## Total Intravenous Anesthesia with Propofol Reduces PACU I Time in Ambulatory Shoulder Arthroscopy: A Randomized Controlled Trial

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INTRODUCTION: The current analgesic standard for outpatient shoulder surgeries is the use of an interscalene nerve block (ISB) with inhaled general anesthesia (GA). The use of GA may cause side effects that delay discharge such as somnolence, short-term cognitive impairment, and postoperative nausea and vomiting (PONV) that impact morbidity and surgical outcomes. Evidence suggests that respiratory monitoring related to GA is the leading risk factor for post-surgical inpatient admission. It is postulated that utilizing total intravenous anesthesia with Propofol (TIVA-P) alongside an ISB can decrease time to meet discharge criteria and use of perioperative interventions due to eliminating ventilator use and the downstream side effects of inhaled anesthetics. Previous studies have shown an increase in patient satisfaction with a decrease in both postoperative pain and PONV with patients receiving ISB compared to ISB with GA. The primary outcome of this study was to delineate any differences in time to meet discharge criteria when using ISB with Propofol vs. ISB w/GA. Secondary outcomes included differences in time to meet discharge criteria, pain scores, perioperative interventions, patient/physician satisfaction, and surgical time.

METHODS: The study enrolled patients who underwent shoulder arthroscopy by a single surgeon at our institution's ambulatory surgical center (ASC) between January 2020 and March 2023. Enrollment was conducted in blocks, with up to three planned interim analyses. After two blocks, enrollment was halted due to significance in the primary outcome measure, PACU I time. One orthopaedic surgeon and three anesthesiologists were involved in the study, and patients were followed postoperatively up to 30 days. Perioperative intervention included the use of oxygen, vasopressor medications, and bronchodilators. Antiemetics included ondansetron and corticosteroids. PACUI time, surgical time, time to meet discharge criteria, perioperative intervention use, and antiemetic use were obtained from the patient’s chart. Pain scores were evaluated with a modified PROMIS Pain Intensity 3A score both before and after the procedure. Patient and physician satisfaction was evaluated with a 1-5 Likert scale at the follow up visit. Pain, satisfaction, antiemetic use, perioperative interventions, surgery time, postoperative care time, and total discharge time were recorded and analyzed using chi-squared and Mann-Whitney U tests with a significance cutoff of 0.0167 to account for interim analysis.

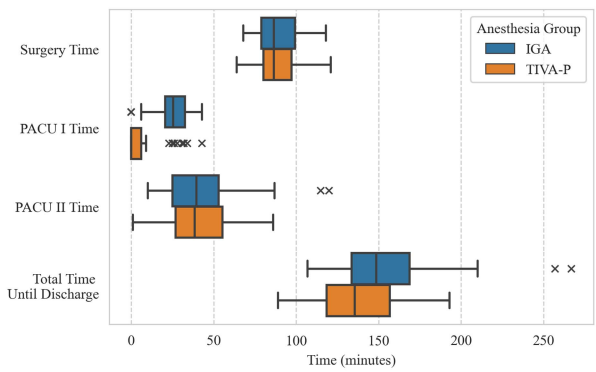
RESULTS:

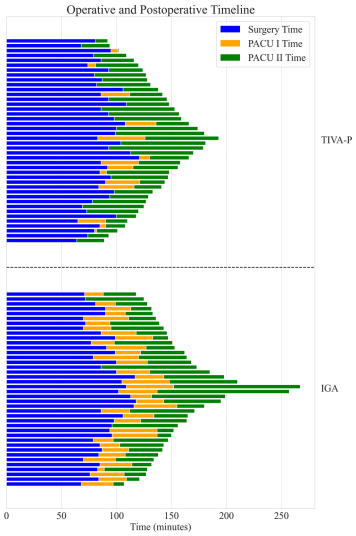
Significant differences were observed in PACU I time and total discharge time between the TIVA-P and IGA groups ($P < 0.001$, $P = 0.0104$). TIVA-P patients had a 9.1% quicker discharge time, primarily due to bypassing PACU I monitoring (66.7%) and spending 25.5 fewer minutes in PACU I overall. TIVA-P group also required fewer antiemetics ($P = 0.0013$). No significant differences were detected in pain, perioperative interventions, or satisfaction metrics.

DISCUSSION AND CONCLUSION:

Compared to IGA, TIVA-P was shown to be 8.9 times more likely to bypass PACU I, leading to a 9.1% reduction in total discharge time. This substantial difference in PACU I utilization was the primary component in the overall time savings observed with TIVA-P. Despite the accelerated recovery of TIVA-P patients, there were no differences in surgical time, satisfaction rates, or pain levels between the two groups. This suggests that the decreased need for PACU I did not come at the expense of other areas of care. This finding is likely related to the pharmacokinetics of Propofol as it

provides euphoric effects as it is hepatically conjugated and renally excreted. It is metabolized in a biphasic manner, with its initial half-life of approximately 40 minutes and terminal half-life of 4-7 hours in those without increased glomerular filtration rate. Given the average time to meet discharge criteria in the TIVA-P group, it is plausible that patients are experiencing this euphoric effect during their PACUI and PACUII stay without the prolonged cognitive impairment experienced by those in the GA group. Together these effects result in patients experiencing a shorter postoperative period and faster time to meet discharge criteria than those with general anesthesia. TIVA-P may be preferable for shoulder arthroscopy in an ambulatory setting given it allows for shorter postoperative recovery and earlier discharge.


Surgery Time
PACU I Time
PACU II Time
Total Time
Until Discharge
Anesthesia Group
IGA
TIVA-P
0
50
100
150
200
250
Time (minutes)


Operative and Postoperative Timeline
Surgery Time
PACU I Time
PACU II Time
TIVA-P
IGA
0
50
100
150
200
250
Time (minutes)