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Postoperative Recovery and Outcomes after Anesthesia in Patients with Morbid Obesity: A Systematic Review

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Abstract

Objectives: To evaluate the postoperative recovery and outcomes in patients with morbid obesity undergoing anesthesia.

Methods: A thorough search across four databases identified 720 relevant publications. After removing duplicates using Rayyan QCRI and screening for relevance, the search yielded 358 publications, of which 90 full-text articles were reviewed, and 5 met the eligibility criteria for evidence synthesis.

Results: We included 5 studies with a total of 477 patients with morbid obesity and less than half of them were females 219 (45.9%). The results indicate that in morbidly obese patients, total intravenous anesthesia (TIVA) with propofol and dexmedetomidine (DEX) was more effective than inhalation anesthesia, leading to reduced analgesic use, fewer postoperative nausea and vomiting episodes, and shorter recovery times. Propofol alone, however, was associated with cardiovascular depression in morbidly obese individuals. DEX outperformed fentanyl by reducing extubation time, opioid consumption, and early postoperative pain scores. Furthermore, sevoflurane was superior to propofol in minimizing complications and optimizing recovery time and hospital stay, while Penthrox demonstrated safety and high satisfaction rates during colonoscopy.

Conclusion: The evidence indicates that DEX, particularly in combination with TIVA, offers superior postoperative outcomes for morbidly obese patients compared to other anesthetic options, such as inhalation anesthesia or fentanyl. Sevoflurane also demonstrated benefits in reducing complications and enhancing recovery metrics. These findings emphasize the importance of selecting tailored anesthetic regimens to improve surgical outcomes in this patient population. Further research is warranted to confirm these results in diverse clinical settings and to explore the long-term impact of these anesthetic strategies.

Keywords: *Morbid obesity; Anesthesia; Postoperative outcomes; Recovery; Systematic review.*

Introduction

A body mass index (BMI) of more than 35 kg/m2 is referred to be morbid obesity (MO) [1]. In Germany, the prevalence of obesity is 19.0%, with 46.6% of women and 60.5% of men being overweight, according to a Robert Koch Institute poll [2].

MO is highly susceptible to a number of psychological and physical illnesses [3]. But a higher BMI does not automatically translate into a higher risk during surgery. There is proof that people with higher BMIs may even die at a lower rate than those with normal weights [4]. The obesity paradox is a phenomena that has been called into question by scientists, particularly in light of the lack of prospective randomized trials that include comparison groups.

Due to influenced cardiopulmonary physiology, comprising decreased functional residual capacity, greater use of oxygen and cardiac output, and linked pathologies like diabetes mellitus, obstructive sleep apnea, and hypertension, obese patients pose a challenge when it comes to general anesthesia [5]. Furthermore, in perioperative settings, obese patients have an increased risk of aspiration and acute upper airway obstruction [6]. Thus, to ensure positive outcomes for these patients, optimal postoperative respiratory function, maximum alertness, hemodynamic equilibrium, avoidance of pain, and prevention of postoperative nausea and vomiting are required [7].

Increased oxygenation, better aspiration protection, and earlier maintenance of patent airways may all contribute to a quicker recovery.6 Research on healthy subjects has shown that desflurane anesthetic recovery is quicker than sevoflurane [8]. When compared to other drugs, total intravenous anesthesia administered with propofol is linked to a quicker recovery and a decreased incidence of PONV [9].

Morbid obesity is associated with increased perioperative risks, including complications related to anesthesia and postoperative recovery. As obesity rates continue to rise globally, it is crucial to understand how this condition impacts surgical outcomes and recovery processes. Evaluating the current evidence on the effects of anesthesia in patients with morbid obesity can help identify specific challenges and inform strategies to optimize postoperative care, reduce complications, and improve patient outcomes. The objective of this systematic review is to evaluate the postoperative recovery and outcomes in patients with morbid obesity undergoing anesthesia, with a focus on identifying factors that influence recovery, potential complications, and strategies for optimizing perioperative care.

Methods

Search strategy

The systematic review adhered to the PRISMA and GATHER criteria. A thorough search was undertaken to locate relevant studies on the postoperative recovery and outcomes in patients with morbid obesity undergoing anesthesia. The reviewers looked at four electronic databases: PubMed, Cochrane, Web of Science, and SCOPUS. Studies published between 2015-2024 were included. We uploaded all of the titles and abstracts identified through electronic searches into Rayyan, removing any duplicates. All texts from papers that met the inclusion criteria based on title or abstract were collected and thoroughly inspected. Two reviewers independently evaluated the appropriateness of the extracted publications and resolved any contradictions through discussion.

