EFFECTS OF ANESTHESIA ON SURGICAL OUTCOMES: ANALYSIS OF THE IMPACT OF DIFFERENT ANESTHETIC TECHNIQUES ON POSTOPERATIVE OUTCOMES

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ABSTRACT

Anesthetic techniques are essential elements in performing surgical interventions, as they ensure analgesia and patient comfort during procedures. In addition, these techniques directly influence postoperative outcomes, affecting factors such as complications, recovery time, pain control, and even mortality. Anesthesia can be classified into three main categories: general, regional, and local, each with its advantages and limitations in different types of surgery. This integrative review aimed to analyze the impact of these different anesthetic modalities on postoperative outcomes, focusing on how they influence recovery and the associated risks. The research was carried out based on studies published between 2013 and 2023, extracted from scientific databases such as PubMed, SciELO, LILACS, and Cochrane Library. The results show that the choice of anesthetic technique has a significant impact on the patient's recovery and the occurrence of complications, varying according to the type of surgery, the patient's comorbidities, and individual clinical conditions. General anesthesia, for example, is often associated with a higher risk of respiratory complications and cognitive dysfunction in elderly patients, while regional anesthesia has been indicated to reduce the risk of venous thromboembolism and improve pain control, especially in orthopedic surgeries. In conclusion, the choice of anesthetic technique should be individualized, considering the specific needs of each patient, in order to optimize postoperative outcomes and minimize risks.

Keywords: Anesthesia. Anesthetic Techniques. Postoperative Outcomes. Recovery. Complications.

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INTRODUCTION

Anesthesia plays a fundamental role in modern medicine, being indispensable for performing surgical procedures safely and effectively. Since its advent in the nineteenth century, anesthetic techniques have evolved significantly, providing comfort to the patient and better conditions for the surgical team. Anesthesia allows interventions ranging from minimally invasive procedures to major surgeries, promoting analgesia, amnesia, and immobility, crucial elements for surgical success.

The main anesthetic techniques currently used include general anesthesia, regional anesthesia, and local anesthesia. General anesthesia induces a state of controlled unconsciousness and is widely applied in more complex procedures. On the other hand, regional anesthesia, which encompasses neural blocks such as spinal and epidural, provides segmental analgesia and is preferred in several orthopedic and obstetric surgeries. Local anesthesia, on the other hand, is used for blockages in restricted areas, and is common in smaller procedures. Each of these modalities has specific characteristics, benefits, and risks that can directly influence postoperative outcomes.

Studies indicate that the choice of anesthetic technique can significantly impact factors such as recovery time, postoperative pain intensity, incidence of complications, risk of infections, development of venous thromboembolism, and even mortality. In addition, factors such as the patient's age, preexisting comorbidities, type and duration of surgery, and the concomitant use of medications are determinant in the selection of the most appropriate anesthetic technique.

With the increasing complexity of surgical procedures and the aging population, there is a growing need to personalize anesthetic management to ensure better clinical outcomes. The choice of anesthetic technique should not be based only on the anesthesiologist's preference or institutional routine, but rather on a careful analysis of the risks and benefits for each patient. Understanding how different anesthetic techniques influence postoperative evolution is essential to reduce complications, optimize recovery, and improve the quality of life of patients in the postoperative period.

In view of this scenario, it is relevant to gather and analyze the available scientific evidence on the impact of different anesthetic techniques on surgical outcomes. This integrative review seeks to offer a comprehensive view of the subject, contributing to more assertive clinical decision-making and the improvement of anesthetic practices. Thus, the objective of this study was to analyze, through an integrative review, the impact of different anesthetic techniques — general, regional and local — on postoperative outcomes, focusing on complications, recovery time, pain control, incidence of infections and mortality.

THEORETICAL FRAMEWORK

Anesthetic techniques are classified into three main categories, each with specific characteristics that influence postoperative outcomes:

GENERAL ANESTHESIA

It is characterized by the induction of a state of controlled unconsciousness, allowing major surgeries to be performed. However, it is associated with risks such as respiratory depression, postoperative nausea and vomiting, as well as possible postoperative cognitive dysfunction (POCD). Studies such as that of Almeida et al., (2024), indicate that general anesthesia can impact cognitive function in elderly patients, increasing the incidence of POCD.

REGIONAL ANESTHESIA

It includes techniques such as spinal anesthesia, epidural, and peripheral nerve blocks, providing segmental analgesia. It is often used in orthopedic and obstetric surgeries, offering advantages such as lower systemic impact and faster recovery. According to Silva et al. (2023), regional anesthesia significantly reduces immediate postoperative pain and opioid consumption, in addition to being associated with fewer respiratory and cardiovascular complications, favoring a smoother recovery.

LOCAL ANESTHESIA

Local anesthesia is used in minor procedures, it involves the application of anesthetics to specific areas to block the perception of pain. It has a low risk of systemic complications and is widely used in several medical specialties. For Nysora (2017), local infiltration, field block, and nerve block techniques are commonly used to achieve the desired anesthesia.

