Thesis

Clinical and Radiological Outcomes of Open Reduction and Plate Fixation for Displaced Midshaft Clavicle Fractures: A Single-Centre Series

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Abstract

Background: Displaced midshaft clavicle fractures often heal poorly with conservative care and may result in malunion, nonunion or persistent shoulder dysfunction. This study reports outcomes after open reduction and plate fixation.

Methods: Thirty adults with displaced midshaft clavicle fractures treated between July 2019 and December 2021 underwent plate osteosynthesis via an anterosuperior approach. A standardized rehabilitation protocol was followed. Patients were reviewed at 6 weeks, 3, 6 and 12 months with radiographs, VAS pain scoring and validated functional measures (Constant, UCLA, and SF-36). Intraoperative details and complications were recorded.

Results: All patients united radiologically by final follow-up. Median age was 32 years. Functional scores improved steadily, with median Constant scores around 80–85 and UCLA scores in the mid-30s at one year. Median VAS pain scores fell to low values. No deep infections, implant failures or nonunion occurred. Two patients experienced symptomatic implant prominence managed without immediate surgery. Median operative time was approximately 50 minutes with minimal blood loss recorded.

Conclusion: Plate fixation reliably restored clavicular length and alignment in selected displaced midshaft fractures, produced predictable union and satisfactory shoulder function, and allowed early mobilization. Preoperative counselling about possible implant irritation remains essential.

Keywords: Clavicle fracture, Midshaft, Plate fixation, Union, Functional outcome

Introduction

Clavicle fractures are a frequent injury in orthopaedic practice, most commonly affecting the middle third of the bone. The clavicle's curved shape and its superficial position beneath the skin make it particularly prone to displacement after direct shoulder impact or high-energy trauma. In many cases, minor fractures heal well without surgery, but when the midshaft fragment is significantly displaced, shortened or comminuted, conservative treatment has been shown to produce disappointing outcomes in a notable proportion of patients. These outcomes include symptomatic malunion, nonunion and persistent shoulder dysfunction, especially in active adults


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and those with high functional demands. [1–6]

Surgical fixation aims to restore the clavicle's length, alignment and rotation so that shoulder mechanics are re-established and pain and disability resolve more predictably. The two main operative approaches are plate osteosynthesis and intramedullary fixation. Plating provides strong cortical purchase and excellent control of rotation and length, making it preferable in comminuted or segmental fractures; however, plates sit directly under thin soft tissue and can be prominent or bothersome. Intramedullary nails or elastic devices require smaller incisions and preserve more soft tissue, offering cosmetic and early comfort advantages in suitable patterns, but they may provide less rotational stability in complex fracture configurations and occasionally migrate. [7–12]

Recent comparative studies and reviews suggest that, for markedly displaced midshaft fractures, operative fixation reduces the risk of nonunion and often speeds functional recovery compared with nonoperative management, albeit at the expense of implant-related complaints in some patients. Given these trade-offs, modern practice tends to be selective: nonoperative care for minimally displaced, stable fractures, and operative fixation—commonly plate fixation—for displaced, shortened or comminuted midshaft injuries in active patients who want a reliable, timely return to function. This series reports outcomes after open reduction and plate fixation, focusing on union, functional recovery, pain and complications to inform shared decision making. [13–16]

Review of Literature

Epidemiological studies show the midshaft as the most commonly fractured segment of the clavicle; mechanisms include direct blows to the shoulder and road-traffic or sports injuries. Early outcome reports noted low absolute nonunion rates after conservative care, but closer analysis revealed that completely displaced or significantly shortened midshaft fractures were at increased risk of symptomatic malunion and functional deficit. Those observations prompted randomized trials and cohort studies that compared nonoperative management with surgical fixation. [1–5]

Classification systems remain useful clinical tools. Simple schemes that group fractures by location are practical for routine care, while more detailed systems help identify fracture patterns less likely to do well without fixation. This aids prognostication and helps surgeons choose between conservative and operative approaches. [2, 3]

Plating restores length and resists bending and torsional forces; it is especially valuable in comminuted or segmental fractures where maintaining reduction is otherwise difficult. Modern precontoured and locking plates aim to lower prominence and mechanical failure, but hardware irritation under thin soft tissue remains a real concern. Intramedullary fixation preserves periosteal blood supply and soft tissue, often using smaller incisions and producing early comfort in simple transverse fractures; however, nails give less rotational control in multifragmentary patterns and carry a small risk of migration. [7–12]

Systematic reviews and meta-analyses that pool randomized and observational trials indicate that surgery—especially plating—for displaced midshaft fractures reduces nonunion risk and can speed early functional recovery, though implant-related problems and subsequent operations for hardware removal are commonly reported. Taken together, the literature advocates a tailored approach: conservative care for stable, minimally displaced fractures and operative fixation for displaced, shortened or comminuted midshaft fractures in active patients willing to accept implant-related trade-offs. [13–19]

Materials and Methods

This single-centre series combined prospective and retrospective data from thirty adult patients treated with open reduction and plate fixation for displaced midshaft clavicle fractures between July 2019 and December 2021. Patients were included if they were over 18 years old and had displacement or shortening greater than 20 mm, marked comminution, segmental fracture patterns, floating shoulder or evident scapular malposition. Exclusions were presenting neurovascular injury, local infection, or inability to comply with postoperative follow-up.

