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Shock phenotypes, mixed shock, and mechanical circulatory support with clinical outcomes in a tertiary cardiac intensive care unit

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Introduction: Circulatory shock is a heterogeneous syndrome with overlapping pathophysiological mechanisms that may evolve during critical illness.[1-3] Data on shock phenotypes and mechanical circulatory support (MCS) in Croatian cardiac intensive care units (CICUs) remain scarce. We aimed to characterize shock phenotypes, their evolution, MCS use, and clinical outcomes at University Hospital Centre Zagreb.

Patients and Methods: We conducted a retrospective, single-center study of 91 patients treated for circulatory shock in a CICU between January 2025 and September 2026. Shock was classified by initial presentation and subsequent phenotype. Mixed shock was defined as the coexistence of two or more shock mechanisms, either initially or during treatment. MCS initiation was individualized by the intensivist team based on clinical condition, hemodynamics, comorbidities, and anticipated benefit. We assessed shock phenotypes, their evolution, and MCS use. The primary outcome was survival to CICU discharge; secondary outcomes were 30- and 90-day survival. Analyses were descriptive and exploratory.

Results: We included 91 patients (70.3% men, median age 64 [IQR 52–70.5] years). Isolated CS was present in 46 (50.5%) patients, mixed shock in 25 (27.5%), septic in 10 (11.0%), obstructive in 8 (8.8%) and hemorrhagic in 2 (2.2%). CS was the initial presentation in 67 (73.6%) patients, and 21 of them (31.3%) subsequently developed another type of shock, most frequently septic (n=16). Temporary MCS was initiated in 34 (37.4%) patients, most often ECPELLA (n=17), VA-ECMO (n=9) and Impella CP (n=5). Of these, 12 (35.3%) died in the CICU, 16 (47.1%) were weaned and discharged alive, and 6 (17.6%) were bridged to a surgically implanted ventricular assist device (LVAD 4, BiVAD 2). Four patients without preceding MCS underwent LVAD implantation, one of whom subsequently underwent heart transplantation. Survival to CICU discharge, 30 and 90 days was 56.0%, 45.1% and 41.1% (n=90), respectively. CICU survival was 67.4% in isolated CS, 44.0% in mixed, 50.0% in obstructive and 30.0% in septic shock. Among patients initially presenting with CS, those developing a second type of shock had lower CICU survival (47.6% vs 67.4%, p=0.18). Non-survivors were older than survivors (median 66 vs 58 years, p=0.025).

Conclusion: Although CS is the dominant phenotype, more than a quarter of CICU patients have mixed shock, most often CS complicated by sepsis, with a trend towards lower survival, while septic shock carries the worst prognosis. High MCS use and frequent device escalation reflect the tertiary referral role of our centre. Early recognition and prevention of infection in CS patients may improve outcomes.

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