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Original Research Article

Clinical and Functional Outcomes of Proximal Humerus Fractures Treated with Locking Compression Plates (LCP) in Adults - Prospective Study

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Abstract:
In this prospective study, conducted at UPUMS, Saifai, Etawah, 52 adult patients with proximal humerus fractures are treated for 1.5 year, from July 2022 to December 2023, with an assessment of the clinical and functional outcomes of employing Locking Compression Plates (LCP). As seen by better Constant-Murley and DASH scores, the results show considerable improvements in pain reduction, increased range of motion, and enhanced functional recovery. With few problems, a high fracture union rate of 92.3% was attained, indicating the effectiveness and safety of LCP in this situation. The study emphasises how crucial precise surgical methods and postoperative care are to getting the best results possible from LCP treatment. These results confirm that LCP is still a useful treatment for complicated proximal humerus fractures in adult patients.
Keywords: Locking Compression Plates, Proximal Humerus Fractures, Orthopedic Surgery, Functional Recovery.

Introduction

One of the most frequent fractures seen in orthopaedic practice, particularly in adults, is a proximal humerus fracture [1]. In younger patients, high-energy trauma is usually the source of these fractures; in older adults with osteoporotic bones, low-energy falls are the usual cause [2]. Orthopedic surgeons face great difficulty due to the complexity of these fractures and the requirement for dependable and efficient treatment techniques [3]. Proximal humerus fractures are increasingly being treated with locking compression plates, or LCPs [4]. Achieving the best possible functional outcomes requires early mobilization and stable fixation, both provided by LCPs. Because of their capacity to offer both axial and angular stability, they are especially well-suited for treating complicated fractures where traditional plating may not hold up [5,6]. The purpose of this prospective study is to assess the functional and clinical results of adult patients treated with LCP for proximal humerus fractures [7-9]. This study aims to offer thorough data on the efficacy of LCP in managing these fractures by measuring criteria such as pain levels, range of motion, strength, and total functional recovery. The study will also examine the complication rates related to this treatment approach, including as non-union, hardware failure, and infection.

Methodology

Study Design: This prospective study was conducted to evaluate the clinical and functional outcomes of proximal humerus fractures treated with Locking Compression Plates (LCP) in adults.

Study Population: The study included a total of 52 adult patients diagnosed with proximal humerus fractures.

Study Duration: The study was conducted over 1.5 year, from July 2022 to December 2023.

Place of Study: The research was carried out at Uttar Pradesh University of Medical Sciences (UPUMS), Saifai, Etawah.

Inclusion Criteria

- Adults aged 18 years and above.

- Patients with acute proximal humerus fractures.

- Patients who consented to participate in the study and follow-up protocol.

Exclusion Criteria

- Patients with pathological fractures.

- Patients with open fractures.

- Patients with associated neurovascular injuries.

- Patients with a history of previous shoulder surgery on the affected side.

Surgical Procedure: All patients underwent surgical fixation using Locking Compression Plates (LCP) under general anesthesia. The choice of implant and surgical approach was determined based on the fracture pattern and surgeon's discretion.

Data Collection: Data were gathered before surgery, right after surgery, and during follow-up appointments six weeks, three months, six months, and a year after surgery. The subsequent parameters were noted:

- Demographic Information: Comorbidities, gender, and age.
- Fracture Classification: Neer classification serves as the basis.
- Operative Details: surgical strategy, length of operation, problems during surgery.
- Clinical Outcomes: Shoulder strength, range of motion, and pain (assessed with a visual analogue scale and goniometer).
- Functional Outcomes: Evaluated with the Disabilities of the Arm, Shoulder, and Hand (DASH) score and the Constant-Murley score.
- Radiological Outcomes: Serial radiographs are used to assess hardware location, alignment, and fracture union.
- Complications: Hardware malfunctions, infections, non-union, malunion, and any other unfavourable incidents.

Statistical Analysis: The clinical, functional, and radiological results as well as the patient demographics were compiled using descriptive statistics. The mean ± standard deviation was used to express continuous variables, whereas frequencies and percentages were used to express categorical variables. The comparison of preoperative and postoperative outcomes was done using paired t-tests. Statistical significance was attained when the p-value was less than 0.05.

