

# Dynamic Condylar Screw Fixation for Comminuted Proximal Femur Fractures

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## ABSTRACT

*Objective* To evaluate the success of dynamic condylar screw (DCS) fixation for comminuted proximal fractures of femur in adults.

*Study design* Case series.

*Place & Duration of study* Orthopedics Department CMH Lahore, from October 2009 to September 2010.

*Methodology* This study included 20 males and 9 female patients with age ranging 25 to 65 year (mean 44 year) who presented with closed comminuted proximal femur fractures (Evan's classification type I c to e and type II). All the patients underwent indirect fracture reduction on a standard orthopedic traction table under C-arm guidance and this was followed by inter-fragmentary stabilization with dynamic condylar screw construct (AO Synthes). Functional outcomes were assessed using the Harris hip score. Post operative patients' evaluation was continued for 12 months.

*Results* The average time to full weight bearing was 14 weeks. (range 12-16 weeks). The mean time to union was 16 (range, 13-22) weeks. The included non-union, delayed atrophic union, implant failure, limb length discrepancy, and knee stiffness. According to the Harris hip score, functional results were excellent in 21 and good in 7, whereas one patient showed poor result. The mean Harris hip score was 88 (range 80-99).

*Conclusions* Our results of DCS fixation for comminuted proximal femoral fractures indicated that it is a very practical and a satisfactory method of fixation. Minimal stripping of the soft tissues and gentle fragmentary manipulation intra operatively remained the pivotal factors for good fracture healing and functional outcome.

*Key words* Fractures comminuted, Proximal Femur, Dynamic condylar screw fixation.

## INTRODUCTION:

Comminuted fractures of proximal femur account for 7 to 15% of all hip fractures and are especially seen in the young age group where trauma plays a major role.<sup>1</sup> These fractures in the subtrochanteric area are usually difficult to treat as the femur here consists of hard cortical bone with an inherent slower healing rate than the metaphyseal area and mechanically

the deforming forces are high.<sup>2</sup> Moreover these fractures are usually the result of a high energy trauma and so the integrity of peri fracture soft tissues is affected seriously. In the elderly, osteoporosis in addition makes such fractures more prone to fixation failure, malunion and non union.<sup>3,4</sup>

Intramedullary implants like proximal femoral nail (PFN, gamma nail) is less capable to bear biomechanical stresses exerted during healing phase of such fractures (as the lever arm is moved medially). They are not very suitable for subtrochanteric fractures with an intertrochanteric extension,<sup>5</sup> where condylar screw or condylar blade

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fixation achieved better results.<sup>6</sup> Dynamic hip or sliding hip screws are technically straight forward, but anchoring the proximal fragment cannot be supplemented with screws and on weight bearing the lateral drift of the proximal fragment leads to construct failure and non union.<sup>7</sup> Here the dynamic condylar screws which exerts vertical forces on weight bearing is a better option. In our study we have reviewed our results retrospectively using DCS fixation for comminuted proximal femoral fractures and tried to evaluate its efficacy first hand in our setup.

#### METHODOLOGY:

From October 2009 to September 2010, 20 male and 09 female patients, with age range between 25 and 65 (mean 44) year presented to CMH Lahore with closed comminuted proximal femoral fractures. Fracture patterns included 14 patients (48%) (M=10, F=4) with comminuted intertrochanteric fractures (Evan's type I c (n=9) to I d (n=5). Eight patients (28%) had Evan's type I e (M=4, F=4) and 07 (24.1%) cases of intertrochanteric fractures neck of femur with reverse obliquity (Evan's type II) (M=6, F=1). Patients with open fractures and fractures resulting due to an underlying pathology (tumors, infection etc) were not included in the study. Ten patients (34.5%) sustained the fracture due to a fall (M=3, F=7) whereas nineteen fractures (M=17, F=2- 63.5%) were caused by high-energy motor vehicle accident. Of the latter group nine patients (31%) had multiple injuries (M= 6, F=3). Life threatening injuries in these cases were treated before carrying out definitive fractures fixation (Delay of 3-10 days).

