Inverted L osteotomy and Dynamic Hip Screw Fixation without Bone Grafting for Primary Nonunion of Intertrochanteric Fracture of Femur; a Case Report

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Abstract

Primary nonunion of intertrochanteric fractures is rare due to the excellent blood supply and good cancellous bone in the intertrochanteric region of the femur. A diagnosis of primary intertrochanteric nonunion is made when at least 15 weeks after the fracture there is radiological evidence of a fracture line, with either no callus (atrophic) or with callus that does not bridge the fracture site (hypertrophic). There is only one published series that exclusively describes seven primary nonunions of intertrochanteric fractures. We present a case of a 2 year old neglected primary non union of intertrochanteric fracture in a 43 year old male which was managed by heavy skeletal traction followed by an inverted L osteotomy of the distal fragment with DHS (Dynamic Hip Screw) fixation using the distal peg to fit into a trough made into the proximal fragment. No bone grafting was done and the fracture united at 21 weeks.

Keywords: intertrochanteric, nonunion, osteotomy, DHS


1. Introduction

Nonunion of intertrochanteric fractures is uncommon because there is excellent blood supply and good cancellous bone in the intertrochanteric region of the femur [1]. Most intertrochanteric fractures treated by conservative methods or internal fixation unite [2,3]. Malunion is relatively common, especially in conservatively managed fractures. Occasionally, nonunion or early implant failure of fracture fixation occurs, the reasons ascribed being delayed treatment, unfavourable fracture patterns, poor bone stock or inadequate fixation [4,5,6,7,8]. Little is written about primary intertrochanteric nonunion and its treatment. Management in fixation failures with revision internal fixation and bone grafting has been reported in few series with good results [8,9,10,11]. In the elderly, total hip arthroplasty is the preferred treatment for intertrochanteric nonunion with joint derangement, or inadequate bone stock, but in the physiologically young with good bone quality preservation of the femoral head is preferred [1]. This study aims to evaluate the results of internal fixation with an inverted L osteotomy and valgization fixed with 135° dynamic hip screw (DHS) without bone grafting in a 43 year old patient with a 2 year old primary nonunion of intertrochanteric fracture.

2. Case Report

A 43 year old male, farmer by occupation, from a remote area of our state presented with limp and shortening of the right limb and difficulty in walking following a fall from a tree two years ago. He had initially been managed by a quack at the time of trauma who had applied some local bandages and put him on strict bed rest for four months. The patient has subsequently started ambulation on crutches for another six months and was now ambulatory using a self made walking stick. However, he was not able to walk long distances or climb steep slopes and had a pronounced limp. He was not able to do his farming properly and had difficulty in performing acts of daily living. On examination, he had six cm shortening on the affected side but there was no appreciable wasting. He was unable to do Straight Leg Raising test and telescopy was positive. The limb was in external rotation.

A radiograph of the pelvis (Figure 1) revealed a primary intertrochanteric non union with proximal migration of the distal fragment. The neck-shaft angle was 107°.

The patient was put on heavy skeletal traction for two weeks followed by surgery in the supine position on a fracture table under an image intensifier. A lateral approach to the proximal femur was used. Pseudoarthrosis was excised with 360° release of fracture surfaces and using a power saw, the fracture end of the distal fragment was osteotomised in an inverted L fashion so that the
cancellous bleeding surface of the bone was revealed (Figure 2a-e). Then the fracture surface of the proximal fragment was freshened and curetted to remove all intervening soft tissues and the end point of curettage was bleeding bony points at both ends of the nonunion. A drill hole was made in the bone peg of the distal fragment about 1.5 cm from the tip and the two fragments were approximated. A guide wire was passed through the drill hole in the distal fragment parallel to the neck. The position of the guide wire was checked under the image intensifier. It was slightly posterior in the lateral view and inferior in the AP view. Incremental reaming was done very carefully and 85mm size lag screw was inserted after reaming. After valgization, a 135° DHS plate was applied with fixation of ten cortices. The fracture gap was closed by inserting the coupling screw on hip screw which was done gently to prevent fracture of the distal bone peg (Figure 3). Postoperatively, Buck’s skin traction with the knee in 15° of flexion was maintained for 3 weeks. Quadriceps strengthening and knee bending exercises on traction were initiated from day 1. Crutch walking with toe touching was initiated at 3 weeks. Patient was followed up at 3-week intervals till union occurred at 21 weeks. Full weight bearing was started when clinical and radiological union was achieved. The patient has not been seen since and is lost to follow up.