The choice of anesthetic technique directly influences postoperative outcomes. For example, regional anesthesia may reduce the need for opioids postoperatively, decreasing the risk of associated complications (Silva et al., 2023). In addition, factors such as the duration of surgery and the anesthetic technique employed can impact the incidence of postoperative nausea and vomiting, which affect about 30% of the general population and up to 80% of patients with risk factors (Ministry of Health, 2012). Therefore, the appropriate selection of anesthetic technique is crucial to minimize risks and promote a more efficient recovery.

METHODOLOGY

This integrative review was conducted according to the methodological steps proposed by Whittemore and Knafl (2005), covering the identification of the research problem, definition of inclusion and exclusion criteria, selection of studies, data extraction and categorization, critical evaluation and synthesis of results. The objective was to analyze the impact of different anesthetic techniques on postoperative outcomes, such as complications, recovery time, pain control, incidence of infections, and mortality.

The search for studies was carried out in the PubMed, SciELO, LILACS and Cochrane Library databases, selected for their relevance in the health area. For the search strategy, controlled descriptors based on Health Sciences Descriptors (DeCS) and Medical Subject Headings (MeSH) were used, combined with Boolean operators (AND, OR) to expand and refine the results. The terms applied included "General Anesthesia", "Regional Anesthesia", "Local Anesthesia", "Postoperative Outcomes", and "Surgical Complications".

Original studies published between 2013 and 2023, in Portuguese, English, or Spanish, that investigated the relationship between anesthetic techniques and postoperative outcomes were included. The types of studies considered were randomized controlled trials, cohort studies, and case-control studies. Review articles, case reports, editorials, letters to the editor, and studies with insufficient samples or inadequate methodologies were excluded.

The selection of articles occurred in two stages. Initially, titles and abstracts were evaluated based on the inclusion and exclusion criteria. Then, the texts were read completely to confirm eligibility. This process followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol, ensuring transparency and methodological rigor.

The data extracted from the included studies were organized in a spreadsheet containing information such as author, year of publication, country, type of study, sample characteristics, anesthetic technique analyzed, outcomes evaluated, and main results. Data analysis was performed qualitatively and quantitatively, allowing the comparison between the impacts of different anesthetic techniques on postoperative outcomes.

To ensure the methodological quality of the selected studies, appropriate assessment instruments were used: the Jadad Scale for randomized controlled trials and the Newcastle-Ottawa Scale (NOS) for observational studies. The studies were also classified according to the level of scientific evidence, following the hierarchy proposed by the Oxford Centre for Evidence-Based Medicine (OCEBM).

Finally, the results were synthesized into thematic categories, organized according to anesthetic techniques and their respective clinical impacts. This methodological approach allowed a critical and comprehensive analysis of the existing literature, contributing to the understanding of the implications of different anesthetic techniques on surgical outcomes and providing subsidies for evidence-based clinical practice.

RESULTS AND DISCUSSION

We included 15 studies published between 2013 and 2023 that evaluated the impact of different anesthetic techniques (general, regional, and local) on postoperative outcomes in various types of surgeries, such as orthopedic, cardiovascular, oncological, and abdominal. The results show significant differences in clinical outcomes, recovery time, pain control, and incidence of complications, depending on the anesthetic technique used.

GENERAL ANESTHESIA

General anesthesia has been widely used in major surgeries, especially in cardiovascular and oncological procedures, because it provides complete unconsciousness and total control of the airways. However, studies have shown that this technique is associated with a higher incidence of respiratory complications, such as atelectasis and postoperative pneumonia, especially in elderly patients and those with pulmonary comorbidities (Schmidt et al., 2018). In addition, according to Inouye et al., (2016), there was a significant frequency of postoperative nausea and vomiting (PONV) and a higher risk of postoperative cognitive dysfunction (POCD) in the elderly, which can compromise recovery and quality of life.

In contrast, general anesthesia remains essential for complex surgeries that require deep muscle relaxation, ventilation control, and prolonged procedures. Studies such as that of Chan et al. (2019) have shown that, in cardiac surgeries, general anesthesia allows for a better conduct of the procedure, despite the associated risks.

REGIONAL ANESTHESIA

Regional anesthesia, which includes neural blocks such as spinal and epidural, has shown favorable results in several postoperative outcomes, especially in orthopedic and abdominal surgeries. Studies such as that by Neumann et al., (2018), have shown that this technique significantly reduces the risk of venous thromboembolism (VTE), due to the preservation of early mobility and the decrease in the systemic inflammatory response.

In addition, regional anesthesia was associated with a lower need for opioids postoperatively, which reduces the risk of adverse effects such as respiratory depression, constipation, and dependence (Memtsoudis et al., 2019). The study by Guay et al. (2016) highlighted that patients undergoing regional anesthesia had a shorter hospital stay and better pain control when compared to general anesthesia. These benefits are particularly important in elderly patients or those with comorbidities, who are at higher risk of complications.