Study population—selection

The PICO (Population, Intervention, Comparison, and Outcome) factors were implemented as inclusion criteria for our review: (i) Population: Patients with morbid obesity, (ii) Intervention: Anesthesia, (iii) Comparator: Other anesthetic interventions, (iv) Outcome: Postoperative outcomes and recovery. Only primary investigations studying the administration of biological treatment to pustular psoriasis were included.

Data extraction

Two unbiased reviewers retrieved data from studies that met the inclusion criteria in a consistent and established format. The following information was retrieved and recorded: (i) First author (ii) Year of publication, (iii) Study design, (iv) Participants' number, (v) Age, (vi) Gender, (vii) Morbid obesity cut off (viii) BMI, (ix) Surgical intervention, (x) Anesthetic intervention, (xi) Main outcomes (Postoperative recovery).

Quality review

The Cochrane Risk of Bias Instrument [10] was used to conduct a critical appraisal of the identified RCTs. This tool evaluates the risk of bias in seven fields: arbitrary sequence generation, allocation secrecy, blinding of participants and employees, blinding of outcome evaluation, inadequate outcome data, selective reporting, and additional bias sources. The risk of bias in each of these domains was classified as low, unclear, or high.

Results

The specified search strategy yielded 720 publications **(Figure 1).** After removing duplicates (n =362), 358 articles were evaluated based on title and abstract. Of these, 265 failed to satisfy eligibility criteria, leaving just 93 full-text articles for comprehensive review. A total of 5 satisfied the requirements for eligibility with evidence synthesis for analysis.

Sociodemographic and clinical outcomes

We included 5 studies with a total of 477 patients with morbid obesity and less than half of them were females 219 (45.9%). All of the included studies RCTs [11-16]. Two studies were implemented in Egypt [12, 14], two in China [13, 15], and one in Australia [16].

Propofol and DEX

The use of TIVA with propofol and DEX in morbidly obese patients undergoing laparoscopic sleeve gastrectomy showed significant benefits over desflurane inhalation. It resulted in reduced analgesic requirements, fewer episodes of nausea and vomiting, and shorter stays in the Post-Anesthesia Care Unit (PACU) [12]. The administration of propofol in morbidly obese patients was associated with a rapid drop in hemodynamic stability during the induction phase, with more pronounced cardiovascular depression compared to individuals of normal weight [13].

In a comparison between DEX and fentanyl, DEX was found to be a superior anesthetic option for morbidly obese patients. It significantly reduced the time needed for extubation, decreased postoperative opioid consumption, and lowered pain scores in the first 12 hours after surgery, indicating enhanced recovery and pain management with DEX [14].

Sevoflurane

When comparing sevoflurane to propofol, sevoflurane emerged as the more effective option for morbidly obese patients, with shorter PACU stay durations, earlier postoperative meal intake, and overall reduced complication rates [15].

Penthrox

In a study involving colonoscopy under Penthrox, a patient-controlled inhalational anesthetic, outcomes were highly favorable. The procedure had a near-perfect success rate, high patient satisfaction, minimal respiratory issues, and shorter recovery times, indicating that Penthrox is a safe, efficient, and cost-effective choice for morbidly obese individuals undergoing minor procedures like colonoscopy [16].