Seventeen patients (58.6%) received general anesthesia with laryngeal mask (M=9, F=8) and spinal anesthesia was administered to twelve patients (41.4%) (M=11, F=1). Access to proximal femur was achieved through a standard lateral exposure. In fifteen patients (51.7%) (M=11, F=4) good interfragmentary stabilization was achieved with application of extra cortical screws in lag pattern and augmented with a neutralizing side barrel plate (95 degrees). The length of side plate applied was dictated by the span of fracture, ensuring at least five cortical screws distal to the fracture site. Efforts were also made to maintain the integrity of soft tissues attached to the fracture fragments.

All patients were administered third generation cephalosporin at the time of induction for anesthesia and the same was continued in the post operative period for six doses. Controlled and gradual active flexion and extension of the hip were started on the third post operative day or once the patient was

relatively pain free. Touch toe weight bearing using crutches was allowed on day 10 in less comminuted cases and in 3<sup>rd</sup> week in the severe patterns. Twenty four patients were allowed partial weight bearing with the support of walking frame after 06 weeks progressing to full weight bearing on an average in 10 weeks. Six patients with more comminuted pattern of fracture were allowed assisted weight bearing by the 10<sup>th</sup> weeks and progressed to full weight bearing by the 19<sup>th</sup> week. Deep venous thrombosis (DVT) was prevented by maintaining good hydration, early movements and Injection Clexane 20mg subcutaneously daily for seven days.

Patients were followed up 4 weekly till 2 months, 8 weekly for next 4 months and then 3 monthly till one year ( total follow ups per patient =6). In all cases (N=29), union was defined as the ability of the patients to bear weight painlessly with adequate hold of fracture by neo callus. Radiological consolidation was declared when there was cortical disappearance of fracture line and reappearance of continuous medullary canal. Functional outcomes were assessed using the Harris hip score.

#### RESULTS:

Average time to full weight bearing was 14 weeks. Non-union was seen in one patient (3.4%) (F=1) whereas one patient (3.4%) (M=1) displayed atrophic-union (complex comminution pattern Evan's type I e). All these were managed with Shing-Ling (AO technique) of the fracture site coupled with

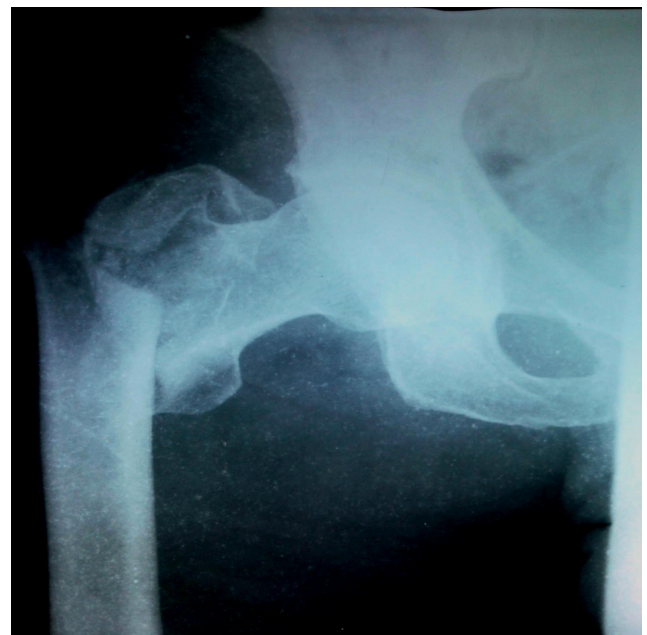


Fig 1: Preoperative fracture neck of femur with subtrochanteric fracture with intertrochanteric extension (Evan's Type Ic).

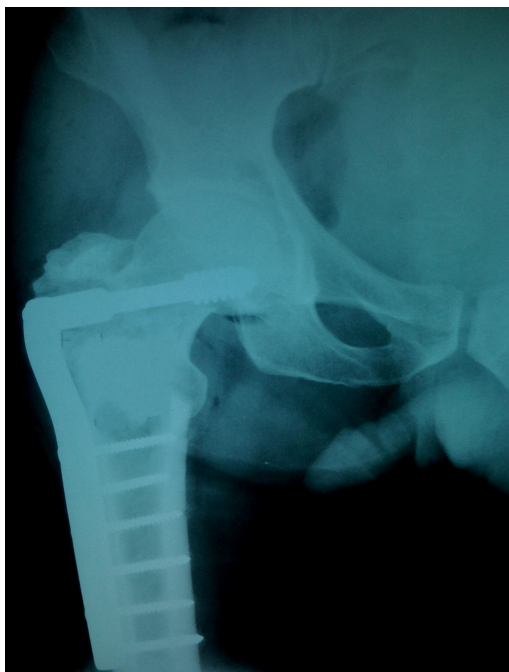


Fig II: Same fracture two months postoperative after fixation with dynamic condylar screw construct.

