Original Article

Evaluation of Risk of Lag Screw Cut Out in Unstable Intertrochanteric Fractures

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ABSTRACT

OBJECT: To evaluate the risk of lag screw cut out in unstable intertrochanteric fractures.
MATERIAL & METHODS: This study was conducted in the Department of Orthopedic Surgery and Traumatology (DOST) Liaquat University of Medical & Health sciences Jamshoro from January 2006 to December 2009. Unstable intertrochanteric fractures type A2 & A3 of AO classification fixed with DHS in stable (anatomic & wayn county) reduction, were included in study. All patients were assessed on six months follow up x-rays for cut out failure in different positions for placement of screw in femoral head. For placement of screw, femoral head was divided in 9 columns/zones on antero-posterior & lateral plane x-rays.
RESULTS: Out of total 66 study subjects 45 (68.1%) were males and 21 (31.8%) were females, 56 (84.8%) were of A2 and 10 (15.2%) of A3 type. Mean age was 65.41 years. Forty (60.6%) patients were fixed in anatomical reduction and 26 (39.3%) in wayn county reduction. The screw placement was 24 (36.3%) in central –central, 9 (13.6%) in central –inferior, 17 (25.7%) in posterior-inferior and 16 (24.2%) in remaining off central (unsatisfactory) zones. The cut out was in 2 patients (8.3%) in central-central , 0% in central inferior position , 3 patients (17.6%) in posterior inferior and 4 patients (25%) in remaining off central zones (all cut out were in superior zones of femoral head).
CONCLUSION We conclude that placement of lag screw in inferior on AP and central on lateral view in femoral head gives excellent results after achieving stable reduction, having maximum bone to plow for cut out. But it is difficult and time consuming so if it is aimed in lower half on AP and central on lateral view in femoral head it will give better results.

KEY WORDS: lag screw; femoral head; cut out failure; unstable intertrochanteric fractures; Wayn County.

INTRODUCTION

The intertrochanteric fracture is life threatening injury among aged having fragile bones. These fractures are highly unstable. The internal fixation of unstable intertrochanteric fracture with DHS is a standard procedure now a days, but not always successful [(1)]. DHS allows control over collapse and impaction of the fracture leading to greater stability. However complications are frequent, failure of fracture union has been reported in upto 10-20% of cases (2). The main problems have been cutting out of femoral head, plate breakage, pulling off plate from shaft, disengagement of components and varus deformity. (1,2,3) The cutting out of implant from femoral head is the most common cause of mechanical failure. The factors implicated for cutting out include fracture subtype, quality of fracture reduction, type of implant, bone quality and position of implant in femoral head. Among these 5 determinants, bone quality and fracture subtype having major impact (4,5), but are beyond human control, however these when combine with poor reduction and/or improper placement of implant yields worse results (6). On the other hand with good reduction and proper placement of implant 75% of patients regain normal pre-fracture activity (7).

The stable reduction of intertrochanteric fracture provides sufficient medial and posterior cortical contact that does allow effective physiological load distribution; this resists not only the varus, but also prevents posterior displacement of proximal and distal fragments; thus contributes significantly to the strength of fixation.. Anatomic reduction of fracture is goal but practically it is not always achievable, therefore reduction with or without fixation of posterior fragment is the recommended and most frequently used method (8). Wayn county (Valgus/lateral) reduction provides bone contact medially to resist further shortening, varus displacement and potentially increasing mechanical stability. (9, 10)

The ideal position of screw placement in femoral head has been the subject of controversy, but despite this controversy there is uniformity of agreement that superior zones (supero-lateral quadrant on AP view and antero-proximal quadrant on lateral view), of femoral head should be avoided because of the increased risk of the devices cutting out.(10,11) Thomas (12) divided

