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ORIGINAL ARTICLE

Short Term Results of Intramedullary Fixation of Supracondylar Fracture of Femur by Retrograde Intramedullary Nail

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ABSTRACT

Background: Distal femoral fractures very difficult to manage are associated with high morbidity and mortality. Internal fixation is the choice of treatment in supracondylar fractures (AO type–A). Retrograde supracondylar nail has shown to give one of the best results in terms of recovery, fracture union, return to work and the functional outcome. This study aimed to evaluate the short term results of retrograde supracondylar nailing technique in supracondylar femur fracture radiologically and clinically.

Methods: This is a retrospective study included 20 patients with supracondylar femoral fractures were treated by retrograde reamed femoral nail, during the period January 2018 and April 2019 at Zagazig university hospital and evaluated clinically and radiologically by Neer’s score.

Results: The patients were followed up clinical and radiological according to Neer’s score was (50.0%) had excellent, (40.0%) had good and (10.0%) had fair outcome. the time to start complete weight bearing in the study group ranged from (10 to 24) weeks, most of the study group (35%) needed fourteen weeks for complete weight bearing, (20.0%) needed sixteen and twelve weeks and 1 (5.0%) case had delayed complete weight bearing.

Conclusions: Retrograde reamed intramedullary nailing is a good fixation system for supracondylar femur fractures with less operative time, less blood loss, not disturbing fracture hematoma, less soft tissue dissection and thus reducing complications. Early surgery and early post-operative knee mobilization are essential for good union and good knee range of motion.

Key words: Supracondylar femur; fracture; retrograde; nail.

INTRODUCTION

Distal femoral fractures account for 7% of all femoral fractures. Supracondylar fractures of the femur are very difficult to manage. These fractures invariably present with a lot of comminution, many times with open injuries and bone loss [1].

Many times they will be floating injuries with associated proximal tibial fractures. Since these fractures involve or close to knee joint, regaining complete knee range of movement is also difficult. Distal femoral fractures are also associated with high incidences of infection,

nonunion and malunion and hence produce significant disability [2].

These fractures are commonly seen in high energy injuries and also in elderly population. It is always a great challenge for the treating orthopedic surgeon to manage these fractures. Many factors come in to play when it comes to plan the treatment of these fractures, such as fracture type, associated injuries, age and soft tissue injuries [3].

Till late 90s open reduction and internal fixation with extra medullary implants was the standard treatment of choice for all supracondylar fractures. This had many drawbacks such as infection, iatrogenic soft tissue injury, periosteal stripping, non-unions and implant failures [4].

After the advent of retrograde supracondylar nailing technique, many of these complications have been avoided. Being a load sharing device, it allows for secondary callus formation, provides 3-point fixation for the fracture, thus not allowing the fracture to displace and also the reamed products contribute to fracture healing [5].

The concept of retrograde intramedullary nailing in distal femur fractures was developed in an attempt to overcome the limitations of antegrade nailing in poly trauma patients and to ensure the advantages of minimally invasive technique over standard plate fixation systems [6].

In 1991 reported that retrograde nails have a biomechanical advantage over laterally placed conventional plating systems. Despite the proven higher stiffness of plate systems compared with intramedullary devices, the latter systems provide the advantage of indirect fracture reduction away from the comminuted metaphyseal region, thus bone grafts can be avoided [7].

Retrograde nailing and plate osteosynthesis have problem with respect to the control of axial reconstruction. The correct choice of nail entry and insertion is mandatory to achieve the physiological rotation and mechanical alignment [8]. So, we aimed to evaluate the

short term results of retrograde supracondylar nailing technique in supracondylar femur fracture radiologically and clinically.

