Fixation of Major Fractures in Polytrauma Patients with Severe Traumatic Brain Injury - Which Conditions Allow for Safe Definitive Fixation

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Purpose: Traumatic brain injuries (TBIs) represent a relevant cause for delayed fracture fixation in polytrauma patients. The aim of this study was to assess factors that allow definitive surgical stabilization in polytrauma patients with severe TBI.

Methods: This retrospective cohort study includes polytrauma patients as defined by an ISS of 16 points or higher that require an ICU stay during their treatment. All polytrauma patients had a severe TBI as defined as Abbreviated Injury Scale (AIS) head of 3 points or higher. Exclusion criteria were early death (within 72 hours), and geriatric patients (70 years and above). Patients were stratified into an early (within 48 hours) and delayed (after 48 hours) group according to the time point of their first definitive surgical treatment. Risk factors for early death were calculated based on univariate analyses. The primary outcome was length of ICU stay and mortality after 72 hours.

Results: Out of 225 polytrauma patients with severe TBI, 123 (87.2%) survived 72 hours and 91 (73.9%) had at least 1 definitive surgical fixation. 13 patients (14.3%) were in the delayed group, and 78 (85.7%) in the early group. Both groups were comparable in ISS, lactate value, and coagulation status. Risk factors for early death included ISS, coagulopathy, shock, and hypothermia. Patients in the early group had a significantly lower stay at the ICU (8.5 ± 5.4 days vs 15.4 ± 9.9 days, P = 0.015). Further, the duration of assisted ventilation was significantly lower (4.5 ± 6.7 days vs 11.2 ± 9.3 days, P = 0.002). Early definitive surgery was associated with a decreased duration of ICU stay by 6.9 days ± 2.8. When corrected for coagulopathy, C-reactive protein, and lung function, the early fixation group still was associated with a decreased duration of ICU stay by 3.2 ± 2.1 days, P = 0.03. The mortality rate was comparable (10.3% in early group, and 15.4% in the delayed group, P = 0.945).

Conclusion: Despite severe TBI, the majority of patients qualified for early fracture fixation. The early fixation was associated with a shorter ICU stay and did not affect overall mortality. Polytrauma patients without increased risk factors for early death (shock, coagulopathy, hypothermia) might benefit from safe definitive surgery despite severe TBI.