3. Discussion

Nonunion of intertrochanteric fractures is relatively uncommon as these fractures tend to occur through well vascularized cancellous bone [1,7,12,13,14,15]. When it does occur, it is usually in patients with unfavorable fracture patterns, poor bone quality, or inadequate internal fixation [14]. Nonunion of these fractures cause considerable morbidity and even mortality [7,14]. The incidence of nonunion in patients with intertrochanteric fractures is reported to be 1-2% [15]. Many patients in the Indian subcontinent seek treatment from quacks and bonesetters, who mostly use local herbal application and inadequate splinting in the treatment of these fractures. Consequently, many fractures result in malunion and a few in nonunion in adult and pediatric patient populations [16]. A diagnosis of primary intertrochanteric nonunion is made when at least 15 weeks after the fracture, there is persistent radiological evidence of a fracture line, with either no callus (atrophic) or with callus that does not bridge the fracture site (hypertrophic) and mobility of the fracture fragments on examination under an image intensifier [8].

An unfavorable pattern of fracture has been mentioned in earlier series as a cause of fixation failures. Most failures of treatment occur in unstable fracture patterns in which posteromedial cortex remained wide apart [7,9,11,14] or the fracture is reverse oblique [6]. Bartonicek et al. had 15 cases of varus malunion and nonunion of trochanteric fractures with two primary nonunions [11]. They were treated by valgus intertrochanteric osteotomy. The authors concluded that valgus intertrochanteric osteotomy is an effective procedure that reliably restores hip function in trochanteric malunion or nonunion. Malkani et al. concluded that fractures that are prone to nonunion include those that are severely comminuted and unstable, with loss of medial calcar bone and a tendency to go into
varus [17]. Said et al [18] presented 23 cases of fixation failures in which 11 had A2 type fracture, 8 had A1 type fracture, and 3 had A3 type fracture; 1 case was not classified. The study of muscular anatomy in an intertrochanteric fracture reveals that, with comminution, the iliopsoas tends to displace the lesser trochanter and the neighboring postero medial cortex proximally and anteromedially. Also, the adductors play a pivotal role in the varus position in these fractures as neither their origin nor insertion is disrupted. Biomechanical studies have proven that these factors lead to high bone stresses and increased mechanical failure [19]. Most reported intertrochanteric are due to unsuccessful attempts of internal fixation of these fractures [6,7,9,11,14]. There is a paucity of published studies on the treatment of primary intertrochanteric nonunions [8,10,11]. One series describes seven primary nonunions of intertrochanteric fractures [8]. Another series included eighteen patients with primary intertrochanteric nonunion [20]. In treatment of nonunion from fixation failures of intertrochanteric fractures, DHS with cementation, medial displacement osteotomy, valgization, and blade plate fixation have all been reported [8,10,11]. These studies confirm that union can be achieved both in primary nonunions and nonunions after implant failure with revision internal fixation for physiologically younger patients with good remaining bone stock. Marti et al. [21] reported 24 cases of patients from different centers with peritrochanteric nonunion. They used osteotomy with different types of angled blade plates for the fixation of the osteotomy. However, the authors did not present any detailed information and results. In most cases of primary nonunions of intertrochanteric fractures, the fracture collapses into varus with shortening. The amount of correction desired is dependent on the existing deformity and the patient's preoperative neck-shaft angle (as seen on the normal side). The critical point in the surgery is the insertion of the lag screw. It should be preferably in the posteroinferior sector of the femoral head, where we think the best bone stock is available. Release of the medial soft tissues (mainly the articular capsule and iliopsoas tendon) at the level of lesser trochanter considerably facilitates reduction of the fragments, including lateral displacement. If this medial soft tissue release is done carefully, close to the insertion, it does not impair vascularity of the femoral head. The medial opening after valgization is filled with corticocancellous bone graft always.

4. Conclusion

The treatment of intertrochanteric nonunion is guided by the age of the patient. In older patients with low-demand activities and poor bone quality or a damaged hip articu lar surface, arthroplasty allows earlier patient mobilization and greater certainty of outcome. Our study had physiologically young patient with long life expectancy with well-preserved femoral head. Our study affirms that in cases with good bone stock, union in primary nonunion of intertrochanteric fractures can be achieved with internal fixation.

Conflict of Interest

Each author certifies that he has no commercial associations (e.g. consultancies, stock ownership, equity interests, patent/licensing arrangements, etc) that might pose a conflict of interest in connection with the submitted article.

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