

A Case Report: Management of Nonunion Fracture Neck Femur in Young Patient

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Abstract

Nonunion femoral neck fracture with varus deformity can be a difficult problem to treat, particularly in the young patients and they are associated with high complication rates of avascular necrosis due to the precarious blood supply and poor biomechanics. For improving either biology or biomechanics various treatment options include cannulated screws fixation with washers in inverted triangle configuration, rigid internal fixation with or without bone grafting, muscle pedicle bone graft, valgus osteotomy of the proximal femur with or without bone graft, valgus osteotomy or hip arthroplasty. Valgus osteotomy, repositioning and fixation with dynamic hip screw (DHS) achieved good union rates and good functional outcome with minimal complications by altering the nature of force transmission across the nonunion, shear forces are converted into compressive forces that lead to rapid osseous union without the need for bone grafting.⁶ Here we are presenting a case of nonunion fracture neck femur in young patient treated with valgus osteotomy stabilized with 140 degree dynamic hip screw.

Keywords: Nonunion; Fracture; Neck; Femur.

Introduction

Nonunion neck of femur fracture collapses in to varus by virtue of deforming action of muscles and thus deranging the biomechanics of the hip and indirectly preventing fracture union further. Such fractures, commonly present with partial or total absorption of femoral neck, osteonecrosis of femoral head in 8–30% cases with upward migration of trochanter posing problem for osteosynthesis, especially in younger individuals.² Hence it is very important to re-orient the abductor lever arm to biomechanically advantageous normal configuration favoring fracture healing. In general, principles of treatment of non-union neck of femur fracture include cannulated screws fixation with washers in inverted triangle configuration, rigid

internal fixation with or without bone grafting, muscle pedicle bone graft, valgus osteotomy of the proximal femur with or without bone graft, valgus osteotomy or hip arthroplasty. Even though lot of controversies exists in the current literature as the various head salvage surgeries, Valgus osteotomy with DHS fixation is a suitable procedure for treatment of nonunion femoral neck fractures in young patients, since it is easy to perform and yields relatively good results by changing the force of action at fracture site.⁴

Case Report

Patient came to orthopaedics OPD with the complaint of pain in left hip since 1 yr. Pain was

sudden in onset, continuous, radiating to knee joint, aggravated on walking and was relieved on taking rest. Patient has difficulty in squatting, sitting cross legged and getting up from sitting position since 5-6 months. Patient limps with support since 1 year. Patient covers a distance of 50 m after which he had to take rest. Past h/o of trivial Trauma. No h/o fever, DM, HTN, Asthma, Loss of appetite, had an alcohol addiction for 10-12yrs and H/O pulmonary T.B 15 years back, for which patient had taken treatment for 1 complete year.

On inspection patient had Trendelenberg gait with Pelvic Tilt present, no lumbar lordosis, left lower limb externally rotated, shortened left lower limb as compared to right, left medial malleolus appears at a higher level than right, quadriceps muscle wasting present with no visible scars or sinuses. On palpation no local rise of temperature, tenderness present on the left hip joint line, greater trochanter of left side at a higher level, tenderness present at greater tuberosity and vascular sign of narath-negative. On movements Flexion at left hip joint painful more than 90 degrees, possible flexion of 110 degree. Abduction at hip joint-10 degree, adduction at hip joint-30 degree, external and internal rotation is painful.

On measurements Bryant's triangle 1 cm less on left side compared to right, Shoemakers line intersects below the umbilicus, Nelton's line-the tip of the left greater trochanter is above the line and special test like telescoping test is positive.



Fig. 1: Pre Operative plain Radiograph pelvis with Bilateral Hips and Left Hip Lateral View.

X-RAY Features:

The radiological findings of x-ray are

1. Fracture surfaces are smooth and sclerosed,
2. The size of the proximal fragment is 2.5 cm,
3. The gap between the fragments is more than 1 cm but <2.5 cm,
4. The head of the femur is viable suggestive of Sandhu stage 2 classification.(Fig. 1)



Fig. 2: Post Operative X-Ray : X-ray pelvis with bilateral hips.

Fixation of Nonunion femoral neck fracture with valgus osteotomy, repositioning and fixation with 140° Dynamic hip screw and Derotational screw.(Fig. 2)

Blood Investigations

HB-10g/dl, Platelet-3.89, Urea-30mg/dl, Creatinine-1.44mg/dl, Sodium-135meq/l, Potassium-4.6meq/l, Uric acid-5.3mg/dl.

Preoperative Planing

1. Preoperative blood investigations
2. Preoperative planning for valgus intertrochanteric osteotomy (VITO). A line representing the compressive force is drawn 25 degrees from the anatomical axis of the femur (upper left). A line perpendicular to the compressive force (X) is then drawn for reference (upper right). Line (Y) represents fracture line obliquity (lower left). The angle formed between (X) and (Y) will reflect the angle of the resected wedge (lower right).³ (fig.3)

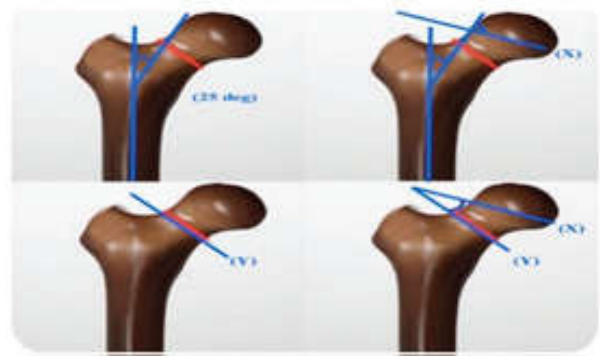


Fig. 3: Preoperative blood investigations.

3. After normalising all blood parameters and getting fitness from physician, cardiologist and anaesthesiologist patient taken for surgery.