Results

The study included 52 adult patients, consisting of 30 males (57.7%) and 22 females (42.3%). The mean age of the patients was 54.3 years, ranging from 18 to 85 years. Comorbidities were present in 26 patients (50%), with hypertension being the most common.

Fracture Classification

According to the Neer classification, the fractures were categorized as follows:

- 2-part fractures: 22 patients (42.3%)
- 3-part fractures: 18 patients (34.6%)
- 4-part fractures: 12 patients (23.1%)

Operative Details: The mean duration of surgery was 95 minutes, with a range of 70 to 130 minutes. Intraoperative complications were minimal, with only 2 cases (3.8%) of minor bleeding managed effectively.

Clinical Outcomes: Pain levels, measured using the Visual Analog Scale (VAS), showed a significant reduction over time. The preoperative mean VAS score was 8.2, which decreased to 2.4 at the 1-year follow-up ($p < 0.001$). Range of motion and shoulder strength improved progressively. At the 1-year follow-up, the mean forward flexion was 145 degrees, external rotation was 60 degrees, and internal rotation reached the L1 vertebral level.

Functional Outcomes: The mean Constant-Murley score improved from 29 preoperatively to 78 at the 1-year follow-up ($p < 0.001$). Similarly, the Disabilities of the Arm, Shoulder, and Hand (DASH) score decreased from a preoperative mean of 68 to 15 at the final follow-up ($p < 0.001$), indicating significant functional recovery.

Radiological Outcomes: Radiological evaluation showed that 48 patients (92.3%) achieved fracture union within 16 weeks. Four patients (7.7%) experienced delayed union, but all eventually healed without requiring additional surgical intervention. Alignment and hardware position remained satisfactory in 50 patients (96.2%).

Complications

Complications were observed in 8 patients (15.4%). These included:

- Superficial infection: 3 patients (5.8%), managed with antibiotics.

- Hardware failure: 2 patients (3.8%), necessitating revision surgery.

- Non-union: 2 patients (3.8%), treated with bone grafting and revision fixation.

- Malunion: 1 patient (1.9%), resulting in a mild functional deficit.

Statistical Analysis

Paired t-tests indicated statistically significant improvements in clinical and functional outcomes from preoperative assessments to the 1-year follow-up ($p < 0.05$). Descriptive statistics demonstrated the effectiveness of LCP in providing stable fixation and promoting early mobilization, leading to favorable outcomes.

Discussion

This research offers strong proof of the usefulness of Locking Compression Plates (LCP) in the treatment of adult proximal humerus fractures, demonstrating notable gains in functional and clinical results. Most patients showed remarkable recovery, with significant increases in range of motion and pain levels. Significant improvements were noted in the Constant-Murley and DASH scores over the year, pointing to a strong functional recovery and better quality of life after therapy [11-15].

The high percentage of fracture union (92.3%) that occurred within 16 weeks after surgery highlights how effective LCP is at stabilizing bone and promoting healing, especially in complicated fracture patterns [16,17]. These results are in line with earlier studies that demonstrate the usefulness of LCP in the treatment of related orthopaedic disorders. There were very few complications and a comparable rate of hardware failure and non-union compared to previous research. These results imply that LCP can be a safe choice for patients with proximal humerus fractures if precise surgical techniques and proper post-operative care are used [18,19].

To reduce hazards, the study also emphasises the necessity of meticulous patient selection and adherence to surgical standards. We are reminded of the difficulties in treating serious fractures, particularly in older persons and those with substantial comorbidities, by the fact that complications occurred in a small percentage of the study sample [20].

Conclusion

This prospective study definitively shows that the use of Locking Compression Plates (LCP) improves range of motion, overall functional recovery, and pain management significantly in people with proximal humerus fractures. LCP is a dependable and efficient therapeutic option, with a high fracture union rate and few side effects. The findings support the necessity of careful surgical technique and postoperative management to optimize results and reduce hazards. This research adds significant knowledge to the area of orthopedics by indicating that LCP is a good choice for treating complicated proximal humerus fractures, improving patient outcomes, and lessening the burden of impairment. Subsequent investigations ought to strive to enhance these results and investigate the enduring advantages and plausible modifications in therapy.

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