CLINICAL RESEARCH ON DYNAMIC HIP SCREW AND PROXIMAL FEMORAL NAIL IN THE TREATMENT OF INTERTROCHANTRIC FRACTURES

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ABSTRACT

BACKGROUND

Intertrochanteric fractures account for nearly 50% of all fractures of the proximal femur. These injuries commonly affect the elderly and they have a tremendous impact on the healthcare system. Intertrochanteric fractures comprise of fractures occurring in the region between greater and lesser trochanters. Despite marked improvement in implant design, surgical technique and patient care, intertrochanteric fractures remains to be a challenge.

MATERIALS AND METHODS

The present study consists of 60 patients with intertrochanteric fractures of femur who were treated with either DHS and PFN at Vijayanagara Institute of Medical Sciences, Bellary, during March 2014 to September 2015. Case were selected by simple random sampling, each individual is chosen randomly and entirely by chance.

This study was carried out to compare the results of intertrochanteric fractures treated with DHS and PFN. All the 60 patients were asked to follow up at regular interval.

RESULTS

Full weight-bearing in PFN was 10.5 weeks and in DHS 14.50 weeks with P value >0.05. Duration of hospital stay 10.5 days in PFN 14.5 days in DHS. Delayed anatomical complications are external rotation in 1 case of PFN and none in DHS, shortening of >1 cm in 4 cases of PFN and in 10 cases of DHS, varus deformity in 5 cases of PFN and 4 cases of DHS.

CONCLUSION

PFN is better alternative to DHS in treatments of intertrochanteric fractures, but is technically difficult procedure and require more expertise compared to DHS.

KEYWORDS

Dynamic Hip Screw (DHS), Proximal Femoral Nail (PFN).

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BACKGROUND

Intertrochanteric fractures account for nearly 50% of all fractures of the proximal femur. These injuries commonly affect the elderly and they have a tremendous impact on the healthcare system. Intertrochanteric fractures comprise of fractures occurring in the region between greater and lesser trochanters. Despite marked improvement in implant design, surgical technique and patient care, intertrochanteric fractures remains to be a challenge. Since this fracture is more common in elder patients, the aim of treatment should be prevention of malunion and early mobilisation. The new generation implant for management of trochanteric fracture is proximal femoral nail, which is also a collapsible device with added rotational stability. Previously, DHS was considered as gold standard for intertrochanteric fracture.

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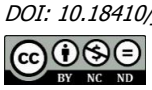

MATERIALS AND METHODS

The present study consists of 60 patients with intertrochanteric fractures of femur who were treated with either DHS and PFN at Vijayanagara Institute of Medical Sciences, Bellary, during March 2014 to September 2015. Cases were selected by simple random sampling, each individual is chosen randomly and entirely by chance. This study was carried out to compare the results of intertrochanteric fractures treated with DHS and PFN. All the 60 patients were asked to follow up at regular interval.

After the patient with intertrochanteric fracture was admitted to hospital, all clinical details were recorded. Inclusion criteria are type 1, 2, 3 (Boyd and Griffin's classification), age >18 years, both sexes, fresh intertrochanteric fractures in adults. Exclusion criteria

includes patient with type 4 Boyd and Griffin's classification, medically who are unfit for surgery, polytrauma patients, pathological fractures, old neglected fractures, age less than 18 years and patient with other associated fractures (multiple fractures).