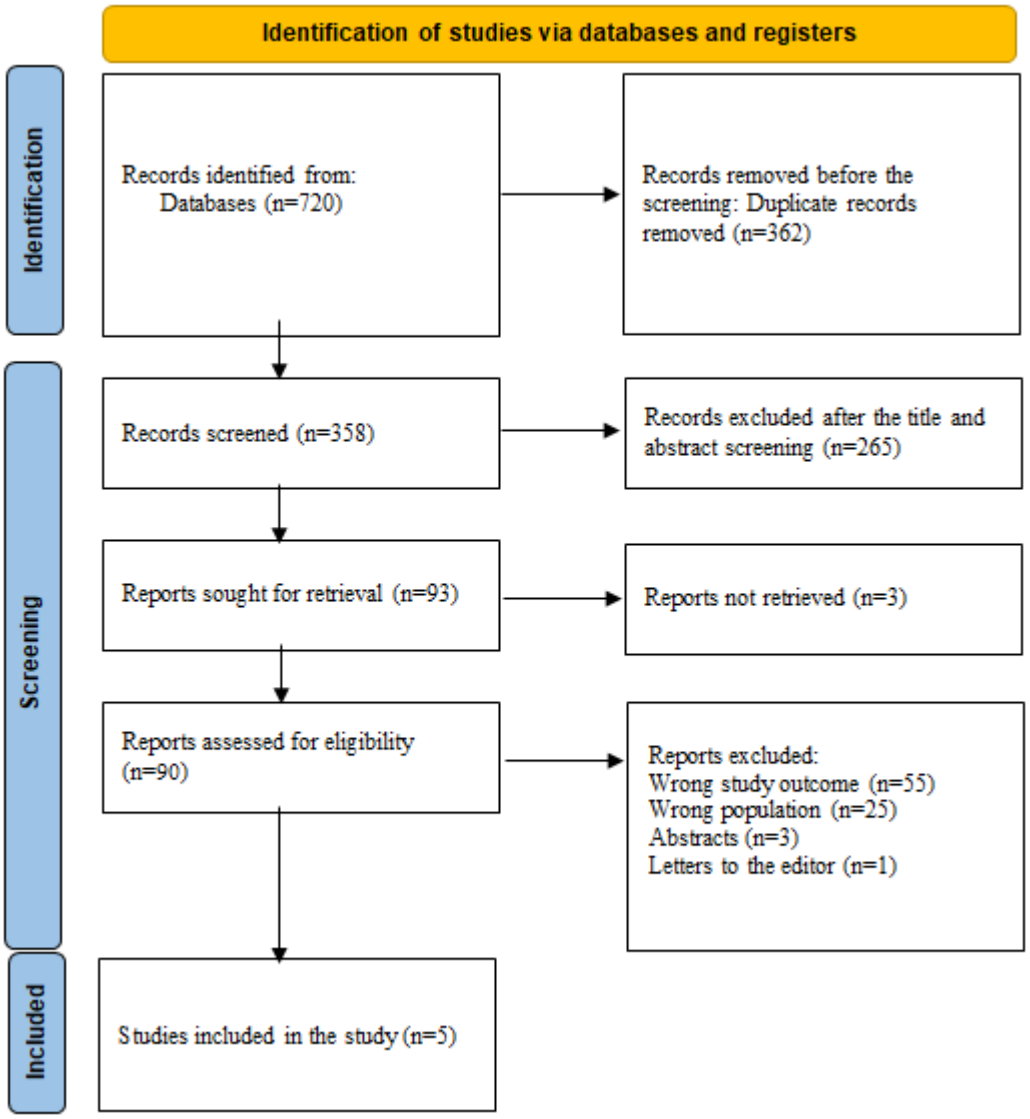

Figure (1): PRISMA flowchart [11].

Table (1): Outcome measures of the included studies

Study ID	Country	Study design	Sociodemographic	Morbid obesity cut off (kg/m^2)	Mean BMI (kg/m^2)	Surgical intervention	Anesthetic intervention	Main outcomes

Elbakry et al., 2018 [12]	Egypt	RCT	Participants: 100 Mean age: 35.31 Males: 32 (32%)	>35	42.55 ± 4.36	LBS	Inhalational (Desflurane) VS TIVA (Propofol and DEX)	In individuals who are morbidly obese, TIVA with propofol and DEX is a more effective anesthetic regimen than inhalation anesthesia with desflurane during laparoscopic sleeve gastrectomy. In addition, the TIVA group used less analgesic medication overall, experienced fewer episodes of nausea and vomiting, and spent less time in the PACU after surgery.
Wu et al., 2018 [13]	China	RCT	Participants: 23 Mean age: 30.4 Males: 9 (39.1%)	>35	47.8 ± 8.02	NS	Propofol	Propofol may significantly worsen cardiovascular depression in people with MO as compared to those with a normal weight. In particular, during the anesthetic induction phase, propofol quickly decreased (within a minute) hemodynamic variables, and MO made this depression worse.
Bakr et al., 2024 [14]	Egypt	RCT	Participants: 64 Mean age: 35.09 Males: 21 (32.8%)	>35	43.77 ± 4.67	LBS	DEX Versus Fentanyl	DEX turns out to be a good anesthetic option. It shortens the time needed for extubation and decreases the amount of opioids taken in the first 12 hours after surgery as well as early postoperative VAS pain scores.
Li et al., 2022 [15]	China	RCT	Participants: 150 Mean age: 47.1 Males: 84 (56%)	>35	42.01 ± 3.08	LBS	Sevo inhalation vs propofol	Along with a decreased rate of complications, sevo inhalation outperformed propofol in terms of standard time out of the PACU, postoperative meal intake, and length of stay.
Nguyen et al., 2015 [16]	Australia	RCT	Participants: 140 Mean age: 54.9 Males: 73 (50.2%)	>35	40.2 ± 0.9	Colonoscopy	Penthrox	colonoscopy using breathed medication under patient control With a 99.99% procedural success record, high patient satisfaction ratings, minimal respiratory problems, far faster procedure and recovery periods, and improved cost-effectiveness, Penthrox is safe and feasible.

