

superior (76,5 % vs. 38,2 %) s hodnotou p 0,001, přičemž kompletní paréza byla přítomna u 44,1 % v interskalenické skupině ve srovnání s 11,8 % ve skupině se selektivní blokádou truncus superior (p 0,002). Doba trvání výkonu (min) byla významně delší ve skupině se selektivní blokádou truncus superior než ve skupině interskalenické ($6,97 \pm 0,67$) resp. ($6,48 \pm 0,69$), přičemž ve zbývajících charakteristikách blokády a parametrech kvality blokády nebyly zaznamenány signifikantní rozdíly. Rovněž nebyly hlášeny významné komplikace.

Závěr: Ačkoli ultrazvukem navigovaná interskalenická a selektivní blokáda truncus superior byly z hlediska kvality analgezie rovnocenné, selektivní blokáda truncus superior byla spojena s významně nižším výskytem hemidiafragmatické parézy.

Klíčová slova: artroskopie ramene, interskalenická blokáda, selektivní blokáda truncus superior.

Introduction

Shoulder arthroscopies are associated with significant post-operative pain [1]. Interscalene brachial plexus block (ISB) is considered the standard and effective analgesic modality after shoulder arthroscopy; however, it has been shown to be associated with undesirable adverse effects, such as hemidiaphragmatic paralysis (HDP), especially with high volume local anesthetics due to the involvement of the phrenic nerve. This represents a major issue among patients with pre-existing pulmonary diseases [2, 3].

Laurent et al. defined the superior trunk block (STB) which is a new modification of the interscalene block. A local anesthetic was injected selectively around the superior trunk. They have reported that this technique limits the local anesthetic extension to the phrenic nerve and, hence, decreases the incidence of hemidiaphragmatic paralysis [4].

This randomized trial investigated whether selective STB would reduce hemidiaphragmatic paresis in participants undergoing arthroscopic shoulder surgery.

The primary outcome of the trial was the incidence of diaphragmatic paralysis after ultrasound (US) guided selective STB and interscalene block (ISB) in shoulder arthroscopy. Block characteristics (procedure duration, duration of motor block and onset of sensory block), block quality (intraoperative hemodynamic parameters, intraoperative fentanyl consumption, and time to the first call of analgesia), and incidence of complications of either block were our secondary outcomes.

The hypothesis of our research was that selective STB would be associated with a lower incidence of diaphragmatic paralysis compared to that of interscalene block.

Materials and methods

This prospective double-blinded randomized controlled trial was performed at Menoufia University Hospital. The study protocol was reviewed and approved by the ethics committee (IRB approval number 2/2022 ANES 37), Menoufia University Hospital, Menoufia, Egypt on 20 February 2022. It was prospectively registered at <https://pactr.samrc.ac.za> (PACTR 202202483221034) prior to enrollment of the first patient on 23 February 2022. The trial was conducted in accordance with the World Medical Association Declaration of Helsinki and following the Reporting Trials (CONSORT) guideline Consolidated Standards. All eligible patients provided written informed consent, and the privacy rights of human subjects have been observed.

The trial included sixty-eight patients of both sexes, aged 18 to 80 years old, who were scheduled for arthroscopic shoulder surgery and

had an ASA I or II physical status according to the American Society of Anesthesiologists (ASA). Patients who had pre-existing neuropathy in the operated limb, ASA $\geq$ III, coagulation disorders, local infection at the puncture site, known allergy to local anesthetics, respiratory failure or chronic obstructive pulmonary disease, breastfeeding, pregnancy, a BMI $\geq$ 35 kg/m², failure to cooperate, and patient refusal were excluded.

Eligible patients who satisfied all inclusion criteria and did not satisfy any exclusion criteria were randomized 1:1 using a computerized software program (GraphPad software QuickCalcs, Inc., California, USA) (website: <http://www.graphpad.com/quickcalcs>). The allocation was concealed from the clinical staff, trial investigators, trial statisticians, and participants. The patients were randomly assigned to receive either US-guided ISB or selective STB. An anesthesiologist who was not involved in the data collection of the trial conducted the entire drug preparation and block administration.

All patients were administered bromazepam (1.5 mg) the night prior to surgery and two hours prior to the call to the operating room. Upon entering the operating room, standard monitoring was implemented, an 18-gauge cannula was inserted in a peripheral vein and lactated ringer infusion was initiated. Before performing the block, an assessment of diaphragmatic movement at baseline was done using a curvilinear probe. Both hemidiaphragms were visualized using B-mode while the excursion was measured using M-mode.

To achieve a Ramsey Sedation Scale score of 2 to 3, all patients were administered intravenous midazolam 2 to 5 mg and fentanyl up to 100 µg, which were titrated.

Interscalene block

The same anesthesiologist administered both blocks in accordance and complete compliance with the antiseptic regulations. A linear US transducer of high frequency (13–6 MHz) (Sonosite, M-Turbo, Washington) was employed to conduct both blocks. The patient was positioned in a semi-recumbent position. The probe was positioned transversely over the interscalene groove at the level of the C6 transverse process to identify the interscalene muscles and the C5 and C6 ventral cervical nerve roots, which are referred to as the spotlight sign. The interscalene groove was reached by introducing a 22-gauge echogenic needle from the lateral to the medial side using the in-plane technique. Subsequently, 15 ml of 0.25% bupivacaine were deposited between the C5 and C6 nerve roots.