Steps of operation of DHS- fracture reduced by first giving traction and 20 degrees abduction (to correct varus deformity) and then limb was externally rotated gently and finally internally rotated up to neutral position. The vastus lateralis splitting approach was used. Lateral skin incision was taken from distal edge of greater trochanter. Subcutaneous tissue and tensor fascia lata were cut in the same line and vastus lateralis was split from trochanteric crest to expose the greater trochanter and upper part of shaft up to two inches. The incision was extended distally for plate application. The lateral cortex was opened with 2 mm drill bit. The guidewire was inserted into the center of femoral head and advanced to subchondral bone. The triple reamer was set at 10 mm shorter than the reading of direct measuring device. Before inserting lag screw, a proper size of hip screw was measured by direct measuring gauge. To insert the screw into the head and neck, the coupling screw guide shaft and the hip screw were assembeled. The coupling screw was inserted through the hallow guide shaft into the hip screw. The screw was driven into the femoral neck by turning the wrench until the zero mark on wrench reached the lateral cortex. This meant that with this selected length of screw, the tip of screw was 10 mm from joint. The T-handle of wrench was made perpendicular with femoral shaft at the end of insertion to allow proper keying of lag screw to the barrel plate. The wrench with the centering sleeve was removed and the DHS plate was slid into the shaft of Richard's screw and the coupling screw and guide. With the impactor, the plate was hammered against the cortex of femur. The plate was fixed to the femoral shaft in usual manner. Traction was released and compression achieved by tightening the top screw. For unstable intertrochanteric fracture, i.e. the fracture with comminution of calcar arch are with posteromedial fragment involving shaft, Dimon Hughston procedure was done. Great emphasis was placed on restoration of medial continuity for successful internal fixation of these types of fracture. Wound closed in layers over the suction drain. Suction drain was removed after 48 hours. Sutures were removed on 10th postoperative day. Full weight-bearing were allowed after reviewing clinically and radiologically.

Operative technique (PFN)- the patient was prepared and draped for the standard hip fixation. In intertrochanteric fracture, we fixed the fracture percutaneously using two K-wires, which pass along the anterior cortex of greater trochanter and neck of femur into the head of femur. The tip of greater trochanter was located by palpation in thin patients, and in hefty patients, we used image intensifier and 5 cm longitudinal incision taken proximal from the tip of the greater trochanter. A parallel incision was made in the fascia lata and gluteus medius was split in the line with the fibres. Tip of greater trochanter is exposed. In AP view on C-arm, the entry point is on the tip or slightly lateral to the tip of the greater trochanter. In the lateral view, guidewire position confirmed in the center of the medullary cavity. The guidewire is inserted in this direction to a depth of 30 cm with a T-handle. After confirming satisfactory facture reduction in an appropriate size nail as determined preoperatively was assembeled to the insertion handle and inserted manually as far as possible into the femoral opening. A 2.8 mm guidewire was inserted through the drill sleeve after a stab incision with its position in the caudal area of the femoral head for the neck screw. This guidewire is inserted 5 mm deeper than the planned screw size. The final position of this guidewire should be in the lower half of the neck in the AP view and in the center of the neck in the lateral view. A second 2.8 mm guidewire is inserted through the drill sleeve above the first one for hip pin. The tip of this guidewire should be 5 mm deeper than the planned hip pin, but approximately 20-25 mm less deep than planned neck screw. The length of the hip pin is indicated on measuring device and is calculated 5 mm before the tip of the guidewire. Drilling is done over the guidewire with 6.5 mm drill bit to a depth up to the length of hip pin previously measured. The same length 65 mm hip pin is inserted with the help of hexagonal cannulated screwdriver. Length and position to be confirmed with C-arm, guidewire then removed. Neck screw is inserted using cannulated screwdriver. Final position is confirmed with image intensifier. Distal locking is usually performed with two cortical screw. For standard PFN, distal locking jig was used. A drill hole is made with 4 mm drill bit through both cortices length is measured directly from the drill marking.

All patients were followed up at an interval of 6 weeks till fracture union is noted and then once in 3 months till one year. At every visit, patient was assed clinically regarding hip and knee function, walking ability, fracture union, deformity and shortening. Modified Harris hip scoring system was used for evaluation. X-ray of the involved hip with femur was done to assess fracture union and implant-related complication.

