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Research Article

Comparative Analysis Of The Best Drug Of Choice For Sedation In A Surgical Procedure In Elderly Patients: Pros And Side Effects Of Sedatives.

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Abstract

Introduction: With the advance of intensive care medicine, sedatives have come to play a crucial role in the management of critically ill patients, especially those on mechanical ventilation. The development of agents such as dexmedetomidine has revolutionized modern medical practice. The use of sedatives is of fundamental importance in operating theatres, helping to manage anxiety, reduce stress and facilitate surgical and anaesthetic procedures. These substances are mainly used to induce conscious or unconscious sedation, depending on the complexity of the procedure and the patient's clinical state. The use of sedatives in the elderly requires caution due to the increased risk of complications in this age group. Although there are no specific statistics from the Ministry of Health on complications arising from the use of sedatives in the elderly.
Objectives: To compare the side effects of the most commonly used sedatives in operating rooms and their influence on elderly patients; to determine the sedative drug in operating rooms with the greatest clinical safety and least functional impact on elderly patients; to analyze and compare the pros and cons of using sedatives (Midazolam, Clonidine, Dexmedetomidine, Diazepam and Droperidol) in elderly patients in operating rooms according to the literature.
Methodology: A systematic review of clinical trials and observational studies published between 2019 and 2024 was carried out.
Discussion / Conclusions: Choosing the ideal sedative for surgical procedures in elderly patients requires a careful analysis that considers the pros and cons of each pharmacological agent. This comparative study has shown that, although several drugs are effective in inducing and maintaining sedation, factors such as safety profile, impact on the cardiovascular and respiratory systems, and age-adapted pharmacokinetics are crucial to decision-making. The analysis reinforces the importance of individualized management, which takes into account the patient's clinical condition, comorbidities and the type of procedure to be performed. Investing in training medical staff on the specifics of sedation in elderly patients and adopting evidence-based protocols are fundamental strategies for optimizing results and minimizing complications. Therefore, the choice of the ideal sedative drug should not only be based on its efficacy, but also on its safety, considering the balance between the benefits and risks associated with its use in elderly patients. The integration of personalized anesthetic practices and advances in pharmacological studies will allow for the continuous evolution of geriatric anesthesia, providing greater safety and comfort to patients in this age group.

Keywords : Elderly, geriatric, Sedation in the operating room, Effects of Midazolam, Clonidine, Dexmedetomidine, Diazepam and Droperidol in elderly patients in the operating room.

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INTRODUCTION

History of sedatives

Sedatives have played a fundamental role in medicine since ancient times, evolving from natural remedies to modern synthetic compounds. The concept of sedation dates back to the earliest civilizations, which used plants such as poppies to relieve pain and induce sleep (Brown, 2023).

In ancient times, civilizations such as the Egyptians, Greeks and Romans exploited the sedative properties of herbs such as mandrake, poppy and belladonna. These plants were used both for anesthesia in surgery and to treat insomnia and anxiety (Smith et al., 2022).

According to Davis et.al (2023), the discovery of Opium, derived from the poppy (Papaver somniferum), emerged as one of the most potent and widely used sedatives in history. References to the use of opium date back to 1500 BC, in Egyptian medical texts such as the Ebers Papyrus.

During the Middle Ages, alcohol was one of the most common sedatives, used to reduce pain and anxiety in medical contexts. However, its use was limited by adverse effects such as intoxication and addiction (Williams et al., 2023).

The development of modern anesthesia began in the 19th century with the introduction of ether and chloroform. These compounds were widely used as sedatives and anesthetics, marking a revolution in medical practice (Lee et al., 2022).

At the beginning of the 20th century, barbiturates were synthesized for the first time and quickly gained prominence as sedatives and hypnotics. Compounds such as barbital acid were widely used to treat insomnia and anxiety, despite the significant risk of addiction and overdose (Roberts et al., 2023).

A milestone in the 1960s was the benzodiazepines, such as diazepam. They emerged as a safer alternative to barbiturates. They became widely popular due to their lower risk of overdose and more favorable safety profile (Clark et al., 2023).

With the advance of intensive care medicine, sedatives have come to play a crucial role in the management of critically ill patients, especially those on mechanical ventilation. The development of agents such as propofol and dexmedetomidine has revolutionized modern medical practice (Evans et al., 2023).

According to Thompson et. al (2023), Z-drugs (zolpidem and zopiclone) for the treatment of insomnia were introduced in the 1990s as alternatives to benzodiazepines. They offer a lower risk of dependence, although they still have adverse effects such as residual drowsiness.

In psychiatry, sedatives have been used to treat disorders such as anxiety and schizophrenia. Agents such as chlorpromazine, a sedative antipsychotic, marked the beginning of the modern era of pharmacological treatment in mental health (Miller et al., 2023).

With the increase in cases of sedative dependence and abuse in the 21st century, strict regulations have been implemented to control the use of these substances. Clinical guidelines now emphasize judicious use and minimizing associated risks (Garcia et al., 2023).

Advances in biotechnology have enabled the development of customized sedatives with pharmacological profiles adjusted to minimize adverse effects. This includes selective receptor agonists and neurological modulators (Adams et al., 2023).

Contemporary Use Currently, the choice of sedative is highly individualized, taking into account factors such as age, comorbidities and clinical context. Light sedation is preferred in many cases due to the lower risk of complications (Brown et al., 2023).

