ORIGINAL ARTICLE

Outcome of Locking Plate Dynamic Hip Screw Fixation in Osteoporotic Intertrochanteric Fractures

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ABSTRACT

Objective: The aim of this study was to determine the outcome of dynamic hip screw with locking side plate for osteoporotic intertrochanteric fractures in terms of Mean Hip Pain score and implant failure.
Material & Methods: A prospective study was conducted on 85 patients having osteoporotic intertrochanteric fractures. Both male and female patients of age more than 55, having a Singh's Index of III or less were included in study. Patients with concomitant hip osteoarthritis, fracture older than 2 weeks, open fracture, pathological fracture, fracture with sub trochanteric extension and patients with ipsilateral or contra lateral lower extremity fractures were excluded from study. All fractures were fixed with locking plate DHS. Patients were followed up regularly at intervals of 3 weeks, 6 weeks, 3 months, 6 months and 1 year.
Results: The mean age was 69.25 years with male to female ratio of 1:0.7. No implant failure was seen in 68 (80%) patients while implant failed in 17(20%) patients. 49 patients (57.64%) had mean hip pain score of 1, 19 patients (22.35%) had pain score of 2, five patients (5.88%) had a score of 3 while 12 patients (14.11%) had pain score of 4.
Conclusion: The results of locking plate DHS in osteoporotic patients are not ideal, given the poor physical status of many of these elderly patients before the injury.
Keywords: Dynamic hip screw with locking plate, osteoporotic intertrochanteric fracture, implant failure, mean hip score.

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INTRODUCTION

Intertrochanteric fractures are common in the elderly due to weaker bones and muscles from aging, making them more susceptible to fractures(1). These types of fractures are often difficult for orthopedic surgeons to treat because they are usually associated with severe osteoporosis and comminution(2). In elderly individuals, low energy trauma is the typical cause of intertrochanteric fractures, while high velocity trauma is more common in younger populations. Surgical treatment is typically the preferred option for intertrochanteric fractures, as it can help mobilize patients, reduce the risk of complications, and facilitate early postoperative ambulation. The standard treatment for these fractures should involve the use of rigid fixation. While there are various devices that can provide this, the dynamic hip screw (DHS) is the most frequently utilized for intertrochanteric fractures(3).

Fractures can be treated using extra-medullary or intramedullary fixation devices, with examples of the former including Jewett nail plate, condylar blade plate, dynamic hip screw, and dynamic condylar screw system, while the latter includes reconstruction nails, Gamma nail, and proximal femoral nail. In rare situations, external fixation may be considered as an alternative(4). According to Goldmen et al's research(5), the healing rates of compression hip screws and Gamma nails were similar, but the latter resulted in higher complication rates such as refracture during the removal process.

DHS (dynamic hip screw) gained popularity in the late 1980s due to its ability to provide stability in unstable fracture patterns(6). However, it is prone to failure in osteoporotic fractures, which not only

contribute to fracture occurrence but also to fixation failure in elderly patients[7,8]. Locking plates, which are fixed-angle implants, provide improved fixation in osteoporotic bones because they do not allow for angular motion at the screw plate junction[9]. While PMMA cement can improve fixation of lag screws in unstable fractures, there is a risk of delayed union and nonunion, as well as an increase in surgical time associated with its use[1,10]. This study was conducted to evaluate the success of locking DHS in trochanteric fracture in elderly patients, as there are limited studies on its efficacy.

This study was aimed to evaluate the results of using dynamic hip screw with locking side plate fixation for osteoporotic intertrochanteric fractures, focusing on the average Hip Pain score and incidence of implant failure.

MATERIALS & METHODS

This prospective descriptive case series conducted from December 2015 to June 2016.

The sample size of 85 cases was calculated using a 95% confidence level and a margin of error of 9.5%, considering the expected percentage of implant failure, which was 27%. The patients were recruited into the study using non-probability purposive sampling.