METHODS

This is a retrospective study included 20 patients with closed supracondylar femoral fractures (extra articular type A) divided into (10 type A1, 7 type A2 and 3 type A3, AO grade of supracondylar distal femur fractures. were treated with retrograde reamed femoral nail, the nail size from 9 to 13 mm, during the period January 2018 and April 2019 in Orthopedic Surgery Department of Zagazig University Hospital. The male represents 40.0% (8 cases) and female 60.0% (12 cases), their age ranged from minimum 19 years to maximum 80 years (Mean±SD) = (52.2±17.5) and evaluated clinically and radiologically by Neer's score for knee, time of follow up ranged from (12-18) month (Mean±SD) = (14.1±2.1). Approval for performing the study was obtained from Orthopedic Surgery Departments, Zagazig University Hospitals after taking Institutional Review Board (IRB) approval.

The work has been carried out in accordance with the code of ethics of the world medical association (Declaration of Helsinki) for studies involving humans.

We include adult patients (skeletally mature) with closed supracondylar femur fracture AO type A (extra articular), C1, C2. However, Patients with pathological fractures, pre-existing knee stiffness preventing nail insertion, open fractures and active infection were excluded.

Each patient in this study was evaluated carefully preoperatively through Clinical and Radiological evaluation: Standard antero-posterior and lateral X- ray views of whole femur including hip and knee joint which were done pre-operative and post-operative. X-rays during follow up were carefully assessed for union, displacement, alignment, position of the implant and any signs of implant failure and the following Laboratory investigations were done: CBC, Renal function test, Liver function test, Random blood sugar and Bleeding profile.

Surgical technique

Anaesthesia was done either: spinal, epidural or general anesthesia. Then the patient was positioned supine on a radiolucent table and the knee of the injured leg was flexed, the lower leg and the foot were hanging free. The entire leg and hip were draped to the iliac crest, The C-arm was positioned perpendicular to the long axis of the table on the contralateral side to allow for ease dealing with imaging and placement of interlocking screws. Knee flexion of 30 to 50 degrees by accomplished with (A) radiolucent supporting pad, it is necessary to allow identification of the proper entry portal and placement of the nail and help in reduction of fracture.

Post-operative follow up

Clinical and radiological assessments were done for all patients. First follow up in the outpatient clinic was after 2 weeks where wound healing was assessed and stitches removed. Follow up X-rays, were done at 6 weeks and then monthly. Follow up after 6 months was according to the patient needs and the fracture union. Presence of complications dictated a more regular follow up. Partial weight bearing was allowed at 3 to 6 weeks depending on the patients' healing status and the presence or absence of complications. Full weight bearing was only allowed after radiological union of the fracture. Patients who couldn't follow up the postoperative instructions and do the flexion extension and quadriceps strengthening exercise were referred to the physiotherapy department with excellent improvement in knee range of motion.

Statistical analysis

Numerical data were presented as mean and standard deviation SPSS Microsoft program version 16 was used for statistical calculation.

RESULTS

Table (1), showed that (50.0%) of the study group was type A1 regarding AO classification, (35.0%) was type A2 and (15.0%) was type A3.

Table (2), showed the time to start complete weight bearing in the study group was (15.6±2.7) ranged from (10 to 24) weeks, most of the study group (35%) needed fourteen weeks for complete weight bearing, (20.0%) needed sixteen and twelve weeks and 1 (5.0%) case had delayed complete weight bearing.

Table (3), showed that (50.0%) of the study group had excellent outcome according to Neer's score, (40.0%) had good outcome and (10.0%) had fair outcome.

Table (4), showed that (60.0%) of the study group didn't have any complications, (10.0%) had pain, (10.0%), had shortening 1cm (5.0%), had shortening 2cm (5.0%), had superficial infection, had delayed union (5.0%) and mal-alignment (5.0%).

Details of one of our Cases: A 48-year-old male patient presented with Lt. closed distal supracondylar fracture femur type 33-A1 according to AO classification, after RTA trauma, Surgery was done 2 days after trauma. Pre-operative AP and lateral x-ray done (Figure 1) and at 16 weeks follow-up AP and lateral x-ray (Figure 2).