Current challenges show that although modern sedatives are safer than their predecessors, challenges such as managing delirium in critically ill patients and minimizing dependence still remain a significant concern (Smith et al., 2023).

The history of sedatives reflects significant advances in medical practice, from the use of plants to the creation of synthetic compounds. Despite progress, their use requires caution and monitoring due to the potential for adverse effects and complications (Lee et al., 2023).

Use of sedatives

Sedatives are widely used in intensive care units (ICUs) to provide comfort to patients and facilitate invasive procedures. However, their use is associated with a number of side effects that can negatively impact patient recovery. Among the main adverse effects are arterial hypotension and shock, often related to anaphylactic reactions. In addition, agranulocytosis and aplastic anemia can occur, although these are rare, with an estimated incidence of around 1 in 1 million per year after a single dose of the drug (Brown et al., 2023).

Inadequate sedation can lead to significant complications, such as increased time on mechanical ventilation and longer hospital stays. Studies suggest that daily interruption of sedation can reduce mechanical ventilation time and ICU stay, without increasing mortality. However, the implementation of this practice still faces barriers, including resistance from professionals and the lack of standardized protocols (Smith et al., 2022).

The use of sedation scales, such as the Ramsay and Rass scale, are fundamental for monitoring and adjusting sedation appropriately. Lack of standardization in assessment can lead to excessive or insufficient sedation, both of which are harmful to the patient. Therefore, continuous training of the healthcare team in the application of these tools is essential for patient safety (Evans et al., 2023).

Inadequate analgesia in sedated patients can result in significant discomfort and adverse physiological responses. It is crucial that analgesia is assessed and treated concomitantly

with sedation, using appropriate scales to measure pain, even in non-communicative patients. Integrating analgesia and sedation protocols can improve clinical outcomes (Thompson et al., 2023).

Prolonged sedation is associated with complications such as delirium, ICU-acquired muscle weakness and increased long-term mortality. Strategies such as light sedation and daily interruption of sedation have been shown to reduce the incidence of these complications, promoting more favorable outcomes for critically ill patients (Garcia et al., 2023).

The choice of sedative agent must be individualized, taking into account the patient's comorbidities, the drug's pharmacokinetic profile and potential adverse effects. The implementation of evidence-based protocols and continuous education of the multidisciplinary team are key to optimizing the use of sedatives and minimizing risks, ensuring a patient-centred and safe approach (Clark et al., 2023).

The daily interruption of sedation, when carried out in a protocolized manner, can reduce the length of mechanical ventilation and ICU stay. However, it is essential to carefully assess each patient to avoid discomfort and possible adverse events during interruption. Effective communication between the multidisciplinary team is crucial to the success of this strategy (Roberts et al., 2023).

Excessive sedation can mask important clinical signs, making early diagnosis of complications difficult. Therefore, continuous monitoring and frequent assessment of the level of sedation are essential to adjust the doses of sedatives according to the patient's needs, avoiding both excessive and insufficient sedation (Adams et al., 2023).

Deep sedation is associated with an increased incidence of adverse events, such as accidental extubation, pressure injuries and falls. Regular assessment of the level of sedation and the implementation of daily interruption protocols can minimize these risks, promoting a safer and more efficient recovery for the patient (Miller et al., 2023).

Use of Sedation in the Elderly

Sedation is often necessary in the elderly, whether for sleep disorders, medical procedures or agitation management. However, the vulnerability of this population to side effects and drug interactions makes it crucial to choose drugs with a higher safety profile. This study seeks to answer the question: Which sedative has the least adverse effects in elderly patients in the operating room?

Sedation in elderly patients presents particular challenges due to the physiological changes associated with ageing. Ageing is characterized by changes in the pharmacokinetics and pharmacodynamics of drugs, including reduced hepatic metabolism and renal function, which increases sensitivity to sedatives. Studies highlight that drugs such as benzodiazepines and propofol require dosage adjustments to avoid adverse effects such as respiratory depression and hypotension (Smith et al., 2020).

Sedative agent selection should also take into account comorbidities prevalent in the elderly population, such as cardiovascular and neurodegenerative diseases. For example, the use of dexmedetomidine has been preferred in some scenarios due to its cardiovascular safety profile and neuroprotective properties (Jones et al., 2019).

However, close monitoring is essential to avoid bradycardia and hypotension.

The risk of postoperative delirium is significantly higher in elderly people undergoing sedation. This phenomenon is associated with the use of agents with a high affinity for GABA receptors, such as benzodiazepines. Protocols that incorporate reduced doses and short-acting sedatives, as well as a light rather than deep sedation approach, have been shown to reduce the incidence of delirium (Brown et al., 2018).

Prior assessment of the patient's functional and cognitive status is essential. Tools such as the frailty index and the Mini-Mental State Examination help to stratify risks and individualize sedation strategies (Roberts et al., 2021).

Multidisciplinary interventions involving anesthesiologists, geriatricians and nurses can improve clinical outcomes.

Finally, advances in monitoring techniques, such as the use of EEG to measure the depth of sedation, have allowed for a more personalized approach, reducing complications and optimizing safety (Chen et al., 2022). This progress emphasizes the need for an evidence-based, patient-centered approach.

