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A prospective study of treatment of intertrochanteric fractures of femur by fixation with dynamic hip screw or proximal femur nailing

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Abstract

Purpose: Fractures of the proximal femur are more than ever, an important challenge in the field of traumatology. An anatomical reduction obtained at the expense of total devascularisation of the fracture is not a well-planned or well-executed procedure. One must always remember that any form of fixation is at best a splinting device with a definite life span and there is always a race between fracture union and failure of implant.

Aims & Objectives: The aim is to study the clinical and radiological outcomes in case of reduction and stabilization of intertrochanteric femur fractures through DHS or PFN. The objectives are to study the advantages and principles of reduction and stabilization methods by DHS or PFN fixation for the treatment of intertrochanteric fractures of femur, to study the range of motion of hip and knee joints and functional outcome, to study complications of the technique.

Material & Methods: After ethics committee clearance, subject recruitment procedure was followed. The sample size is total 100 cases with age between 18 to 100 years. The inclusion criteria include 1. Unstable intertrochanteric fractures with posteromedial comminution. 2. Patients with co-morbid conditions like diabetes, hypertension and ischemic heart disease. 3. All patients were ambulatory before the injury. The exclusion criteria include fractures other than intertrochanteric femur and non-ambulatory patients. Standard lateral approach was followed for the fixation of intertrochanteric femur fractures using dynamic hip screw or proximal femur nailing.

Results: Out of 100 patients (48 males and 52 females), we have follow up of 67 patients with intertrochanteric femur fracture between July 2013 to May 2016. Majority of the patients in our series were male (53.7%) compared to females (46.3%). The average of male patient was 56 years and that of female patients was 69.9 years.

Discussion: The mean Harris Hip Score of DHS is 89.07 and PFN is 89.00. Thus, there was no statistical significance for using DHS or PFN in per-trochanteric femur fractures.

Conclusion: Implant selection for the patients must be based on the ability of the implant to withstand long term cyclical loading, the implant should splint the entire femur to bridge other potential areas of unrecognized or future metastatic disease. One must develop mastery over the usage of the implant in a particular fracture and then one can convert that implant as Gold standard for that fracture.

Keywords: intertrochanteric, dynamic hip screw, proximal femur nailing

Introduction

Fractures of the proximal femur are more than ever, an important challenge in the field of traumatology. These fractures are one of the most common fractures occurring in the hip in the elderly as emphasized by Smith Peterson 'Human beings come in this world through pelvis and leave the world through broken hips'. An anatomical reduction obtained at the expense of total devascularisation of the fracture is not a well-planned or well-executed procedure. One must always remember that any form of fixation is at best a splinting device with a definite life span and there is always a race between fracture union and failure of implant. In the current century, due to increased life expectancy and increased expectancy of a better quality of life, the orthopaedic surgeons have a great challenge to face in treating proximal femoral fractures^[1]

The surgical management of these fractures has gone through an array of implants and surgeries. Many questions have been raised regarding the configuration of a perfect fixation device. Until recently, most of these fractures were treated by a sliding hip screw system. Since this device performed less well in unstable proximal femoral fractures with high rates of failure, intramedullary fixation devices using minimal invasive fracture fixation technique have become increasingly popular [2].

A skilled surgeon can treat these fractures with any type of fixation device as long as he remembers that the fixation device will never make up for surgical failures. Therefore improvement in the treatment of proximal femoral fractures will be predominantly in the hands of surgeons, rather than those of the implant industry.

Aims & Objectives

The aim is to study the clinical and radiological outcomes in case of reduction and stabilization of intertrochanteric femur fractures through DHS or PFN. The objectives are to study the advantages and principles of reduction and stabilization methods by DHS or PFN fixation for the treatment of intertrochanteric fractures of femur, to study the range of motion of hip and knee joints and functional outcome, to study complications of the technique with regards to clinical like wound dehiscence, infection, re-fractures, thigh pain, intra-operative blood loss, operative duration, limb length discrepancy and radiological like mal-union, non-union, shortening and post op collapse in DHS and PFN.

