NEUROMUSCULAR MONITORING DURING GENERAL ANESTHESIA: BENEFITS IN REDUCING POSTOPERATIVE COMPLICATIONS

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Abstract: Neuromuscular monitoring during general anaesthesia is a crucial practice for the proper management of muscle blocks, allowing the dosage of muscle relaxants to be optimized and adverse effects to be minimized. The use of neuromuscular blocking agents is common in surgery, especially to facilitate intubation and muscle relaxation. However, inappropriate or excessive use of these agents can result in post-operative complications, such as residual muscle weakness, breathing difficulties and delayed recovery. Neuromuscular monitoring has proven to be an essential tool for mitigating these risks. The aim of this study is to evaluate the benefits of neuromuscular monitoring during general anesthesia, with a focus on reducing postoperative complications such as residual muscle weakness, respiratory difficulty and prolonged recovery time. The aim is also to compare the results of patients who receive real-time monitoring with those who do not. This is a qualitative literature review whose aim is to explore the implications of neuromuscular monitoring in anesthetic practices and its effects on postoperative recovery, opioid consumption and residual neuromuscular blockade. To this end, the PubMed, Scopus and Web of Science databases will be used. The review will be refined using health descriptors such as “Neuromuscular Monitoring,” “Residual Paralysis,” “Opioid Consumption,” with a time frame from 1998 to 2020, covering both review articles and clinical studies and randomized trials. Neuromuscular monitoring has shown clear benefits in reducing residual muscle weakness and improving postoperative respiratory function. Studies indicate that patients who use real-time monitoring during general anesthesia have shorter recovery times, lower rates of respiratory complications and less need for assisted ventilation. In addition, monitoring allows for more precise dosing of muscle relaxants, avoiding overuse and the occurrence of adverse effects. When applied correctly, monitoring also contributes to reducing the duration of anesthesia and improves the patient’s post-operative experience. Neuromuscular monitoring during general anesthesia is essential for reducing postoperative complications, especially residual muscle weakness and respiratory

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difficulty. Its effective use contributes to a faster and safer recovery for patients, allowing healthcare professionals to adjust the dosage of muscle blockers more precisely. The widespread implementation of this practice in surgical centers is recommended to optimize anesthetic management and improve postoperative outcomes.

Keywords: Anesthesiology; Neuromuscular Monitoring; General Anesthesia.

INTRODUCTION

Neuromuscular monitoring during general anesthesia has been consolidated as an essential practice in anesthetic medicine, with the aim of optimizing the management of neuromuscular blockers used during surgical procedures. The use of muscle relaxant agents is common in many interventions, especially those that require tracheal intubation, making it easier to perform maneuvers that would otherwise be difficult. However, adequate monitoring of the depth of neuromuscular blockade during general anesthesia is crucial to avoid complications, such as residual paralysis, which can negatively impact patient recovery (KHETERPAL et al., 2009). Accurate monitoring, therefore, plays a key role in reducing the risks associated with anesthesia and improving postoperative outcomes, including faster and safer recovery of patients.

In many clinical practices, the assessment of neuromuscular blockade intensity is performed with the aid of monitoring devices, such as the peripheral nerve response monitor, which allow for accurate quantification of muscle relaxation. These systems provide real-time data on the depth of the blockade, helping anesthesiologists adjust the doses of anesthetic agents and muscle relaxants, avoiding both over- and under-dosing (SEYMOUR et al., 2010). With this monitoring, it is possible to ensure that the block is sufficient for the procedure without resulting in unwanted adverse effects such as residual paralysis.

The reduction of postoperative complications, such as respiratory failure and difficulties in recovering muscle function, is one of the main benefits of neuromuscular monitoring. Studies indicate

that monitoring during general anesthesia is related to a decreased incidence of respiratory complications, such as hypoxemia and respiratory failure, which can occur when neuromuscular blockade is not fully reversed (RAMPIL, 1998). In addition, proper neuromuscular monitoring can improve efficiency in reversing muscle blockade, resulting in a faster recovery of muscle function and, consequently, decreasing the need for prolonged mechanical ventilation or reintubation.

Therefore, neuromuscular monitoring in general anesthesia not only facilitates the surgical procedure itself, but also plays a significant role in preventing postoperative complications, favoring a safer and faster recovery of patients. The evolution of monitoring technologies has allowed for more precise control, expanding the benefits of this practice and having a direct impact on reducing the risks associated with inappropriate muscle blockages.

MATERIALS AND METHODS

This is a qualitative literature review, whose objective is to explore the implications of neuromuscular monitoring in anesthetic practices and its effects on postoperative recovery, opioid consumption, and residual neuromuscular blockade. For this, the PubMed, Scopus and Web of Science databases will be used. The review will be refined using health descriptors such as “Neuromuscular Monitoring,” “Residual Paralysis,” “Opioid Consumption,” with a time frame from 1998 to 2020, covering both review articles and clinical studies and randomized trials.

1. Guiding Question:

How does neuromuscular monitoring impact anesthetic recovery, opioid consumption, and the risk of residual neuromuscular blockade in patients undergoing surgical procedures?