RESULTS

In our study, maximum age was 86 years and minimum age was 33 years. Most of the patients were between 61-80 years. Mean age was 72.18 years. In PFN group, 20 were females and 10 were males; in DHS group, 15 males and 15 females. According to type of fracture- type 1, 16 cases (27%); type 2, 31 cases (31%); and type 3, 13 cases (13%). Most of our patients were 50 years and above. In them, domestic fall (at home) and trivial trauma was main reason behind the fracture, while road traffic accident, young patients were affected. Fall from height 18%, RTA 12%, slip and fall 70%. All the cases included in study group were fresh fractures who underwent surgery at the earliest possible in our setup. The delay was due to medical comorbidities of patients. All the patients were operated at an average interval of 3 days from the day of trauma. Overall complications in DHS was 44% and 56% in PFN. Average time for surgery in PFN is 80 minutes and 100 minutes in DHS (P value = 0.0001). There is a statistically significant blood loss measured by mop count (each fully-soaked mop

containing 50 mL blood). Blood loss was measured by mop count and collection in suction. Blood loss was more for DHS compared to PFN. Average blood loss in PFN is 271 mL and 434 mL in DHS and results were statistically significant. Postoperative complications during hospital stay in PFN group- chest infection in 2 cases; in DHS group- chest infection 2 cases and superficial wound infection in 2 cases. Average hospital stay in PFN group was 10.5 days and 15.40 days in DHS group. There was statistical significance since p value is less than 0.05. Full weight-bearing in PFN was 10.5 weeks and in DHS 14.50 weeks with P value >0.05. Duration of hospital stay 10.5 days in PFN 14.5 days in DHS. Delayed anatomical complications are external rotation in 1 case of PFN and none in DHS, shortening of >1 cm in 4 cases of PFN and in 10 cases of DHS, varus deformity in 5 cases of PFN and 4 cases of DHS. Functional results as follows- excellent in 8 cases, fair in 1 cases and good in 11 cases; lost in follow up 3 cases, poor in 5 cases and 2 cases expired in PFN group and excellent in 10 cases, fair in 3 cases and good in 7 cases; lost in follow up 2 cases, poor in 6 cases and 2 cases expired in DHS group.

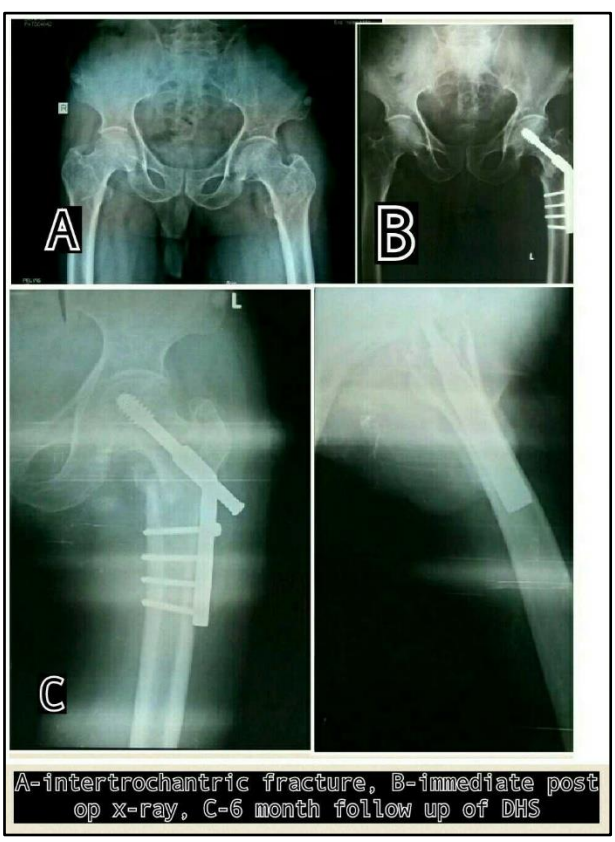

Figure 1

Figure 2

DISCUSSION

Fractures of intertrochanteric fracture have been recognised as a major challenge by orthopaedic community, not solely for achieving fracture union, but for restoration of optimal function in the shortest possible time that too with minimal complication. The aim of management accordingly has drifted to achieving early mobilisation, rapid rehabilitation and quick return of individuals to premorbid home and work environment as a functionally and psychologically independent unit. In this study, an attempt was made to survey, evaluate, document and quantify our results in the management of such individuals by using Proximal Femoral Nail (PFN) and Dynamic Hip Screw (DHS) implants and compare the results in these two groups.

Most of the patients in present study were age group 6th to 8th decade of life. Mean age in years both groups combined = 72.18. This signifies the fact that patients from these age groups are involved in low energy trauma like domestic fall (fall at home).[1,2,3,4,5] H.B. Boyd and LL Griffin 166 in their study of 300 cases found a marked sex

difference 226 (75.8%) of the patients were females and 74 (24.2%) were males.