Material & Methods

After ethics committee clearance, subject recruitment procedure was followed. The sample size is total 100 cases with age between 18 to 100 years. The inclusion criteria include 1. Unstable intertrochanteric fractures with posteromedial comminution. 2. Patients with co-morbid conditions like diabetes, hypertension and ischemic heart disease. 3. All patients were ambulatory before the injury. The exclusion criteria include fractures other than intertrochanteric femur and non-ambulatory patients. Standard lateral approach was followed for the fixation of intertrochanteric femur fractures using dynamic hip screw or proximal femur nailing.

Results

Out of 100 patients (48 males and 52 females), we have follow up of 67 patients with intertrochanteric femur fracture between July 2013 to May 2016. Among those, 1 patient has expired during hospital stay due to cardio-vascular arrest and other 4 patients have expired due to natural causes. A prospective randomized study was done for the evaluation of results of this technique. All the cases were classified according to the A.O. classification, which is most accepted classification all over the world. All the operations were done either by consultants themselves or under their guidance. All the patients were followed up for an average period of 6 months. The results are evaluated on the basis of Harris Hip Score. This system is slightly modified according to the needs of the Indian patients .i.e. in place of “ put on shoes and socks” we have used “squatting” and in place of “sitting”, we have used “ cross legged sitting”. Most of our patients in the current series were old aged, the average age being 68.48 years. This means that the per-trochanteric femur fractures occur in the elderly people. Majority of the patients in our series were male (53.7%) compared to females (46.3%). The average of male patient was 56 years and that of female

patients was 69.9 years. This signifies that female patients are older than male patients in the series. The most common mode of injury in our series was fall while walking or slip in bathroom, which is a low velocity injury. Overall, it signifies that intertrochanteric femur fractures are caused mainly by low velocity trauma on osteoporotic bones. Also, female patients are more prone for this fracture due to trivial injuries (like slip in bathroom and fall from stairs), which may be because of post-menopausal osteoporosis. As far as implant usage is concerned, DHS was used in 46.3% of patients in our series and PFN was used in 50.7% of cases as shown in the Figures 1, 2 and 3. DHS+INTERFRAGMENTARY screw were used in 1 patient and PFN + bone graft was used in 1 patient. The average injury operation interval was 2.99 days. The delay in surgery was primarily because majority of the patients were of geriatric age group and many of them had other medical comorbidities. However, early operative treatment gives best chance of early independence and reduces the risk of prolonged immobilization. Along with comorbidities, most of the geriatric age group had associated osteoarthritis of the knee joint which affects the functional results. The preoperative factors taken into consideration were the average operating time and average blood loss. The combined average blood loss in our series was 276.34 ml. The average blood loss in patients operated with DHS had been 356.27 ml and those operated with PFN had been 196.41 ml. The less amount of blood loss had reduced the amount of blood transfusions postoperatively especially in cases of PFN. The mean operating time in our series was 137.18 minutes, with DHS and PFN operating time same. Though DHS is simpler procedure, closure of the incision takes a significant amount of time; while PFN is a masterly technique which requires perfection over a period of time. However, operative time may differ for different surgeons and according to the complexity of the fracture. The skin incision was 9.42 cm on an average with wider exposure required in DHS fixation than PFN. The average time of full weight bearing in the present series was 9.74 weeks which showed no statistical difference between DHS and PFN. The weight bearing time was less in A.O type 2 fractures than A.O type 3 fractures. We have used Harris Hip Score for the evaluation of the results. 58.2% have excellent results, 17.9% have good results, 6% have fair results and 10.4% have failure as results. The mean Harris Hip Score of DHS is 89.07 and PFN is 89.00. Thus, there was no statistical significance for using DHS or PFN in per-trochanteric femur fractures.

