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EARLY RESULTS OF CONTRA- LATERAL REVERSE DISTAL FEMORAL LOCKING COMPRESSION PLATE VS DYNAMIC HIP SCREW IN THE TREATMENT OF SUBTROCHANTERIC FRACTURES OF FEMUR

Orthopaedics

Dr. Vijendra Kumawat Junior Specialist (Orthopaedics), Department of Medical And Health, Rajasthan.

Dr. Rakesh Chand Meena* Medical officer (Orthopaedics), Department of Medical and health, Rajasthan.
*Corresponding Author

Dr Ratan L Dayma Senior Professor & Unit Head, Department of Orthopaedics, S.M.S. Medical College, Jaipur, Rajasthan.

ABSTRACT

Aim: The present study is designed to asses early functional results of contralateral reverse distal femoral locking compression plate with comparison of dynamic hip screw in subtrochanteric femur fracture.

Patients And Methods: 30 cases in each group with S/T fracture were treated with contalateral reverse DFLCP and DHS at orthopaedic department, S.M.S Medical College , Jaipur from APRIL 2015 to DEC.2016 were included who fulfilled the inclusion criteria after taking informed written consent.

Results: The fracture united by average 11.5 weeks with DFLCP and 14.92 weeks with DHS. Average Time Of Full Weight Bearing was 12.6 weeks with DFLCP and 16.56 weeks with DHS . According to the Modified Harris Hip Score, the results were excellent in 19, good in 6 cases with reverse DFLCP while with DHS result were excellant in15 cases, good in 5 cases, fair in 3 cases, poor in 2 cases. 1 case developed superficial wound infection at the suture site in reverse DFLCP as compare to DHS which had 4 cases of complication. 2 cases had implant failure & non-union, both occured with DHS.

Conclusion: Contra-lateral reverse distal femoral locking compression plate is more effective way of fixation specially in unstable S/T fractures than dynamic hip screw.

KEYWORDS

Femoral subtrochanteric Fractures, Contra-lateral Reverse Distal Femoral Locking Compression Plates, Dynamic hip screw.

BACKGROUND:

The subtrochanteric area of the femur has been defined as the region between the lesser trochanter and the junction of the proximal and the middle third of the femur(lesser trochanter to 5 cm).Subtrochanteric fractures comprises about 10 to 34% of hip fractures.High energy trauma is the major culprit causing subtrochanteric fractures in young adults.The predominantly cortical nature of the region along with the strong muscular attachments and high compressive forces acting medially are responsible for intra-operative difficulties and high rate of complications associated with the fractures of this region.[1,2,3] The fixation demands an implant that provides a suitable environment for fracture healing, in addition to providing stability. There is always a debate between intramedullary and extra-medullary devices which seems never ending for fixation of these fracture. Although the intramedullary fixation seems to be the current treatment of choice but in cases where the medial cortex is comminuted the use of conventional femoral interlocking nails makes for an unstable biomechanical construct and lead to complications like implant failure, Z effect, abductor weakness, impingement & insertion site pain[4]. So Various extramedullary devices have been developed and used over time for fixing subtrochanteric fractures like angled blade plate, dynamic condylar screw, dynamic hip screw, contra-lateral reverse distal femoral locking compression plate, proximal femoral locking compression plate.

We intend to present early results of reverse contralateral distal femoral locking compression plate (DFLCP) and dynamic hip screw to find as an biomechanically sound alternative extramedullary devise for fixation of subtrochanteric fractures.

MATERIALS AND METHODS:

30 cases in each group with S/T fracture were treated with contra-lateral reverse DFLCP and DHS at orthopaedic department S.M.S Medical College, Jaipur from APRIL 2015 to DEC.2016. Patients with age more than 18 years, single fracture and fresh (less than 2 weeks old) closed subtrochanteric fractures with follow-ups were included in the study. Those excluded from the study had 1) multiple fractures; 2) open injuries and pathological fracture ; 3) not cooperating with treatments. There were 41 males and 19 females in the study. They had age ranging from 20 to 98 years old with an average of 55.02 years. 37 had right side fractures and 23 cases had left side fractures. For the traumatic causes 37 had a traffic accident, 14 had a fall and 9 had a fall from height. Patient had a plain radiograph anteroposterior (AP) view of the pelvis with both hips with 15 degrees of internal rotation and lateral view of hip with thigh done at the time on admission, and all fractures were categorized according to **Seinsheimer's classification**. According to Seinsheimer's classification , there were 28 type III fractures, 18 type IV fractures, 8 type II fractures and 6 type V fractures.