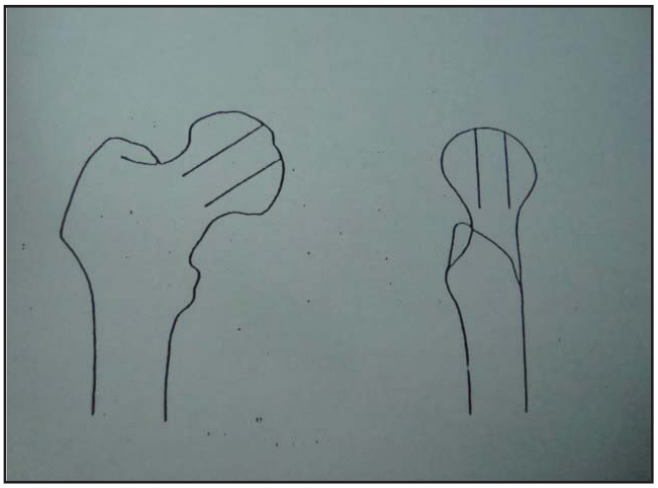
femoral head in 9 zones for screw placement and assessed failure of fixation and recommended satisfactory placement in lower two third of femoral head. Larson (13) recommended central-central placement while others (7,13,14) recommended posterior-inferior placement in femoral head. Larose 1975 (15) recommended that tip of the nail should be past ward's triangle and into femoral head where tension and compressive trabeculae cross but no closer to the subchonderal cortex then 10mm. Baumgaertner MR (16) described tip apex index distance (TAD) should be 11-25mm and found no cutting out failure . Wolfgang (2) and Bryan D.H. et-al (17) found that in postero-inferior placement of screw there is rotation of femoral head and neck on the lag screw, created by bending moments having reason that tip of screw is rounded and has little resistance to rotation. Despite all of these reports, complications are still frequently encountered. We have conducted this study to evaluate the risk of lag screw cut out in unstable intertrochanteric fractures having stable reduction in our local circumstances.

MATERIALS &METHODS

A prospective study was conducted in Department of Orthopedic Surgery and Traumatology, Liaquat University of Medical & Health Sciences Jamshoro. Ninety-eight patients of unstable intertrochanteric fractures were fixed with Dynamic Hip Screw (DHS) in stable reduction (anatomic & wayn county) from January 2006 to December 2009. Out of 98 patients 66 were included in this study. All patients were operated on routine operation list under image intensifier after routine investigations and fitness for anaesthesia. AO classification was followed and A2 & A3 type of fractures were included in the study. All non ambulatory patients before fracture were excluded from study. All fractures were reduced stably (anatomically and wayn county) and fixed with DHS through lateral approach. The tip apex distance was maintained in between 11-25 mm as standard. Procedure was done mostly by senior surgeons but few by junior consultants as well. After surgery patient was allowed to sit on side of bed on postoperative day, on the chair after removal of drain and allowed for toe touch walking with walker on 4-5th post operative day depending upon the general condition of patients and the stability of internal fixation. Partial weight bearing walk with support of walking frame allowed as patient became pain free mostly in between 3-4 weeks after surgery, full weight bearing with walker after 6 weeks, full weight bearing with one cane after 12 weeks and without cane after 20 weeks. Patients were followed up for 6 months. All patients were followed on every fortnightly upto 12 weeks and then every month for 6 months. All patients were assessed on postoperative x-rays for cut out failure in different positions of screw placement in femoral head.

Placement Of Screw Position

It was assessed by dividing the femoral head in nine zones/ columms on anterio-posterior and lateral x-rays. superior, middle/central and inferior zones on anterio-posterior plane and anterior, middle/central and posterior zones on lateral plane.(10) Screws placed in central on AP and central on lateral plane ,and inferior on AP and central on lateral plane were considered as good position , those which were placed inferior on AP and posterior on lateral plane as satisfactory position, remaining were considered un satisfactory.



Femoral head divided in nine zones on AP and lateral views for placement of lag screw.

