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Pharmacology of general anesthetic agents in cardiac surgery: Pharmacokinetic and pharmacodynamic properties

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ABSTRACT

INTRODUCTION: General anesthetic agents play a crucial role in performing cardiac surgeries by providing analgesia, amnesia, muscle relaxation, and control of autonomic responses. The appropriate selection of these agents is essential to ensure hemodynamic stability and minimize perioperative risks. Understanding the pharmacokinetic and pharmacodynamic properties of general anesthetics is vital to optimize anesthetic management in patients undergoing cardiac procedures. OBJECTIVE: This study aims to review and synthesize recent literature on the pharmacokinetic and pharmacodynamic properties of the main general anesthetic agents used in cardiac surgeries, providing a knowledge base for clinical practice. METHODOLOGY: An integrative review was conducted using the search terms "general anesthetics," "cardiac surgery," "pharmacokinetics," and "pharmacodynamics" in the SCIELO and PubMed databases, focusing on studies published in the last five years in Brazil. A total of 60 articles were initially identified, with 35 selected for detailed analysis based on their relevance and contribution to the topic. RESULTS: The main general anesthetic agents used in cardiac surgeries include propofol, sevoflurane, and midazolam. Propofol, an intravenous agent, is widely used due to its rapid induction and recovery, as well as its antiemetic effect. Pharmacodynamically, propofol acts as a positive modulator of GABA-A receptors, promoting sedation and amnesia. Pharmacokinetically, it has a short half-life and is rapidly eliminated. Sevoflurane, an inhaled anesthetic, is preferred for its rapid induction and low blood solubility, allowing quick adjustment of anesthetic depth. Pharmacodynamically, sevoflurane reduces systemic vascular resistance and maintains hemodynamic stability. Pharmacokinetically, it is predominantly eliminated through the lungs, with minimal hepatic metabolism. Midazolam, a benzodiazepine used as an adjunct, provides anxiolysis and preoperative sedation. Pharmacodynamically, midazolam acts on GABA-A receptors, similar to propofol but with a longer action. Pharmacokinetically, it has an intermediate half-life and is metabolized by the liver. CONCLUSIONS: The choice of general anesthetic agents should consider the specific pharmacokinetic and pharmacodynamic properties of each drug to ensure hemodynamic stability and patient safety during cardiac surgeries. Individualizing the anesthetic plan based on the patient's clinical profile and the characteristics of the anesthetic agents is crucial to optimize surgical outcomes.

Keywords: General anesthetics, Cardiac surgery, Pharmacokinetics, Pharmacodynamics.

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