Most of our patients were females. There was a female predominance in our patient. Amongst them, majority were in 6th-7th decade of life and female-to-male ratio 1.4:1. David G. Love found trochanteric fractures more common in women than men by a margin of three to one. Melton JL, Ilistrup DM, Riggs BL et al (1982) released a study titled 50 years trend in hip fracture incident and reported female-to-male ratio of 1.8:1.5.

We have studied 60 cases of different types of intertrochanteric fractures in our present study. Amongst 30 cases operated by PFN, 12 (40%) patients were found to have proximal femoral fractures on the left side, while 18 (60%) patients were having fracture on right side. Among the 30 cases operated by DHS, 16% patients were found to have proximal fractures on the left side, while 14 (47%) patients were having fractures on the right side.

Superficial wound infection seen in two cases in total. Both were seen in those operated by DHS at suture site. This may be attributed to low immunity status as the patient was asthenic built and belonging to low socio-economic status and more soft tissue exposure, which is more in cases operated by DHS. Verley GW, Milner SA[6] (1995) in their study of 177 patients of proximal femoral fracture, in their surgeries, they kept drain in the wound. They found that those patients, which drain was kept showed better wound healing in terms of ASEPSIS wound scoring system and had reduced rate of infection.

In the series by K.D. Harrington,[7] out of 72 cases, there were 4 cases of coxa vara and 56 cases of limb shortening at an average of 1.5 cm. In his series, shortening was noted in unstable fractures in which Dimon Hughston procedure was done. In series by Julur P. Rao[8] of the 124 cases of intertrochanteric fractures, 5 cases of unstable fracture had limb shortening.

We found the mobilisation of patient operated by both PFN and DHS was almost same, but the weight-bearing of patients from the PFN group was earlier. In the series of B. Mall[9] (30 patients), average time of ambulation was 14 days. In the series of Dr. G.S. Kulkarni, ambulation was usually started after 11-12 days after stitch removal.

Menez and Daneil conducted study on 155 cases of intertrochanteric fractures treated with PFN and found 2% failure of fixation. Our study, however, no such complications was reported in our study.

A study of 20 patients of unstable intertrochanteric fractures treated with PFN and DHS by Arshad Bhatti conducted in 2004,[10] they found duration of stay for PFN and DHS were 14 and 22 days, blood loss was 275 and 475 mL, persistent hip pain was seen in 3% and 9%, respectively. In our study, the duration of hospital stay was 10.5 days in PFN and 15.6 days in DHS cases, average blood loss was 271 and 434 mL.

In a study by Pajarein and Lindal[11] of 100 patients of pertrochanteric fractures treated with DHS and PFN found PFN allowed faster restoration of postoperative walking ability compared with DHS. In our study, mean time for full weight-bearing for DHS was 15 weeks that for PFN was 13.7 weeks. 12 of 30 patients treated with PFN had independent mobility, while 8 of 30 patients of DHS had independent mobility at the end of 6 weeks.

A comparative study of 30 cases of trochanteric fracture femur treated with DHS and PFN by Jaswinder Pal Singh Walia and Himanshu tailor showed fractures treated with PFN had earlier radiological union, better functional outcome, less complications and earlier weight-bearing. This study correlates to our study regarding early weight-bearing and less complications.

CONCLUSION

In the present study, which was carried out in VIMS, Bellary, from March 2014 to September 2015, 60 patients of intertrochanteric fracture were included. There were 30 patients operated by PFN, 30 by DHS.

In our series of 60 patients, there were 35 females and 25 males. Minimum age was 33 years, maximum 86 years with mean age of 72.18 years. Most of the people were between 60-80 years. Slip and fall accounted for 70% of cases. Right side was more common accounted for 53.3% of cases. Boyd and Griffin type 2 fracture account for 51.7% of cases. Average blood loss was 271 mL for PFN, 434 mL for DHS. Mean duration of hospital stay was 10.5 days in PFN and 15.4 days in DHS group. Mean time for full weight-bearing was 10.5 weeks for PFN and 14.5 weeks for DHS group. Out of 60 cases, 5 cases were lost in follow up and 4 cases died. Good excellent results were seen in 63% of cases in PFN and 56.7% in DHS group.