All the patients were evaluated for associated medical problems and were referred to respective departments and necessary treatment was given. Associated injuries were evaluated and treated simultaneously. All the patients were operated on elective basis after overcoming the avoidable anesthetic risks.

Operative technique of Contra-lateral reverse DFLCP insertion:

The vastus lateralis splitting approach was used for both type of fixation. Lateral skin incision was taken from tip of greater trochanter. Subcutaneous tissue, 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 2 inches. The incision was extended distally for plate application.Reduction of fracture maintain by k-wire and bone holding forceps then appropriate hole size contralateral side DFLCP plate taken and reversed upwards.Tip of proximal side of plate kept at tip of greater trochanter and fix with k-wire and distal part of plate hold with bone holding forceps.Post fixation alignment was acceptable as the cases were reduced under direct vision taking care about the length and rotation. We did not denude the bone; only the fracture site was exposed to attain direct anatomical reduction. Being a locking plate, it did not require any periosteal stripping.For the purpose of fixation in the proximal femur, the target was to drive long screws up to the femoral calcar in two rows of locking screws through the proximal expanded part of the locking plate and 6-8 cortices purchased in the distal fracture fragment.

In this plate proximal part have 7 holes but in practice one can usually put a maximum of 5 bolts (three bolts in central row and two either anterior or posterior) as shown in fig2. In view of the some spiral configuration of the fracture, it was fixed with inter-fragmentary screws and neutralized with a plate. After fixation, we moved the hip joint through the complete range of motion and checked the stability. All wounds were closed in layers and drain applied dressing done.

Operative technique of Dynamic hip screw insertion:

The vastus lateralis splitting approach was used. To determine femoral neck anteversion, a Kirschner wire was passed over the front of

femoral neck. Using the appropriate DHS angle guide with 'T'- handle. The guide wire should lie in middle of the femoral neck in both AP and Lateral views.The level of insertion of guide wire varies with angle of plate used. The proximal aspect of osseous insertion of gluteus maximus and the tip of lesser trochanter, which are 2 cm below the vastus lateralis ridge, help to identify the level of entry of 135° angle plate. If higher angle side plate is used move the entrance site 5 mm distally for each 5° increase in barrel angle.

The **direct measuring device** was slided over the guide pin and reading of length of pin inside femoral neck and head was taken. The triple reamer was set 10mm shorter than the reading of the direct measuring device. The triple reamer was placed over the guide wire and the neck portion was reamed. Generally for osteoporotic bone there was no need to tap. Tap was inserted with the help of short centering sleeve to cut the threads into reamed portion of head and neck in the hard cancellous bone.

The leg screw was driven into the femoral neck by turning the wrench, until the zero mark on wrench reached the lateral cortex. The 'T' handle of wrench was made perpendicular with femoral shaft at the end of insertion, to allow proper keying of the lag screw to the barrel plate.With the **impactor**, the plate was hammered against cortex of femur. The plate was fixed to the femoral shaft with screws in usual manner, traction was released and compression achieved by tightening the coupling screw.

In DHS fixation for the Richard screw(lag screws) placement the rule also applies. The lag screw placement must be in the centre as far as possible i.e in both AP and lateral view. It may be placed slightly inferior and posterior but never in the anterior or superior aspect. The TAD should be also less than 25 mm as shown in fig 2. . As far as possible, must try and achieve the placement of lag screw 5-10 mm short of the subchondral bone.

