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SMALL INCISION PFNA FOR THE TREATMENT OF FEMORAL INTERTROCHANTERIC FRACTURES

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Целью данной работы было оценить эффективность и целесообразность использования проксимального бедренного деротационного штифта (PFNA) при лечении пожилых пациентов с межвертельными переломами бедренной кости.

Метод: Проведен анализ лечения 35 пожилых пациентов с межвертельными переломами бедренной кости с использованием малоинвазивного остеосинтеза проксимальным бедренным деротационным штифтом (PFNA) в период с сентября 2013 по апрель 2015 года.

Результаты: Проведен анализ результатов лечения 35 пациентов в период 6 и более месяцев с момента операции. Полное восстановление функции поврежденной конечности без укорочения, смещения и несращения получено у всех 35 пациентов. У 30 пациентов получен отличный, у 5 хороший результат лечения.

Заключение: Использование технологии остеосинтеза межвертельных переломов бедренной кости проксимальным бедренным антиротационным штифтом у пожилых пациентов можно назвать идеальным методом. К преимуществам метода можно отнести простоту оперативного пособия, небольшой доступ, отсутствие интраоперационной травмы мягких тканей, быстрое восстановление, малое количество осложнений и высокая удовлетворенность пациентов результатами проведенного лечения.

Ключевые слова: малоинвазивность, проксимальный бедренный штифт, межвертельные переломы бедренной кости, интрамедуллярный остеосинтез.

Intertrochanteric fracture is a common fracture in the elderly, and the discussions on its treatment is very necessary for the early recovery of limb functions, reducing the trauma and the complications caused by prolonged bed rest and improving the quality of life. Due to osteoporosis, minor violent movements such as falls can cause fractures in the elderly. With the aging of the population in the society, there has been an increased incidence of femoral intertrochanteric fractures, (Ruecker, et al) [1], which is expected to double in 25 years. If not treated properly after fracture, the conditions will seriously affect the quality of life of the elderly patients, even endanger lives. According to the report in 1994 by Xu Jigang, among the 438 cases of femoral intertrochanteric fracture, the case fatality rate (CFR) of traction therapy was 6.1%, while the CFR of surgical treatment was 0.9%. Therefore, currently, the clinical treatment for femoral intertrochanteric fractures is mainly surgical treatment for better efficacy and lower CFR. [3] There are numerous various methods of the surgical treatment, and the close reduction combined with PFNA intramedullary fixation has become the common practice clinically because of its bio-mechanical and technological advantages.

35 cases of different types of femoral intertrochanteric fractures in senile people were admitted and treated with PFNA in our hospital from September 2013 to April 2015, and the results were satisfactory.

1. Clinical Data

1.1 General information: in the 35 cases of this study, 12 cases were male and 23 were female, with the average age of 78.6 years old (65-88 years old). The types of the fractures were divided with AO Classification of Fractures [5]: AO Type A1-2 cases, A2.1-5

cases, A2.2- 4 cases, A2.3- 20 cases, A3- 4 cases; also 10 cases with complications: high blood pressure- 10 cases, diabetes - 3 cases. The reasons of the fractures included falling (25 cases) and being twisted (10 cases), in which 3 cases were combined with wrist fracture. All the cases were performed with elective surgery, and the operation time was generally within 3-7 days after the injury, averagely 3.5 days.

1.2 Surgical methods: the cases with good cardiopulmonary function (30 cases) were performed with general anesthesia, and the cases with poor cardiopulmonary function and normal blood coagulation (5 cases) were given combined spinal-epidural anesthesia (CSEA). In this procedure, after effective anesthesia, each patient was in supine position on the orthopedic traction and surgery bed with proper traction. The injured limb was put in middle vertical position with inclination of 150°. With the guidance of C-arm X-ray, the incision point, location and incision size were determined. After the observation of the relocation conditions, after satisfactory relocation, the injured limb was then fixed. After routine sterilization, with surgical drape on the patient, the vertical incision of approximately 3cm was cut 5cm proximal from the vertex of the greater trochanter, the layers were then separated, and the fascia lata was cut open. With the index finger touching and locating the vertex, and place the 3.2mm guiding needle into the femoral medullary cavity with the vertex as the entry point, confirmed with the anteroposterior X-ray. Along the direction of the guiding needle, the proximal medullary cavity was expanded with the mating expansion device (diameter: 17mm). Then the main nail of PFNA with the right diameter was inserted into the medullary cavity. After adjustment of the depth of the main nail, drill the guiding needle in with the anteversion angle

of 150°. After confirming good location of the guiding needle at the lower 1/3 inferior the femoral head from the front and 1/2 in the femoral neck from the lateral view. After the length of spiral blade required was measured, the right spiral blade was selected, inserted and fixed. The distal fixation sighting device was then installed. According to the conditions of the fracture, the distal fixation screw nail was fixed with static or dynamic of distal fixation. For the cases of fracture of femoral shaft on the same side with dissatisfactory traction treatment and obvious dislocation, a small incision was cut in the fracture part of the femoral shaft to relocate the femoral shaft with temporal fixation. Then the previous surgical procedures were performed. For the similar cases with satisfactory fraction treatment, the incision should not be performed, and the patients should be given PFNA main nail with the guiding needle directly. With the guidance of C-arm X-ray, the PFNA location was confirmed to be good, the tip cap was then installed, and the wound was rinsed and sutured layer by layer.