1. Advantage with PFN is that smaller exposure required than DHS, therefore be associated with lesser blood loss, shorter operating time and less morbidity.
2. PFN gives biomechanically sound fixation because the shaft fixation is nearer to the center of rotation of hip, giving shorter lever arm and lower bending movements on the device.
3. Rotational stability was higher when PFN is used.
4. The incidence of wound infection was found to be lower with intramedullary implants, which resulted in early ambulation of patients.
5. In PFN entry point, determination is crucial particularly in elderly with osteoporotic bones as wrong entry point may result in iatrogenic comminution of lateral cortex.
6. Early mobilisation can be begun postoperatively in case of PFN as it is a load sharing device and less surgical dissection.
7. The learning curve for treatment of fracture by DHS was smaller as compared to PFN.
8. The screening time with help of image intensifier was much lesser in cases operated by DHS as compared to PFN.
9. The implant-related complications were much lesser in DHS. However, the rate of union was same in two groups (PFN and DHS). Both the implants in their own wright are equally effective in management of IT fracture of femur.

For the reasons mentioned above, we consider PFN as better alternative to DHS in treatments of intertrochanteric fractures, but is technically difficult procedure and require more expertise compared to DHS.

Limitations of Study

Lack of control group as no two fractures are the same to compare.

Relatively small patient population (sample size), so it may not be true representative of population under study.

Outcome of the surgical management, whether PFN or DHS had a great influence on the existing medical conditions of the patients, these were not taken into account.

The study done in a limited span of time, which also posed a limiting factor.

Complications and outcome of surgery also depends on the experience of the surgeon.

REFERENCES

[1] Berman AT, Metzer PC, Basacco SJ, et al. Treatment of subtrochanteric fractures with the compression hip nail: a review of 38 consecutive cases. Othop Trans 1979;3:255.

[2] Leung KS, So WS, Shen WY, et al. Gamma nails and dynamic hip screw for pertrochanteric fractures. A randomised prospective study in elderly patients. J Bone Joint Surg Br 1992;74(3):345-351.

[3] Miedel R, Ponzer S, Tornkvist H, et al. The standard Gamma nail or the Medoff sliding plate for unstable trochanteric and subtrochanteric fractures. A randomised, controlled trial. J Bone Joint Surg Br 2005;87(1):68-75.

[4] Parker MJ, Handoll HH, O'Brien PJ. The sliding hip screw is better than short femoral nails for extracapsular femoral fracture. J Bone Joint Surg 2004;86(8):1836.

[5] Evans EM. The treatment of trochanteric fractures of femur. J Bone Joint Surg Br 1949;31B(2):190-203.

[6] Varley GW, Milner SA. Wound drains in proximal femoral fractures surgery: a randomized prospective trial of 177 patients. J Roy Soc Med 1995;88(1):42-44.

[7] Harrington KD, Johnston JO. The management of comminuted unstable intertrochanteric fractures. J Bone Joint Surg Am 1973;55A(7):1367-1376.

[8] Rao JP, Banzon MT, Weiss AB, et al. Treatment of unstable intertrochanteric fractures with anatomic reduction and compression hip screw fixation. Clin Orthop Relat Res 1983;175:65-71.

[9] Pathak SK, Mehrotra V, Mall B. Role of dynamic compression hip screw in trochanteric fractures of femur. Indian Journal of Orthopaedics 1999;33(3):226-228.

[10] Bhatti A, Power D, Qureshi S, et al. O3466 a prospective trial of proximal femoral nail versus dynamic hip screw for unstable and complex intertrochanteric fractures of the femur. Bone & Joint 2004;86-B(Suppl 3):377.

[11] Pajarinen J, Lindahl J, Michelsson O, et al. Pertrochanteric femoral fractures treated with a dynamic hip screw or a proximal femoral nail. A randomized study comparing postoperative rehabilitation. J Bone Joint Surg Br 2005;87(1):76-81.