augmentation iliac bone grafting. One patient (3.4%) (M=1), went into implant failure (breakage of side plate) due to premature weight bearing which was treated with exchange plating and bone grafting. One patient (F=1) (3.4%) developed a limb length discrepancy of 1.5 cm. Loss of knee flexion of 15 degrees was noted in one patient (3.4%) (F=1). She developed this complication due to refusal to move her limb in the fear of breaking the implant, inspite of repeated counseling. Near full range of motion (ROM) was however eventually regained with physiotherapy which lasted for four months. No intra or perioperative mortality was encountered in our study group. In spite of the fact that prophylactic low molecular weight heparin (Clexane ® 10mg) was administered subcutaneously once a day to all patients after admission to hospital, one insulin dependent diabetic patient (3.4%) (female, age 30 years) developed deep vein thrombosis on 3rd postoperative day who responded remarkably to the thrombolytic treatment instituted. According to the Harris hip score, functional results were excellent in 21 and good in 7, whereas one patient showed poor result (Fig I & II). The mean Harris hip score was 88 (range, 80-99).

#### DISCUSSION:

Comminuted fracture pattern in the proximal femur are encountered commonly. These fractures are mostly challenging in nature to manage especially when they are of complex patterns. Most of these

fractures may also have multi trauma patterns which prioritize the management of life-threatening conditions over the definitive fixation of these fractures. In many severely traumatized patients, the concept of damage control in acute management must be considered and practiced whenever it is appropriate.<sup>9</sup> Management of comminuted proximal femur fractures needs proper understanding of fracture patterns and mechanism of injury.

Nonoperative treatment for such fractures is only indicated in the pediatric age group where the potential of union is excellent if managed on conservative note, or for those adult patients who are unfit for anesthesia for a variety of reasons. Healing in such fractures is highly dependent on the degree of vascular insults to the bone. Operative success of fixation of these fractures depends on intra-operative care of factors like meticulous patient positioning on the traction table, and the precise maneuvers in reduction. Avoiding over distraction in the fracture site is another important factor to ensure good fracture healing.<sup>10</sup> In absence of these measures, there is an increased risk of delayed union, infection, non-union, re-fracture, and implant failure.<sup>11</sup>

Image assisted indirect reduction enables faster healing, lower nonunion and infection rates, earlier full weight bearing, and avoids bone grafting. However in cases where satisfactory alignment is not achievable and intra-fragmentary lag stabilization is mandatory then a meticulous technique and dissection cannot be over emphasized. Vertical fractures too can be effectively treated with DCS fixation.<sup>12</sup> The recent advent of 95 degree angled side plate with a locking mechanism for the screw like locking compression plate (LCP) has further increased the effectiveness of DCS especially in the older osteoporotic patients.<sup>13</sup> Post operative weight bearing must be strictly monitored as early implant loading in the face of inadequate new bone or callus formation is seriously dreaded with strong bending forces leading to implant failure. Technically it is important to remember that a valgus reduction ( $\approx 85^\circ$ ) is preferred to a varus reduction as the incidence of osteoarthritis is less.<sup>14</sup> Moreover the tip of the greater trochanter should point to the centre of rotation of the femoral head, remembering that the greater trochanter is eccentric in its relation to the femoral neck.

The down side of procedure remains that DCS insertion in proximal femur has a slow learning curve. It is also important to avoid unnecessary soft tissue dissection and stripping which can be

catastrophic in regards to a satisfactory fracture union and culminates in various complications.<sup>15</sup>

# CONCLUSIONS:

Use of DCS for fixation of comminuted fractures of proximal region of femur coupled with a meticulous surgical technique, proper planning, preservation of vascularity of medial fragments, and avoiding unnecessary soft tissue dissection is an effective method of fixation with promising results in terms of fracture healing and patient recovery.

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