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DYNAMIC CONDYLAR SCREW IN SUBTROCHANTERIC FRACTURES OF FEMUR- AN IDEAL OPTION IF DONE IN THE BEST WAY

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ABSTRACT

Objective: To study the results of 31patients with subtrochanteric fractures of the femur, treated surgically with fixation by dynamic condylar screw at a secondary care hospital of Kerala, India between June 2012 and May 2017**. Methods:** The patients were reviewed with the mean follow-up of 28.90 weeks (range- 8 to 104 weeks) postoperatively. The mean duration of union was 10.61 weeks (range 6 to 12 weeks).One fracture was found malunited in varus. Excellent or good clinical and radiological scoring was achieved in 23patients (74%); but fair in 8(26%). **Conclusions:** We concluded that DCS is an ideal option for treating subtrochanteric fractures of femur considering its reasonable functional outcome and easy availability.

KEYWORDS: Subtrochanteric fracture, dynamic condylar screw, internal fixation.

INTRODUCTION

Subtrochanteric fractures are those fractures occurring within an area extending from lesser trochanter to isthmus of femur.[1,2] These fractures are more common in the elderly who often sustain fracture following a trivial fall. Incidence of subtrochanteric fractures is found increasing with ageing of the society. Comminution will be less in the elderly compared to youngsters who present with history of high energy trauma.[3,4]

Treatment of subtrochanteric fracture is highly challenging because of high stress concentration, varying degrees of comminution and possible slower healing resulting out of poorly nourished cortical bone of the fractured area.[5] Most patients will have severe osteoporosis and other co-morbid conditions that increases the risk of surgery as well as anaesthesia. Aim of treatment should be restoration of femoral length, anatomic reduction and optimal fixation for faster healing and early ambulation.[4] Many devices are available for fixation which can be categorised as extramedullary and intramedullary. Whatever be the implant used, it should prevent angular and rotational malalignment throughout the process of healing. These fractures may occur singly or in combination with trochanteric fractures as an extension. As mentioned earlier healing time for these fractures will be more due to predominantly cortical bone and poor vascularity of the area. Moreover different deforming forces act on the fragments leading to flexion, abduction and external rotation of proximal part with adduction of distal fragment. Sheer forces thus acting can lead to implant failure if not well fixed.[3,6] Biomechanically proximal femur is like a cantilevered arch. The bending force when loaded will cause compression in the medial cortex and tension over the lateral side[3] If the medial cortex is deficient because of comminution or bone loss, there is high chance for loss of fixation or implant failure.[7] So restoration of the medial cortex continuity is key to the success especially in extramedullary fixation if implant is not prestressed in tension.

More proximal the fracture is, more difficult is to fix it with considerable stability. Intramedullary nail provides better biomechanical stability than extramedullary devices in such situations.[1] With the advantage of early weight bearing, locking plates provide better vascularity preservation compared to conventional plating methods like dynamic condylar screw(DCS) since wider exposure is needed for the later.[15] No single implant fits all the variations of subtrochanteric fractures so as to be considered as the method of choice.[5,6]

DCS act as static and rigid implant in pure subtrochanteric fractures whereas biomechanical changes are noted in combined intertrochanteric-subtrochanteric fractures where the implant outperforms intramedullary nail in terms of stability. DHS if used in such fractures will result in construct failure due to lateral drift of proximal fragment, excessive sliding of the lag screw resulting in limb shortening and medialization of the femoral shaft.[5,8,9] Though designed for use in distal femur DCS has certain salient features that make it advantageous for use in subtrochanteric fractures too.[10]

The main aim of this study is to find out clinical and radiological outcomes in the treatment of subtrochanteric fractures using DCS.

MATERIALS AND METHODS

33 patients with subtrochanteric fractures were treated using dynamic condylar screw (DCS) as fixation device at a secondary care hospital of Kerala, India between June 2012 and May 2017. Patient when arrived at casualty department was examined thoroughly including general, local and systemic examination to rule out polytrauma. Evaluation of X- rays were done and classified according to AO manual (figure 1) to assess the fracture pattern. Patients after admitting were temporarily immobilised with skin traction and necessary investigations done for surgical fitness. Most patients were operated within 12-36 hours of admission except in three patients because of associated co-morbid diseases. Polytrauma patients were excluded from the study.

