

Outcomes of some surgical fixation techniques for supracondylar femoral fractures: a comparative study

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Abstract: Supracondylar fracture of the femur is a composite injury that poses challenge for the orthopaedist to manage. The potential long-term disability is the culprit behind this problem. Thus, choice of a suitable treatment option for any case of supracondylar femur fracture is a vital task. In our study, a total of 193 patients were enrolled, of which 158 patients were randomly subjected to various operative procedures, viz., fixed angle blade plate method, supracondylar nailing and locking compression plate method. The treatment outcomes depicted that the patients who had undergone locking compression plate established 86.5% of improvement in the movement whereas the patients with supracondylar nail and fixed-angle blade plate methods reported only 56.6% and 53.8% respectively. Besides, 90.4% patients in locking compression plate group resumed to normal activities earlier and only 9.6% were delayed. But, only 47.2% of patients of supracondylar nail method recovered earlier and 52.8% of patients delayed to resume their normal activities. Similarly, only 46.2% of patients engaged in fixed-angle blade plate operative method were reported with early resumption and 53.8% depicted delayed resumption to normal activities. From this comparative study, we inferred that the locking compression plate method provides a better outcome in the treatment of supracondylar fracture of the femur.

Keywords: Supracondylar fracture, Femur, Locking Compression Plate.

I. Introduction

Supracondylar femoral fracture is an unusual but devastating complication of the lower extremity which frequently entails damage of the cartilage surface of the knee joint. The fracture is generally transverse or slightly oblique and sometimes comminuted. This fracture typically occurs in osteoporotic patients, in patients who have undergone knee manipulation or total knee arthroplasty (TKA) as well as in elderly patients who have brittle and frail bones. Surprisingly, the incidence supracondylar femoral fracture is increasing nowadays (1). This kind of fracture is often associated with the succeeding evolution of arthritis in knee. Heavy training could damage the internal architecture of the bone resulting in femur fracture as observed in most athletes (2). The treatment of supracondylar femur fractures may be either non-surgical or surgical and it depends on the severity of the injury and patient's health condition. Non-surgical methods include casting, cast bracing and traction with or without early motion (3). The operative methods include the fixed angle blade plate (FABP), compression-screw systems (Locking Compression Plate; LCP), condylar buttress plates, intramedullary nailing system (Supracondylar nailing; SCN), external fixation, and modular distal femoral replacement (4). Selection of devices is crucial which relay strongly on the location of the fracture according to the knee component. Inadequate fixation of fracture fragments ultimately results in the surgical failure. In the past days, supracondylar nail method was used only for the low femur shaft fractures, but later on, the introduction of interlocking screws has extended its use in treating distal femur fractures. The fixed angled plate was introduced by AO (Association of Osteosynthesis) in 1963 for the treatment of distal femur fractures. Several studies (5, 6, 7) have substantiated that fixed angle blade plate is a reliable and commonly used surgical method for fixation of supracondylar femur fracture. However, this method has its limitation due to the problems like healing delay, diverse infections, joint stiffness (8) and even amputation (9, 10). However, better results were achieved by using implants with various surgical techniques (11). Locking Compression Plate method has better angular stability and preserves blood supply to the fragments. This locking compression plate method has also been used in the treatment of comminuted supracondylar femoral fractures (12). As a general rule, any operative surgery must provide rigid fixation and early motion to resume normal activities of the patients. In this milieu, this randomized clinical study was made to scrutinize and compare the outcomes of these three surgical options of supracondylar fracture of femur.

II. Materials And Methods

A total of 193 patients were enrolled and the study was conducted at Department of Orthopaedics, Bharati Vidyapeeth Medical College and Hospital, Sangli, India, over seven years from 2005 to 2012. This comparative study reviewed the clinical files of all the study subjects. After diagnosis, patients were included in the trial. Once consent was obtained, patients were randomly assigned to fixed-angle blade plate group or

locking compression group or supracondylar nail group. After surgery, physiotherapy was initiated to improve the recovery. The treatment outcomes were compared by analyzing the early mobilization, rigid fixation, movements like full flexion of the knee joint and the lesser duration taken by the patient to resume his/ her normal activities.

III. Results

This randomized clinical study included a total of 193 patients, 82% of whom were operated (158/193) and 18% of non-operated (35/193) (Table 1). The distribution of patients according to treatment is shown in Fig 1. Out of 158 patients who undergone surgery, 33.5 % (n=53) of them were treated with fixed angle blade plate, 33% (n=52) patients treated with locking compression plate and remaining 33.5% (n=53) patients switched to supracondylar nail method (Table 1). According to the parameters analyzed after the surgery, patients those who had undergone locking compression plate established 86.5% of improvement in the movement and 13.5% depicted difficulty in movement. Supracondylar nail and fixed-angle blade plate methods reported 56.6% and 53.8% of patients with good improvement with about 43.4% and 46.2% of patients with movement difficulties respectively (Table 2). Also 90.4% patients of locking compression plate group resumed to normal activities earlier and only 9.6% were late. 47.2% of patients of supracondylar nail method recovered earlier and 52.8% of patients delayed to resume their normal activities. 46.2% of patients engaged in fixed-angle blade plate operative method were reported with early resumption and 53.8% depicted delayed resuming to normal activities (Table 3).

