Quality of Surgical Technique in Patients With a Humeral Shaft Fracture in the HUMMER Study: An International Survey Among Expert Surgeons

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Purpose: Operative treatment for a humeral shaft fracture is superior over nonoperative treatment. It is undetermined whether quality of surgical technique affects outcomes. The aim of this study was to evaluate quality of surgical technique performed in patients with a humeral shaft fracture and to assess if quality was associated with complications and (functional) outcomes.

Methods: Upper extremity experts assessed surgical technique in patients who participated in the HUMMER study. The surgical technique was well performed if the expert considered that it (at least) adhered to the AO principles. Consensus on quality of surgical technique was achieved through a structured survey. When consensus was not reached, patients were discussed in an expert panel discussion. Surgical technique (good, sufficient, or poor) was linked to functional outcomes, complications, and reoperations. Outcomes included Disabilities of the Arm, Shoulder, and Hand (DASH), CMS, pain (VAS), quality of life (SF-36, EQ-5D), and range of motion (ROM).

Results: Among 245 surgically treated patients, a panel of 16 orthopaedic trauma surgeons from seven countries classified 81.6% of plate cases and 59.8% of intramedullary nailing (IMN) cases as well-performed or sufficient- performed. Compared to a poor-performed technique, CMS, shoulder abduction, forward flexion, external rotation, and elbow pronation-supination displayed a significant treatment effect ($p_{treatment}<0.05$) and faster improvement of the DASH score ($p_{interaction} = 0.014$) and pain levels ($p_{interaction} = 0.034$), in favor of a well- performed technique. Performance of the surgical technique seemed unrelated to quality of life, complication rates, reoperations, and nonunion. Compared to nonoperative treatment, well-performed surgery had superior functional outcomes and lower complication (16.0% vs 34.5%, $p = 0.019$) and nonunion rates (2.5% vs 26.3%, $p<0.001$). These differences were less emphasized for poor-performed operations.

Conclusion: Well-performed surgical technique leads to faster functional recovery, improvement of ROM, and fewer complications than poor technique. Although operative treatment is superior to nonoperative treatment, this is particularly demonstrated when the surgery is performed well after assessment of the experts. In cases of poor-performed surgical technique, the benefits of operative treatment over nonoperative treatment are less pronounced, emphasizing the crucial role of the quality of surgical technique in achieving optimal outcomes.