Epidemiology and risk factors of multiple-organ failure after multiple trauma: An analysis of 31,154 patients from the TraumaRegister DGU

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BACKGROUND: In the severely injured who survive the early posttraumatic phase, multiple-organ failure (MOF) is the main cause of morbidity and mortality. An enhanced prediction of MOF might influence individual monitoring and therapy of severely injured patients.

METHODS: We performed a retrospective analysis of a nationwide prospective database, the TraumaRegister DGU of the German Trauma Society. Patients with complete data sets (2002–2011) and a relevant trauma load (Injury Severity Score [ISS] ≥ 16), who were admitted to an intensive care unit, were included.

RESULTS: Of a total of 31,154 patients enclosed in this study, 10,201 (32.7%) developed an MOF according to the Sequential Organ Failure Assessment score. During the study period, mortality of all patients decreased from 18.1% in 2002 to 15.3% in 2011 (p < 0.001). Meanwhile, MOF occurred significantly more often (24.6% in 2002 vs. 31.5% in 2011, p < 0.001), but mortality of MOF patients decreased (42.6% vs. 33.3%, p < 0.001). MOF patients who died survived 2 days less (11 days in 2002 vs. 8.9 days in 2011, p < 0.001). Independent risk factors for the development of MOF following severe trauma were age, ISS, head Abbreviated Injury Scale (AIS) score of 3 or higher, thoracic AIS score of 3 or higher, male sex, Glasgow Coma Scale (GCS) score of 8 or less, mass transfusion, base excess of less than −3, systolic blood pressure less than 90 mm Hg at admission, and coagulopathy.

CONCLUSION: Over one decade, we observed an ongoing decrease of mortality after multiple trauma, accompanied by decreasing mortality in the subgroup with MOF. However, incidence of MOF in the severely injured increased significantly. Thus, MOF after multiple trauma remains a challenge in intensive care. The risk factors from multivariate analysis could be instrumental in anticipating the early development of MOF. Furthermore, a reliable prediction model might be supportive for patient enrolment in trauma studies, in which MOF marks the primary end point. (J Trauma Acute Care Surg, 2014;76: 921–928. Copyright © 2014 by Lippincott Williams & Wilkins)

LEVEL OF EVIDENCE: Epidemiologic study, level III.

KEY WORDS: Multiple-organ failure; multiple trauma; epidemiology.

During the last years, an increasing rate of multiple trauma patients has survived the early posttraumatic course because of improved trauma and critical care. Nevertheless, multiple-organ failure (MOF) is still considered the main cause of late postinjury mortality and intensive care unit (ICU) resource use, as reflected in several single-center studies. Ciesla et al. reported an overall incidence of MOF of 25% in high-risk polytrauma patients in a 12-year prospective study. According to further studies, MOF incidence in trauma patients decreased slightly4–6 or remained constant7 during the last years. Furthermore, postinjury MOF caused significant increased ICU length of stay5,8 and caused approximately 51% of late trauma deaths. However, multicenter epidemiologic data on incidence and mortality are scarce; one prospective cohort study on seven US trauma centers excluding relevant brain injury has even implicated an early onset of MOF.9

In addition, independent risk factors for posttraumatic MOF have been discussed recently. Different authors have described general patient data such as age, male sex or injury severity, as well as early therapy such as the amount of packed red blood cells (pRBC) as independent predictors.3,10 Dewar et al.11 recently described further laboratory analyses such as platelet count, bilirubin, and creatinine for a prediction model. However, injury pattern or anatomic localizations of injuries have not yet been analyzed.

In the context of decreasing mortality from multiple trauma, we hypothesized an increase in MOF incidence. Based on a large multicenter database, the aims of the current study...