2. Databases Used

PubMed

Scopus

Web of Science

3. Health Descriptors and Boolean Markers

Health descriptors were used in the MeSH/DeCS vocabulary:

Descriptors:

“Neuromuscular Monitoring”

“Residual Paralysis”

“Opioid Consumption”

“Anesthesia”

“Anesthesiology”

“Perioperative Care”

Boolean Markers:

“Neuromuscular Monitoring” AND “Opioid Consumption”

“Residual Paralysis” AND “Recovery”

“Neuromuscular Blockade” AND “Anesthesia” AND “Recovery”

“Neuromuscular Monitoring” AND “Residual Paralysis” AND “Opioid Use”

4. Inclusion and Exclusion Criteria

Inclusion Criteria:

Studies published between 1998 and 2020;

Peer-reviewed articles, including clinical trials, systematic reviews, meta-analyses, and guidelines;

Studies focused on neuromuscular monitoring and its effects on anesthesia and postoperatively;

Publications in English.

Exclusion Criteria:

Studies not focused on anaesthesia or neuromuscular monitoring;

Works exclusively related to pediatric anesthesia or other age groups irrelevant to the research;

Articles without comparative data on the effects of neuromuscular monitoring.

THEORETICAL FOUNDATION

Neuromuscular monitoring during general anesthesia is crucial to ensure patient safety, especially when the use of neuromuscular blockers is required. These drugs have the function of relaxing skeletal muscles, facilitating endotracheal intubation and providing ideal conditions for surgery. However, to avoid complications associated with over- or under-use of these drugs, it is essential to monitor the depth of neuromuscular blockade. Proper monitoring not only allows for the administration of more accurate doses, but also reduces the risk of respiratory complications, such as residual paralysis, which can prolong postoperative recovery time and increase morbidity (NAGUIB and BRULL, 2020).

Monitoring of neuromuscular function can be performed by several methods, the most commonly used being peripheral nerve response devices, such as peripheral nerve stimulators (PNS). This device allows the electrical stimulation of a peripheral nerve and the observation of the muscle response, which makes it possible to evaluate the depth of the muscle block. This assessment is essential for anesthesiologists to adjust the dosage of the neuromuscular blocker appropriately, avoiding residual paralysis and respiratory compromise (ELIA et al., 2018). An adequate muscle response to stimuli can indicate the appropriate time for block reversal, ensuring that the patient recovers muscle function efficiently and without complications.

Residual paralysis is one of the main risks associated with the inappropriate use of neuromuscular blockers. It occurs when the patient still shows signs of paralysis after surgery, which can lead to breathing difficulties, hypoventilation, and, in more severe cases, the need for reintubation (KHAMIEES et al., 2020). Continuous neuromuscular monitoring allows these signs to be detected early, facilitating complete reversal of the blockade before serious complications occur. The use of

monitoring techniques has been shown to be effective in reducing the incidence of residual paralysis and improving postoperative respiratory outcome (SEYMOUR et al., 2020).

In addition, neuromuscular monitoring is directly related to optimizing the reversal of muscle blocks. When the blockade is monitored efficiently, the administration of reversing agents, such as neostigmine or sugammadex, can be done more precisely, avoiding the overuse of anticholinesterase drugs and accelerating the recovery of muscle function. This results in a faster and safer recovery, as well as minimizing the need for postoperative mechanical ventilation (NAGELHOUT and PLAUS, 2019). A successful reversal of neuromuscular blockade reduces the incidence of respiratory complications and contributes to improved post-surgical outcomes.

Another important aspect is the impact of neuromuscular monitoring on reducing the use of opioid analgesics in the postoperative period. When neuromuscular blockade is properly monitored and reversible, the patient experiences less pain due to rapid recovery of muscle function, which decreases the need for strong painkillers. This, in turn, reduces opioid side effects such as respiratory depression and constipation, promoting a more comfortable and safer recovery (KHAN et al., 2020).

In conclusion, neuromuscular monitoring during general anesthesia plays an essential role in reducing postoperative complications, allowing for more accurate administration of neuromuscular blockers and ensuring complete reversal of the blockade. By reducing the risks of residual paralysis and respiratory complications, this practice has a positive impact on patient recovery, improving post-surgical outcomes and promoting a faster and safer recovery.

CONCLUSION

Neuromuscular monitoring during general anesthesia is an indispensable tool to ensure safety and efficacy in the management of neuromuscular blockade, especially in patients who require complex surgical procedures. Proper use of monitoring devices has been shown to significantly reduce the risk of residual paralysis, one of the main factors contributing to postoperative respiratory complications.

Continuous monitoring allows anesthesiologists to precisely adjust the dosage of neuromuscular blockers, promoting effective and faster reversal of muscle blockage. This not only speeds up the patient's recovery but also decreases the need for mechanical ventilation, contributing to a more comfortable and safer recovery.

In addition, neuromuscular monitoring is directly associated with decreased use of opioid analgesics in the postoperative period, which reduces the side effects of these drugs and improves the quality of the patient's recovery. Systematic implementation of this practice is therefore crucial to optimize postoperative outcomes and promote faster and more efficient recovery. By reducing respiratory complications and accelerating muscle block reversal, neuromuscular monitoring is an essential component to improve surgical outcomes and promote patient safety throughout the perioperative process.

In summary, neuromuscular monitoring represents a significant advance in modern anesthesia, with direct implications for the quality of post-surgical recovery, the reduction of respiratory complications, and the increase in overall patient safety. Its continuous integration into anesthetic practices is essential to ensure better outcomes and optimize perioperative care, reflecting an increasingly grounded and precise practice in the field of anesthesiology.

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