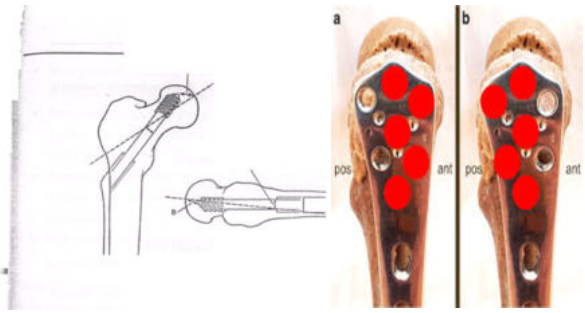

Fig:2

Suction drain was removed after 48 hours. Static quadriceps exercises and knee mobilisation were begun on 2nd post-operative day.Patients were discharged after 3-5 days with instruction to non weight bearing and static quadriceps exercises. Sutures were removed on 14th post - operative day and toe touch weight bearing was started. Partial weight bearing was started after reviewing clinically and radiologically at 6 weeks post operatively.

Early aggressive weight bearing was not pursued as most patients were elderly with advanced osteoporosis and poor physical fitness. 3-6 months later, the patients were allowed full weight after looking at callus response seen in radiographs. Patients were advised to come for follow up and clinico-radiological assessment at two weeks, six weeks, three months, six months. Patients with a minimum follow up of six month were included in the final analysis.

Patient were assessed functionally with the Modified Harris Hip score. The results were excellent for a score of ≥ 90, good for 80-89, fair for 70-79 as fair and poor for <70, respectively.18 For radiological assessment, serial radiographs of the hip were taken at 6 weeks, 3 months and 6 months.

RESULTS:

The period from injury to operation within 7 days, with an average delay of 3.98 days as most of the cases were elderly patients with co-existing morbidities. They had to be evaluated by Internal medicine team prior to surgery. Both procedure had no much significant operative time difference with 64.2 minutes for reverse DFLCP and 60.9 minutes for DHS. Fluoroscopy time or radiation exposure time was significantly less in reverse contralateral DFLCP procedure in our study with mean 46.93seconds (for DHS 68.33 seconds). Mean time of hospital stay was same for both procedure. Out of 60, 50 cases were followed up for 6 to 9 months (10 cases lost in follow up, 5 in each group). The fracture united by average 11.5 weeks with DFLCP and 14.92 weeks with DHS. Average Time Of Full Weight Bearing was 12.6 weeks with DFLCP and 16.56 weeks with DHS . According to the Modified Harris Hip Score, the results were excellent in 19, good in 6 cases with reverse DFLCP while with DHS result were excellant in15 cases, good in 5 cases, fair in 3 cases, poor in 2 cases. As about the complications, 1 case developed superficial wound infection at the suture site in reverse DFLCP as compare to DHS which had 4 cases of complication in which 1 had implant failure & 1 had non-union.

DISCUSSION:

Fractures of subtrochanteric femur have been recognized as a major challenge by the Orthopaedic community, not solely for achieving fractures union, but for restoration of optimal function in the shortest possible time. The aim of treatment is to achieving early mobilization, rapid rehabilitation and quick return of patients for active daily living. Operative treatment in the form of internal fixation permits early rehabilitation and offers the best chance of functional recovery, and hence has become the treatment of choice for virtually all fractures in the trochanteric region. Varity of fixation methods are available today for fixation of subtrochanteric fractures. There is always a debate between intramedullary and extra- medullary devices which seems never ending for fixation of these fracture.

Intramedullary devices are placed close to mechanical axis of femur so moment arm is less in them leading to less tensile stress, thus they behave as load bearing devices.[2] Simmermacher et al. recommended Proximal Femoral Nail Antirotation (PFNA) as optimal implant for subtrochanteric fractures in osteoporotic bone5. However, use of intramedullary nail in subtrochanteric fractures requires a long learning curve, and associated with high failure rates specially in cases where the medial cortex is comminuted the use of conventional femoral interlocking nails makes for an unstable biomechanical construct and causes complicatios like Z effect & reverse Z, producing varus collapse , joint penetration implant back out leading to implant failure[6,7,8,9,10,11], fracture shaft of femur below tip of nail [12,13]. The evidence-based studies have not been able to establish conclusively, the superiority of intramedullary devices over extramedullary implants[14,15].

