



Original contribution

Entropy vs standard clinical monitoring using total intravenous anesthesia during transvaginal oocyte retrieval in patients for in vitro fertilization^{☆,☆☆}



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Abstract

Study objective: Day care surgery is an important arena for monitors of anesthetic depth where minimizing drug use is essential for rapid turnover. Underdosage, on the other hand, carries the risks of intraoperative awareness and pain. Transvaginal oocyte retrieval (TVOR), often performed under total intravenous anesthesia using propofol and fentanyl in Indian patients, is a procedure of special interest because, in addition to the above concerns, toxic effects of propofol on oocytes have been described. We have studied the role of entropy monitor, a depth of anesthesia monitor, in optimising drug titration and facilitating distinction between analgesic and hypnotic components of anesthesia.

Design: Prospective randomized controlled study.

Setting: Operating theater and postoperative recovery area.

Patients: One hundred twenty American Society of Anesthesiologists class I and II female patients coming to the IVF centre for TVOR under total intravenous anesthesia using propofol and fentanyl. They were randomly allocated into 2 groups: Group EM (drugs titrated as per entropy values: state entropy and response entropy) and group CM (drugs titrated as per standard clinical monitoring).

Intervention: None.

Measurements: Total propofol consumption (TP), total fentanyl consumption (TF), on-table recovery time (T1), time to discharge (T2), intraoperative awareness (A).

Main results: Patients in group EM demonstrated 6.7% lesser consumption of propofol ($P=.01$), 10.9% more consumption of fentanyl ($P=.007$) and 1 minute faster recovery on-table ($P=.009$) as compared to group CM. In the PACU, only 10% patients of group EM required supplemental analgesia as opposed to 28.3% in CM group ($P=.01$). Time to discharge was similar in both groups and no intraoperative awareness was noted.

[☆] Disclosures: none.

^{☆☆} Conflicts of interest: none.

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Conclusion: Entropy monitor is a useful tool allowing distinction between analgesic and hypnotic components of general anesthesia in patients undergoing TVOR and facilitating drug titration accordingly. Its impact on intraoperative awareness needs to be further evaluated.

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1. Introduction

Recent investigations of awareness during surgery emphasize the distinction between analgesic and hypnotic components of general anesthesia. Entropy monitor, a newer monitor for depth of anesthesia, allows this distinction. Day care surgeries with total intravenous anesthesia (TIVA) is an important arena for monitors of anesthetic depth where minimizing drug use is essential for rapid turnover. Transvaginal oocyte retrieval (TVOR), performed as a day care procedure, carries the additional concern of dose and time dependent toxic effect of propofol on fertilization of oocytes as suggested by recent conflicting studies [1]. Underdosage of these drugs, on the other hand, could be frequently associated with awareness [2] and inadequate analgesia. Devices measuring depth of anesthesia should make it possible to tailor drug delivery in order to minimize drug administration, and at the same time, optimize the delivery of drug to each individual patient in order to guarantee loss of awareness. We have studied the role of entropy monitor in achieving the same during TVOR under TIVA.

2. Materials and methods

After obtaining institutional review board approval (Maulana Azad Medical College, Delhi University, New Delhi), this prospective randomized controlled study was conducted in the Department of Anesthesiology and Intensive Care.

2.1. Patients

All American Society of Anesthesiologists (ASA) class I and II female patients of reproductive age group coming for transvaginal oocyte retrieval (TVOR) under general anesthesia, who could read or understand the consent form, were included in the study. Patients with known neurological, psychiatric or neuromuscular disorder; patients on anticonvulsants or any other centrally acting medications; patients with facial nerve palsy; history of head injury; congenital or acquired scalp or skull abnormalities; history of substance abuse; obese patients with BMI ≥ 30 and patients with history suggestive of hypersensitivity to propofol were excluded from the study.

These patients were randomly allocated by a computer generated randomization table into 2 groups:

Group EM (entropy monitoring) (n = 60)

Group CM (standard clinical monitoring) (n = 60)

2.2. Methodology

Detailed preanesthetic checkup was done a day before surgery and appropriate investigations were obtained. The anesthetic technique and the questionnaire were explained to the patients and an informed written consent was taken. Patients remained fasting overnight before surgery and were premedicated with tablet ranitidine 150 mg and tablet alprazolam 0.5 mg on the night before surgery and repeated on the next day 1 hour before surgery with sips of water.

2.2.1. Once the patients were shifted into the operation theater

In all patients, routine ASA monitors were attached. Commercially available disposable Entropy sensor strips were attached after the required skin preparation as recommended by the manufacturer. The impedance of less than 10 k Ω for the sensor was acceptable. Entropy module of the S/5 Anesthesia monitor (GE Healthcare, Finland) (formerly Datex-Ohmeda, Helsinki, Finland) was used.

A 20G intravenous cannula was secured in all patients, preferably over the dorsum of the hand. After 3 to 5 minutes of stabilization period of the patient, basal vital parameters (heart rate [HR], blood pressure [BP], oxygen saturation [SpO₂]) were noted in both groups. Baseline response entropy (RE) and state entropy (SE) values were noted as well. In group CM, the Entropy values were obscured to the anesthesiologist conducting the procedure and the RE and SE values were recorded by another investigator throughout the procedure.

All patients received injection Midazolam 0.015 mg/kg IV and injection fentanyl 1.5 μ g/kg IV. After 3 minutes, anesthesia was induced with injection Propofol 2 mg/kg IV along with 50% O₂ in all patients. Subsequently, anesthesia was maintained with propofol infusion at 100 μ g/kg per minute along with 50% O₂ in both groups. The appropriate size of I-Gel was inserted in both the groups, and secured after confirmation of correct placement. All patients were maintained on spontaneous respiration keeping EtCO₂ between 35 to 45 mmHg. The circuit was attached to the Standard Anesthesia Workstation. Intraoperative fluid replacement was done with lactated Ringer solution.

Oocyte retrieval was performed in both the stimulated ovaries in the lithotomy position. Thereafter the needle was withdrawn and hemostasis, if necessary, was achieved.

Intra-operatively HR, BP, respiratory rate (RR), end tidal carbon dioxide, SpO₂, response entropy (RE) and state entropy (SE) were recorded every 2 minutes in all patients till the time of patients' recovery on table.

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