On the other hand, regional anesthesia is not without risks, including hypotension and neurological blocks. The choice of this technique requires careful evaluation of the patient's clinical status and the type of surgery to be performed.

LOCAL ANESTHESIA

Local anesthesia has been shown to be effective in small and medium-sized procedures, such as dermatological and dental surgeries and minor orthopedic interventions. Nysora (2017) points out that this technique provides a quick recovery, with a low rate of complications and early return to usual activities. According to Ilfeld et al. (2018), local anesthesia is a safe and efficient option, reducing the length of hospital stay and eliminating risks related to the use of systemic anesthetics. However, it is limited to procedures in which there is no need for deep pain block or airway control.

COMPARISON BETWEEN ANESTHETIC TECHNIQUES

Comparative studies indicate that regional anesthesia offers advantages over general anesthesia in terms of faster recovery, less need for opioid analgesia, and reduction of thromboembolic complications (Memtsoudis et al., 2019; Guay et al., 2016). However, the choice of anesthetic technique must be individualized, considering factors such as the type of surgery, the patient's clinical conditions, the experience of the surgeon and anesthesiologist, as well as the patient's preferences.

For example, Johnson et al. (2020) showed that patients undergoing knee arthroplasties with regional anesthesia had better outcomes in pain control and shorter hospital stay compared to general anesthesia. In extensive oncological surgeries, general anesthesia remains the most indicated technique due to the complexity of the procedure.

The results of this review reinforce the importance of a careful evaluation in the choice of anesthetic technique, as each modality has specific benefits and risks. Regional anesthesia stands out for its potential to reduce complications and optimize recovery, while

general anesthesia remains essential in more complex procedures. Local anesthesia remains a safe and efficient technique for smaller procedures.

Therefore, the anesthetic decision should be based on an individualized analysis that considers not only the safety and efficacy of the technique, but also the objectives of the surgical procedure and the patient's general conditions. Integration between the surgical and anesthetic teams is essential to ensure better clinical outcomes and promote safe and efficient recovery.

CONCLUSION

The data analyzed in this review indicate that the choice of anesthetic technique has a significant impact on postoperative outcomes, influencing factors such as recovery time, incidence of complications, and pain control. Regional anesthesia has been shown to be particularly advantageous in certain surgeries, such as orthopedic and abdominal surgeries, as it reduces complications, reduces the need for opioids, and accelerates recovery, contributing to a shorter hospital stay and a lower risk of venous thromboembolism. In addition, this technique has shown benefits in elderly patients and those with comorbidities, offering more efficient pain control and better functional recovery.

On the other hand, general anesthesia remains essential in procedures of large size and complexity, such as cardiovascular and oncological surgeries, where the need for deep muscle relaxation and airway control make it indispensable. However, general anesthesia is associated with higher risks of respiratory complications, postoperative nausea and vomiting (PONV), and in the elderly, with the risk of postoperative cognitive dysfunction (POCD), which requires close monitoring and appropriate management to optimize recovery and reduce risks.

The choice between these anesthetic techniques should therefore be individualized, considering the clinical conditions of the patient, the type of surgery to be performed, the experience of the medical team, and the specific risks of each anesthetic modality. Collaboration between surgeons, anesthesiologists, and other healthcare professionals is essential to ensure an integrated approach that targets patient safety and well-being throughout the surgical process.

Although this review covered a wide range of studies on anesthetic techniques and their effects on postoperative outcomes, some limitations should be considered. First, the heterogeneity of the included studies, both in terms of methodologies and patient characteristics and types of surgery, may have influenced the results found. In addition, the quality of studies varied, with some presenting small sample sizes or subjective evaluation

methods. The lack of longitudinal data on the long-term effects of different anesthetic techniques is also a relevant limitation, since many studies focus on immediate postoperative outcomes.

Another point of limitation was the exclusion of review articles and case reports, which could offer a more comprehensive view of anesthetic practices in different clinical contexts. Although the choice of inclusion criteria was made to ensure the quality and reliability of the data, it may also have restricted the variety of information available.

Future studies may explore more specific approaches, such as direct comparison between general and regional anesthesia in at-risk populations, such as patients with cardiovascular or respiratory comorbidities, to identify which techniques provide better outcomes in terms of complications and recovery. In addition, research on combined anesthesia strategies—such as the use of regional anesthesia plus general anesthesia in complex surgeries—can offer valuable insights into how to maximize patient safety and improve postoperative outcomes.

Another promising field would be the evaluation of the long-term effects of anesthetic techniques, especially in elderly patients, to better understand the risks of late complications, such as postoperative cognitive dysfunction. The implementation of randomized controlled trials with a larger sample size and long-term follow-up can provide more robust and conclusive evidence.

Finally, further investigations can be directed towards the use of emerging technologies, such as artificial intelligence (AI)-based anesthesia monitoring, to further personalize anesthetic choices and optimize safety and efficacy during the surgical procedure.

These future studies are essential to continue to improve anesthetic practices, ensuring a faster recovery, with fewer complications and a better quality of life for patients after surgery.

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