NS=Not-Specified

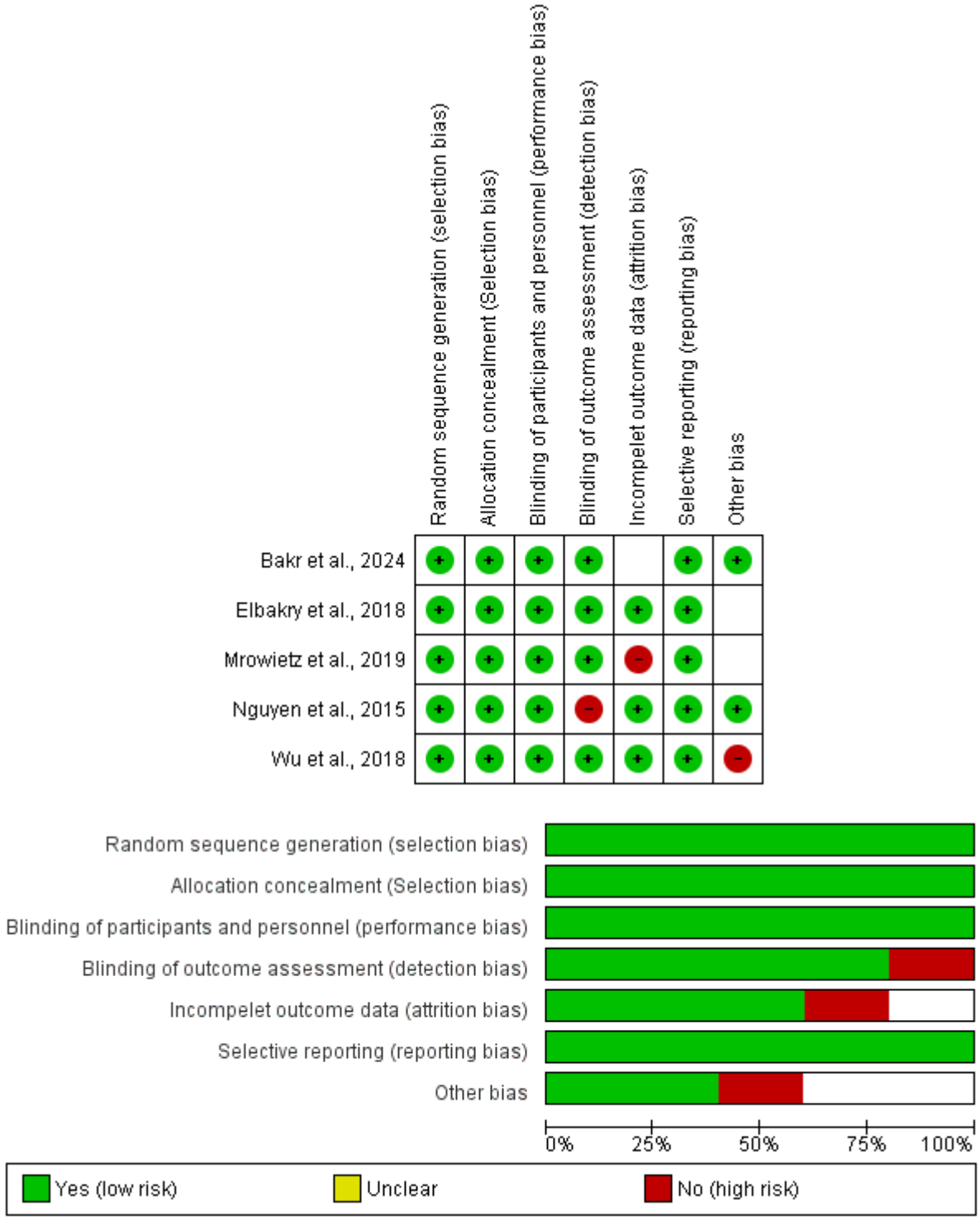

Figure (2): Cochrane risk of bias assessment.

