Which Pathophysiologic Change Is Most Relevant for Delaying Definitive Surgery in Polytrauma Patients?

Sascha Halvachizadeh, MD*; Ladislav Mica, MD; Yannik Kalbas, MD; Kai Oliver Jensen, MD; Roman Pfeifer, MD; Hans-Christoph Pape, MD*
University Hospital Zurich, Zurich, SWITZERLAND

Purpose: Numerous studies have investigated treatment strategies in polytrauma patients. The goal of this study was to investigate the 4 vicious cycles (parameters of shock, coagulopathy, hypothermia, and soft-tissue injury) on the decision-making of timing of definitive surgical fixation in polytrauma patients.

Methods: In this retrospective cohort study, inclusion criteria were polytrauma patients (ISS of 16 points), requirement of intensive care, and treatment between 2012 and 2018. Stratification was according to timing of the first definitive surgery: no surgery, no definitive surgery (NDS), immediate surgery (IMS, definitive surgery within 12 hours of admission), safe definitive surgery (SDS, definitive surgery within 12 to 48 hours of admission), and delayed definitive surgery (DDS, definitive surgery after 48 hours of admission). Assessed parameters were shock (lactate, hemoglobin), temperature, coagulation (international normalized ratio, ROTEM [rotational thromboelastrometry]), and soft-tissue damage (Abbreviated Injury Scale [AIS] head, thorax, abdomen, lower extremity, and pelvis). The worst reading defined strata into stable, borderline, and unstable following known reference values.

Results: 813 polytrauma patients were included: Group no surgery (n = 256, 31.5%), Group NDS (n = 93, 11.4%), Group IMS (n = 48, 5.9%), Group SDS (n = 362, 44.5%), and Group DDS (n = 5.4, 6.6%). Highest ISS was in Group DDS (27.5 ± 12.2 points) versus SDS (24.6 ± 10.8 points) versus IDS (19.8 ± 14.0 points) versus NDS (23.9 ± 10.6) versus Group no surgery (20.2 ± 11.4, P<0.001). The admission lactate value was comparable among all groups (2.3 ± 2.1 mmol/L, P = 0.957). Shock stable: Group no surgery (n = 124, 53.2%), NDS (n = 51, 65.0%), IDS (n = 25, 53.2%), SDS (n = 182, 51.7%), DDS (n = 27, 51.9%, P = 0.005). Coagulation unstable: No surgery (n = 53, 74.6%), NDS (n = 34, 75.6%), IDS (n = 21, 87.5%), SDS (n = 158, 73.8%), DDS (n = 20, 74.1). The rate of patients with unstable soft-tissue status was significantly lower in Group SDS (n = 83, 68.0%) when compared with DDS (n = 18, 85.7%), NDS (n = 32, 94.1%), or Group no surgery (n = 67, 85.9%, P = 0.03).

Conclusion: Among the 4 pathophysiological cycles known to be relevant for assessment, those summarized under soft tissue (brain injury, lung contusion, abdominal injury, pelvic and crush injuries) outweighed the others in causing delays in early definitive fracture fixation.