joints on the first postoperative day and partial weight bearing was allowed with the aid of crutches on the following day.

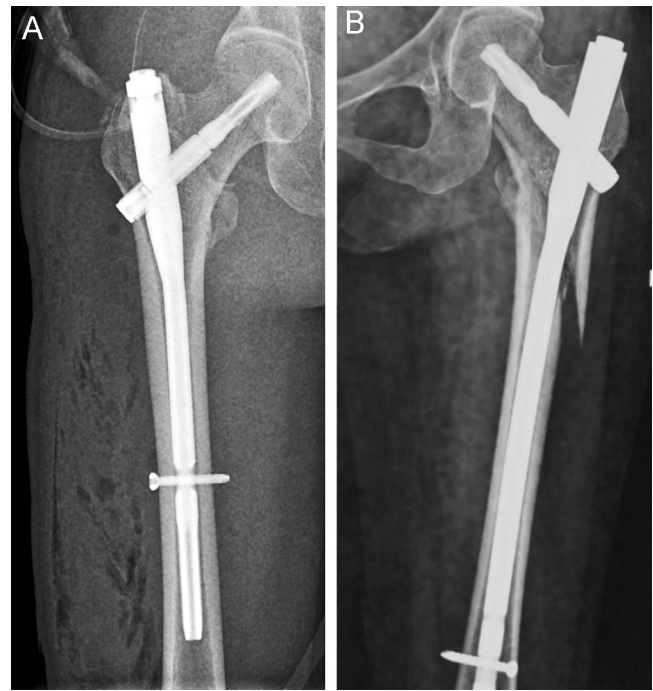


Fig. 1. A: anteroposterior hip radiographs of intertrochanteric fracture treated with PFNA. B: anteroposterior hip radiographs of intertrochanteric fracture treated with PFNA-II.

2.3. Method of assessment

Follow-up evaluations were performed at 1, 3, 6, 9 and 12 months, and every year thereafter. The operative time, blood loss during surgery, amount of transfused blood, overall fluoroscopy time, postoperation drainage, duration of hospitalization, postoperative complications, and assessment of nail handling for Asia proximal femoral nail antirotation were compared with those of proximal femoral nail antirotation.

Plain anteroposterior and lateral radiographs were obtained at each visit (Fig. 1). At the last follow-up, the degree of pain was measured by visual analogue scale (VAS) and the functional outcome was evaluated on the basis of Harris Hip Score (HHS) [15]. The radiographs of affected hip were achieved in the AP. The mediolateral planes at every follow-up visit, the extent of fracture and any changes in the position of the implant were noted.

The quality of the fracture reduction was graded as poor ($>10^\circ$ varus/valgus), acceptable (5° – 10° varus/valgus), or good ($<5^\circ$ varus/valgus). The position of the implant was graded as optimal if the blade was placed into the centre of the neck on a lateral view and lower half on a AP view [6]. Which was graded as suboptimal if the blade was not placed into the centre of the neck on a lateral view or lower half on a AP view.

2.4. Statistical analysis

Statistical analysis was performed using SPSS statistical package, version 16.0 (SPSS Inc., Chicago, IL, USA) for Windows. Quantitative variables were analysed using the Student's *t*-test and categorical variables were analysed by the χ^2 test or Fisher's exact test where appropriate. The level of statistical significance was set at a two-sided *P*-value of 0.05.

3. Results

Between June 2008 and December 2011, 188 elderly Chinese patients with unstable intertrochanteric fractures were treated

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