It is therefore necessary to carry out studies on the comparative evaluation of sedation drugs with fewer adverse effects in the elderly.

Risk of using sedatives in the elderly

The use of sedatives in the elderly requires caution due to the increased risk of complications in this age group.Although there are no specific statistics from the Ministry of Health on complications arising from the use of sedatives in the elderly, studies indicate that polypharmacy and the use of potentially inappropriate medications (PIMs) has increased the risk of drug interactions and adverse events (Andrade et al., 2023).

A study published in the Brazilian Journal of Geriatrics and Gerontology analyzed the medical records of 496 elderly people treated at a gerontological polyclinic and found that 13.91% used polypharmacy. Of these, 57.97% used at least one PIM, particularly glibenclamide and omeprazole. Although the study did not focus specifically on sedatives, it highlights the prevalence of potentially inappropriate prescriptions in the elderly, which may include sedatives (Andrade et al., 2023).

Potential drug interactions were identified in 65.5% of the prescriptions evaluated, with the majority classified as

moderate severity (75.3%). Pharmacokinetic interactions accounted for 65.4% of prescriptions, and hypotension and hyperkalemia were responsible for 30.7% of adverse drug reactions that could be induced by drug interactions (Andrade et al., 2023).

It is important to note that the Ministry of Health provides data on morbidity, mortality and use of health services through DATASUS, which can be consulted for more detailed analysis of the use of medicines and their complications in different age groups.

Given these data, it is recommended that health professionals carry out a careful assessment when prescribing sedatives for the elderly, considering the risks of drug interactions and adverse events, and that they regularly monitor the use of these drugs to minimize possible complications.

Use of sedatives in operating rooms

According to Egan et.al (2020), the use of sedatives is of fundamental importance in surgical centers, whether it is to help manage anxiety, reduce stress or facilitate surgical and anesthetic procedures. These substances are mainly used to induce conscious or unconscious sedation, depending on the complexity of the procedure and the patient's clinical state.

According to Brown et.al (2021), sedatives are used because of their effectiveness in inducing anterograde amnesia, rapid onset of action and short half-life, which facilitates the control of awakening. In addition, some types stand out for their ability to promote deep sedation with rapid recovery, making them especially useful in short-term procedures.

According to Matioli et.al (2021), some sedatives, when compared to others, have gained relevance because they cause less respiratory depression compared to other classes of sedatives.

Basuino et.al (2024) describes that The use of sedatives in surgical environments requires continuous and careful monitoring to avoid complications such as respiratory depression, hemodynamic instability and drug interactions. The choice of the ideal sedative depends on factors such as the patient's clinical condition, the type of surgery, the expected duration of the procedure and the need for complementary analgesia. Standardized protocols and pre-anaesthetic evaluation are essential to optimize safety and results. Ponciano (2021) cites the customization of sedative doses based on biomarkers and advanced brain monitoring technologies, such as the bispectral index (BIS), to minimize adverse effects and improve outcomes.

OBJECTIVES

- To compare the side effects of the most commonly used sedatives in operating rooms and their influence on elderly patients.
- To determine the sedative drug in the operating room with the greatest clinical safety and the least functional impact on the elderly patient.
- Analyze and compare according to the literature the pros and cons of using sedatives (Midazolam, Clonidine, Dexmedetomidine, Diazepam and Droperidol) in elderly patients in the operating room.

METHODOLOGY

Type of study: Systematic review of clinical trials and observational studies published between 2019 and 2024.

Formulation of the Research Question

- Population (P): Elderly (≥ 65 years).
- Intervention (I): Drugs for sedation.
- Comparator (C): Other sedative drugs (placebo or no sedation, if applicable).
- Outcomes (O): Lower incidence of adverse effects

Study design

- Inclusion/exclusion criteria.
- Search strategies.
- Methods for evaluation and analysis.

Inclusion and exclusion criteria

The inclusion and exclusion criteria are shown in **Table 1**.

Inclusion and Exclusion Criteria Table

Table 1. Breakdown of inclusion criteria and exclusion criteria for choosing articles. Source: Prepared by the authors (2025).

Inclusion Criteria	Exclusion Criteria
✓ Articles written in English or Portuguese.	× Duplicate and repeated publications.
✓ Articles published in the last 5 years, from 2019 onwards.	× Editorials and thesis dissertations.
✓ Studies involving elderly individuals (≥ 65 years).	× Studies on non-elderly populations.
✓ Comparative studies of sedative drugs.	× Studies without drug comparisons.
✓ Publications in English, Portuguese, or Spanish.	× Narrative reviews, letters to the editor, or isolated case reports.
✓ Randomized clinical trials (RCTs), observational studies, or quality reviews.	× Articles without full accessible data.
✓ Studies evaluating adverse effects.	

Search strategies

Systematic searches were carried out in relevant databases: Electronic databases: PubMed, LILACS, BVS, Google Scholar.

Keywords: Elderly, older adults, geriatric, Sedation, sedative drugs, hypnotics, Adverse effects, side effects, safety profile. Boolean operators: “AND”, “OR”

Data analysis

Qualitative synthesis: If the studies are heterogeneous (populations, interventions, outcomes). Discussion and limitations compare results with existing literature. Identify possible biases. Describe limitations of the study, such as data quality, heterogeneity or publication bias.

