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A Prospective Study On Functional And Radiological Outcome Of Valgus Osteotomy With DHS Fixation For Nonunion Neck Of Femur.

S Eswarapandi[1]*, M Mohamed Ibrahim[2], EMV Muthu Subash[3], and T Bharanidharan[4].

[1,2,3]Assistant Professor, Department of Orthopedics, Government Tirunelveli Medical College, Tirunelveli, Tamil Nadu, India.
[4]Assistant Surgeon, Government Medical College & Hospital, Nagapattinam, Tamil Nadu, India.

ABSTRACT

Nonunion neck of femur can be a difficult problem to treat, particularly in the young, and is associated with high complication rates of avascular necrosis due to the precarious blood supply and poor biomechanics. The various treatment options that have been described can be broadly divided according to the aim of improving either biology or biomechanics. Surgeries aimed at improving the biology, such as vascularized fibula grafting, have good success rates but require high levels of expertise and substantial resources. A popular surgical treatment aimed at improving the biomechanics-valgus intertrochanteric osteotomy-optimizes conditions for fracture healing by converting shear forces across the fracture site into compressive forces. Numerous variations of this surgical procedure have been developed and successfully applied in clinical practice. As a result, the proximal femoral orientation for obtaining a good functional outcome has evolved over the years, and the present concept of altering the proximal femoral anatomy as little as possible has arisen. This technical objective supports attaining union as well as a good functional outcome, since excessive valgus can lead to increased joint reaction forces. This review summarizes the historical and current literature on valgus intertrochanteric osteotomy treatment of nonunion neck of femur, with a focus on factors predictive of good functional outcome and potential pitfalls to be avoided as well as controversies surrounding this procedure.

Keywords: Neck of femur, Valgus intertrochanteric osteotomy, Head shaft angle, Neck resorption ratio, Nonunion.

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Corresponding author

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INTRODUCTION

The principal complications of femoral neck fractures are non-union and Avascular necrosis of the femoral head. The rate of non-union neck of femur fractures is 10 to 20% and might be up to 33%. The treatment for non-union neck of femur fractures is internal fixation, valgus intertrochanteric osteotomy, non-vascularised fibular grafting, vascularized bone grafting, and total hip arthroplasty [1]. Non-union following fixation of femoral neck fractures may be due to initial fracture displacement, fixation in fractures with posterior comminution and poor fracture reduction. Neglected femoral neck fractures are more commonly observed in the developing world and are associated with a special paradigm of complications that includes osteopenia, resorption of neck, and avascular necrosis (AVN); unfortunately, these complications are also detrimental to head preservation . The methods of treating non-union aim either at improving the biology and bone stock (i.e., non-vascularized and vascularized bone grafts, muscle pedicle graft) or improving the biomechanics (i.e., valgus osteotomy) [2]. The concept of valgus osteotomy was clarified by Pauwels in 1927, according to his findings showing that non-union of femoral neck fractures was due to the high shear forces that increased with the vertical orientation of the fracture. The proposed biomechanical solution was to change these forces into compression forces through an angulation osteotomy and fixation with a blade plate device [3]. Valgus intertrochanteric osteotomy as qualified by Pauwels [1976] and then modified by Muller is still in use, and remains a admired treatment option as it has a high success rate and corrects the common symptoms of coxa vara and linked limb length discrepancy. Marti et al helped to popularize the valgus intertrochanteric osteotomy for non-union of femoral neck fractures by acquainting good outcome in a long-term follow-up study [4]. The biomechanics around the femoral neck fractures are the backbone for valgus intertrochanteric osteotomy for non-unions Angled blade plate (110˚ and 120˚), 95˚ blade plate, the sliding hip screw device (135˚ the 95˚ angled blade plate and a modified prebent dynamic condylar screw device have all been used as fixation devices for this surgery. In our study we use135˚ DHS plate [5].

MATERIALS AND METHODS

This is a prospective interventional clinical study on Functional and radiological outcome of valgus osteotomy with DHS fixation for nonunion neck of femur. This study includes 20 cases done in Department of Orthopaedics in Tirunelveli Medical College, Tirunelveli in the year 2022.

