Rising trend of proximal femoral nail in therapy of Extracapsular Hip Fractures
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Abstract

Introduction: Fracture distal to the capsular attachment i.e. pertrochanteric area of hip including intertrochanteric and subtrochanteric region called as extracapsular hip fractures. Management of these fractures is big challenge in acute trauma. Unstable Extracapsular hip fractures accounts for 2% of all hip fractures. Dynamic hip screw (DHS) has some surgical drawback in unstable extra capsular hip fractures leading to more usage of proximal femoral nail (PFN).

Aim of Study: This study is undertaken to assess the changing patterns of Dynamic hip screw and Proximal femoral nail in extra capsular hip fractures.

Materials and Methods: This is a retrospective study from 2008 to 2014. The study included 786 patients (Mean age 66.2 years) who underwent Dynamic hip screw and Proximal femoral nail fixation for extracapsular hip fractures. Out of 786 patients, 508 patients had DHS fixation and 278 patients had PFN fixation.

Results: This study evaluated early complications and technical failures of both methods. Fracture classification used was AO type and patients were divided into two methods of fixation. Data analysis showed dramatically rising trend of PFN.

Conclusion: We have concluded that PFN was used aggressively in the last 3 years which may be due to the changing behavior of fracture pattern. It may be intrinsic attraction to new surgical techniques with the younger orthopaedic surgeons.

Key words: Dynamic Hip Screw, Proximal Femoral Nail, Extracapsular Hip Fracture, Trend.

Introduction

Fractures which are located distal to the capsular attachment of hip are called as extracapsular hip fracture. The incidence of extracapsular hip fracture has been estimated to be more than 250000 patients each year in the united states, with the reported mortality ranging from 15-20% [1,2]. The incidence of extracapsular hip fracture has increased significantly during recent years due to the advancing age of the world’s population [3]. The reverse oblique trochanteric fractures of proximal part of femur is a distinct fracture pattern which is mechanically different and accounts for 2% of all the hip fracture and 5% of all the intertrochanteric and subtrochanteric fracture[4]. Most frequently these fractures are seen in two patients population, namely older osteopenic patients with a low energy trauma and younger patients with high energy trauma[5,6,7,]. With these fractures old patients withstand badly their immobilization in bed & they are threatened with hypostatic pneumonia, catheter sepsis, cardiorespiratory failure, and decubitus. Moreover, nursing care is also aggravated by psychological changes. All the circumstances mentioned above require using an urgent surgical solution for a vital indication because early rehabilitation and mobilization of the patient can be possible in this way. The sliding hip screw and side plate have for decades been the implant of choice in the management of extracapsular hip fractures [8]. Cutting out of the sliding hip screw, excessive medialisation of the distal fragment (in unstable fracture) and collapse upon weight bearing are major concern [9,10]. To overcome these problems intramedullary device has been more used, one of them is proximal femoral nail (PFN) which has been used since few years in our institute.

Classification [11, 12]: Based on the AO classification of fractures, these fractures ranges from simple intertrochanteric to multifragmental fractures of trochanteric region and may involve:
- Fracture of neck of femur/intracapsular/mediocervical column fracture (31B2)
- Fracture intertrochanter/extracapsular/laterocervical column fracture (31A 1 to 31A 3)
- Pertrochanteric fracture
- Isolated fracture of trochanter
- Subtrochanter fracture i.e. fracture in the zone of transition between the proximal end and the femur diaphysis (about 5 cm distal to lesser trochanter).
Material and Methods

Nowadays, so many methods of surgical solution of fracture of the proximal femur have been available. When choosing a certain method, the type of the fracture, age and biological condition of the patient, the degree of osteoporosis, the state of the hip joint, last but not least, the period elapsed from the injury to the day of surgery of patient must be taken into consideration. In extracapsular fractures, two methods best meet the requirements of stable osteosynthesis at present: DHS and PFN.

In multifragmental fractures treated with DHS, medialisation can be prevented by applying a trochanteric stabilizing splint. Angle and T-shaped splints are less reliable as they fail in such types of fractures where a medial support is missing [13].

Our retrospective study consisted of 786 patients with extracapsular hip fractures, from 2008 to 2014 in Gandhi medical college and Hamidia hospital Bhopal. 508 patients were treated with DHS fixation and 278 patients were treated with PFN fixation.