Table 1: AO grade in the study group

Clinical history	NO (20)	%
A1	10	50.0%
A2	7	35.0%
A3	3	15.0%

Table 2: Time to start complete weight bearing in the study group

Variable	The study group (20) mean \pm SD median (Range)	
Time to start complete weight bearing (weeks):	15.6 \pm 2.7 (10-24)	
Variable	NO(20)	%
10 weeks	1	5.0%
12 weeks	4	20.0%
14 weeks	7	35.0%
16 weeks	4	20.0%
18 weeks	1	5.0%
20 weeks	1	5.0%
24 weeks	1	5.0%

Table 3: Clinical evaluation and radiologically according to Criteria (Neer's score) in the study group

Neer's score	NO (20)	%
Fair	2	10.0%
Good	8	40.0%
Excellent	10	50.0%

Table 4: Post-operative complications in the study group

Post-operative complications		NO (20)	%
No complications		12	60.0%
Knee Pain		2	10.0%
Superficial infection		2	10.0%
Shortening	1cm	1	5.0%
	2cm	1	5.0%
Delayed union		1	5.0%
Mal-alignment		1	5.0%



Figure 1: Pre-operative AP and lateral x-ray



Figure 2: At 16 weeks follow-up AP and lateral x-ray

DISCUSSION

A supracondylar fracture of the femur has been recognized as a major challenge by the orthopedic community, not solely for achieving

fractures union, but for restoration of optimal function in the shortest possible time that to with minimal complications. The aim of management accordingly has drifted to

achieving early mobilization, rapid rehabilitation and quick return of individuals to premorbid home and work environment as a functionally and psychologically independent unit.

Distal femur fractures make up to 7% of all femoral fractures. Most high energy distal femoral fractures occur in males 15-50 years and low energy fractures occur in osteoporotic women more than 50 years [8].

In our study, (50.0%) of the study group was type A1 regarding AO classification, (35.0%) was type A2 and (15.0%) was type A3. In a study by Loya and Quadri, [9] type A1 constituted 11 patients, Type A2 presentation constituted the majority (17) and type A3 were relatively rare (4) [9]. Based on Muller's classification system, extra articular i.e., type A fractures constituted 75% (30 patients) and 25% (10) were intra articular C1 and C2 fractures [10].

Time of union in our study shows that the time to start complete weight bearing in the study group was (15.6±2.7) ranged from (10 to 24) weeks, most of the study group (35%) needed fourteen weeks for complete weight bearing, (20.0%) needed sixteen and twelve weeks and 1 (5.0%) case had delayed complete weight bearing. Study by Rao et al., [11] showed that average weight bearing for A1 type fractures was 8.84 weeks; Type A2 was 10.53 weeks and 8 weeks for type A3 fractures. 70% of cases done by closed method and 90% done by open method had full weight bearing within 8 to 12 weeks. Average weight bearing for closed reduction was 12.2 weeks, and for open reduction was 13 weeks [11]. Other study by Loya and Quadri, [9] showed that full weight bearing was achieved on an average in 11.68 weeks.

This study shows that (50.0%) of the study group had excellent outcome according to Neer's score, (40.0%) had good outcome and (10.0%) had fair outcome. In a study by Rao et al., [12] 85% good to excellent result were obtained using Neer's evaluation scoring system. In another study mean Neer's score was

79 suggestive of good results. Neer's score was 85 in shaft fractures showing excellent results and 73 in supracondylar fractures suggestive of good results. In a study by Loya and Quadri [9] (53.12%) of the study group had excellent outcome according to Neer's score, (15.62%) had good outcome and (25.0%) had fair outcome and (6.25%) had poor outcome.

In a study by Raju et al., [10] Neer's score was assigned for each patient. Using this rating scale, there were 22 (55%) excellent results, 12 (30%) good results, 4 (10%) fair result and 2(5%) poor result.

Our study shows that (60.0%) of the study group didn't have any complications, (10.0%) had pain, (10.0%) had superficial infection, (5%) experienced 1 cm shortening, (5%) experienced 2 cm shortening (5%) experienced delayed union and (5%) mal-alignment. In a study by Rao et al., [11] they had 2 cases of superficial infection, treated by antibiotics and debridement, 3 cases of distal screw related problems were treated by screw removal and one case of delayed union which was treated by delaying full weight bearing. Anterior knee pain due to impingement might be attributed to faulty nailing technique. In a study by Shah and Patel, [12] no early or immediate postoperative complication was noted. As a late complication, back out of distal screw was seen in one case after complete osseous healing, and screw removal was done.

