Comparative Study between Locking Compression Plate vs. Supracondylar Nail for Supracondylar Femur Fractures

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ABSTRACT
Fractures of the supracondylar femur are a treatment challenge despite new fixation options. Except in extreme circumstances, operative treatment for supracondylar femoral fractures is the standard, while nonsurgical treatment has largely fallen out of favour as the result of further advances in technique and implants. The operative methods include the fixed angle blade plate (FABP), compression screw systems (locking compression plate; LCP), condylar buttress plates, intramedullary nailing systems (supracondylar nailing; SCN), external fixation and modular distal femoral replacement. However LCP plating proved to be better choice than supracondylar nail. Locking condylar plate group had the best functional outcome followed by SCN group according to Schatzker and Lambert criteria and our study based on it.

INTRODUCTION
Supracondylar femur fracture is a devastating complication of the lower extremity which frequently entails damage to the cartilage surface of the knee joint. Fractures of the distal femur comprise 4–6% of all femoral fractures.¹² The fractures occur in a bimodal distribution. One group includes patients below 40 years of age, predominantly males, sustained high energy trauma such as traffic accidents or a fall from heights. The other group consists of patients >50 years, predominantly females, with osteoporosis, who sustained relatively low energy trauma.³⁴

Fractures of the supracondylar femur are a treatment challenge despite new fixation options. Except in extreme circumstances, operative treatment for supracondylar femoral fractures is the standard, while nonsurgical treatment has largely fallen out of favour as the result of further advances in technique and implants.⁴ The operative methods include the fixed angle blade plate (FABP), compression screw systems (locking compression plate; LCP), condylar buttress plates, intramedullary nailing systems (supracondylar nailing; SCN), external fixation, and modular distal femoral replacement.⁵

Many classification systems have been used but most widely accepted classification of supracondylar fractures is that developed by Müller, updated by the AO group,⁶ and adopted by the Orthopedic Trauma Association (OTA).

MATERIALS AND METHODS
• Retrograde locked intramedullary nail, LCP, Reamer, Bone aw, Shantz Screw, Tunneler/Bristo, Drill, Drill Bit of 3.2 mm, 4.0 mm, and 4.3 mm, Drill Sleeve, Trocar, Depth Gauge, Tap 4.5 mm,Tap Sleeve, Screw Driver, Plate Bender, Cortical and Cancellous Screws of All Sizes and Range, C-Arm Image Intensifier
• Criteria for grading of result for supracondylar femur fractures was Schatzker and Lambert Criteria⁷

All the patients were treated according to a protocol which consisted of:
1. Standard antero posterior and lateral plain X-ray including knee joint.
2. All patients examined for any neurovascular injury.
3. Below knee skin/upper tibial skeletal traction applied and limb kept on Bohler Braun Splint.
4. Pre operative CT scan for pre operative planning if needed.
5. Open wounds were taken to operation theatre for wound debridement within 5 hours of admission.
6. Investigations done, patients general condition assessed and fitness for surgery taken.
7. Poly trauma patients were fixed as soon as their general condition allowed for surgery.
8. Patient managed by closed reduction and internal fixation under C-arm or by open reduction and internal fixation using tourniquet.
9. CPM (continuous passive movement) for 3–5 days immediately post operative.
10. Partial weight bearing with early signs clinically and radiologically of union.
11. Patient follow up depended on the clinical
12. Follow up was done at 2 weeks, 6 weeks, 3 months, 6 months, and 1 year.

**DISCUSSION**

The youngest of the patients was a 21-year-old female and the oldest one was an 80-year-old female patient. Most of the patients were in age group between 40 years and 60 years. Age and sex distribution were quite similar in both groups.

Mechanism of injury was high energy impact in 37 patients (61.67%) [LCP group 63.33% (19 patients), SCN group 60% (18 patients)] and low energy impact in 23 patients (38.33%) [LCP group 36.67% (11 patients), SCN group 40% (12 patients)].

Out of 60 patients, 27 were compound fracture and 33 were simple fracture.

Thus the nature of fracture was about same in both LCP (compound 46.67%) and SCN group (compound 43.33%).