Discussion

In morbidly obese patients, we thoroughly investigated and evaluated the recovery following surgery profiles of the intravenous and inhalational anesthetics, DEX, desflurane, sevoflurane, and propofol. This review found that propofol and DEX in morbidly obese patients undergoing laparoscopic sleeve gastrectomy showed significant benefits over desflurane inhalation. It resulted in reduced analgesic requirements, fewer episodes of nausea and vomiting, and shorter stays in the Post-Anesthesia Care Unit (PACU) [12]. However, the administration of

propofol in morbidly obese patients was associated with a rapid drop in hemodynamic stability during the induction phase, with more pronounced cardiovascular depression compared to individuals of normal weight [13]. **Liu *et al.*** reported that during the early PACU time or during surgery, patients in the propofol groups also showed significantly lower mean arterial pressure than those in the sevoflurane group [17]. **Wani *et al.*** also found that propofol sedation, when given by qualified specialists, can be utilized safely in obese patients undergoing advanced endoscopic procedures, despite the fact that obesity has been linked to a higher incidence of issues connected to sedation [18].

In a comparison between DEX and fentanyl in this study, DEX was found to be a superior anesthetic option for morbidly obese patients. It significantly reduced the time needed for extubation, decreased postoperative opioid consumption, and lowered pain scores in the first 12 hours after surgery, indicating enhanced recovery and pain management with DEX [14]. A retrospective chart review by **Hayes & Esteves** demonstrated that On DEX, however, patients with morbid obesity showed noticeably shorter times in target sedation; this is probably because obesity-related pharmacokinetic alterations occur. Additionally, the overall proportion of time that patients were inside their target RASS range was quite low. Higher incidences of over-sedation were observed in all groups in correlation with this [19]. These findings support the use of DEX not only for its anesthetic properties but also for enhancing postoperative recovery and improving overall patient outcomes in the morbidly obese population.

When comparing sevoflurane to propofol in this review, sevoflurane emerged as the more effective option for morbidly obese patients, with shorter PACU stay durations, earlier postoperative meal intake, and overall reduced complication rates [15]. **Hardt & Wappler** found that due to its significant environmental impact, desflurane is currently losing relevance and should only be used infrequently for minimal flow anesthesia, while being more controllable than sevoflurane with shorter wash-in and wash-out rates [20]. **Agoliati *et al.*** reported that demonstrated rapid recovery from desflurane anesthesia [21].

Our findings suggest that TIVA using propofol and DEX may be more advantageous for morbidly obese patients undergoing surgery, as it reduces the need for postoperative analgesia and shortens recovery time. The use of DEX, in particular, appears beneficial in enhancing postoperative outcomes, such as decreasing extubation time, minimizing opioid requirements, and improving early pain management. Additionally, sevoflurane could be considered a preferred anesthetic due to its ability to reduce complications and expedite patient recovery. These results highlight the need for personalized anesthetic plans in morbidly obese patients to optimize safety and effectiveness.

Strengths and limitations

The studies included in the table utilized randomized controlled trial (RCT) designs, which provide a high level of evidence regarding the effectiveness of different anesthetic approaches. The inclusion of multiple anesthetic options allows for a comprehensive comparison, offering valuable insights into the optimal strategies for managing morbidly obese patients. Additionally, the analysis of various outcomes, such as extubation time, opioid consumption, pain scores, and recovery duration, provides a multidimensional understanding of anesthetic efficacy.

Some limitations include the variability in sample sizes and participant characteristics across studies, which may affect the generalizability of the findings. Additionally, not all studies specified the type of surgical procedures performed, potentially influencing the anesthetic outcomes. The lack of long-term follow-up data limits the ability to assess the enduring effects of different anesthetic interventions on patient recovery and health outcomes.

Conclusion

The evidence indicates that DEX, particularly in combination with TIVA, offers superior postoperative outcomes for morbidly obese patients compared to other anesthetic options, such as inhalation anesthesia or fentanyl. Sevoflurane also demonstrated benefits in reducing complications and enhancing recovery metrics. These findings

emphasize the importance of selecting tailored anesthetic regimens to improve surgical outcomes in this patient population. Further research is warranted to confirm these results in diverse clinical settings and to explore the long-term impact of these anesthetic strategies.

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