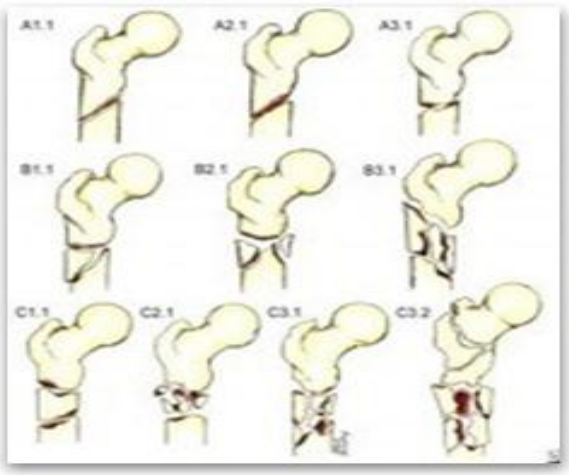

Fig.1:AO classification of peritrochanteric fracture.

Surgical Technique

With the patient lying in supine position on fracture table and under the guidance of image intensifier, guide wire was passed into the neck of femur percutaneously (fig2a) with entry point about one inch below the tip of greater trochanter at an angle of 95 degree through the centre of neck of femur so as to reach upto two millimetre of subchondral bone. Central positioning of guide wire was confirmed in AP and lateral views using image intensifier (fig. 2b & c). Three centimetre vertical incision was made incorporating the the guide wire so as to facilitate entry of hip screw which was done in routine steps of reaming (fig.2d,3e,f).

3e,f). Incision was then extended downwards upto a few centimetres distal to the distal most end of fracture line so as to include a minimum of 3 screws beyond the tip of fracture. Fracture was then reduced and fixed with adequate length barrel plate and screws (fig.3g,h). Large comminuted fragments if present were fixed with inter fragmentary screws. None of the patient underwent primary bone grafting. Fracture site was exposed in all patients since we believe anatomical reduction of the fracture is the most important step in this fixation technique so as to achieve best results. Prophylactic broad spectrum antibiotics were given intravenously in all patients 1 hour before the induction of anaesthesia and same dose was repeated every 12th hour for a maximum of three days post operatively.

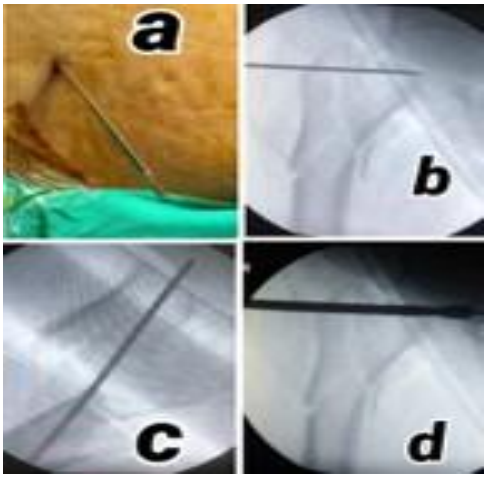

Fig.2 showing steps in surgical procedure - Introduction of guide wire percutaneously (a) confirmed using image intensifier in AP and lateral views (b and c). (d)Reaming of the neck of femur.

Fig.3 Continuation of surgical steps-Triple reamer application in AP and lateral views (e and f). Plate application through extended exposure after manual reduction of the fracture (g). Plate position and fracture reduction confirmed(h).

Post-operative care

Static quadriceps exercises were started the very next

day of surgery and non weight bearing walker assisted walking was started on 3rd post-operative day depending on patient compliance, type of fracture and rigidity of fixation.Partial weight bearing was started at a minimum of 3 weeks after the surgery once adequate callus was seen in follow up X-ray films.

Follow up

Outpatient follow up was done at regular intervals with mean follow up of 28.90 weeks (range- 8 to 104 weeks) postoperatively. Final clinical assessment was done including pain, walking ability, hip motion and limb length. Both anteroposterior and lateral radiographs were taken at regular intervals to look for signs of fracture healing, deformity and implant failure. Modified Schatzker- Lambert scoring system (fig.2) was followed for the clinical and radiological assessment.

Excellent	Full extensionFlexion loss of <10° No varus, valgus, or rotary deformityNo painPerfect joint congruency
Good	Not more than one of the following:Length loss of not >1.2 cmVarus or valgus deformity of <10° Flexion loss of not >20°Minimal pain
Fair	Any 2 of the criteria in the good category
Poor	Any of the following: Varus or valgus deformity exceeding 15° Joint incongruence Disabling pain

Fig.4: Modified Schatzker - Lambert scoring system.