In LCP group, there were 8 type A fractures and 22 type C fractures while in SCN group 2 patients of LCP group and 1 patient of SCN group developed superficial infection while 1 patient of LCP group developed deep infection requiring wound lavage and high dose intravenous antibiotics. No deep infection was encountered in SCN group. All the three patients of superficial infection and one of deep infection had suffered open fracture of the distal femur were 16 type A fracture and 14 type C fracture.

One out of 30 patients (3.33%) developed non union in the LCP group and in the SCN group, non union was observed in 2 out of 30 patients (6.67%) after 9 months.

Knee pain was more common after nailing (16.67% vs. 6.67%) than plating and it significantly affected the knee flexion postoperatively.

The mean range of movement was 96.33° ± 8.03° in the LCP group and 90.83°±8.84° in the SCN group at the end of 8 weeks (t = 2.5225 , df = 58 , p = 0.0144). The range of movement improved to 118.93°±17.30° in the LCP group and 109.03°±18.78° by 6 months follow up after vigorous

### Table 1

<table>
<thead>
<tr>
<th>Type</th>
<th>Subtype</th>
<th>LCP group (number/percentage)</th>
<th>SCN group (number/percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group</td>
<td>20–40</td>
<td>7(23.33%)</td>
<td>6(20%)</td>
</tr>
<tr>
<td></td>
<td>40–60</td>
<td>15(50%)</td>
<td>15(50%)</td>
</tr>
<tr>
<td></td>
<td>60–80</td>
<td>8(26.67%)</td>
<td>9(30%)</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>22(73.33%)</td>
<td>23(76.67%)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>8(26.67%)</td>
<td>7(23.33%)</td>
</tr>
<tr>
<td>Mechanism of injury</td>
<td>High energy</td>
<td>19(63.33%)</td>
<td>18(60%)</td>
</tr>
<tr>
<td></td>
<td>Low energy</td>
<td>11(36.67%)</td>
<td>12(40%)</td>
</tr>
<tr>
<td>Type of fracture</td>
<td>Simple</td>
<td>16(53.33%)</td>
<td>17(56.67%)</td>
</tr>
<tr>
<td></td>
<td>Compound</td>
<td>14(46.67%)</td>
<td>13(43.33%)</td>
</tr>
<tr>
<td>Infection rate</td>
<td>Superficial</td>
<td>2(6.67%)</td>
<td>1(3.33%)</td>
</tr>
<tr>
<td></td>
<td>Deep</td>
<td>1(3.33%)</td>
<td>Nil</td>
</tr>
<tr>
<td>Non-union</td>
<td></td>
<td>1(3.33%)</td>
<td>2(6.67%)</td>
</tr>
<tr>
<td>Knee pain</td>
<td></td>
<td>2(6.67%)</td>
<td>7(11.67%)</td>
</tr>
<tr>
<td>Average knee flexion after 6 months</td>
<td>-</td>
<td>118.93 ± 17.30</td>
<td>109.03 ± 18.78</td>
</tr>
</tbody>
</table>
physiotherapy ($t = 2.1236, df = 58, p = 0.0380$). Thus flexion at knee is significantly better in LCP group than SCN group.

Supracondylar fracture of the femur is a composite injury that poses challenge for the orthopaedics to manage. This serious injury had potential risk to produce long-term disability.

Most of these surgical failures were due to inadequate fixation of the fracture fragments. The prognostic factors for supracondylar fracture included age, intra-articular involvement, methods of treatment, and timing of joint motion. There has been no uniform reporting of the results of the treatment of distal femur fractures. It is difficult to compare the results of different reported series in literature, because of differences in demographic characteristics and different fracture characteristics and is further complicated by the use of different classification systems and functional rating systems.

Indication for LCP plate osteosynthesis are as follows: short distal fragment, C2 and C3 fracture patterns, failed closed reduction with retrograde IM nailing, salvage implant for revision surgery and complicated situations. In our series, predominant indications for LCP plate osteosynthesis included short distal fragment and C2 and C3 fracture configuration, severe osteoporosis and severe degenerative changes of the knee joint.