Discussion

Once surgical treatment is chosen for a geriatric patient with a hip fracture, it should be performed as soon as possible. Many studies have shown an association between a surgical delay of more than 24 to 48 hours and a higher 1 year mortality rate. However, there is an important balance between the optimization of medical issues and expeditious surgical management. In general, hip fracture surgery should be done as soon as possible after the stabilization of all comorbid medical conditions especially cardiopulmonary problems and fluid and electrolyte imbalances [3, 4]

In our current series, 4 patients had developed infection which included 3 patients with DHS fixation and 1 patient with PFN fixation. This implies that infection is directly proportionate to the average skin incision and average operating time which is fairly more in cases of DHS fixation than PFN fixation. All the cases of infection subsided with appropriate antibiotics. However these cases had long term complications of delayed

union and difficulty in squatting and cross-legged sitting. The complications of the operative fixation techniques of intertrochanteric fractures can be divided as follows:

Intraoperative: Shattering or bursting of greater trochanter as seen with proximal femoral nail is usually due to inappropriate selection of nail. Imperfect reduction is usually seen with unstable varieties of intertrochanteric fractures. The fracture lies in various positions. Eccentric placements of screws in the femoral head, usually in the anterior and upper quadrants, have been reported.

Immediate Post-Operative: Incidences of superficial and gross infections have been reported occasionally.

Delayed: Loss of fixation is reported to be as high as 20% in unstable fractures. Most commonly it is characterized by varus collapse of proximal fragment with cut out of lag screw from the head. It usually occurs due to eccentric placement of screw, improper reaming that creates a second track, unstable reduction, excessive fracture collapses so that the capacity of implant is exceeded, severe osteopenia which precludes optimum fixation. Shortening and mal-rotation deformity is usually caused by excessive collapse and internal rotation of distal fragment during surgery. This is because in unstable fracture, proximal and distal fragment move independently. Non-union: Uncommon because fracture occurs through highly vascularised area of cancellous bone. It usually occurs when there is loss of reduction. Cut out of the hip screws occurs because of knife effect of the screws. Medial migration of the hip screws occurs when the sliding mechanism of the screw within the nail is not matching with the collapse of fracture. Back out of the hip screws occurs due to excessive collapse [5-10]. In our series, 1 patient had distal shaft perforation with use of long PFN. The reason been that patient was elderly female with severe osteoporosis and thinning of the cortices with short curved femur. Extension knee brace was given to support the distal shaft perforation and provide pain relief to the patient during mobilization.

In our series, 1 patient had peri implant fracture after DHS fixation in an elderly osteoporotic female due to physiotherapy. Revision surgery in form of long DHS fixation was carried out. However, as far as long term results are concerned, patient still has difficulty in walking, cross legged sitting and squatting. In our series, 1 patient had non-union of PFN in an elderly male. However, he still walks with crutches and has no difficulty in squatting or cross-legged sitting and activities of daily living.

In our series, 3 patients had reverse Z effect and 1 had 'Z' effect causing pain and decreased activities of daily living. 1 patient had complete implant removal and hemi-replacement arthroplasty carried out. In 1 patient again retightening of the screws was done and outcome was favourable. While in another 2 patients, the screws were taken out after which also outcome was favourable. None of the implants give 100% immunity to complications for a particular fracture but the implant which can avoid maximum complications is considered as a gold standard for that particular fracture.

In literature, there are still no clear guidelines to determine the best implant shows for stable and unstable per-trochanteric femur fractures. For all fracture patterns, no clinical or functional benefits of theorized biomechanical advantages of intramedullary nails have been shown. Studies vary as to which implant is most advantageous regarding operating time, fluoroscopy time and blood loss with transfusion requirements. However, all show no differences in mortality, ambulatory ability, and return to pre-injury level of function,

