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Original contribution

A comparison between inhalational (Desflurane) and total intravenous anaesthesia (Propofol and dexmedetomidine) in improving postoperative recovery for morbidly obese patients undergoing laparoscopic sleeve gastrectomy: A double-blinded randomised controlled trial

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ABSTRACT

Study objective: Laparoscopic sleeve gastrectomy is commonly performed under total intravenous anaesthesia (TIVA) or balanced anaesthesia using an intravenous and inhalation agent. It is still unclear which anaesthesia regimen is better for this group of patients. The present study has been conducted to compare the use of the inhalation anaesthesia technique using desflurane with the TIVA technique, using propofol and dexmedetomidine.
Design: Prospective, randomised, double-blinded study.
Setting: Menoufia Univeristy Hospital.
Patients: This randomised trial was carried out on 100 morbidly obese patients undergoing laparoscopic sleeve gastrectomy. The patients were randomised into two equally sized groups; one group received the inhalation anaesthesia technique and the other received the TIVA technique.
Interventions: All patients received general anaesthesia, which was induced by propofol, remifentanil, and rocuronium. Anaesthesia was maintained using desflurane in oxygen air mixture in the inhalation group, whilst anaesthesia was maintained by intravenous infusion of propofol and dexmedetomidine in the TIVA group.
Measurements: Intra-operative vital signs, anaesthesia recovery time, postoperative nausea and vomiting, pain score, post-anaesthetic care unit (PACU) stay time, total first 24 h post-operative analgesic needs and the onset of first bowel movement were recorded.
Main results
The TIVA group had lower intra-operative heart rates and mean arterial blood pressure ($P < 0.0001$). The TIVA group also had a lower post-operative visual analogue score for pain assessment (VAS) ($P < 0.0001$), lower total analgesic requirements ($P < 0.0001$), a lower incidence of nausea ($P = 0.01$) and vomiting ($P = 0.03$), and shorter PACU stays ($P = 0.01$). There was no significant difference between groups with regard to the onset of bowel movement ($P = 0.16$).
Conclusions: TIVA using propofol and dexmedetomidine is a better anaesthetic regimen than inhalation anaesthesia using desflurane for laparoscopic sleeve gastrectomy in morbidly obese patients. The TIVA technique provided better postoperative recovery with fewer postoperative side effects and analgesic requirements.
Clinical trial registery number: NCT03029715.

1. Introduction

Anaesthesia for morbidly obese patients is considered to be a real challenge to the anaesthetist. This group of patients may have comorbidities in addition to the expected difficulties relating to airways and ventilation. They require careful preoperative evaluation and intraoperative management to ensure rapid recovery with fewer anaesthetic side effects [1].

Laparoscopic sleeve gastrectomy is a common procedure for bariatric patients and is usually done under general anaesthesia [2,3,4]. The common anaesthetic technique used for these patients is either total intravenous anaesthesia (TIVA) or balanced general anaesthesia using intravenous induction and an inhalation agent for the maintenance of anaesthesia [5,6,7]. Ultra-short-acting anaesthetics are recommended for bariatric surgery to achieve rapid recovery and fast tracking [8,9].

Dexmedetomidine is a selective agonist for the central presynaptic α_2 adrenergic receptors with sedative and analgesic properties which

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is commonly used for intraoperative and intensive care unit sedation. It has been used for anaesthesia for morbidly obese patients with promising results regarding effectiveness and safety [10,11].

The present study is designed to compare the inhalation anaesthetic technique using desflurane, our current practice at Menoufia Univeristy hospital, with the TIVA technique using propfol-dexmedetomidine mixture for patients undergoing sleeve gastrectomy.

2. Material and methods

This randomised double blinded study complies with the Consolidated Standards of Reporting Trials (CONSORT) guidelines. This study was conducted in the period between February 2014 and September 2016 after obtaining the ethics committee approval of El Menoufia University Hospital and the informed written consent from all patients. The present study included 100 morbidly obese patients of both genders of ASA Class III aged between 30 and 50 years old and who were scheduled for laparoscopic sleeve gastrectomy operations. The exclusion criteria included having a history of cardiac comorbidity, chronic obstructive lung disease, drug abuse, expected difficult intubation, chronic pain and a history of allergy to any of the study drugs. A computer software program (GraphPad software QuickCalcs, Inc.California, USA. web site: http://www.graphpad.com/quickcalcs/index.cfm) was used to randomly assign the patients into two groups: the desflurane group and the TIVA group. Each group contained fifty patients. A CONSORT flow diagram displaying the number of participants who were randomly assigned, excluded, received intended treatment, and analysed is shown in Fig. 1. Anaesthesia was maintained by desflurane and TIVA for each group respectively. To avoid overdose from using the actual body weight or underdosing from using the ideal body weight, all drug doses were calculated according to the adjusted body weight (ABW) which was calculated using total body weight (TBW) and ideal bodyweight (IBW), as described by Servin et al. using the following formula: adjusted body weight = ideal body weight + (0.4 × [actual body weight – ideal body weight]) [12].