Inclusion Criteria

- Patients 18-60 years of age with fracture neck of femur of more than or equal to3 weeks since injury.
- Patients 18-60 years of age with failed primary fixation.
- Pauwel's type 2 and 3
- Sandhu stage 1 and 2
- Non union neck of femur with Ficut and Arlet stage 1 and 2A

Exclusion Criteria

- Age group more than 60 years and less than 80 years
- Sandhu classification stage 3
- Pauwels type I
- Ficut and Arlet classification stage 2B, 3 and 4

The study was approved by the ethical committee of our institution, and all patients gave informed consent. Patients with intra capsular femoral neck fracture >3 weeks old, Garden type III/IV fractures, Pauwels type II/III fracture line and those with acceptable reduction (closed/open) on fracture table were selected for the procedure. Elderly patients (age >60), patients having preexisting diseases in same/opposite hip or having medical co-morbidities, those failing to get acceptable reduction and those having signs of avascularity on X-ray were excluded from the study.

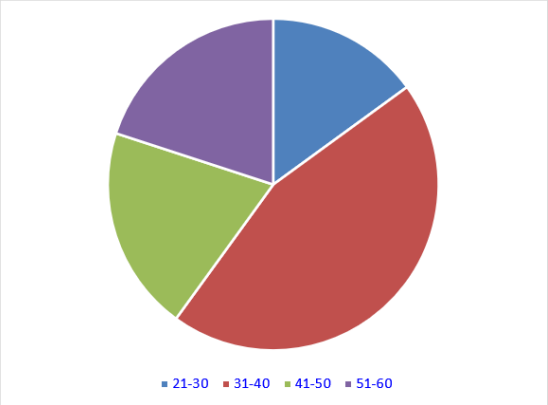
RESULTS

During the study period from august 2021 to august 2022, 20 patient with Nonunion neck of femur

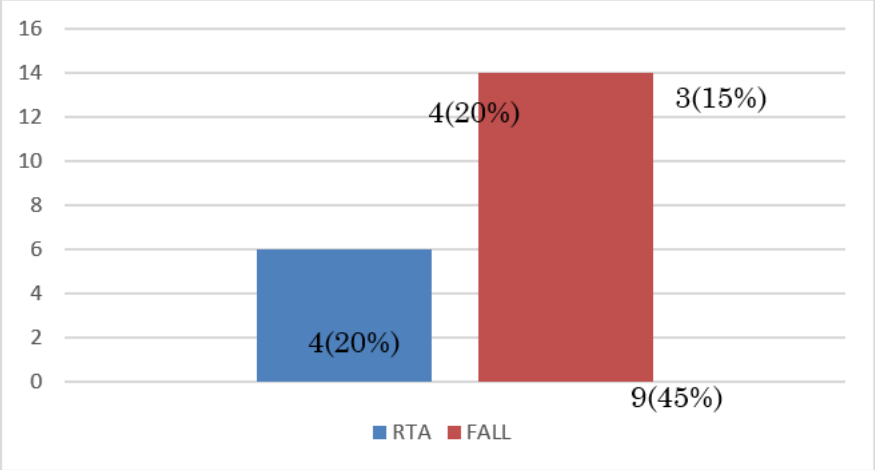
Treated with valgus osteotomy and DHS Fixation. There were 14 males and 6 females in our study with the left side being more commonly affected in 12 patients. The mean age of the patients was 40 years ranging from 20 to 55 years. The most common mode of injury was Accidental fall. The mean time since injury and presentation to the hospital was 5 weeks ranging from 3 weeks to 10 weeks. The average duration of surgery was 78 minutes. The average time to clinical union of fracture was 4.4 months. Ranging from 3 months to 6 months. Out of 20 patients ,18 patients Fractured site and osteotomy site united well.For 1 patient the fracture site not united and another patient screw cut through happened before the union of fracture site. For the above two patients DHS was done. The average preoperative pauwells angle was 53degree, Ranging from 48 to 62 degree. while the average neck shaft angle was 119degree,Ranging from 104 degree to 128 degree. The posteratively average pauwells angle was 29 degree, ranging from 25 to 35 degree, While the average neck shaft angle was 134 degree ranging from 129 to 138 degree. The average preoperative oxford hip score was 19 ranging from 12 to 29. While there was a significant increased postoperatively to 38 .Post operatively 6 patient had a shortening ranging from 0.3 to 0.5cm .Managed by Heel rise. One patient developed superficial skin infection .it will settle down with antibiotics. Intraoperatively Greater trochanter was fractured in one patient was managed by tension band wiring. Post operatively the SS wire was broken but the patient was clinically asymptomatic. There were no AVN encountered in our study. None of our patients were lost to follow up. Out of 20 patients ,70% of patient had excellent Outcome , 20% of patients had good Outcome and 10% of patients had poor outcome based on the oxford hip score.

