



Research Article

The effect of ondansetron in preventing the hypotensive bradycardic events during shoulder arthroscopy done under interscalene block in the sitting position



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KEYWORDS

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Sitting position;
Interscalene block

Abstract Purpose: This study was conducted to test whether blocking the serotonin receptors by intravenous [IV] ondansetron; can help in reducing the hypotensive bradycardic events [HB events] associated with shoulder arthroscopy done in the sitting position under interscalene plexus block [ISB].

Methods: One hundred and fifty patients, scheduled for shoulder arthroscopy in the sitting position under ISB, were randomly assigned to one of three groups receiving either: 4 mg ondansetron, or 8 mg ondansetron or saline.

Results: IV injection of ondansetron 4 mg or 8 mg significantly reduced the incidence of HB events from 20.4% in the saline group to 6.1% after injection of 4 mg ondansetron and 6% after injection of 8 mg ondansetron; *p* value [0.030].

Conclusion: IV ondansetron either 4 mg or 8 mg reduces the HB events during shoulder arthroscopy in the sitting position under ISB.

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1. Introduction

Arthroscopic shoulder surgery is now preferred to be done in the sitting position [1,2], under interscalene brachial plexus blockade (ISB) [3,4]. ISB is an effective anesthetic technique for shoulder surgery [3]. ISB reduces the hospital stay [5], and the need for postoperative analgesics [2,6]. Patients undergoing ISB also experience high levels of satisfaction with their anesthesia [7].

Although ISB has been shown to be successful when done by skillful anesthesiologists, but resistance to its use still

presents because of hemodynamic changes in the form of sudden bradycardia and/or hypotension (HB) events, frequently associated with nausea and/or lightheadedness that have been seen in 13–29% of patients who received ISB for shoulder arthroscopy in the sitting position [8,9].

These HB events may be a form of vasovagal syncope mediated by the Bezold–Jarisch reflex (BJR), which happens when venous pooling and increased sympathetic tone cause a low-volume, hyper contractile ventricle [9–11]. This leads to sudden activation of the parasympathetic nervous system and sympathetic withdrawal, causing bradycardia and hypotension.

Animal studies reported that serotonin (5-HT), may be an important contributing factor to the occurrence of BJR in the settings of decreased blood volume [12,13], which can be blocked by antagonizing the serotonin at the level of the receptors [14]. Also Owezuk et al. [15] reported that intravenous ondansetron attenuated the spinal induced hypotension that might be caused by BJR.

We hypothesized that blocking the serotonin receptors by ondansetron [a selective 5-hydroxy tryptamine 3 (5-HT₃) receptor antagonist] can help in reducing the HB events associated with shoulder arthroscopy done in the sitting position under ISB.

2. Materials and methods

After obtaining approval from our ethical committee written informed consent was obtained from 150 patients with ASA physical status I or II; who were scheduled for shoulder arthroscopy in the sitting position under ISB, at Saad Specialist Hospital, Alkhobar, Saudi Arabia, between June 2011 and December 2012.

One hundred and fifty patients were assigned to one of three equal groups receiving either the following:

- 4 mg ondansetron (group I) diluted in 10 ml normal saline.
- 8 mg ondansetron (group II) diluted in 10 ml normal saline
- 10 ml normal saline group (group III).

All the tested drugs were injected over 1 min, 5 min before starting the ISB.

Randomization was performed using random computer allocation with numbered envelop. The syringes were prepared by a technician anesthetist who was not involved in the study.

The power analysis was done using the reported incidence of HB events of 24% [16]; which revealed that 150 patients were needed to detect 50% decrease in these events with 95% confidence limit.

Patients were excluded if they refused the ISB, had coagulation disorders, sensitivity to local anesthetic, severe chronic pulmonary disease, coronary heart disease, arrhythmias, neuropathy or neurologic deficiency at the site of the procedure, infection at the site of injection, uncooperative patients, patients with history of chronic pain and patients receiving beta blockers or calcium channel blockers.

Immediately after arrival to the operating room; intravenous cannula was inserted and non-invasive monitoring of blood pressure, oxygen saturation, and electrocardiogram were applied to all patients and their baseline vital signs were measured. All patients received midazolam 0.03 mg/kg IV, and fentanyl 1 µg/kg IV, 10 min before the block. All

patients received oxygen through nasal cannula at a rate of 2 L/min.

After confirming the proper site of the operation; all patients were put semisetting with their head turned to the opposite side of the block.

ISB was done under the guidance of both nerve stimulator and ultrasound using 30 ml of 0.5% bupivacaine.

After proper sterilization of the skin; the linear ultrasound probe was draped with disinfected wrap and gel was applied; and we screened for the round to oval-shaped honeycomb appearance of hypoechoic nerve roots in short-axis view located between anterior and middle scalene muscles using a 5–12 MHz linear probe of ultrasound (SonoSite M-TurboTM, SonoSite, Bothell, USA). Two milliliters of lidocaine 1% were injected subcutaneously to anesthetize the skin using 25-gauge needle. A 22 G 50 mm length insulated needle (Stimuplex®, B. Braun Melsungen, Melsungen, Germany) connected to a nerve stimulator (Stimuplex DIG®, B. Braun, Melsungen, Germany) was used via the in-plane method. The local anesthesia (LA) for each group was slowly administered after twitch confirmation from the deltoid, pectoralis major, triceps, or biceps through 2 Hz after reducing the initial current from 1.2 mA to less than 0.5 mA of electrical stimulation, and after negative aspiration of blood. Diffusion of LA was observed with ultrasound, and needle position was adjusted to surround all nerve roots with LA.

All ISB were done by one anesthesiologist, and all surgeries were performed by the same surgeon.

After the ISB was done, noninvasive blood pressure (BP) was measured every 5 min with more frequent measurement if needed, and continuous ECG monitoring. Then the patients were placed in the sitting or “beach chair” position, which was achieved by elevating the back of the operating room table to 60–80° and flexing both the knees and hips to 90° with the patients’ feet resting properly on a footboard.

Sensory blockade was evaluated every 5 min by pinprick test in the area of distribution of the circumflex nerve, musculocutaneous nerve, and radial cutaneous nerve of the arm. Sensory blockade was defined when there was no sensation to pin prick test. However, motor block was tested by asking the patient to raise his arm (circumflex nerve), to abduct/adduct the thumb (radial/ulnar nerves) and to flex the forearm on the arm (musculocutaneous nerve).

The block onset time was defined as the time elapsed between the end of injection and the achievement of complete sensory and motor block (surgical anesthesia).

Intraoperative sedation with midazolam boluses of 0.02 mg/kg if needed, fentanyl 1 µg/kg boluses were given only if the patient complaint of pain. The amount of midazolam and fentanyl and the degree of sedation were recorded (sedation score: 1 = awake, 2 = awake but sedated, 3 = asleep but responsive to verbal stimuli, and 4 = asleep but responsive to tactile stimuli). Total intravenous fluid was limited to 10–12 ml/kg.

HR and BP were recorded by anesthesiologist blinded to the study drugs. A BH event was defined by Liguori et al. [10], if HR decreased more than 30 bpm in less than 5 min or any decrease less than 50 bpm, and/or a systolic BP decrease more than 30 mmHg in less than 5 min or any decrease to less than 90 mmHg. This event was managed by intravenous injection of atropine (0.5 mg boluses) or ephedrine (5 mg boluses).

Lightheadedness, nausea, and sweating were recorded but were not essential in defining a HB event.

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