RESULTS AND DISCUSSION

Though all fractures united at an average union time of 10.61 weeks (range, 6 to 12 weeks), one fracture was found malunited in varus. Average follow up period was 19.09 weeks (range, 12 to 104 weeks). None of the patients in our study revealed any sign of avascular necrosis of femoral head till last follow up. Cut out of neck screw was not observed in any patient; but one had failure of barrel plate fixation with pull out of the structure along with screws. Out of 31 patients, 12(31%) had excellent results with return to pre injury activities;8 patients (26%) had mild to moderate discomfort on prolonged activities and minimal restriction of hip joint range of motion; thus graded them as fair outcome. Rest of the 11 patients (43%) were graded as good result outcome.

Subtrochanteric fractures has always been a challenge to Orthopaedic surgeons because of its high rate of complications which in turn is due to unpredictable amount of stress concentration and high degree of comminution. There is no role for non-operative treatment in subtrochanteric fractures except in pre adolescent age group patients and also in those adults where other co-morbid conditions makes them unfit for anaesthesia. Healing in such patients is dependent on the degree of vascular insult at the time of trauma.

Operative treatment should aim at faster healing and early mobilisation which in turn is achieved by rigid and adequate fixation. Meticulous planning thus helps in preventing delayed union,non-union, infection, refracture and implant failure. Available evidence supports using a cephalomedullary device for the treatment of patients with unstable subtrochanteric fractures especially those with medial cortical comminution.[11,12] Previous studies have proved that extramedullary devices necessitates for extensive surgical exposures, soft tissue damage and blood loss compared to intramedullary devices with increased risk of delayed or nonunion and implant failure.[13]

In those fractures where intramedullary nailing is difficult due to technical reasons, DCS is a good alternative due to its affordability and easy availability. Near anatomic reduction is possible even in vertical fractures which makes the implant user friendly.[5] Possibility for application of lag screws away from the plate makes the fixation more rigid for vertical fractures. Recently introduced locking compression plate(LCP) with screws provide better stability to fracture fixation especially in elderly osteoporotic patients.[13] If anatomic reduction is not possible due to comminution, prefer for valgus reduction than varus so as to prevent early hip arthritis. Minimal incision introduction and meticulous soft tissue stripping should be opted which will favour faster healing. Postoperative weight bearing should be planned depending on fracture pattern and stability since delayed healing and early loading will lead to implant failure.[1]

Age of the patients in our study varied from 32-90 years with an average age of 68.5 years. Low velocity injury were noticed in elderly patients whereas younger age group sustained high velocity injury. In the series of 25 patients undertaken by Shah SN and others[5] age distribution was 24-75 years with an average age of 48.85 years. In our series, more excellent results were observed in the middle age group than in old age group in whom associated medical disease and general disability affected their mobility and thus the final outcome. Compared to other studies, excellent results were less observed in our study probably due to inclusion of more number of elderly osteoporotic patients.

We reviewed many study reports of treating subtrochanteric fractures by different surgeons.In a series by Sharma et al, where 25 adult patients with relatively younger age (average Age 45.44 years)were treated with DCS, 56% of the fractures were type-A, 28% type-B and 16% type-C. They got 92% excellent/good results, 8% fair results and no failure. The reason for down grading 2 patients (8%) to fair results, were restriction of knee flexion, varus/valgus deformity and pain.[10] In another study by Rajesh Rohilla et al where they adopted more

biological method of sliding plate technique, union rate was 100% without any functional disability.[14] This explains the efficacy of the procedure and its reliability as far as function is concerned. In a study by Ahmet et al where they compared results of PFN(16 cases) and plating in peritrochanteric patients, they didn't notice any difference in final functional outcome.[13] Similar was the result in an Indian population series by Tulasidas and others.[2] In a study by Khallaf et al.[6] where they compared outcome of DCS and DHS in subtrochanteric fractures, more complex and unstable fractures showed better results with DCS thus reiterating its application of choice in such situations. In a review literature by Constantine and others, the authors concluded that sliding hip screw is still the device of choice except in very unstable A3 fractures where failure rates of upto 25% have been documented.[7] Interestingly both of the A3 fractures in our series showed good to excellent results which we believe is due to structural advantage of DCS used in our series over DHS used by those studies. In a study by Christian Von Ruden and others, they reported high rate of intramedullary nail breakage if fracture is not adequately reduced per-operatively[15] probably due to indirect reduction method opted compared to DCS.

CONCLUSION

From the present study of 31 patients with subtrochanteric fractures of various patterns, we recommend dynamic condylar screw as an ideal implant for fixation because of its cheaper cost, easy availability and near equal functional outcome as of other fixation techniques.

Conflict of interest

Both authors declare that there is no conflict of interest.

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