RESULTS

Out of 66 patients 45(68.1%) were males and 21 (31.8%) were females, having male female ratio 3.1:1. The range of age was from 20-99 years mean 65.41, median 66.50, mode 69 and standard deviation 12.2, and the highest incidence was in 60-70 years. Fifty-six patients (84.8%) were of A2 and 10 patients (15.2%) were of A3 type. Forty patients (60.6%) were anatomically reduced and 26 patients (39.3%) were reduced in wayn county reduction. Average time lapse between injury and hospitalization was 5 days. Average delay in surgery after admission was 7 days. Average healing time was 14 weeks. Associated injuries were present in 5 patients. One patient (immunocompromised) has got deep infection, was treated by local wound debridement and antibiotics according to culture and sensitivity. The screw placement in femoral head was central-central zone 24 (36.3%), central –inferior zone 9 (13.6%), posterior inferior zone 17 (25.7%) and in remaining zones 16 (24.2%).

The cut out of femoral head was in 2 patients (8.3%)

out of 24 in central –central placement, 0% out of 9 patients in central-inferior placement, 3 patients (17.6%) out of 17 in posterior placement and 4 out of 16 patients (25%) in remaining off central un-satisfactory zones (all cut out were in superior zones).

FIGURE I: SCREW PLACEMENT IN DIFFERENT ZONES OF THE FEMORAL HEAD

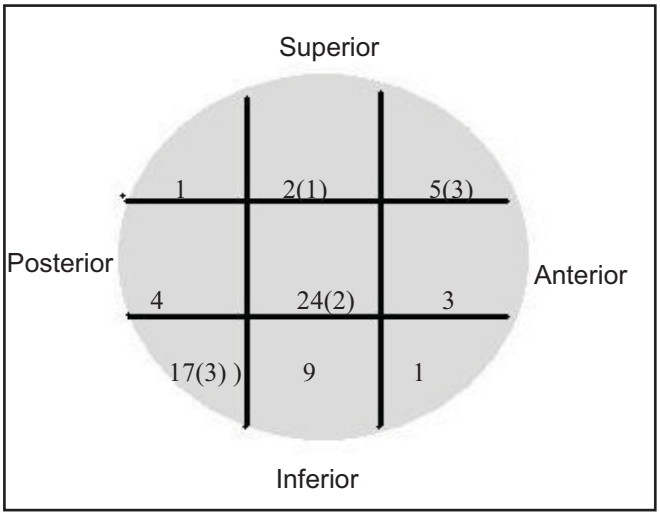


TABLE I:

Placement of screw	No. of Patients	Cut Out Rate
Central- central placement	24	2 (8.3%)
Central- inferior Placement	9	0 (o%)
Posterior- inferior placement	17	3(17.6%)
Remaining zones placements	16	4(25%)

CASE NO. 1: INTERTROCHANTERIC FRACTURE TYPE A3

CASE NO 1 AFTER ANATOMICAL REDUCTION LAG SCREW PLACEMENT IN CENTRAL ZONE ON AP& LATERAL VIEW

CASE NO. 2 INTERTROCHANTERIC FRACTURE AO TYPE 2

CASE NO. 2 AFTER ANATOMICAL REDUCTION AND DHS FIXATION WITH LAG SCREW PLACE-MENT IN INFERIOR ZONE ON AP & CENTRAL ON LATERAL VIEW, WITH SOLID UNION

CASE NO. 3 INTERTROCHANTERIC FRACTURE AO TYPE A2

CASE NO. 3 WAYN COUNTY (VALGUS) REDUCTION WITH LAG SCREW PLACEMENT IN INFERIOR ZONE ON AP VIEW & POSTERIOR ZONE ON LATERAL VIEW WITH SOLID UNION

CASE NO. 4 CUT OUT FAILURE FROM FEMORAL HEAD

DISCUSSION

The strength of fracture fragments implant assembly is determined by 5 variables i.e. bone quality, fracture geometry, fracture reduction, implant design and implant placement. Out of these five, bone quality and fracture geometry are beyond the surgeon's control (18). Implant failure is a major problem in the treatment of intertrochanteric fractures. The major problem has been cutting out from head superiorly (with in or through the femoral head superiorly or neck confinement), bending breakage of plate, pulling off plate from shaft, disengagement of screw within femoral head and pain (1-3,19).