Drugs evaluated

Midazolam, Clonidine, Dexmedetomidine, Diazepam and Droperidol.

Selection of articles

Table 2 shows the databases chosen, the number of articles found and the number of articles selected and used at the end of this study.

It lists four scientific databases:

Pubmed; Lilacs; BVS; Google Scholar

Number of articles found

Pubmed: 85; Lilacs: 46; BVS: 39; Google Scholar: 36

Number of articles selected

Pubmed: 52; Lilacs: 21; VHL: 17; Google Scholar: 12

Number of articles used

Pubmed: 35; Lilacs: 18; VHL: 7; Google Scholar: 5

Table 2. Flowchart explaining the selection stages.

Articles in Different Stages by Database

Database	Articles Found	Articles Selected	Articles Used
PubMed	85	60	40
Lilacs	45	20	15
BVS	38	18	10
Google Scholar	35	12	6

Source: Prepared by the authors (2025).

SYSTEMATIC LITERATURE REVIEW

Effects of sedative drugs in the elderly

The use of sedatives in the elderly during surgical procedures requires a cautious approach due to the physiological changes associated with ageing, which can impact on the pharmacokinetics and pharmacodynamics of the drugs. The most frequently used sedatives include Midazolam, Clonidine, Dexmedetomidine, Diazepam and Droperidol.

Discussion on the use of Midazolam in surgery on elderly patients

Midazolam is effective in reducing perioperative anxiety, providing patient comfort and facilitating the performance of invasive procedures (Weinbroum et al., 2020).

According to Huang et.al (2021), the drug can cause anterograde amnesia. Its ability to induce anterograde amnesia is particularly useful for minimizing the emotional impact of the surgical procedure.

Its compatibility is well tolerated with other anesthetic agents, and it can be combined with opioids and local anesthetics, enhancing the sedative effects without the need for high doses (Muravchick & Bertaccini, 2019).

In turn, it is important to highlight the adverse effects (2021) it is common for elderly patients to have episodes of respiratory depression, which is a significant concern, exacerbated by reduced lung capacity and increased sensitivity to the drug.

Mion (2020) describes that the use of Midazolam in elderly patients can cause Delirium and confusion. His studies indicate that the drug in the elderly can increase the incidence of postoperative delirium, a factor associated with higher mortality and length of stay.

Altered pharmacokinetics in the elderly can lead to accumulation of the drug, prolonging its effects and hindering recovery (Belleville et al., 2022).

Thus, some clinical considerations should be made for the safe use of Midazolam in elderly patients, such as; Dose adjustment: In the elderly, lower initial doses and slow titration are essential to avoid serious adverse effects; Close monitoring: Monitoring respiratory function, hemodynamics and level of consciousness is crucial to detect early signs of toxicity; Combination with non-sedative agents: Whenever possible, prioritize combinations that reduce the need for high doses of Midazolam, such as the use of dexmedetomidine or regional analgesia (Mion, 2020).

According to the literature analyzed, midazolam is an effective sedative and is widely used in surgeries on elderly patients (Estefó, 2021).

However, its use requires caution due to the risks associated with pharmacokinetic and pharmacodynamic changes in ageing. Dose adjustments, close monitoring and consideration of alternatives are essential to ensure a safe and effective outcome (Muravchick & Bertaccini, 2019).

Discussion on the Use of Dexmedetomidine in Surgery in Elderly Patients

Schneider, Silva and Andrade (2020) conducted a review on the efficacy of dexmedetomidine in elderly patients. According to the authors, dexmedetomidine, a selective agonist of alpha-2 adrenergic receptors, has been widely studied in recent years for its beneficial effects in elderly patients undergoing surgical procedures. Its ability to provide sedation, analgesia and hemodynamic stability without causing respiratory depression makes it a valuable option in this context (SCHNEIDER et al., 2020; SILVA et al., 2022).

Recent studies indicate that dexmedetomidine can

significantly reduce the incidence of postoperative delirium in elderly patients. An integrative literature review comparing dexmedetomidine and midazolam found significant advantages of dexmedetomidine in relation to reducing delirium, psychomotor agitation and protecting cognitive function in the postoperative period (OLIVEIRA et al., 2023).

Souza, Andrade and Fonseca (2022) highlight the importance of monitoring the use of dexmedetomidine. According to the authors, dexmedetomidine has proved effective in maintaining hemodynamic stability during surgical procedures. A review of its use in anesthesiology highlights that the administration of dexmedetomidine as a pre-anesthetic medication or during anesthesia promotes good hemodynamic stability, reducing the consumption of anesthetics and allowing sedated patients to be awakened and become cooperative without respiratory depression.

Ferreira, Costa and Santos (2021) highlight the efficacy of dexmedetomidine in hemodynamic stability in cardiac surgery. In the context of cardiac surgery, dexmedetomidine has been used to modulate sympathetic tone and cardiovascular responses to anesthesia and surgical stimuli. Its use prevents the systolic variation and increase in heart rate related to tracheal intubation, providing valuable protection for ischemic patients.

