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Pharmacology Abstracts

The role of activated charcoal in expedited awakening from general anesthesia in patients scheduled for intra-abdominal surgeries. A single-center randomized controlled trial

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INTRODUCTION

Activated charcoal filters are an effective, simple, and sustainable method of removing volatile anesthetic agents from anesthesia machines (Thoben et al., 2019). A 2024 pilot study by Schneider et al. found that the use of a reusable activated charcoal container [RACC] at the end of surgery expedited emergence by 4–15 minutes compared with the control group. We designed a double-blinded study to test this hypothesis.

Our primary outcome was minutes elapsed from cessation of isoflurane to extubation. While our secondary outcomes included the surgeon's rating of surgical conditions, associations between temperature and time to awakening, and between the type of surgery and time to awakening.

Objectives: To assess whether using the RACC will accelerate emergence time in intubated patients scheduled for gynecological and intra-abdominal surgeries, and to assess surgical closure conditions at the end of the procedure with and without the RACC.

METHODS

This study was a randomized, single-center, double-blinded, controlled clinical trial conducted in Guyana over 3 months. After obtaining ethics approval, data were collected from 66 patients—60 females and 6 males—aged 18-65 who met the inclusion criteria. At the end of the intra-abdominal or gynecological procedures, patients were randomly assigned to either BOX A or BOX B (A: n = 31; B: n = 35), which may or may not contain the activated charcoal. At the end of the surgery, this box was then attached to the expiratory limb of the breathing circuit, and isoflurane was discontinued. The patients' paralysis was

reversed by the primary anesthetist, and they were spontaneously ventilated with a minute volume similar to that during the intraoperative period at a fresh gas flow rate of 10 $L \cdot min^{-1}$ with 100% O_2. The primary outcome analysis involved applying a one-way ANOVA to examine group differences in eye-opening time, extubation time, and τ values. Additionally, a post hoc analysis using Tukey's Honest Significant Difference (HSD) test was performed to determine pairwise group differences.

RESULTS

Analysis of times to extubation demonstrated a Welch's t-test mean difference between case and control groups of 0.77 minutes (95% CI: -1.66 to 3.19), p = 0.5297 (Table 1). Surgical conditions were satisfactory in both groups. Patients with body temperatures below 34°C were more likely to experience delayed emergence of > 10 minutes (OR 2.15, CI: 1.01-4.59) (Figure 1). Patients undergoing laparoscopic cholecystectomy woke up faster than those having total abdominal hysterectomy (TAH) (n = 19) (Welch t-test): p = 0.0072 (n = 44) (Figure 2).

Table 1: Time to extubation in Boxes A and B

BOX	Time to extubation (minutes) (SD)
A (Control)	9.57 +- 4.70
B (RACC)	8.80 +- 5.16

Figure 1

Figure 2

DISCUSSION

The data from Schneider et al. (2024) and Chang et al. (2011) notwithstanding, our clinical trial does not demonstrate any significant difference in emergence time, regardless of whether the RACC was used.

Analysis of our secondary outcome indicated that patients with body temperatures below 34°C were more likely to experience delayed awakening (>10 minutes), and patients undergoing laparoscopic cholecystectomies emerged faster than those undergoing TAH (mean difference of 4.69 minutes). However, these findings should be treated as tentative because the study may not have included enough participants to detect differences reliably.

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