The fractures were divided into two groups based on fracture pattern: Group I included patients with comminuted, displaced, and unstable fractures, while Group II included patients with un-displaced and stable fracture configurations.

Both male and female patients with intertrochanteric fracture having a Singh's Index[15] of III or less and age more than 55 years of age were included in study. Patients with concomitant hip osteoarthritis, fracture older than 2 weeks, younger than 55 years, open fracture, pathological fracture, fracture with sub trochanteric extension and patients with ipsilateral or contra lateral lower extremity fractures were excluded from study.

Prior to enrolling in the study, patients were provided with an informed consent form to sign. Their personal information, including name, age, sex, and pre-operative mobility status, was recorded on a pre-designed form and kept confidential. The surgical procedure involved the use of a dynamic hip screw fixation with a locking side plate on a traction table under an image intensifier, performed by trainees in their 4th or 5th year of surgical training. Patients were regularly followed up at intervals of 3 weeks, 6 weeks, 3 months, 6 months, and 1 year, during which they were mobilized with a walker and kept on toe-touch weight bearing for the first 3 weeks, followed by gradually increasing partial weight bearing up to 6 weeks and then full weight bearing. Radiographs were taken at each follow-up visit to check for evidence of implant failure, such as cutout of the lag screw, locking screw pullout/breakage, or plate pullout. The mean pain score was assessed using a 4-point scale during each visit, with pain graded as follows: "no pain at all," "mild pain not affecting walking or requiring regular analgesic medication," "moderate pain affecting walking and/or requiring regular medication," or "severe pain, even at rest requiring stronger analgesics." Stratification was used to counteract any effect modifiers, such as smoking, displaced or un-displaced fractures, and stable or unstable fractures.

DATA ANALYSIS

The data gathered was inputted into the statistical software SPSS version 17.0 for analysis. The age of patients, as a quantitative variable, was represented using the mean and standard deviation. On the other hand, the gender, pain score, and implant failure, as qualitative variables, were presented using frequency and percentage calculations.

RESULTS

There were 50 males and 35 females with male to female ratio were 1:0.7. The mean±SD between the ages was 69.25±10.40 years. The size of lag screw in 24 patients was smaller than 90 mm screw and 61 patients of 90 mm screw or longer screw were used.

With regards to fracture characteristics, comminuted, displaced and unstable fracture pattern (Group I) was seen in 60 patients (71.6%) and un-displaced stable fracture configuration (Group II) was found in 25 patients (29.4%).

In 68 (80%) patients, there was no implant failure while implant failed in 17(20%) patients. Implant failure was mainly seen in Group I (n-16) as only one patient in group II had failure of implant. In 8 patients lag screw cut out was seen (9.4%), in 2 patients locking plate was pulled out from shaft (2.3%) and in 7 patients locking screws pulled out from plate or broke (8.2%).

According to mean pain hip score, 49 patients (57.64%) turned out to be having pain score of 1, 19 patients (22.35%) had pain score of 2, five patients (5.88%) had a score of 3 while 12 patients (14.11%) had pain score of 4.

DISCUSSION

Intertrochanteric fractures of the femur in elderly patients are difficult to treat and rehabilitate, but internal fixation is the standard procedure. Most surgeons prefer to use the DHS implant(11). However, using DHS in osteoporotic bones can lead to technical complications such as side plate pull-out, late medialization of the shaft, implant cutting out of the femoral head, implant breakage, and loosening in the femoral head due to decreased holding power of screws in osteoporotic bone(12). Factors causing fracture to settle in varus and implant cutting out superiorly include type of fracture, type of reduction, medial comminution, bone quality and improper placement of screw within the femoral head(13).

Patients in our series were relatively younger with a mean age of 69 years. We found more males (58.82%) than females in our study, with a male to female ratio of 1.5 to 1. It contradicts most of studies which show high female predominance, but some studies find results similar to our study. Simbak et al(14). found increased male incidence in their study with male to female ratio of 1.9 to 1.