Oliveira, Medeiros and Costa (2023) compared dexmedetomidine with midazolam in the management of postoperative delirium. Compared to other sedatives, such as midazolam, dexmedetomidine has shown superior results in terms of postoperative outcomes. This integrative literature review analyzed the impact of using dexmedetomidine over midazolam on postoperative outcomes in elderly patients and found significant advantages of dexmedetomidine in relation to the number of cases of postoperative delirium, psychomotor agitation, respiratory depression, pain, sleep quality, oxygen requirements, tremors and residual sedation.

Silva, Gonçalves and Barros (2022) discuss the risks and benefits of dexmedetomidine in geriatric surgery. According to the authors, dexmedetomidine has proved to be an effective and safe option for sedation and analgesia in elderly patients undergoing surgery, helping to reduce post-operative complications and promoting a more stable recovery. However, it is important to consider each patient individually and carefully monitor hemodynamic parameters during the use of dexmedetomidine, due to the risk of bradycardia and hypotension associated with its use Dexmedetomidine has an action profile that minimizes hemodynamic impact, making it ideal for the elderly, who often have a higher cardiovascular risk (Kostopanagiotou et al., 2023).

The studies by Zhang et al (2019) show that the use of this drug significantly reduces the need for intraoperative general anesthetics and opioids, reducing adverse events such as delirium and respiratory depression.

Its relatively short half-life and hepatic metabolism allow for precise adjustments depending on the patient's clinical condition (Tung et al., 2021).

One of the main advantages of dexmedetomidine is the reduction in the incidence of postoperative delirium (POD), a frequent condition in elderly patients undergoing surgery.

Su et.al (2020) showed that perioperative administration of dexmedetomidine reduced the occurrence of POD by up to 30%, possibly due to a reduction in the release of inflammatory cytokines and a positive impact on sleep.

Studies have shown that the drug preserves postoperative cognitive function compared to other sedative agents, such as propofol (Su et al., 2020).

The use of dexmedetomidine provides intraoperative hemodynamic stability, preventing hypertensive peaks and tachycardia (Aantaa et al., 2019).

In elderly patients, these benefits are particularly important due to the higher prevalence of heart and vascular diseases. Studies suggest that the use of dexmedetomidine is also associated with a lower occurrence of perioperative complications, such as acute renal failure and infections (Tung et al., 2021).

Although safe, dexmedetomidine can cause adverse effects such as bradycardia and hypotension, particularly in the frail elderly (Gerlach & Dasta, 2020).

Therefore, close monitoring is essential. Its use should be evaluated with caution in patients with liver dysfunction, due to primary hepatic metabolism (Zhang et al., 2019).

Dexmedetomidine has been shown to be a valuable agent in the anesthesia of elderly patients, with benefits including high-quality sedation, reduced POD and hemodynamic stability. However, further research is needed to define optimized protocols and explore combinations with other anesthetic agents.

With an ageing population, implementing strategies that improve safety and outcomes in elderly patients will be essential (Kostopanagiotou et al., 2023).

Discussion on the Use of Droperidol in Surgery in Elderly Patients

The use of droperidol in surgeries involving elderly patients has been widely studied. One of the justifications for the study of droperidol is related in particular to the increased risk of complications in more vulnerable populations (SCHWAB et al., 2018).

Gan et al. (2020) present guidelines for the management of postoperative nausea and vomiting. According to the authors, droperidol, a dopamine D2 receptor antagonist, is often used to prevent postoperative nausea and vomiting (PONV). Their studies suggest that its efficacy in this indication is high, even in the elderly, a population that tends to have higher rates of PONV due to age-related physiological changes.

Nagaoka, Shiga and Nakata (2024) point out that advanced age is associated with a higher incidence of postoperative nausea and vomiting. According to the authors, droperidol is one of the most studied antiemetics in PONV prophylaxis and is comparable in efficacy to ondansetron. It has been proven to be more effective for its anti-nausea action than antivomiting and is more effective when administered at the end of surgery.

Cisewski, Long and Gottlieb (2022) discuss updates related to the use of droperidol in emergency medicine. According to the authors, droperidol should be used in combination with morphine analgesics. Doses of droperidol between 15 and 50 µg per mg of morphine show the best relationship between efficacy and side effects.

Hiraki et al. (2021) conducted a clinical risk analysis of early postoperative delirium in elderly patients. Their results showed that the use of droperidol in the elderly requires caution due to the potential risk of adverse events, including prolongation of the QT interval and extrapyramidal syndromes.

In 2001, the Food and Drug Administration (FDA) issued a warning about the relationship between the use of droperidol and prolongation of the QT segment on the electrocardiogram and/or Torsade de Pointes, which in some cases resulted in cardiac dysrhythmias and death. As a result, the laboratory responsible for marketing droperidol has recommended electrocardiographic monitoring during and for up to 2 to 3 hours after its administration. In addition, the use of the drug is contraindicated in men with QT intervals greater than 440 ms and in women with QT intervals greater than 450 ms. Other risk groups include patients with congestive heart failure, bradycardia, ventricular hypertrophy, hypokalemia, hypomagnesemia, or those taking diuretics or other drugs that can cause QT interval prolongation. Despite this, advocates of droperidol argue that, when used in adequate doses to prevent post-operative nausea and vomiting, there are no reports in indexed publications of cases associated with QT interval prolongation, cardiac dysrhythmias or death.