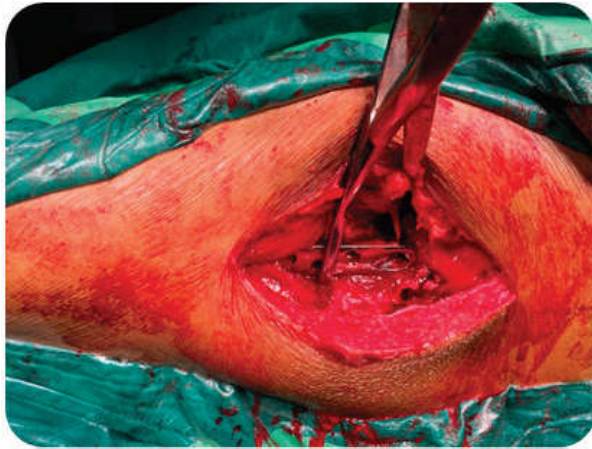


Fig. 4: Intra-Operative Images.

Intra Operative Image: Femoral Neck Fracture with Valgus Osteotomy, Repositioning and Fixation with 140° Dynamic Hip Screw Using Direct Lateral Approach. (Fig. 4)

Discussion

The treatment options of these fractures could be broadly categorized into head-sacrificing and head-preserving groups. The choice of treatment depends considerably on age of the patient, functional demands, and congruity of the femoral head. The head preservation is the treatment of choice in younger individuals and in undisplaced fractures irrespective of age with congruous head.

The proximal femoral osteotomies work on the principle of converting shearing forces to compressive forces by realigning the fracture site, V-shaped wedge-removing osteotomy provides broad osteotomy surfaces that ensure good bony contact on closure of the osteotomy and lateralization of the femoral shaft.⁹

Femoral neck non-union occur in 20–30% of all displaced neck of femur fractures. Femoral neck fractures should unite by 6 months. If there is no evidence of healing, or the patient continue to have pain at 3 month or 9 month after surgery, then a delayed union(3 months) or non-union(9 months) should be suspected.¹

Causes of non-union include

1. Failure to reduce or maintain reduction,
2. Absence of cambium layer of periosteum,

3. Compromise of blood supply of head of femur,
4. Development of shearing forces at the fracture site causing vertical inclination.

Pauwel’s and Garden’s classification systems are the two most commonly used radiological classification system for fresh femoral neck fractures. These classifications describe for fresh fractures and cannot be used reliably to predict the outcome in cases of nonunion femoral neck fracture.

X-ray of pelvis including both hip joints in the identical position should be taken to classify NONUNION femoral neck fracture. The length of the proximal fragment is measured from upper margin of fovea centralis to the midpoint of fracture margin. Sometimes the absorption of the proximal fragment is more marked in the center than the periphery giving it the shape of a cup or moon, fracture surfaces, gap between fragments and viability of head.

Sandhu described a classification system for NONUNION femoral neck fracture incorporating these changes at various stages. Based on these changes, he classified the Nonunion femoral neck fracture into 3 types (described as 3 stages).⁸

Table 1: Classified the Nonunion femoral neck fracture into 3 types.

Sandhu type	Fracture surfaces	Proximal fragment	Fracture gap	Femoral head
1.	regular fracture surfaces	of 2.5 cm or more	less than 1 cm	no signs of AVN
2.	smooth and sclerosed	of 2.5 cm or more	between 1 and 2.5 cm	the head of the femur still viable
3.	smoothed fracture surfaces	<2.5 cm	more than 2.5 cm	presenting signs of AVN

The radiological findings of above X-ray are 1) Fracture surfaces are smooth and sclerosed, 2) The size of the proximal fragment is 2.5 cm, 3). The gap between the fragments is more than 1 cm but <2.5 cm, 4). The head of the femur is viable suggestive of Sandhu stage 2 classification.(Table 1)

If either sclerosed and smoothed proximal end or a fracture gap more than 1 cm is observed it can be labeled as stage II. The freshening of fracture surfaces by drilling or curettage while performing open reduction is indicated along with bone grafting. The proximal fragment is big enough for good and stable purchase by implant, hence suitable for osteosynthesis.¹⁰

Conclusion

Controversy exists about the best method of fixation for Nonunion/not united subcapital and transcervical femoral neck fractures with varus deformity, and there are strong advocates for compression hip screws. Biomechanical studies suggest that a compression hip screw coupled with a derotational screw and valgus osteotomy is stronger than other ways of fixations like valgus osteotomy and fixation with double angle barrel plate, Osteosynthesis of non-union Femoral Neck Fracture by Internal Fixation Combined with Iliac Crest Bone Chips and quadratus femoris muscle pedicle grafts.

The choice of treatment depends considerably on age of the patient, functional demands, and congruity of the femoral head. The head preservation is the treatment of choice in younger individuals and in undisplaced fractures irrespective of age with congruous head.⁷

The osteotomy line becomes obliquely situated, running downward and laterally, and its lateral end is displaced distally, resulting in lengthening. Lengthening is usually desirable to compensate for the shortening that is present in this case. The femoral shaft is now displaced medially and becomes vertically oriented after the osteotomy.

Implant cost is less even after comparing with intramedullary nails, and the technique of placement of a hip screw device is familiar to most experienced orthopaedic surgeons. Valgus intertrochanteric osteotomy is an effective procedure to achieve union in nonunion fracture neck femur in young patients.⁵ They proposed fixation with 140 degree dynamic hip screw which provides additional compression and, with valgus osteotomy, improved stability of internal fixation. As per the latest available literature treatment of choice for NONUNION femoral neck fracture is valgus osteotomy, repositioning and fixation with dynamic hip screw in young patients.

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