

Conservative Management with Functional Bracing versus Various Surgical Fixation Techniques for Humeral Shaft Fractures: A Network Meta-Analysis

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INTRODUCTION:

Historically, humeral shaft fractures have demonstrated successful treatment with nonsurgical management and functional bracing. Surgical indications for humeral shaft fractures vary and can be performed through different plating and nailing techniques. Each surgical technique has associated complications, and no consensus exists in the literature about the preferred management of these fractures. Common complications associated with treatment of humeral shaft fractures include nonunion, radial nerve palsy, and infection. The purpose of this study was to compare outcomes of nonsurgical versus operative interventions for the treatment of extra-articular humeral shaft fractures.

METHODS:

This study was a systematic review and network meta-analysis of prospective randomized controlled trials (RCTs) that sought to compare clinical outcomes between different treatment methods for humeral shaft fractures. These included nonsurgical management with functional bracing (FB) and surgical techniques, such as open reduction internal fixation (ORIF), minimally invasive plate osteosynthesis (MIPO), and intramedullary nailing through both antegrade (aIMN) and retrograde (rIMN) approaches. Outcome measures assessed included time to union, rates of nonunion, malunion, delayed union, secondary surgical intervention, iatrogenic radial nerve palsy, and infection. A frequentist approach to network meta-analysis was performed to compare outcomes between treatment groups. Mean differences (MD) and log odds ratios (OR) were used to analyze continuous and categorical data, respectively.

RESULTS:

Twenty-one RCTs were included, reporting the outcomes of 1,203 patients treated with either FB (n=190), ORIF (n=479), aIMN (n=312), or rIMN (n=45). FB had significantly higher odds for nonunion and significantly longer time to union than ORIF, MIPO, and aIMN (p<0.05). Comparison of surgical fixation techniques demonstrated significantly faster time to union with MIPO than ORIF (p=0.008). There were higher odds of malunion with FB than ORIF (p=0.047). Odds for delayed union were significantly higher with aIMN than ORIF (p=0.036). The odds for secondary surgical intervention were significantly higher with FB than with ORIF (p=0.001), MIPO (p=0.007), and aIMN (p=0.004). However, ORIF was associated with significantly higher odds of iatrogenic radial nerve injury and superficial infection than both FB and MIPO (p<0.05).

DISCUSSION AND CONCLUSION:

Compared to functional bracing, surgical intervention universally demonstrated lower rates of nonunion and reoperation. MIPO demonstrated significantly faster time to union, allowing for preservation of patient biology through minimal periosteal stripping, while ORIF was associated with significantly higher rates of radial nerve palsy. Nonsurgical management with FB demonstrated higher nonunion rates than most surgical techniques, often requiring conversion to surgical fixation.