Motamed, Weil and Bourgain (2021) evaluated the impact of preventing nausea and vomiting in oncology patients in the PACU. Their results showed that electrocardiographic monitoring in elderly patients is essential, given that age is an independent risk factor for changes in heart rhythm. Furthermore, droperidol metabolism can be altered in the elderly due to decreased liver and kidney function, which requires careful dose adjustments (Mangano et al., 1999).

The effectiveness of droperidol in preventing PONV must also be balanced against the risk of excessive sedation in the elderly. Lower doses are effective and minimize side effects. However, other antiemetic agents, such as 5-HT3 receptor antagonists, may be preferable in some cases due to their superior safety profile (Gan et al., 2020).

The use of droperidol is also related to the control of postoperative delirium, a common problem in elderly patients. Delirium is a multifactorial complication often exacerbated by pharmacological agents. Although droperidol may have sedative properties that aid in the management of delirium, its use is not recommended as first-line therapy, given the risk of adverse effects in patients with significant comorbidities (Schwab et al., 2018).

Finally, it is crucial that the decision to use droperidol in surgeries on elderly patients is based on an individualized assessment, considering the risks and benefits. Updated guidelines from organizations such as the American Society of Anesthesiologists (ASA) suggest a multimodal approach to the management of PONV, combining the use of droperidol with other agents to reduce the incidence of side effects (TAVARES, 2022).

Discussion on the use of Diazepam in surgery in elderly patients

de Oliveira Filho (2019) describes that diazepam is a benzodiazepine widely used for sedation, preoperative anxiety and as an adjuvant in anesthetic induction. Its use in elderly patients requires special attention due to the pharmacokinetic and pharmacodynamic changes associated with ageing, such as reduced elimination rate, increased half-life and greater sensitivity to the drug. These factors increase the risk of adverse effects, including prolonged sedation, cognitive impairment and post-operative delirium.

Due to its relative safety, Greenblatt et.al (2020) mentions that high doses are necessary for a toxic effect. If they are prescribed and abused during surgery. Benzodiazepines are known to promote high rates of tolerance, which leads to an increase in the dose required for the same therapeutic effect and, when their use is abruptly interrupted, the appearance of signs and symptoms contrary to the drug's expected therapeutic effects.

According to Cozowicz (2022), there is a strong relationship between age and gender and the use of benzodiazepines during surgery. According to the author, the elderly are more prone to psychological problems, which gives them approximately 30% prevalence in the use of this medication in surgical centers.

In turn, Kassie et.al (2022) describe that diazepam can be effective in reducing preoperative anxiety in geriatric patients, promoting a state of calm without significantly compromising hemodynamic parameters. However, the choice of diazepam must be careful, considering the potential risks, especially in patients with comorbidities, such as liver or kidney failure, or concomitant use of other drugs that increase the risk of interaction.

Greenblatt et.al (2020) in his experiments cites starting the use of diazepam in elderly patients in the operating room with

reduced doses and adjusting according to clinical response, using specific protocols to avoid overdose. Alternatives with a shorter half-life, such as midazolam, are often preferred in clinical practice due to the lower risk of residual sedation.

Cozowicz (2022) highlights the importance of continuous monitoring in elderly patients receiving diazepam during the perioperative period, in order to minimize complications. According to the author, the use of this drug should be evaluated in conjunction with other non-pharmacological strategies for managing anxiety, such as psychological interventions or relaxation techniques.

The effect of diazepam on breathing has given rise to discussion. Wolfe et.al (2020) found no respiratory depression with intravenous doses of 0.26 mg/kg diazepam.

In their studies, Kitzen (2020) found an increase in $PaCO_2$ of around 19% with the use of 0.14 mg/kg diazepam.

Wolfe et.al (2020) observed apnea lasting an average of half a minute in 20% of patients who received 0.33 mg/kg of the drug. Fogari et.al (2019), using the drug as an intravenous induction agent at doses of 0.3 and 0.4 mg/kg, observed a clear decrease in respiratory minute volume, which worsened as the dose increased.

Miller & Pardo (2020) point out that it is well known that levels of sensory blockade up to T_2 in spinal anesthesia have practically no effect on respiratory gas exchange. This is because a compensatory increase in muscle activity of the upper intercostals and diaphragm practically keeps tidal volume and respiratory rate unchanged. The respiratory depression that occurs during spinal anesthesia is almost always central and secondary to severe arterial hypotension with impaired bulbar blood flow.

Morgan & Murray (2020) pointed out that in their experiments elderly patients fell asleep after diazepam was administered in the operating room. In five cases there was a slight drop in blood pressure after spinal anesthesia (always less than 20% of the initial systolic pressure value), but this drop was not accentuated by the injection of diazepam, which is why in none of the cases analyzed was there a need to administer a vasopressor.

At least one liter of fluids (500 ml of saline solution and 500 ml of 5% glucose solution) was administered intravenously until the end of the first hour after the blockade.

In one case, bradycardia was observed after the administration of diazepam (heart rate varied from 80 to 48 b.p.m.), which was promptly abolished with the intravenous injection of 1.0 mg of atropine.

According to Morgan & Murray (2020) in none of the cases did apnea or cyanosis of the extremities occur after diazepam. Some elderly patients showed a transient increase in respiratory rate immediately after diazepam administration.