1.3 Postoperative process: the patients were given 24h routine postoperative infection prevention treatment. On the day3, the patients presented pain reduction and started limb function exercises in bed. Patients with better recovery could start early activities on the floor. After 1 month, all the patients could perform activities on the floor step by step, until the full weight-bearing.

2. Results

Of all the 35 cases in this study group, the average incision size was 3cm (2.5-4cm), and the average operative time was 50min (45min-1.5h), and the average intraoperative bleeding was 150ml (100-200ml). All the patients presented primary healing of the surgical wounds, and were discharged day 12 postoperatively. There were no cases of death, deep vein thrombosis or exacerbation of cardio-cerebral diseases. The average follow-up period was 8 months (6-12 months), and the patients all presented bone healing with no shortening or malunion, no blade withdrawal or femoral cut. According to Huang Gongyi's Evaluation Standards [6], 30 cases presented excellent recovery, and 5 cases were good recovery, and the rate of good recovery was 100%.

3. Discussion

There has been a common agreement on the treatment for femoral intertrochanteric fracture: if there is no absolute contraindication, active surgical treatment should be performed. Currently, there are 2 types of surgical treatments for intertrochanteric fracture: extramedullary and intramedullary fixations. The previous method is represented by the application of dynamic hip screw (DHS), while the latter is mainly characterized by proximal femoral nail (PFN). DHS is better for stable fractures, while PFN is applicable for the severe comminuted unstable fractures. Because the bio-mechanical features of the PFN system are consistent with the biological loading line to support the majority load through the proximal femur, especially the inside. With the reduction of the compression stress of the femoral calcar area and the internal migration of the arm of force, the tension stress and compression stress at the junction of the nail is significantly reduced with a smaller stress shielding, so as to facilitate the healing of the fracture.

There are also some shortcomings of PNF:

1. it's difficult to insert 2 parallel screws correctly into the femoral neck, and 2 screws can cause bone degeneration with the risk of femoral head necrosis;
2. the screw nails in the femoral neck need bigger diameter of the drilling holes with more bone damage, therefore the patients with severe osteoporosis would have poor and unstable fixation;
3. the screws in the femoral neck may cause the Zigzag effect and then the failure of the internal fixation;
4. the intramedullary PFN nails with bigger radian and length are not applicable in patients with severe anterior arch of the femoral shaft. PFNA is the improvement and replacement product of PFN, and its main advantage is that the stability and resistance to rotation of the fixed part is achieved by the special design of spiral blades, and is applicable to various types of proximal femoral intertrochanteric fractures [7].

We also have the following experiences and understanding in this study:

1. the preoperative C-arm X-ray to locate the entry point can effectively reduce the size of the incision, hence to reduce the bleeding;
2. The key procedure is to insert the main nail into the medullary cavity: locating the vertex of the greater trochanter with the guiding needle under X-ray, all in the middle of the medullary cavity front and laterally with the confirmation of the X-ray, with the expansion along the guiding needle, as well as with the patient inclination of 150°; with all these points to facilitate the procedure, the main nail can be inserted smoothly;
3. The surgeons should have mental preparation for the size of the medullary cavity before the operation, with the narrow medullary cavity during the insertion of the main nail, and the process cannot be forced through to avoid the splintered intertrochanteric-femoral shaft fracture and the failure of the operation. In this situation, the main nail should be changed into one with smaller diameter with more expansion of the cavity;
4. Apply proper smooth spiral force with a small torsion during the entry of the screw blades, generally there is no risk of separation of dislocation of the femoral head and neck; if any concern, the Kirschner wire can be used for temporal fixation to control the rotation;
5. The operational procedures should be followed strictly with constant observation of the location of the fixations under X-ray during the operation; The blades should be fixed firmly after insertion, the internal fixation will be failed if there is any withdrawal.

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Objective To explore the method and the efficacy of small incision proximal femoral nail antirotation (PFNA) in the treatment of senile femoral intertrochanteric fractures. **Method** 35 cases of elderly patients with femoral intertrochanteric fracture treated with small incision PFNA from September 2013 to April 2015 were selected and compared in this study. **Results** With the follow-up period of at least 6 months, the 35 cases in this study presented complete recovery, with no bone shortening, dislocation or malunion. 30 cases presented excellent recovery, and 5 cases were good recovery, and the rate of good recovery was 100%. **Conclusion** PFNA is an ideal method of treatment for senile femoral intertrochanteric fracture, because of the advantages of simple operation, small incision, less injury, quick recovery, less complications and good curative effect satisfaction.

Key words: small incision; minimally invasive; PFNA; femoral intertrochanteric fracture; internal fixation.