Indications for retrograde IM nailing for the treatment of distal femur fractures include: distal femur fracture AO type A, C1 and C2, open wound around the knee, bilateral femur fractures, ipsilateral segmental fracture, and severe obesity (Fig. 1).

Disadvantages of the nailing technique may be lack of alignment control, posterior angulation, perforation of joint cartilage, and intra-articular distribution of reaming debris. Stability is limited if small diameter and short nails are inserted.

In the LCP group, 1 out of 30 patients (3.33%) developed non union as no bony consolidation of the femoral fracture was observed 9 months after osteosynthesis. In the SCN group, 3 out of 30 patients (10%) developed non union requiring bone grafting.

In our study, majority of patients were males 75% and females was only 25%. Sex distribution was quite similar in both groups with 73.33% males in LCP group and 76.67% males in SCN group. Our observation are comparable to reports made by Kanda Gao et al (2012) who reported 63.15% males in LCP group and 74.47% males in SCN group. Male predominance in our study and majority of studies are understood to be due to more exposure of males to high velocity trauma than females.

In our study, 3 patients (2 in LCP group and 1 in SCN group) developed superficial infection while 1 patient developed deep infection (LCP group). On evaluating the persistent joint pain in the series, the complaint was much more common in the nailing group after SCN (5 cases) (16.67%) than plating (2 cases) (6.67%) and was due to the tip of the nail within the joint which had to be redriven within the subchondral bone. This joint pain significantly affected the knee flexion postoperatively.

**CONCLUSION**

Sixty cases of supracondylar fracture of femur, admitted in D Y Patil Medical College, Pune, were included in
this study. Out of them, 30 were treated by distal femur locking late and were designated LCP group. The rest 30 were treated by supracondylar nail and were included in the SCN group.

Using Schatzker and Lambert criteria, we had 19 (63.33%) excellent, 7 (23.33%) good, 2 (6.67%) fair, and 2 (6.67%) poor results in LCP group while in SCN group we achieved 16 excellent (53.33%), 5 good (16.67%), 4 fair (13.33%), and 5 poor (16.67%) cases. Thus in our study, LCP plating proved to be a better choice than supracondylar nail. Locking condylar plate group had the best functional outcome followed by SCN group. Locking plates had better outcome in both extra-articular and intra-articular group. They also had better outcome in both younger and older age groups. SCN group had moderately good outcome in extra-articular group, but had inferior outcome in intra-articular fractures comparing with LCP group. Thus, we can conclude that locking plates remain the better purchase in both intra-articular and extra articular fractures, in both young and old patients.

RESULTS

Results were graded according to Schatzker and Lambert criteria. In LCP group there was 19 excellent (63.33%), 7 good (23.33%), 2 fair (6.67%), and 2 poor (6.67%) cases while in SCN group, there was 16 excellent (53.33%), 5 good (16.67%), 4 fair (13.33%), and 5 poor (16.67%) cases.

Other important contributing factors affected result

<table>
<thead>
<tr>
<th>Grade</th>
<th>LCP group</th>
<th>SCN group</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of cases</td>
<td>%</td>
<td>No. of cases</td>
</tr>
<tr>
<td>Excellent</td>
<td>19</td>
<td>63.33</td>
<td>16</td>
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<tr>
<td>Good</td>
<td>7</td>
<td>23.33</td>
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<tr>
<td>Fair</td>
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<td>6.67</td>
<td>4</td>
</tr>
<tr>
<td>Poor</td>
<td>2</td>
<td>6.67</td>
<td>5</td>
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</table>

REFERENCES


**Article citation:** Shroff A, Herode P, Mohan PJ, Sadaria MH, Nair V. Comparative study between locking compression plate vs. supracondylar nail for supracondylar femur fractures. Orthopedic Research and Review 2016;01(01):12–16.

**Statement of originality of work:** The manuscript has been read and approved by all the authors, the requirements for authorship have been met, and that each author believes that the manuscript represents honest and original work.

**Source of funding:** None

**Competing interest / Conflict of interest:** The author(s) have no competing interests for financial support, publication of this research, patents, and royalties through this collaborative research. All authors were equally involved in discussed research work. There is no financial conflict with the subject matter discussed in the manuscript.

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