RESULTS

Graph 1: Age Incidence



Graph 2: Mode Of Injury



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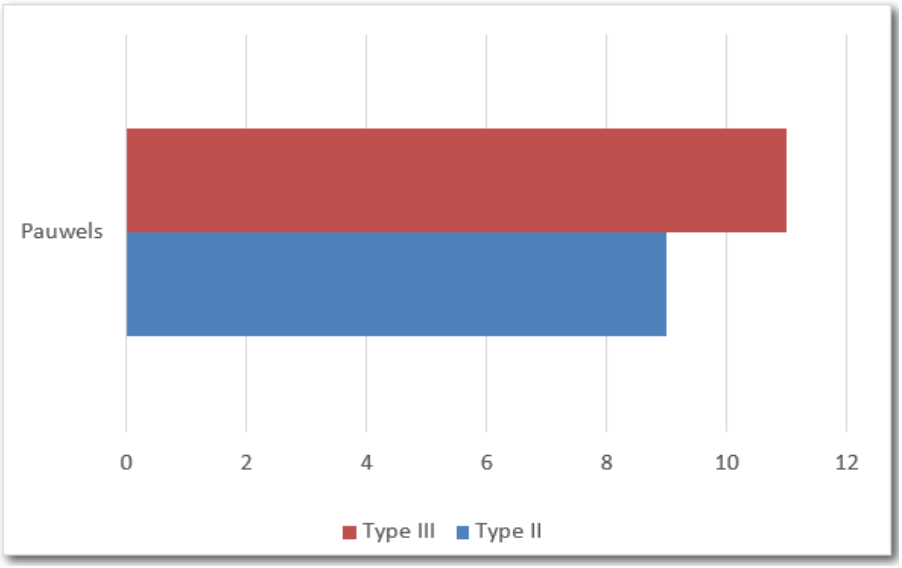
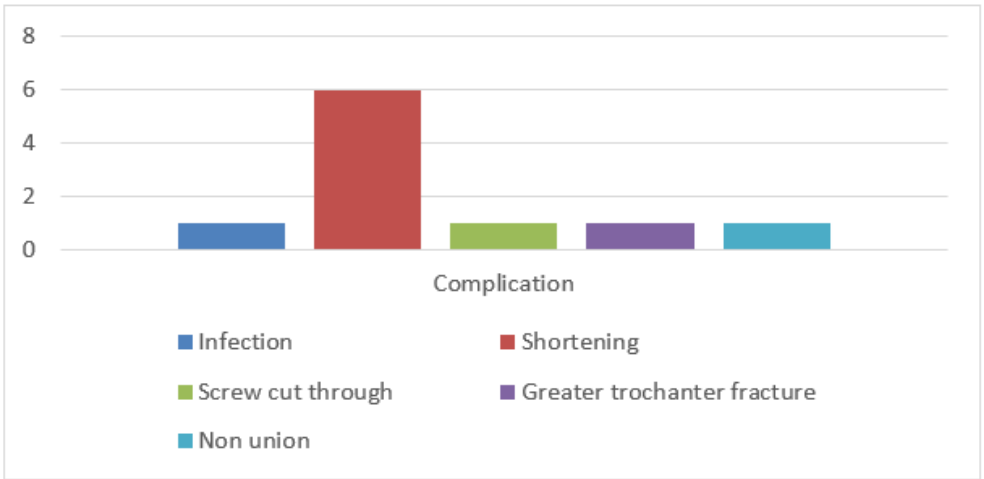
Graph 3: Side Of Injury