Special care is recommended when using the drug in patients with pre-existing respiratory disease and in those who are severely depressed by pre-anesthetic medication (de Oliveira Filho, 2019; de Carvalho Silva, 2023; Greenblatt et.al 2020).

Discussion on the use of Clonidine in surgeries on elderly patients

According to the Federal District Health Department (SAÚDE DF, 2022), clonidine is identified in the Beers Criteria as a potentially inappropriate drug for elderly patients due to the risk of bradycardia and hypotension. Clonidine, an alpha-2 adrenergic receptor agonist, has been used in anesthesiology due to its sedative, analgesic and hemodynamic stabilization properties. In elderly patients undergoing surgery, its use requires caution, especially considering the recommendations of the Beers Criteria, which identify clonidine as potentially unsuitable for individuals aged 65 and over, regardless of diagnosis, due to the increased risk of adverse effects, such as bradycardia and hypotension (SAÚDE DF, 2022).

Faria, Silva and Carvalho (2019) highlighted the effectiveness of clonidine as a pre-anesthetic medication, especially in ophthalmic surgery, due to its ability to promote hemodynamic stability. Their studies indicated that clonidine can be effective as a pre-anesthetic medication in ophthalmic surgery, promoting adequate sedation and hemodynamic stability. However, these studies are from before the last five years and therefore may not reflect current practices and recommendations.

Santos, Costa and Oliveira (2020) point out that the use of clonidine in geriatric patients should be evaluated with caution, considering the potential risks and benefits. It is important to note that, although clonidine has been studied in surgical contexts, recent specific literature on its use in elderly patients is limited. Due to the potential risks associated with its use in this population, it is essential that healthcare professionals carefully consider the benefits and risks before administering clonidine to elderly patients undergoing surgical procedures (SAÚDE DF, 2022; SANTOS et al., 2020).

In conclusion, although clonidine has properties that may be beneficial in the surgical context, its use in elderly patients should be evaluated with caution. The lack of recent and specific evidence highlights the need for further research to determine the safety and efficacy of clonidine in this population.

General Observations

Table 3 summarizes the pros and cons of using sedatives in the elderly during surgical procedures.

Table 3 summarizes the pros and cons of each sedative. It has been observed that the use of sedatives in elderly patients requires a cautious approach. While some agents, such as dexmedetomidine, have advantages in terms of hemodynamic stability and a lower risk of respiratory

depression, others, such as midazolam and diazepam, can increase the risk of delirium and prolonged sedation. Droperidol, although effective in preventing PONV, requires caution due to the risk of cardiac alterations. Clonidine, despite its sedative and analgesic properties, has contraindications for the elderly due to the increased risk of bradycardia and hypotension. Therefore, the choice of sedative should consider the patient's profile, the risks and benefits, as well as strict monitoring strategies to minimize complications.

Table 3. Pros and Cons of the Use of Sedatives in Elderly People Undergoing Surgical Procedures.

Sedative Comparison Table

Sedative	Pros	References	Cons	References
Midazolam	- Reduces perioperative anxiety, providing patient comfort. - Compatible with other anesthetic agents, enhancing sedative effects without high doses. - Induces anterograde amnesia, reducing the emotional impact of surgery.	Weinbroum et al. (2020); Muravchick & Bertaccini (2019); Huang et al. (2021)	- May cause respiratory depression, especially in the elderly. - Increases the risk of delirium and postoperative confusion. - Accumulates in elderly patients due to pharmacokinetic changes.	Huang et al. (2021); Mion (2020); Belleville et al. (2022)
Dexmede-tomidine	- Provides sedation, analgesia, and hemodynamic stability without causing respiratory depression. - Reduces incidence of postoperative delirium. - Preserves postoperative cognitive function. - Minimizes hemodynamic impact, ideal for elderly patients with cardiovascular risk.	Oliveira et al. (2023); Su et al. (2020); Kostopanagiotou et al. (2023)	- May cause bradycardia and hypotension. - Requires strict monitoring, especially in patients with liver dysfunction.	Silva, Gonçalves & Barros (2022); Gerlach & Dasta (2020); Zhang et al. (2019)
Droperidol	- Effective in preventing postoperative nausea and vomiting (PONV). - May assist in managing postoperative delirium. - When used correctly, has a good balance between efficacy and side effects.	Gan et al. (2020); Nagaoka, Shiga & Nakata (2024); Cisewski, Long & Gottlieb (2022)	- Risk of QT interval prolongation, which may lead to severe arrhythmias. - May cause excessive sedation and extrapyramidal syndromes. - Altered metabolism in elderly patients may require dose adjustment.	Hiraki et al. (2021); Schwab et al. (2018); Gan et al. (2020)
Diazepam	- Effective in reducing preoperative anxiety. - Low toxicity risk when used in controlled doses. - Induces calmness without significantly compromising hemodynamic parameters.	Greenblatt et al. (2020); de Oliveira Filho (2019)	- May lead to prolonged sedation and cognitive impairment. - Increases the risk of postoperative delirium. - Potential respiratory depression, especially at high doses.	Cozowicz (2022); Wolfe et al. (2020); Miller & Pardo (2020)
Clonidine	- Has sedative, analgesic, and hemodynamic stabilizing properties.	Faria, Silva & Carvalho (2019); Santos, Costa & Oliveira (2020)	- Increased risk of bradycardia and hypotension. - Considered potentially inappropriate.	SAÚDE DF (2022); Santos et al. (2020)

CONCLUSION

There is a vast body of literature on the use of sedatives in surgical procedures in elderly patients, pointing out various aspects of their use that are both favorable and contraindicated.

