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ORIGINAL ARTICLE

Comparing fracture healing disorders and long-term functional outcome of polytrauma patients and patients with an isolated displaced midshaft clavicle fracture

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Background: Although clavicle fractures are a common injury in polytrauma patients, the functional outcome of displaced midshaft clavicle fractures (DMCFs) in this population is unknown. Our hypothesis was that there would be no differences in fracture healing disorders or functional outcome in polytrauma patients with a DMCF compared with patients with an isolated DMCF, regardless of the treatment modality.

Methods: A retrospective cohort study of patients (treated at our level I trauma center) with a DMCF was performed and a follow-up questionnaire was administered. Polytrauma patients, defined as an Injury Severity Score ≥ 16 , and those with an isolated clavicle fracture were compared. Fracture healing disorders (nonunion and delayed union) and delayed fixation rates were determined. Functional outcome was assessed by the Quick Disability of the Arm, Shoulder, and Hand questionnaire.

Results: A total of 152 patients were analyzed, 71 polytrauma patients and 81 patients with an isolated DMCF. Questionnaire response of 121 patients (80%) was available (mean, 53 months; standard deviation, 22 months). No differences were found between polytrauma patients and those with an isolated DMCF with regard to nonunion (7% vs. 5%, respectively), delayed union (4% vs. 4%), and delayed fixation rate (13% vs. 13%). Polytrauma patients had an overall worse functional outcome, regardless of initial nonoperative treatment or delayed operative fixation.

Conclusion: Polytrauma patients had a similar nonunion and delayed fixation rate but had an overall worse functional outcome compared with patients with an isolated DMCF. For polytrauma patients, a wait and see approach can be advocated without the risk of decreased upper extremity function after delayed fixation.

Level of evidence: Level III; Retrospective Cohort Design; Treatment Study

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Keywords: Displaced; clavicle; fracture; delayed; fixation; functional; outcome; polytrauma

This research was performed according to local protocol of the Medical Ethics Review Committee (MERC) and medical ethical standards. The MERC confirmed that the Medical Research Involving Human Subjects Act (WMO) does not apply to this study and that an official approval by the MERC is therefore not required under the WMO. Study No. 14-021/C.

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During the past 10 years, the treatment of displaced midshaft clavicle fractures (DMCFs) has shifted more toward operative management, although the optimal treatment is not yet fully elucidated.^{6,14} Previous studies primarily focused on patients with an isolated DMCF and excluded polytrauma patients, even though the incidence of clavicle fractures in these patients is about 15%.^{2,8,9,11,16,21} Therefore, it is currently unknown if polytrauma patients benefit from acute surgical fixation of a DMCF.

Operative fixation of DMCF has been shown to decrease nonunion rates, and patients benefit from early mobilization and thus potentially early return to work.^{1,6} A wait and see approach with nonoperative treatment and delayed fixation in case nonunion develops has previously been examined.^{8,11,21} No difference in patient-reported outcome measures and only a minor decrease in objective measures could be found in patients with an isolated DMCF.^{8,11,21}

The decision to proceed to operative fixation in polytrauma patients is a complex process. In the polytrauma setting, the diversity and severity of a wide spectrum of injuries often dictate the priority of management. In these patients, when early return to daily activities seems an unachievable goal, the advantages of early fixation might not outweigh the possible complications of surgery.^{26,28} In contrast, early recovery of shoulder function can be essential to the rehabilitation process in patients with severe concomitant injuries. Additional

individual factors, such as lower extremity mobility requirements, duration of treatment, and prospect of early return to work, should also be considered in the decision-making process.

Our hypothesis was that there would be no differences in fracture healing disorders or functional outcome in polytrauma patients with a DMCF compared with patients with an isolated DMCF, regardless of the treatment modality.

Materials and methods

Subjects and data collection

Institutional Review Board approval was obtained for a single-center (level I trauma) retrospective cohort study with a follow-up by questionnaire. Data were derived from the Dutch National Trauma Database and electronic patient documentation. Patients were selected from 2007 until 2013 by the *International Classification of Diseases* diagnostic code for a clavicle fracture. Patient demographics, trauma mechanism, treatment modality, department of admission, and affected body region with highest Abbreviated Injury Scale (AIS) score (head, face, thorax, abdomen, and extremities) were collected. Criteria for high-energy trauma were assigned according to the Advanced Trauma Life Support guidelines.²⁵

Criteria for inclusion and exclusion are shown in [Figure 1](#). Polytrauma was defined as patients with a DMCF and any

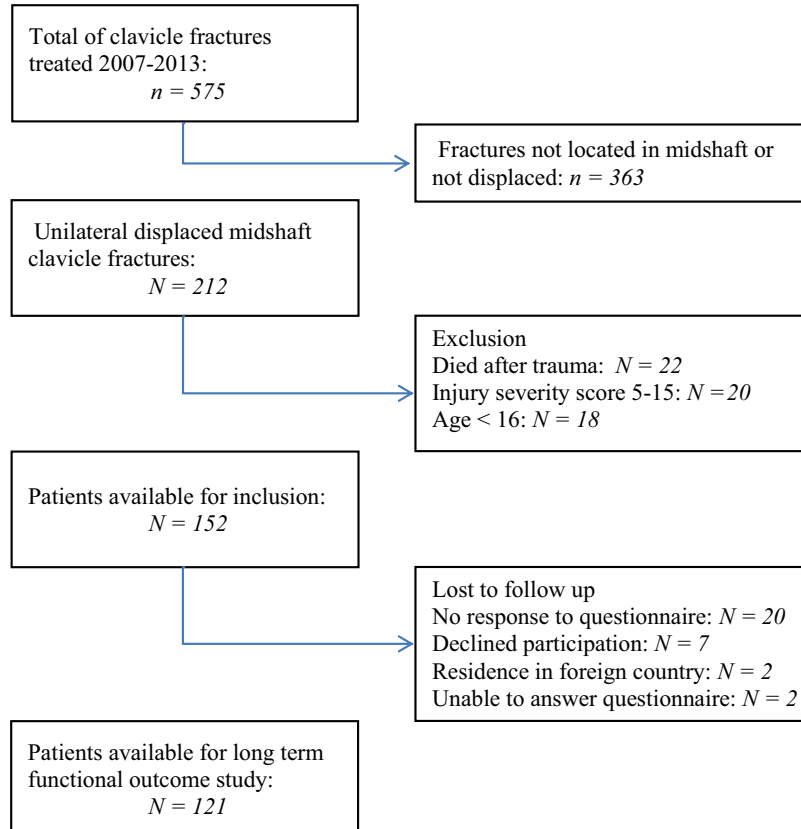


Figure 1 Flow chart of included and excluded patients.

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