IV. Discussion

Supracondylar fracture of the femur is a composite injury that poses challenge for the orthopaedist to manage (3). This serious injury has potential risk to produce long term disability. Osteoporosis, total knee replacement and aging are the prominent risk factors for this fracture. In 1981, supracondylar fracture following the total knee arthroplasty was first reported by Hirsh *et al* (13). Due to unbalanced pull of thigh and calf muscles it is arduous to maintain the bony alignment in treating the distal femur fractures. Supracondylar fracture may also result from rheumatoid arthritis, steroidal use, neurological disorder, osteolytic defects (14), low energy fall in elderly osteoporotic women (15) as well as in elderly osteopenic and debilitated patients (16, 17). Treatment includes both conventional and operative treatments. The average time of mobility in conservative methods have been reported as minimum 3 months (18) and tend to have potential complications such as loss of movement, muscle wasting, thromboembolism and deformities (19). Since, no single method has been advocated for all types of supracondylar fracture (20), determining the appropriate operative treatment must be associated with location of fracture in relation to the femoral knee component (21). Even though early reports of operative treatments had high complication rates, recent techno-advancements have championed early mobilization, high union rates and better post operative level of motion (22). Modalities followed in this study were fixed-angle blade plate, locking compression plate and supracondylar nailing. Fixed angle blade plate is commonly used but often associated with complications. A study by Ito *et al* underscored that the stiffness of fixed-angle blade plate is equivalent to or higher than that of intramedullary nails (23). Locking compression plate (LCP) gives better angular stability and act as both internal and external fixator (24). As a constraint, like all plates, LCP demands wide surgical dissection (25). In our comparative study, treatment outcome was observed according to the movement of knee joint and time taken by the patients to resume their normal activities. Though supracondylar nail offers advantages like short duration of operation, small incision and less blood loss, patients were suffered from stiffness and pain in knee joints. Most of the patients treated by supracondylar nail method and fixed-angle blade plate were found to have restricted movements in post operative period when compared to the locking compression plate. Due to this, the early mobility outcome of patients was very poor. Fixed-angle blade plate did not give rigid fixation as much as locking compression model. So, chances of non-union were elevated and it engendered further complications of fracture healing. Among the patients subjected to LCP method, majority of them showed good movements and resumed to their normal activities soon, when compared with the patients under other surgical options. Over all, the outcome measures in LCP group are comparatively better have major impact on the recovery of the patients of supracondylar femur fractures.

V. Conclusion

From this comparative study we inferred that the locking compression plate method provides a good outcome in the treatment of supracondylar fracture of the femur. Observations based on time to resume towards normal activities and early mobilization were considered as the indicators of surgical outcome. LCP provides rigid fixation, early mobilization and no post operative immobilization. The rate of union is high with low incidence of complications. Hence, locking compression plate method is better than the fixed-angle blade plate and the supracondylar nailing system.

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Table 1: Treatment of patients included in the study

Year	No. of fractured patients	No. of non-operated patients	No. of operated patients	Surgical Option		
				Fixed angle blade plate	Locking Compression Plate	Supracondylar nailing
2005	23	5	18	2	7	9
2006	20	3	17	8	6	3
2007	26	6	20	6	9	5
2008	15	2	13	3	4	6
2009	27	7	20	7	5	8
2010	25	5	20	8	6	6
2011	37	4	33	11	9	13
2012	20	3	17	8	6	3
Total	193 (100%)	35 (18%)	158 (82%)	53(33.5%)	52(33%)	53(33.5%)

Table: 2 Movement of the wrist joint after surgery

Name of the procedure	Total number of patients (n)	Good movements n (%)	Restricted movements n (%)
Locking Compression Plate (LCP)	52	45 (86.54)	7 (13.46)
Supracondylar nail	53	30 (56.60)	23 (43.39)
Fixed angle blade plate	52	28 (53.84)	24 (46.15)

Table: 3 Days taken by the patients to resume towards normal activities after surgery

Name of the procedure	Total number of patients	Early resumption n (%)	Late resumption n (%)
Locking Compression Plate (LCP)	52	47 (90.38)	5 (9.615)
Supracondylar nail	53	25 (47.16)	28 (52.83)
Fixed angle blade plate	52	24 (46.15)	28 (53.84)

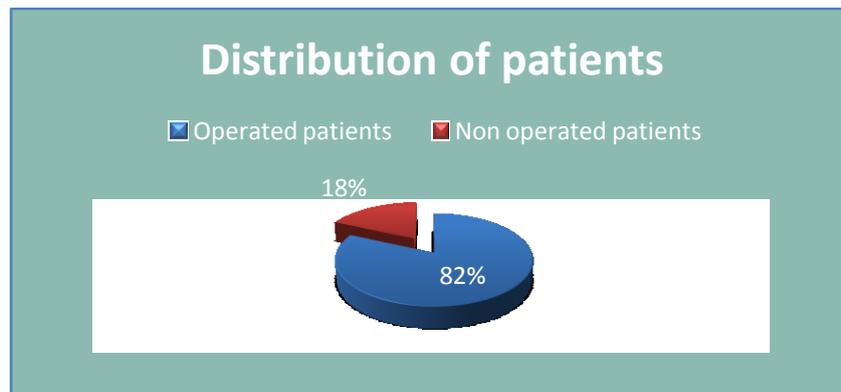


Fig : 1 Distribution of patients according to the treatment option