Osteoporosis leads to healing problem and may end up in delayed or nonunion(15). Increased malunion with low functional results are seen in osteoporotic fracture(16). DHS is not an ideal option in unstable and osteoporotic fractures as varus collapse of femoral neck and lag screw failure may occur in 4% to 19%(17).

Jewell et al. compared the standard plate DHS with locking plate DHS and found that the locking DHS is better at minimizing the risk of DHS failure, especially in osteoporotic bones and unstable fractures. The mean number of cycles to failure for the LCP construct is 2.6 times greater than for the DCP construct(18). Streubel et al. also found that locking plate DHS is associated with good outcomes, with a lower failure rate than 4.5 mm locking compression plate in unstable fracture patterns. The overall observed failure rate in their series was 38%, with mean time to failure of 18 weeks 14, while the failure rate for locking plate DHS in literature is lower(19).

In a study of 30 patients, it was found that there were no instances of fixation failure due to side plate pull-out, screw cutout, or varus collapse among the patients being studied. The results were considered good, even though up to thirty percent of the fractures were unstable and even more were osteoporotic(19). In Siwach et al's study of the Dynamic Helical Hip System (DHHS) and its mechanical complications in 51 patients, the study found four mechanical complications, including late helical blade migration in one patient, late medialization of shaft in two patients, and varus collapse with cut through in one patient. Importantly, the study did not find any instances of plate pull-out(20).

In our study lag screw cut out rate was relatively high (9.4%) while plate pulled out in 2 patients (2.3%). The results in our series of patients were not as good as discussed in few other series(21). In our study, implant failure was seen 20% of patients (n=17). The commonest complication was lag screw cut out (9.4%) followed by locking screw breakage or pull out from plate (8.2%) and locking plate pull out was least common (2.3%). Implant failure was more common in unstable fracture patterns which are more prone to complications, 26% (n-16) of group I patients were recognized with implant failure while only 1 patient with stable fracture configuration (Group II) had this complication. Secondly, we also included patients with locking screw breakage or pull out from plate in implant failure group. if we exclude these patients because it did not affect union in our series, failure rate reduces to 11.7%.

Considering higher failure rates in elderly patients, we searched for other techniques mentioned in literature that can be employed to improve outcome. One of these techniques is PMMA cement augmentation though it increases operative time substantially(22). Bartucci et al. found that patients who received PMMA (polymethylmethacrylate) cement augmentation in the proximal fragment had fewer fixation failures compared to those who did not receive PMMA cement augmentation(23),12. Another option which can be considered is replacement instead of fixation, Kim et al advised use of endoprosthesis in patients prone to fixation failure(24).

In terms of post-operative pain and mean hip pain score our results were consistent with most of the studies. We attributed it to the fact that fracture union was seen in those 7 patients of those patients who had locking screw breakage or pull out. Lee et al analyzed mean hip pain score in their series of 102 patients and found mean hip pain score of 1.9(22). In our study, 60% patients had mean pain hip score of 1 and 14 % patients had hip pain score of 4, with a mean hip score of 1.76.

A study conducted to evaluate the functional and radiological outcome of DHS fixation. At the end of three months after DHS fixation, the study reported that 82.1% (87) patients had no pain,

indicating a good pain relief outcome. Additionally, 85.8% (91) of patients had normal function, indicating a good functional outcome[20]. A study by Foss et al showed patients with arthroplasty had the lowest pain levels and patients with operative fixation reported higher scores, scores were highest for Intra medullary fixation[25].

We experienced relatively higher implant failure. As locking plate implant is mechanically considered a better implant with relatively fewer failure rates, we still believe that better results can be achieved with more precise operative techniques and enthusiastic rehabilitation program. Our sample size was not very large, so we recommend further studies with a larger sample size comparing other variables such as quality of reduction and lag screw position as well. Other modalities which include PMMA and endoprosthesis should also be considered in management of these difficult injuries.

CONCLUSION

Osteoporotic intertrochanteric fractures are challenging to treat, further study should include larger number of patients with taking into consideration the confounder variables to determine the actual outcome.

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