So Various extramedullary devices have been developed and used over time for fixing subtrochanteric fractures like angled blade plate, dynamic condylar screw, dynamic hip screw, contra-lateral reverse distal femoral locking compression plate, proximal femoral locking compression plate. Use of locking plate (LCP) as an internal fixator reduces the plate contact area thus preserving the vascularity and enhances healing; the chances of osteoporosis at the plate bone interface is also reduced[9]. Thus, using an extra-medullary implant with minimal soft tissue stripping we can achieve a quick callus formation and good union rate so allowing patients an early rehabilitation and weight bearing comparable to that of Intramedullary fixation.[16]

Dynamic hip screw(DHS) is widely preferred and time tested for intertrochanteric fracture. Due to its mechanism of long lever arm, it is also used for subtrochanteric fracture fixation. The sliding screw is technically straightforward to use and familarity of most surgeons with sliding hip screw technique in the treatment of trochanteric fractures made its use enhanced. According to our study, sliding screw showed excellent results in type II fractures but it had some complications with unstable S/T fractures. Results are also not very promising for unstable S/T fractures. In our study, DHS had more complications than contralateral reverse DFLCP. Two cases, one had non union and one had implant failure, both had undergo DHS fixation.

On the other hand, the DFLCP has long been used in distal fractures of the femur shaft with good results.[17]It is a biomechanically good implant to be used in the subtrochanteric region as well. The shape of a reversed contralateral distal femoral plate fits very well with the contour of the greater trochanter and the shaft of the plate fits well with the anterolateral curve of the femur. The use of locking screws further leaves a gap between the bone and the implant thus preserving the periosteal bold supply of the bone.[18]The placement of the proximal part of the plate at the trochanteric ridge ensures at least one row of screws

in the femoral calcar. Also, it was observed even if the most proximal screw went into the neck. It, being of a locking nature ensured sufficient hold. Femoral subtrochanteric fractures extending to pyriform fossa or trochanteric fractures with comminution or split in coronal plane, obese patients, patients with previous fracture in femur ,excessive anterior bowing of femur, narrow femoral canal. Contra-lateral reverse DFLCP is a viable choice in such situations[19].

In our study, there was significantly reduced bone union time, less fluoroscopy time, early full weight bearing, less complications and excellent harris hip score in reverse contralateral DFLCP group compare to DHS in our study. Only superficial would infection was seen in 1 cases which was resolved by oral antibiotics for 7 days. While on the other hand, with DHS group 1 case presented with nonunion and treated by revision surgery with RC-DFLCP & bone grafting after 6 month of follow up. 1 patient operated with DHS presented in follow up with varus collapse and shortening of 1 cm which was not functionally significant for the patient. 1 patient operated with DHS presented in follow up after 3 month with broken dhs implant due to slip & fall. Patient was reoperated with implant removal and fixation with RC-DFLCP and bone grafting.

Some Advantages of RC-DFLCP over DHS is:

- Many screws (5-7) in head & neck of femur so it gives good purchase and stability
- Screws goes both in calcar and cancellous part of neck
- Plate is locking in nature so preserve periosteal blood supply
- Good results in comminuted fracture by bridging or MIPPO techniques
- Less need of image intensifier
- Rotational stability more
- Also use for failed DHS,PFN,broken implant
- Less complication

Limitation and Recommendations:

The are many limitations of our study including small sample size, shorter duration of follow up, lack of any statistical verification. Large, double-blind, and randomized prospective trials are needed to verify the long-term results. In our study, we had to delay full weight bearing for 3-6 months till plain radiographs fulfilled the radiological criteria of union of fracture. Most of our study patients were economically poor and came from very far distance from our centre so we have to make our follow up protocol as, the patients were followed up at two weeks, six weeks, three months, six months, thus making it difficult to know exactly when union occurred in each individual patient. So, we suggest the patients should be followed up at more frequent and at uniform interval of 1 month till fracture union. This will help to detect more precisely at what time the union has occurred and allow weight bearing after that.

CONCLUSION:

We conclude that contra-lateral reverse DFLCP is a reasonable alternative of intamedullary nailing for subtrochanteric fractures, especially in the world where costly image intensifier facilities are not availabe due to financial constraint compare to dynamic hip screw.

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