need for assistive devices, or overall functional recovery. No studies have shown a significant difference in the rates of fixation failure when comparing the sliding hip screw with intramedullary nails [11-13]. The frequency and amount of pain are comparable with both the implants, but the location of the pain changes, with lateral thigh and groin pain reported with compression hip screws and mid to distal thigh pain with intramedullary nails. In the treatment of A3 fractures, decreased complications and improved clinical outcomes have been reported with intramedullary nails, but there is still no evidence of significant functional differences. No evidence in the literature confirms that using intramedullary devices leads to a decrease in intraoperative or postoperative complications or postoperative mortality, improved mobility or improved patient and hip function outcomes compared with compression hip screws in A2 fractures. In the treatment of A3 fractures, decreased complications and improved clinical outcomes have been reported with intramedullary nails, but there is still no evidence of significant functional differences. A careful assessment for the presence of metastatic disease is mandatory because metastatic lesions are unlikely to heal and normal union is compromised [14-21]. The deforming forces acting at the level of the proximal femur commonly lead to varus, apex posterior angulation or translation and rotational mal-alignment. Regardless of the implant chosen, it is imperative that the proximal fixation be placed in the area of the sub-chondral bone in the centre of femoral head. The most common reasons for failed treatment of per-trochanteric femoral fractures are use of wrong implant, poor implant placement, poor bone quality, limited biologic potential for healing, infection and patient related risk factors such as underlying systemic diseases or smoking. Other considerations include the viability of the proximal femoral bone segment, its related healing potential and the functional demands of the patient [22-27].

Conclusion

Implant selection for the patients must be based on the ability of the implant to withstand long term cyclical loading, the implant should splint the entire femur to bridge other potential areas of unrecognized or future metastatic disease. A long intramedullary implant that provides fixation into the femoral head and distal interlocking is best used in these patients. In patients with significant osteoporosis, similar recommendations apply to implant selection. Central placement of the screw in the femoral head is paramount to limiting failure. Using an intramedullary device with a compression hip screw for proximal fixation minimizes the risk of failure at the implant- bone interface distal to the fracture. In contrast, sliding hip screw device may increase the chance of femoral head cut out because controlled collapse to a stable position is limited by the shaft of the intramedullary device, increasing the deforming varus force at the tip of the screw. Non-anatomic reduction of per-trochanteric fractures can lead to deformity and non-union. Improving outcomes in patients with per-trochanteric fractures involves maximizing the perioperative environment and understanding the fracture patterns and classifications that ultimately guide treatment and its implant selection. Success is a Journey, not the Destination. One must develop mastery over the usage of the implant in a particular fracture and then one can convert that implant as Gold standard for that fracture.



Fig 1: Preoperative radiograph of intertrochanteric femur fracture of 77 years female



Fig 2: Post-operative radiograph of intertrochanteric femur fracture of 77 years female with PFN (Proximal Femur Nailing)

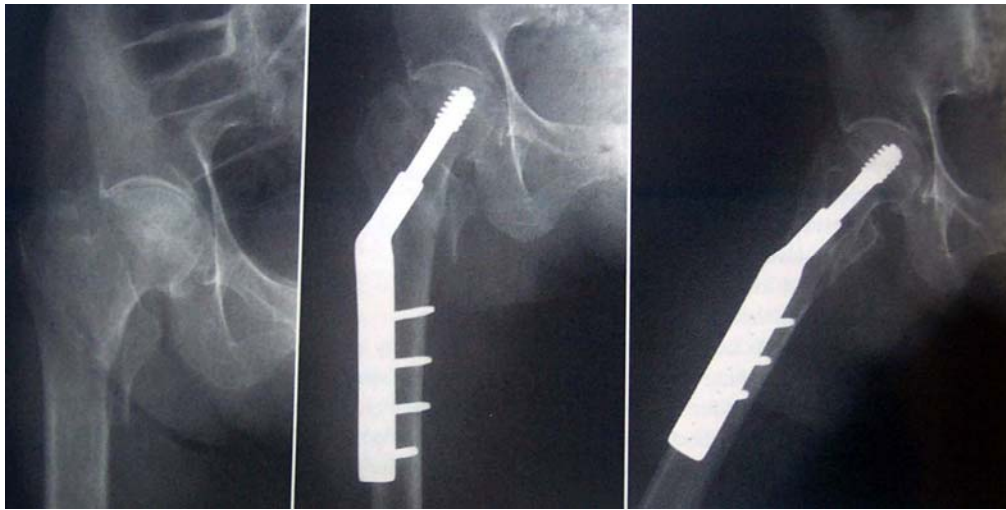


Fig 3: Preoperative and post-operative radiograph of intertrochanteric femur fracture of 65 years male operated with DHS (Dynamic Hip Screw)

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