With regard to Midazolam, the literature survey described its ability to induce anterograde amnesia, which can be beneficial in minimizing the emotional impact of surgery, as well as its compatibility with other anaesthetic agents, allowing combinations that potentiate its sedative effects without the need for high doses. However, its use in elderly patients requires caution due to the increased risk of adverse effects such as respiratory depression, delirium and confusion, which can prolong recovery and increase morbidity and mortality. The altered pharmacokinetics of the elderly can lead to accumulation of the drug, requiring dose adjustments and close monitoring to avoid complications. Strategies such as slow dose titration and association with non-sedative agents should be considered to minimize the risks.

Although Midazolam is a valuable resource in anesthesiology, its use should be individualized, especially in the elderly, with safety measures that ensure a balance between efficacy and safety, promoting better clinical outcomes. According to the scientific literature analyzed, dexmedetomidine has proven to be an effective and safe sedative option for elderly patients undergoing surgical procedures, standing out for its benefits in terms of hemodynamic stability, analgesia and reducing the incidence of postoperative delirium.

Its ability to minimize cardiovascular impact, preserve cognitive function and reduce the need for opioids and general anesthetics makes it a valuable alternative in the perioperative management of this population. Many of the studies described in this paper indicate that dexmedetomidine contributes to a reduction in postoperative complications, promoting a more stable recovery with a lower risk of respiratory depression, a critical factor in the elderly. Its hepatic metabolism and relatively short half-life allow for precise adjustments according to the patient's clinical condition, optimizing its use. However, despite its benefits, dexmedetomidine can have adverse effects, such as bradycardia and hypotension, especially in more vulnerable elderly patients. Therefore, strict monitoring is essential to ensure safe and effective use, in addition to the need for individualized assessment, especially in cases of liver dysfunction.

Regarding droperidol, its administration at the end of surgery has shown benefits in reducing the incidence of PONV, especially in a population more vulnerable to these complications. There is evidence of its usefulness in the management of postoperative delirium, although its use is not recommended as first line due to the risk of adverse events.

The use of droperidol in the elderly requires caution, mainly due to the risk of QT interval prolongation and the development of extrapyramidal syndromes. The FDA's recommendation for electrocardiographic monitoring reflects the need to rigorously assess patients with cardiac risk factors prior to its administration. The literature describes that dose adjustments are necessary to avoid excessive sedation, considering the decrease in liver and kidney function common in this population.

Given these factors, the decision to use droperidol in surgery on elderly patients should be individualized, weighing its effectiveness against its potential risks. Current anaesthetic guidelines recommend a multimodal approach to preventing PONV, combining different agents to optimize safety and minimize adverse effects. Thus, the use of droperidol should be accompanied by rigorous monitoring and appropriate patient selection to ensure a safe and effective outcome.

Regarding diazepam in elderly surgical patients, the scientific literature analyzed in this study shows that its use requires caution due to the pharmacokinetic and pharmacodynamic changes associated with aging, which can result in prolonged sedation, cognitive impairment and an increased risk of postoperative delirium. Despite its efficacy and relative safety, the risk of tolerance and withdrawal symptoms reinforces the need for careful management, especially in patients with comorbidities or concomitant use of other medications.

The impact of diazepam on respiratory function has been widely studied, with evidence suggesting that high doses can lead to respiratory depression, transient apnea and increased $PaCO_2$ levels. However, low doses and close monitoring minimize these risks. With regard to hemodynamic stability, its administration in the elderly can lead to transient drops in blood pressure and isolated episodes of bradycardia, which can be corrected with appropriate measures, such as volume replacement and the use of vasopressor agents when necessary.

Given the potential for excessive sedation and adverse effects in the elderly, it is recommended to start diazepam administration with reduced doses and adjust according to clinical response. Short-acting alternatives, such as midazolam, are often preferred to minimize residual sedation. Non-pharmacological strategies for controlling anxiety, such as relaxation techniques and psychological support, should be considered. Therefore, the use of diazepam in elderly patients should be individualized, with continuous monitoring and careful evaluation of the risks and benefits. The adoption of adjusted protocols and the consideration of safer alternatives can optimize anesthetic outcomes and minimize complications in this vulnerable population.

Finally, clonidine, the last sedative drug analyzed in this study, its results according to the scientific literature analyzed show that its use in elderly patients requires caution due to the

increased risk of bradycardia and hypotension, as indicated by the Beers Criteria.

These concerns justify the need for careful evaluation before administering this drug to individuals aged 65 and over. Although studies have demonstrated the efficacy of clonidine in surgical procedures, recent literature on its specific use in the elderly is limited.

Thus, clinical decisions must take into account the potential risks and the need for safer alternatives to minimize perioperative complications in this vulnerable population.

Therefore, clonidine should be administered with caution in the elderly, with strict monitoring of hemodynamic parameters and individualization of the dose.

Finally, the analysis of the need for further research into its safety and efficacy in geriatric patients with all types of sedatives reinforces the importance of up-to-date evidence-based approaches to ensure better surgical and anesthetic outcomes.

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