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Original Contribution

Is perioperative administration of 5% dextrose effective in reducing the incidence of PONV in laparoscopic cholecystectomy?: A randomized control trial

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ABSTRACT

Study objective: To compare the incidence of postoperative nausea and vomiting (PONV) during perioperative administration of 5% dextrose and normal saline in laparoscopic cholecystectomy.
Design: Prospective, randomized, double-blind trial.
Setting: Operating rooms in a tertiary care hospital of Northern India.
Patients: One hundred patients with American Society of Anesthesiologists status I to II undergoing laparoscopic cholecystectomy were enrolled in this study.
Interventions: Patients were randomized into two groups [normal saline (NS) group and 5% dextrose (D) group]. Both the groups received Ringer acetate (Sterofundin ISO) intravenously as a maintenance fluid during intraoperative period. Besides this, patients of group NS received 250 ml of 0.9% normal saline and patients of group D received 5% dextrose @ 100 ml/h started at the time when gall bladder was taken out. It was continued in the postoperative period with the same rate till it gets finished.
Measurements: Incidence of PONV, Apfel score, intraoperative opioids used and consumption of rescue antiemetics.
Main results: Demographic data was statistically similar. Out of total 100 patients, 47 patients (47%) had PONV. In group D, 14 patients (28%) had PONV while in group NS, 33 patients (66%) had PONV within 24 h of surgery (p value 0.001). The incidence of PONV was reduced by 38% in group D which is significantly lower when compared with that of group NS (p value 0.001). The consumption of single dose of rescue antiemetics in group D was also reduced by 26% when compared to that of group NS (p value 0.002).
Conclusions: Perioperative administration of 5% dextrose in patients undergoing laparoscopic surgery can reduce PONV significantly and even if PONV occurs, the quantity of rescue antiemetics to combat PONV is also reduced significantly.

1. Introduction

Postoperative nausea vomiting (PONV) and pain are two major concerns for patients undergoing surgery. In spite of multiple advances to reduce these, patients continue to rank nausea and vomiting as the most undesirable adverse effect of surgical procedure [1,2,3,4]. With the availability of modern anesthetic techniques and better antiemetic drugs, the overall incidence of PONV has lowered down to around 30%, which is still a significant number [5]. The scenario is worse for high-risk patients, where the incidence of PONV is as high as 80% [6]. It is estimated that a single episode of vomiting increases stay in post anesthesia care unit (PACU) by about 25 min and patients usually rate PONV to be more problematic than postoperative pain [7,8]. It is one of the leading causes of unexpected admission to the hospital following daycare surgery [9]. Risk factors for PONV consist of females, nonsmokers, postoperative use of opioids and previous history of PONV or motion sickness. These factors have been incorporated in the simplified PONV-risk score, the "Apfel-score". It includes all these 4 variables and assigns one point for each [10].

There is unnecessary rise in costs if numbers of patients need to be treated to prevent one patient from PONV are more. This cost of prophylactic treatment may be reduced by keeping number of patients to be treated small and by usage of multimodal approaches [10]. Many

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studies in the past have proved that preoperative intravenous fluid therapy decreases postoperative nausea and vomiting presumably by reducing hypovolemia [11,12,13]. Other studies have proved that giving oral carbohydrate load preoperatively was associated with reduced incidence of PONV presumably by lowering down the postoperative catabolism and insulin resistance [14,15]. In the present study, we observed the relationship between perioperative intravenous dextrose administration and the incidence of PONV in patients undergoing laparoscopic cholecystectomy and its effect on patient having high (3,4) and low (0,1,2) Afpel score.

2. Material and methods

The study was approved by the Institutional Ethics Committee and was registered with the Clinical Trials Registry of India (CTRI number: CTRI/2016/03/006697). One hundred American Society of Anesthesiologists (ASA) status I to II adults, aged 18–65 years scheduled for laparoscopic cholecystectomy were included in this prospective, randomized, double-blind trial at a tertiary care hospital in Northern India (Fig. 1). An informed written consent was obtained from all the patients prior to the initiation of the study. Patients with these conditions were excluded from the study i.e. patient refusal, history of coronary artery disease/congestive heart failure, diabetes mellitus, renal insufficiency, hypertension, gastro esophageal reflux disease/peptic ulcer disease, receiving antiemetics/steroids, pregnant females, abnormal blood glucose on the morning of surgery (fasting > 140 mg/dl), requiring large volume of intravascular fluid treatment for severe intraoperative hypotension, increased intracranial tension due to some pathology e.g. intracranial space occupying lesion (ICSOL), meningitis, pseudotumorcerebri etc., cancer patients on chemotherapy and opioids, vestibular dysfunction of Meniere's Disease. Patients were randomized into two groups (50 patients in each group) normal saline (NS) group and 5% dextrose (D) group with the help of computer generated random number table. Sealed opaque envelopes were opened in the OT and study fluid (normal saline or 5% dextrose) was decided according to the particular randomized group. All the 100 patients received the allocated intervention according to their groups allotted. The Sample size was selected on the basis of previous studies where <50 patients in each group were taken.