Graph 4: Fracture Type



Graph 5: Complications



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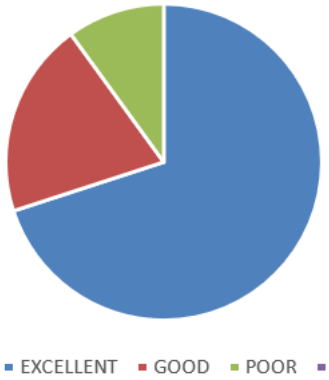
Graph 6: Functional Outcome



DISCUSSION

The management of fracture non-union of the neck of femur is technically demanding and age specific. The treatment of choice in elderly individuals would be a replacement arthroplasty as in either a bipolar or total hip arthroplasty. In younger individuals, there is a need to salvage the femoral head and hence they would not be ideal candidates for replacement arthroplasty. Internal fixation with cannulated cancellous screws would be beneficial only in the acute set up and they do not have a role to play in cases of established non-union [7]. In such situations, Valgus osteotomy would be the procedure of choice as it would address all the parameters as required. In fractures of the neck of femur the Pauwels angle ranges from 30° to 70°. With an increase in the Pauwels angle the fracture line becomes more vertical which increases the shearing forces acting on the hip leading to the formation of fibrous tissue at the fracture site leading on to the formation on a non-union [8]. The aim of surgery would be to make the fracture line more horizontal by ideally reducing the Pauwels angle around 30° so that the shearing forces are converted into compressive forces. The neck shaft angle is also to be restored to around 130° to135° in order to restore the normal anatomical lever arm of the abductors. Valgus osteotomy decreases the forces acting on the hip joint and restores the decreased neck shaft angle to normal values. It makes the fracture line more horizontal thereby converting the shearing forces into compressive forces. The osteotomy per se improves the vascularity at the fracture site and promotes fracture union while addressing the limb length discrepancy as well [9]. Fixation following osteotomy can be done with either a DHS or an angled blade plate. We routinely used a DHS with a fixed 135° angle as we found it to be technically easier to perform as compared to a blade plate which is more technically demanding [10]. All the patients in our study opted for native treatment initially and presented to us at an average of 5 weeks since the initial injury. They presented with hip and back pain, limp, shortening and an abductor lurch. There were treated with valgus osteotomy with DHS fixation. 18 out of 20 fractures united at the end of 6 months [11]. There was an average correction achieved in the Pauwels angle by 29° and the neck shaft angle was restored to around 134°. There was a significant increase in the Oxford hip score from an average of 19 preoperatively to 38 the postoperative period. 18 out of 20 patients returned to their preinjury status at the end of 6 months and were able to walk comfortably without pain. Shortening was seen in 6 patients ranging from 0.3 to 0.5 cm but it was not causing any functional disability for the patients and was well tolerated by a heel or sole rise [12]. Major ccomplications were encountered in our study was Nonunion [1case] and screw cut through[1case]. none of our patients were lost to follow up. We had a union rate of 90% in our study with One case of nonunion and one case of screw cut through [13]. We thereby conclude by stating that Valgus osteotomy with DHS fixation is a good option for the management of fracture non-union of the neck of femur in younger individuals where the femoral head needs to be salvaged. It restores the neck shaft angle and the integrity of the abductor mechanism, addresses limb length discrepancy, promotes union at the fracture site and gives good functional results [14,15].

CONCLUSION

In our study we conclude that valgus osteotomy with DHS fixation is a good option in the management of fracture non-union neck of femur in younger individuals. It promotes union at the fracture site and gives excellent functional results. We strongly recommend its usage in the management of these fractures.

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