In a study by Loya and Quadri, [9] 15% of their patients had local symptoms at distal screw, 3% had impingement, 6% had superficial infection, 3% had delayed union, 3% had distal migration of nail, 3% had deep infection and 6% showed distal screw breakage. In a study by Raju et al., [10] complications included anterior knee pain in 8 patients, shortening (1-2cm) in 6 patients and one patient had nail breakage due to early weight bearing ambulation. There were no superficial or deep infections. There were no cases of heterotopic ossification.

CONCLUSIONS

Retrograde reamed intramedullary nailing is a good fixation system for supracondylar femur fractures with less operative time and blood loss. By closed reduction, not disturbing fracture hematoma and even in open reduction less soft tissue dissection and thus reducing complications like infection, stiffness, knee pain related local symptom is a common problem. Utmost aseptic precaution great care required to prevent infection. Early surgery, closed reduction and early post-operative knee mobilization are essential for good union and good knee range of motion. Parapatellar knee approach is recommended by us.

Conflicts of interest: None.

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REFERENCES

- 1- Raju KP, Madhuchandra P, Pawankumar KM, Shrinidhi IS. Functional outcome of type a and type c supracondylar fractures of femur treated by retrograde intramedullary nailing technique. *Int J Orthop Sci.* 2017; 3(4):769-75.
- 2- El-Tantawy A, Atef A. Comminuted distal femur closed fractures: a new application of the Ilizarov concept of compression–distraction. *Eur. J Orthop Surg & Traumatology.* 2015; 25(3):555–62.
- 3- Bertrand ML, Andrés-Cano P. Suppl 1: M10: Management of the Floating Knee in Polytrauma Patients. *Open Orthop J.* 2015; 9:347-55.
- 4- Helfet DL, Lorich DG. Retrograde intramedullary nailing of supracondylar femoral fractures. *Clin Orthop Relat Res.* 1998; (350):80–4.
- 5- Hoskins W, Bingham R, Griffin XL. Distal femur fractures in adults. *Orthopaedics and Trauma.* 2017; 31(2):93–101.
- 6- Moed BR, Watson TJ. Retrograde nailing of the femoral shaft. *J Am Acad Orthop Surg.* 1999; 7(4):209–16.
- 7- Henry SL, Trager S, Green S, Seligson D. Management of supracondylar fractures of the femur with the GSH intramedullary nail: preliminary report. *Contemporary orthopaedics.* 1991; 22(6):631-40.
- 8- Beltran MJ, Gary JL, Collinge CA. Management of distal femur fractures with modern plates and nails: state of the art. *J Orthop Trauma.* 2015; 29(4):165–72.
- 9- Loya LS, Quadri M. Retrograde intramedullary interlocking nailing for supracondylar fractures of femur: A prospective study. *Int J Orthop.* 2019; 5(2):35-38.
- 10- Raju KP, Madhuchandra P, Pawankumar KM, Shrinidhi IS. Functional outcome of type a and type c supracondylar fractures of femur treated by retrograde intramedullary nailing technique. *Int J Orthop.* 2017; 3(4):769-75.
- 11- Rao DV, Chaitanya G, Sangepu A. Supracondylar fracture femur treated with intramedullary nail: a prospective study. *J Evol Med Dent Sci.* 2015;4(65):11352-61.
- 12- Shah MN, Patel JS. Outcomes of retrograde nailing of distal femoral fractures in Indian population: a prospective study. *Int J Med Sci Public Heal.* 2016;5(04):769.

alfurtas, M., hassan, K., marie, M., Fahmy, F. Short Term Results of Intramedullary Fixation of Supracondylar Fracture of Femur by Retrograde Intramedullary Nail. *Zagazig University Medical Journal*, 2022; (197-203): -. doi: [10.21608/zumj.2020.14011.1277](https://doi.org/10.21608/zumj.2020.14011.1277)