A thorough pre-anesthetic work up was carried out for all the patients. General anesthesia was induced in all patients with intravenous (IV) propofol, fentanyl and atracurium. Maintenance of anesthesia was done with isoflurane in oxygen and air (50:50). Intra-operatively, IV fentanyl (0.5 mcg/kg) was administered if heart rate (HR) and blood pressure (BP) is >20% of the base line excluding the other causes of increase in HR and BP like raised end tidal carbon dioxide ($EtCO_2$) and due dose of nondepolarizing muscle relaxant. All patients received IV dexamethasone (4 mg) after induction. During intra operative period both the groups received ringer acetate solution (Sterofundin ISO) intravenously @ 100 ml/h as maintenance fluid. Apart from this, patients of group NS received 250 ml of 0.9% normal saline and patients of group D received 5% dextrose @ 100 ml/h started at the time when gall bladder was taken out. It was continued in the postoperative period with the same rate till it gets finished.

For the purpose of blinding, the label of the study fluid (5% dextrose or normal saline) was removed by a senior anesthesiologist to prevent observer's bias. The person who was administering the study fluid was kept unaware about the type of study fluid. In the recovery room or in the ward, an independent observer who was not aware of the type of study fluid, noted the numbers of PONV episodes. Parameters like HR, systolic blood pressure (SBP), diastolic blood pressure (DBP), mean blood pressure (MBP), SpO_2 (% saturation of hemoglobin), $EtCO_2$, airway pressure (Paw) were noted at time of induction, intubation, after 10 min and then at the difference of 10 min till extubation. All patients received injection paracetamol (15 mg/kg) intravenously at the end of surgery and neuromuscular blockade was reversed with injection neostigmine and glycopyrrolate.

All patients were assessed for PONV by using visual analogue scale (VAS) from 0 to 10, where 0 means no nausea and 10 means worst possible nausea or any episode of retching or vomiting. Patients with VAS score of 3 or more received ondansetron 4 mg intravenously as a first line antiemetic treatment. However, if PONV persisted after 30 min after above treatment, then metoclopramide 10 mg was administered intravenously. The VAS score for PONV was recorded after 30 min, 60 min, 90 min, 6 h, and 24 h after patient arrival in PACU. The total amount of rescue antiemetic (intravenous ondansetron in an incremental dose of 4 mg) in 24 h postoperatively was noted for every patient.

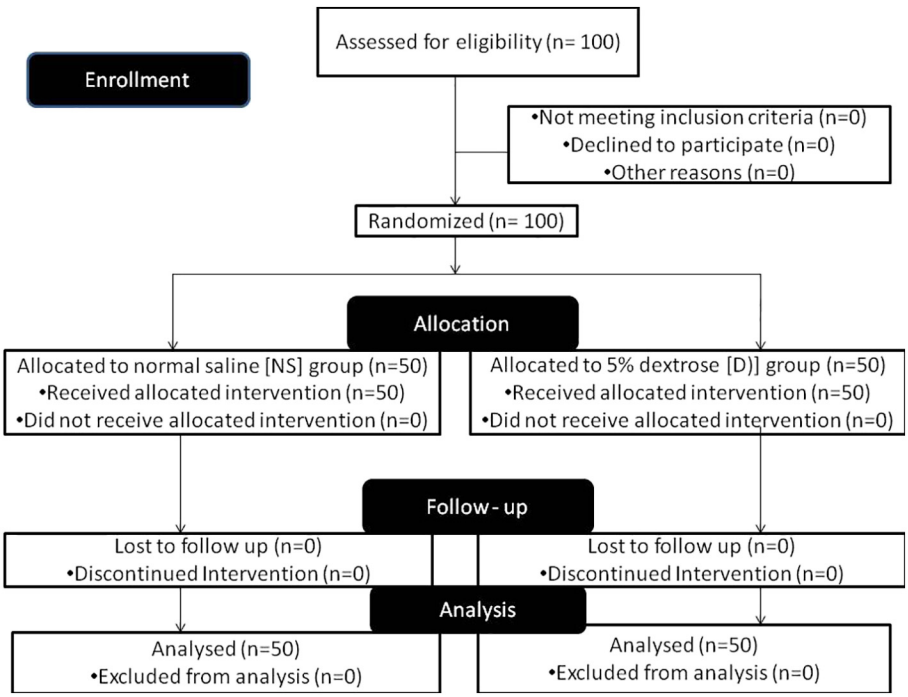

Fig. 1. Consort diagram.