All surgeries were done under spinal anaesthesia, in supine position on traction table, a C arm was placed between his/her lower limb in the angle of about 45 degree to the operated extremity. Preoperative parental antibiotics administered 1 hr before surgery [14]. The definitive closed reduction of fracture was completed on a traction table. Those fractures which not reduced by close manipulation, opened limited to achieve satisfactory reduction and hold with bone holding forceps during procedure, then surgical procedure was performed either DHS or PFN fixation. In early postoperative periods complication (systemic and local) and technical failures were noted so observation analysis was done to compare in both method of fixation.

Results

Table 1: showing distribution of patients and fracture type in study population with pre fracture variable

| Gender | Total | DHS | PFN |
|--------|-------|-----|-----|
|        | n (%) | n (%) | n (%) |
| F      | 575(73.16) | 401(78.94) | 174(62.59) |
| M      | 211(26.14) | 107(21.06) | 104(37.41) |
| Injury type | | | |
| Low energy | 193(24.55) | 126(24.80) | 67(24.10) |
| High energy | 593(75.45) | 382(75.20) | 211(75.90) |
| Fracture type AO [11] | | | |
| 31A1 | 155(19.72) | 125(24.61) | 30(10.79) |
| 31A2 | 309(39.31) | 161(31.69) | 148(53.24) |
| 31A3 | 286(36.39) | 200(39.37) | 86(30.94) |
| 31B2 | 36(4.58) | 22(4.33) | 14(5.04) |

Females were more frequently involved in fractures. According to AO classification [11] there were 155 cases with 31A1, 309 cases with 31A2, 286 cases with 31A3 and 36 cases were of 31B2 fracture type.

Table 2: Year wise operated man and female in both methods of fixation.

| Year | DHS | PFN |
|------|-----|-----|
|      | Male | Female | Male | Female | Total |
| 2008 | 15  | 49   | 14  | 06   | 84  |
| 2009 | 15  | 47   | 13  | 11   | 86  |
| 2010 | 17  | 55   | 12  | 16   | 100 |
| 2011 | 14  | 55   | 14  | 23   | 106 |
| 2012 | 15  | 58   | 19  | 28   | 120 |
| 2013 | 13  | 72   | 14  | 45   | 144 |
| 2014 | 18  | 65   | 18  | 45   | 146 |
| Total| 107 | 401  | 104 | 174  | 786 |

From 2008 to 2014, 786 patients with proximal femoral fractures were treated using DHS and PFN. The study consisted of 211 males and 575 females. The average age was 66.2 years (men 64.1 years and women 68.3 years).
Table 3: Comparison of DHS of PFN for Extracapsular hip fracture each year from 2008 through 2014

| Year | DHS       | PFN       | Total |
|------|-----------|-----------|-------|
| 2008 | 64(76.19) | 20(23.81) | n = 84|
| 2009 | 62(72.10) | 24(27.90) | n = 86|
| 2010 | 72(72)    | 28(28)    | n = 100|
| 2011 | 69(65.10) | 37(34.90) | n = 106|
| 2012 | 73(60.83) | 47(39.17) | n = 120|
| 2013 | 85(59.03) | 59(40.97) | n = 144|
| 2014 | 83(56.85) | 63(43.15) | n = 146|
| Total| 508       | 278       | 786   |

Over this period of time a dramatic shift in PFN fixation increased from approximately 24% in 2008 to 43% in 2014 with the most dramatic increases being in the last three years and DHS fixation decreased from 76.19% in 2008 to 56.85% in 2014 (Table 3).

Table 4: Complication observed in both techniques

| Complications                  | DHS (508) | PFN (278) |
|-------------------------------|-----------|-----------|
| A. Systemic                   | 0         | 1         |
| (I) Pulm. Embolism.           |           |           |
| (II) Bronchopneumonia         | 0         | 2         |
| (III) DVT.                    | 0         | 1         |
| B. Local                      | 2         | 0         |
| (I) Hematoma                  |           |           |
| (II) Infection                | 0         | 3         |
| (III) Delayed wound healing.  | 12        | 2         |
| C. Technical Failures         |           |           |
| (I) Breakage of guide wire/drill bit | 0 | 4         |
| (II) Iatrogenic fracture of GT | 9         | 1         |
| (III) Inappropriate length of central Screw or DHS screw | 0 | 2 |
| (IV) Difficulty in proximal locking. | 0 | 6 |
| (V) Difficulty in distal locking | 0 | 1 |
| Total                         | 23        | 23        |
| Percentage wise               | 4.53%     | 8.27%     |

During the immediate postoperative period 4 patients suffered from systemic and 19 patients from local complication (see Table 4). No cases of early fixation failure were recorded in both methods of fixation. Some technical complication observed intraoperatively in both methods of fixation (see Table 4). Overall observed (intraoperative technical failure and immediate postoperative) complications rate was higher in PFN that was 8.27% as compared with DHS which was 4.53%.

