

ADVANCED OXYGENATION PHYSIOLOGY DURING CARDIOPULMONARY BYPASS AND PRECISION PERFUSION

*Organ Vulnerability, Physiological Mismatch, and Individualized
Perfusion*

Mustafa EREN

İstanbul Medipol Üniversitesi



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LITERATURE SEARCH AND EVIDENCE ASSESSMENT

A focused literature search was undertaken to support this academic synthesis of advanced oxygenation physiology and individualized perfusion management during CPB. PubMed/MEDLINE, the current EACTS/EACTAIC/EBCP guidelines, and publisher records for relevant journals were searched through 17 September 2026. The terms “cardiopulmonary bypass,” “oxygen delivery,” “goal-directed perfusion,” “oxygen extraction,” “cerebral autoregulation,” “near-infrared spectroscopy,” “acute kidney injury,” “renal oxygenation,” “venous congestion,” “rewarming,” “hyperoxia,” “myocardial protection,” and “precision perfusion” were used individually and in clinically relevant combinations.

Priority was given to international guidelines, systematic reviews and meta-analyses, randomized controlled trials, and large clinical cohorts. Mechanistic reviews were used when they clarified the physiological interpretation of clinical findings. Seminal randomized trials were retained when necessary to explain the evidentiary basis of current recommendations. Observational associations were not presented as causal findings, and physiologically plausible frameworks were not presented as validated treatment algorithms. Article titles, authors, journals, publication years, and digital object identifiers were cross-checked against PubMed and/or publisher records [1–4].

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