Original articles

Minimally invasive percutaneous compression plating versus dynamic hip screw for intertrochanteric fractures: a randomized control trial

*Cheng Qiang, Huang Wei, Gong Xuan, Wang Changdong, Liang Xi, Hu Ning**

【**Abstract**】**Objective:** Intertrochanteric femur fracture is a common injury in elderly patients. The dynamic hip screw (DHS) has served as the standard choice for fixation; however it has several drawbacks. Studies of the percutaneous compression plate (PCCP) are still inconclusive in regards to its efficacy and safety. By comparing the two methods, we assessed their clinical therapeutic outcome.

Methods: A total of 121 elderly patients with intertrochanteric femur fractures (type AO/OTA 31.A1-A2, Evans type 1) were divided randomly into two groups undergoing either a minimally invasive PCCP procedure or a conventional DHS fixation.

Results: The mean operation duration was significantly shorter in the PCCP group (55.2 min versus 88.5 min, $P<0.01$). The blood loss was 156.5 ml±18.3 ml in the PCCP group and 513.2 ml±66.2 ml in the DHS group ($P<0.01$). Among the patients treated with PCCP, 3.1% needed blood transfusions, compared with 44.6% of those that had DHS surgery ($P<0.01$). The PCCP group displayed less postoperative complications ($P<0.05$). The mean American Society of Anesthesiologists score and Harris hip score in the PCCP group were better than those in the DHS group. There were no significant differences in the mean hospital stay, mortality rates, or fracture healing.

Conclusion: Due to several advantages, PCCP has the potential to become the ideal choice for treating intertrochanteric fractures (type AO/OTA 31.A1-A2, Evans type 1), particularly in the elderly.

Key words: ***Hip fractures; Osteoporotic fractures; Surgical procedures, minimally invasive; Fracture fixation, internal***

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A high incidence of osteoporotic proximal femoral fractures among the elderly is a "modern epidemic" and is leading to severe medical and socioeconomic consequences as both life expectancy and population size are increasing.[1] Of all hip fractures, intertrochanteric fractures account for approximately 50%.[2] Ninety percent of these patients are over the age of 65 at the time of hip fracture and a large proportion already suffer from other major comorbidities.[3] Of all fall-related fractures, hip fractures cause the greatest number of deaths and lead to the most severe health problems and reduced quality of life. Maintaining the patients' quality of life is the treatment goal of intertrochanteric fractures, and remains a subject of great interest.

At present, the dynamic hip screw (DHS) serves as the standard and is the most common device for fixation of intertrochanteric femoral fractures.[4] For this conventional procedure, the lateral vastus muscle must be split broadly, which is associated with significant soft tissue damage and inevitable blood loss, both of which may worsen multiple

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Department of Orthopaedic Surgery, The First Affiliated Hospital, Chongqing Medical University, Chongqing 400016, China (Cheng Q, Huang W, Liang X, Hu N)

Outpatient Department, Chongqing Zhongshan Hospital, Chongqing 400000, China (Gong X)

Department of Biochemistry and Molecular Biology, Molecular Medicine and Cancer Research Center, Chongqing Medical University, Chongqing 400016, China (Wang CD)

*Corresponding author: Tel/Fax: 86-23-89011212, 86-18696761022, Email: 1276321387@qq.com

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existing comorbidities of elderly patients.[3] More importantly, relatively high failure rates (5%-20%) of re-displacement or collapse treated with DHS for unstable intertrochanteric hip fractures are reported.[5,6]

Minimally invasive surgery is gaining popularity in modern orthopedic trauma, as it has shown some potential benefits including decreased blood loss and postoperative pain, lower risk of postoperative morbidity and faster recovery of function.[7] These factors are particularly important for elderly patients to allow early weight-bearing and reduce related complications.[8] The percutaneous compression plate (PCCP) device, which was developed by Gotfried in the late 90's, is a relatively new system for the osteosynthesis of intertrochanteric hip fracture.[9,10] The design of the implant offers minimal operative trauma, and only requires two small (2 cm) incisions in order to insert a plate with a distal beveled end through the vastus lateralis muscle. The device provides rotational stability and compression of fractures by means of two telescoping neck screws of relatively small diameter (9.3 mm) and area (68 mm^2 each), as opposed to the single bigger screw used in the DHS. Lateral cortical support is conferred by a proximal extension of the locking plate. This minimizes soft tissue damage and blood loss, avoids excessive periosteal stripping and devascularization of fracture segments.[11]

There are only a few studies evaluating the efficacy of PCCP, and comparative studies are still inconclusive. This study aims to answer the following questions: Is there any difference in blood loss, transfusion, operation duration, incidence of postoperative comlications, length of hospital stay, fracture healing and Harris hip score between the PCCP and DHS groups?

METHODS

All study procedures were approved by the hospital ethics committee. All patients gave the required written informed consent preoperatively. The study only recruited patients with an intertrochanteric fracture who were mentally competent and gave their consent to participate.

Surgery using the PCCP device was introduced in our hospital in 2004. The first three years were considered the "learning curve" period, and patients treated at that time were not included in our study. A total of 152 elderly patients with intertrochanteric hip fracture were admitted to our department and were considered for this prospective, randomized and controlled trial during the period of October 2007 to February 2011. The acquisition of all patients was consecutive. Inclusion criteria were: (1) age of 60 years or greater; (2) an intertrochanteric fracture amenable to satisfactory reduction (type AO/OTA 31.A1-A2, Evans type 1); (3) ability to ambulate independently prior to the fracture with or without assistive devices.[12] Exclusion criteria were: (1) reversed oblique fractures (type AO/OTA 31.A3 or Evans type 2); (2) nonunion, pathological fractures, or the presence of metastatic disease; (3) bilateral hip fractures, previous ipsilateral lower-limb surgery, or contralateral hip fracture within the last year; (4) patients who required intensive care or treatment in other departments;[13] (5) patients with diabetes difficult to control. Randomization was done by nurses who drew a sealed, numbered envelope containing the treatment method for each patient prior to surgery. There were 133 patients who met these criteria, including 5 patients who used aspirin for many years. We replaced aspirin with low-molecular-weight heparin one week before surgery and stopped its use one day before surgery. No patient used warfarin or other anticoagulants for a long time. For the patients with diabetes, the surgeries were performed until fasting blood-glucose dropped to 7 mmol/L. No patient was excluded for death in the perioperative period. However, 12 patients could not be followed up postoperatively due to death from other diseases (2 cases) or changing residence (10 cases). Therefore, 121 patients were included in our study, of which there were 65 patients in the PCCP group and 56 in the DHS group. All the patients were followed up postoperatively for 15 months on average (range 6-26 months).

Baseline data included gender, age, injury mechanism, and fracture type according to the AO classification, main comorbidities and the American Society of Anesthesiologists (ASA) grade of operative risk.[14] We reviewed the AP films of the