Fig. 2 Year wise percentage of DHS and PFN.
bending/breakage of the implant. In our study we found failure such as which 170 were unstable) and no cases of mechanical failure rate of only 4.6%, in a series of 191 fracture (of fracture distal to tip of implant [20]. Simmermacher et al [21] reported an overall technical strain[19]. cyclical loading [18] and greater stiffness under more rigid than the DHS [17], has greater stability under the introduction of intramedullary nail i.e. Gamma nail (GN). The use of a DHS has been supported by biomechanical properties [16] which are assumed to be improve the healing of fracture. Intramedullary device such as GN is more rigid than the DHS [17], has greater stability under cyclical loading [18] and greater stiffness under strain[19]. The PFN has been developed as an alternative to the GN, and it seems to be associated with a lower incidence of fracture distal to tip of implant [20]. Simmermacher et al [21] reported an overall technical failure rate of only 4.6%, in a series of 191 fracture (of which 170 were unstable) and no cases of mechanical failure such as fracture below the tip of nail or bending/breakage of the implant. In our study we found 1.77% technical failure in DHS method and 5% in PFN method. The most recent study evaluating the use of PFN is from Fogagnolo et al who reported 46 patients with an average rate of intraoperative technical or mechanical complication of 23.41% [22]. Comparison of technical failure in our study to those in other series isn't easy because an exact definition of failure is absent in most cases. In a study, Perez JV et al suggest early operation and early patient mobilization reduce the risk of fatal pulmonary embolism and the risk of DVT, whereas prolonged bed rest may increases the risk of medical complication such as DVT, pulmonary complication, UTI and skin breakdown [23]. The cephalomedullary Femoral reconstruction nails have gained popularity in recent years to treat extravascular hip fracture, and shown biomechanical stronger than extramedullary implant [24]. The introduction of PFN into practice has caused an evident qualitative shift in the therapy for extravascular hip fracture. In accordance with the literature and indication scheme[13,25,26],this method was applied particularly in unstable extravascular hip fracture. The scientific evidence, at least in the English language literature, does not support the superiority of intramedullary nail fixation over standard sliding compression hip screw and side plate fixation for the treatment of extravascular hip fracture [27]. However in our study data shown that PFN has overtaking DHS rapidly among last three years. We do not know for sure why these practices have changed so
dramatically in such a short period in the favour of PFN method. Many surgeon believe that PFN is quicker, easier, more stable and offer improved patient mobility, despite the fact that the English literature does not support these claims. It is possible that there has been change in the nature of fracture type which could be leading cause of raising trend of PFN.

Conclusion
It is evident from our study that there is rising trend to use PFN in extracapsular hip fractures. It may be that younger orthopaedic surgeons are responding to a change in training and that for some reason residents are currently being trained preferentially in PFN fixation for extracapsular hip fractures. As our institute is a teaching institute in which may be an intrinsic attraction to newer surgical technique. It may be changing behavior of fracture pattern to lead more uses of PFN for extracapsular hip fracture. Younger orthopedic surgeon may be under certain pressure to offer new technique in a medical field that is constantly searching for the latest in technology. It may be that there is no much harm to use PFN even in stable extracapsular hip fracture. Recently there is in an inclination towards minimally invasive surgeries which can be another factor for raising trend of PFN. The author still feels that a judicious use of newer technology is preferable before discarding older stabilized method.

Abbreviations
PFN: Proximal Femoral Nail, DHS: Dynamic Hip screw, AO: Arbeitgemeinschaft fur Osteosynthesefragen, DVT: Deep vein Thrombosis, GT: Greater Trochanter, GN: Gamma Nail, UTI: Urinary Tract Infection.

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