Unstable fractures has tendency to collapse, fracture parts tends to settle by decreasing posterior-medial gap and goes into varus during weight bearing. (20). DHS allows the control collapse with in the barrel and this allows physiological compression at fracture site and minimize the possibility of cutout (21,22). When device loses its sliding capacity by jamming, it acts like fixed device and cause cut through failure in osteoporotic bone. The jamming occurs when 23 mm.or less of screw left in barrel and screw allows less than 20 mm for to slide or screw has length less than 81 mm (23). Anis Bhatti (24) recommended trochanteric support plate to prevent excessive collapse of DHS. Placement of screw in femoral head is also an important factor and has major impact on cut out. It is accepted practice to insert the tip of device in such a place in femoral head that if it get cut through the head, there would be some distance for it to travel before it to cut out completely and placement near the margins of femoral head seem more likely to fail (12).

Maindas and Newsman (25) recommended placement of screw in lower half of femoral head. Guven M. et-al (26) favoured posterior inferior placement. Noordin and colleagues (27) recommended posterior inferior and central – central position of screw in femoral head having stable reduction. He had 16.7% cutting out rate with these placements. Parker (28) concluded that screw should be placed inferiorly in AP and central on lateral plane with wayn county reduction, he had 4.2% cut out rate. Davis (1) have 22% cut out rate with pos-

terior – inferior, 9% with central –inferior, 8% with central-central positions of screw, 30% with central- posterior, 6% with central- anterior, 29% with central- posterior, 4%.central superior and 25% in superior anterior positions. He had these rates for both the Kuntscher Y nail and the DHS. Arshad Bhatti (29) determined that achieving adequate reduction imparts inherent bony stability and allows optimal screw placement resulting low implant failure, he reported 0% cut out rate in anatomical reduction and 18.75% in non-anatomical reduction and 5.4% with central –central placement, 0% with central- inferior placement, 14.3% in posterior- inferior placement and 10% in remaining outer columns of femoral head. Hsueh KK et-al (30) have 2.1% with central –central, 7% with central - anterior, 5% with central posterior 4% with central – inferior,13% posterior –inferior, 4.2% inferior anterior, 20% with superior- anterior, 36.8%superior central and 33.3% with superior posterior placement of screw having anatomical reduction . Our results are comparable to all others showing 0% cut out in central- inferior, 8.3% in central -central 17.6% in posterior inferior placement and 25% in all superior zones placement. Our results show excellent results while lag screw placed in inferior on AP and central on lateral view. We observed that cut out failure is multifactorial. In our society where the living standard of people is very low and malnutrition is common problem, because of that patients develop early osteoporosis and hence have increased risk of cut through failure. Also they are short stature having average height five and half feet in males and 5 feet in females and require usually small size of lag screw such as 75-80mm, only few require 85mm as favored by Jabshetty AB (22) in India (by using 75 mm screw in 80% of his cases). So lag screw gets jammed and lost its sliding property. This all show that in our circumstances osteoporotic bone, improper reduction, small size screw and inappropriate screw placement in femoral head are major factors associated with increased cut out rate. We recommend that inferior –central placement of lag screw in femoral head gives excellent results in stable reduction but is slightly difficult and time consuming so if it is aimed in lower half in AP and central in lateral view it will give good results.

CONCLUSION

We conclude that placement of lag screw in inferior on AP and central on lateral view in femoral head gives excellent results after achieving stable reduction, having maximum bone to plow for cut out. But it is difficult and time consuming so if it is aimed in lower half on AP and central on lateral view in femoral head it will give good results.

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