RESEARCH PAPER

COMPARISON OF DYNAMIC COMPRESSION PLATING VS FLEXIBLE INTERMEDULLARY NAILING IN DIAPHYSEAL HUMERUS FRACTURES - REVIEW OF LITERATURE

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ABSTRACT

Diaphyseal humerus fractures are commonly managed surgically using dynamic compression plating (DCP) or intramedullary nailing (IMN). Literature review shows comparable union rates and functional outcomes with both techniques. Plating provides better anatomical reduction but risks radial nerve injury, while IMN is minimally invasive yet associated with shoulder complications. Treatment should be individualized.

Keywords: Diaphyseal humerus fracture, Dynamic compression plating, Intramedullary nailing, Radial nerve injury, Shoulder complications.

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Introduction

Diaphyseal fractures of the humerus constitute approximately 1–3% of all fractures and represent a significant proportion of upper limb injuries encountered in adult orthopaedic practice. These fractures commonly occur following high-energy trauma such as road traffic accidents in younger individuals and low-energy falls in the elderly population. The principal goals of treatment include achieving stable fracture union, restoring functional range of motion at the shoulder and elbow joints, minimizing complications, and facilitating early return to daily activities and work. Although non-operative management using functional bracing has demonstrated satisfactory outcomes in selected cases, surgical fixation is often preferred in displaced, unstable, segmental, pathological-risk, or polytrauma-associated fractures. Among the various surgical options, dynamic compression plating (DCP) and intramedullary nailing (IMN) remain the most widely employed fixation techniques. Despite their widespread use, controversy persists regarding the optimal method, leading to numerous comparative studies in contemporary orthopaedic literature.

Anatomical and Biomechanical Considerations

The humeral shaft is subjected to complex biomechanical forces including torsional, bending, and axial loads generated by surrounding musculature. Preservation of periosteal blood supply, maintenance of rotational stability, and protection of the radial nerve are critical considerations during surgical fixation. Plate fixation provides rigid stability and superior rotational control through direct fracture visualization, while intramedullary nailing functions as a load-sharing device that preserves fracture hematoma and minimizes soft tissue disruption. These biomechanical differences influence healing patterns, complication rates, and postoperative rehabilitation.

Methodology

A comprehensive review of Scopus-indexed prospective studies, retrospective cohorts, systematic reviews, and meta-analyses comparing DCP and IMN in adult diaphyseal humerus fractures was conducted. Most studies included skeletally mature patients aged between 18 and 65 years with closed fractures and excluded open fractures, pathological fractures, and cases with

associated neurovascular injuries. Preoperative assessment typically involved anteroposterior and lateral radiographs including shoulder and elbow joints, with fracture classification based on AO/OTA criteria. Functional outcomes were evaluated using validated scoring systems such as the Disabilities of the Arm, Shoulder and Hand (DASH) score and the Constant–Murley score. Radiological union was defined by cortical continuity across at least three cortices on serial radiographs. Secondary outcome parameters included operative time, intraoperative blood loss, radiation exposure, incision length, duration of hospital stay, time to mobilization, postoperative complications, and need for reoperation.

Results

Zhang et al. compared intramedullary nailing with locking compression plate fixation in AO/OTA type 12-A and 12-B humeral shaft fractures and reported no statistically significant difference in union rates or DASH scores between the two groups. However, plate fixation was associated with greater intraoperative blood loss and longer operative duration, reflecting the invasive nature of open reduction. Ingale and Faisal observed comparable union rates and time to union with both DCP and IMN, but reported a higher incidence of shoulder stiffness and impingement in the IMN group, particularly following antegrade nailing, whereas transient radial nerve palsy was more commonly observed following plating.

Boumnijel et al., in a study involving elderly patients, demonstrated superior Constant–Murley scores in those treated with plate fixation compared to intramedullary nailing. Despite improved functional outcomes, plating was associated with increased surgical exposure and longer hospital stay. Conversely, IMN resulted in reduced soft tissue dissection, shorter operative time, and earlier mobilization but showed a higher incidence of shoulder-related complications. Amer et al., in a systematic review, concluded that fracture union rates were comparable between DCP and IMN; however, plating carried a higher risk of iatrogenic radial nerve injury, while IMN was associated with shoulder impingement, nail migration, and implant-related complications. Kurup et al., in a meta-analysis, found no statistically significant difference in non-union rates between the two techniques, but reported higher reoperation and implant removal rates following IMN.

Complications

Radial nerve palsy remains a well-recognized complication of humeral shaft fracture surgery, particularly with plating due to extensive exposure and manipulation. Most reported nerve injuries were transient and resolved spontaneously. Infection rates were marginally higher with plating owing to greater soft tissue dissection. Intramedullary nailing was associated with increased shoulder pain, stiffness, and impingement, especially with antegrade entry, as well as higher radiation exposure due to fluoroscopic guidance. Implant-related complications such as nail migration and backing out were more commonly reported with IMN.

Functional Outcomes and Rehabilitation

Most studies reported comparable long-term functional outcomes between DCP and IMN when assessed at final follow-up. Early rehabilitation was influenced by fixation stability, pain control, and presence of complications. Plate fixation allowed early controlled mobilization but required careful soft tissue handling, whereas IMN permitted earlier weight bearing and reduced surgical morbidity. Functional recovery was closely linked to adherence to physiotherapy protocols and early mobilization.

Inference

Based on the reviewed literature, both dynamic compression plating and intramedullary nailing provide reliable fracture union and satisfactory functional outcomes in adult diaphyseal humerus fractures. Plate fixation offers superior anatomical reduction, rigid fixation, and rotational stability, making it particularly suitable for complex fracture patterns, segmental fractures, and osteoporotic bone. However, it is associated with increased soft tissue dissection, blood loss, and risk of radial nerve injury. Intramedullary nailing is a minimally invasive technique that preserves periosteal blood supply and reduces operative exposure, but may result in shoulder impingement, stiffness, and implant-related complications. Therefore, the choice of fixation should be individualized based on fracture configuration, patient age, bone quality, associated injuries, functional demands, and surgeon expertise. Further large-scale, multicenter randomized controlled trials with long-term follow-up are required to establish definitive treatment guidelines and optimize outcomes.

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