All patients received premedication with oral sodium citrate 15 ml [0.3 M (1.16 g)] and intravenous (IV) 4 mg ondansetron fifteen minutes before induction. The patients were connected to the routine monitors and the bispectral index (BIS) upon arrival to the operating theater. Induction of anaesthesia for both groups was carried out by 0.5–1 μg kg^{-1} remifentanil, 2–3 mg kg^{-1} propofol, and 0.6 mg kg^{-1} rocuronium. Neuromuscular block was monitored by a nerve stimulator.

In the desflurane group, anaesthesia was maintained by desflurane in an oxygen air mixture of 60/40%. In the TIVA group, anaesthesia was maintained by propofol 100–200 μg kg^{-1} min^{-1} and dexmedetomidine 0.5–1 μg kg^{-1} h^{-1}. Remifentanil infusion of 0.05–2 μg kg^{-1} min^{-1} was administered for both groups. Muscle relaxation was maintained in both groups by rocuronium infusion at a rate of 10–12 μg kg^{1} min^{-1}. The depth of anaesthesia was monitored by the bispectral index and anaesthetics were titrated to obtain a BIS of 40 to 60 by using boluses of 0.5 μg kg^{-1} remifentanil in both groups. The total boluses of intraoperative remifentanil were recorded. Intravenous crystalloids were given at a rate of 10–15 ml kg^{-1} h^{-1}. Intra-abdominal pressure was kept between 12 and 16 mm Hg. At the end of the procedure, all patients received sugammadex in a dose of 2 to 4 mg kg^{-1} depending on the degree of neuromuscular block and given according to

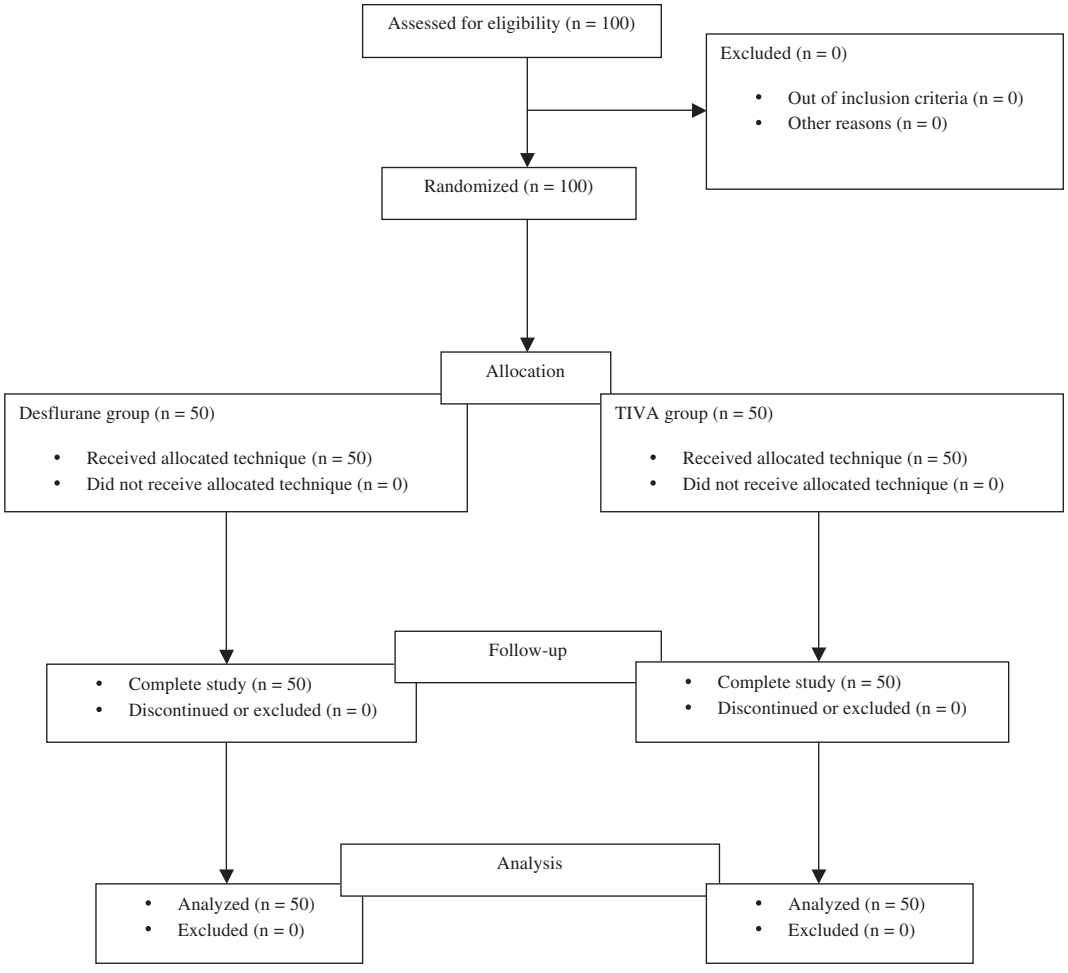

Fig. 1. The studied groups.