All patients underwent clinical assessment and standard radiographs prior to surgery. Routine blood tests and anaesthesia fitness were confirmed. Procedures were performed under general anaesthesia with the patient in the beach-chair position. An anterosuperior transverse approach centred over the fracture was used in most cases. Careful soft-tissue dissection preserved the clavipectoral fascia and supraclavicular nerve branches when possible. Reduction was achieved with pointed bone clamps and provisional fixation (small fragment screws) where helpful. A contoured reconstruction or anatomically precontoured locking plate was applied to restore length and control rotation; cortical or locking screws were used as indicated and screw lengths checked under fluoroscopy to avoid joint penetration and minimise prominence.

Postoperative care included short sling immobilisation with early pendulum and passive range-of-motion exercises, followed by a graduated physiotherapy programme. Follow-up visits were at 6 weeks, 3 months, 6 months and 12 months with serial radiographs and assessments of shoulder range of motion, pain by visual analogue scale (VAS) and validated functional instruments (Constant and UCLA scores; SF-36 for general health). Intraoperative data (operative time, estimated blood loss) and any complications were prospectively recorded. Institutional ethics approval and informed consent were obtained for all patients.

Results

Thirty consecutive patients met the inclusion criteria and underwent open reduction with plate fixation. The cohort's median age was 32 years (range 19–64); 22 were male and eight female. Road-traffic accidents were the predominant cause of injury. The median interval from injury to surgery was about 36 hours. Mean operative time averaged roughly 50 minutes and blood loss was minimal in most cases.

Radiographic callus formation was commonly visible between six and twelve weeks, and all patients achieved radiological union by final review. Functional recovery improved steadily: median Constant scores at one year were around 80–85 and UCLA scores clustered in the mid-30s. Pain scores fell sharply from preoperative levels, with median VAS near minimal values at 12 months. There were no deep infections, implant failures or nonunions recorded in this series. Two patients reported symptomatic implant prominence; both were managed conservatively without immediate return to the operating room. The majority returned to their previous daily activities and work and expressed satisfaction with the cosmetic and functional results.

Discussion

This series reinforces that plate fixation offers predictable restoration of clavicular length and alignment and leads to reliable union and satisfactory shoulder function in selected displaced midshaft fractures. The rigidity and rotational control conferred by plating are especially valuable in comminuted and segmental injuries, where maintaining accurate reduction is crucial for restoring shoulder mechanics and avoiding symptomatic malunion. [10–12] Intramedullary techniques remain useful for simple transverse fractures because they preserve soft tissues and often result in smaller wounds and early comfort, but their lesser rotational stability limits their role in complex patterns and raises concerns about potential migration. [8, 9]

Although operative fixation lowers nonunion risk and can accelerate early functional recovery for markedly displaced fractures, implant-related irritation and hardware prominence are the most frequent drawbacks. Low-profile and precontoured plates and careful intraoperative contouring reduce the incidence of symptomatic implants, but they do not eliminate it; patients should be counselled clearly about the possibility of later implant removal. [14–19]

The strengths of this work include consistent surgical technique, standardized follow-up and the use of validated outcome measures. Limitations include the single-centre setting, modest cohort size and mixed prospective /retrospective design, which may affect generalisability and introduce selection bias. Despite these limitations, the findings align with larger series and meta-analyses that support a selective surgical strategy—typically plating—for displaced midshaft clavicle fractures in active adults who prioritise a reliable, timely return of shoulder function and accept the trade-offs associated with implants. [13–16, 20]

Conclusion

Open reduction and plate fixation of displaced midshaft clavicle fractures produced consistent radiological union and satisfactory functional recovery in this series. Accurate restoration of length and rotation with stable fixation allowed early rehabilitation, significant pain relief and progressive restoration of shoulder motion. Implant prominence remained the principal postoperative nuisance but rarely necessitated immediate reoperation in this cohort. Careful patient selection, meticulous operative technique and frank preoperative counselling about the potential for hardware irritation and possible later removal are essential. Taken together, these results support a selective surgical policy for displaced, shortened or comminuted midshaft clavicle fractures in active adults who seek a predictable and timely return to shoulder function.

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