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Research article

Analgesic efficacy of ultrasound guided versus landmark-based bilateral superficial cervical plexus block for thyroid surgery

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ABSTRACT

Background: The use of bilateral superficial cervical plexus block (BSCPB) to provide analgesia for thyroid operations remains debatable. This study was done to assess the analgesic efficacy and safety of ultrasound (US) guided or landmark-based BSCPB, performed under general anesthesia, compared to systemic narcotics in thyroid surgery.

Patients and methods: A total of 69 patients ASA I and II scheduled for thyroid surgery were randomly assigned into three groups (23 patients each): Group (US) received US guided BSCPB. Group (LM) received landmark-based BSCPB. In both groups, the block was performed under general anesthesia and before surgery using 0.5% bupivacaine 12 ml on each side. Group (C) who didn't receive any block. We measured intra-operative hemodynamics and fentanyl requirements. We also measured postoperative analgesia within 24 h of surgery as regard: pethidine consumption, visual analogue scale (VAS) pain scores and time to first rescue analgesic demand. Postoperative nausea and vomiting (PONV) and other adverse events were noted as well.

Results: There was a significant reduction in systolic blood pressure (SBP) and heart rate (HR) in groups US and LM compared with group C. Intra-operative fentanyl requirements were significantly increased in group C compared to groups US and LM. Time to first analgesic request was significantly longer in groups US and LM than in group C. Postoperative pethidine consumption and VAS scores, measured during the first postoperative day, were significantly higher in group C than groups US and LM. No significant difference was noted between the three groups regarding PONV. No other adverse events were recorded. No significant differences were noted between groups US and LM.

Conclusion: BSCPB (US guided or landmark-based), performed under general anesthesia, effectively decreased peri-operative analgesic requirements in thyroid operations. However, there was no significant difference in analgesic efficacy or safety between US guided and landmark based BSCPB.

1. Introduction

The importance of preemptive analgesia has been driven from an assumption that specific changes happen in higher centers in the brain and the spinal cord in response to pain. These changes may result in stimulation and enhancement of pain transmission and perception. Accordingly, postoperative analgesia should be considered before the start of surgery, together with intraoperative analgesia [1].

Patients may complain of moderate pain that is generally of short duration following thyroid surgery but none the less, some patients ask for analgesics in the form of narcotics or non-opioid analgesics during the first day after thyroid operations. Postoperative pain management after thyroid surgery has also gained more importance and attention because thyroid surgery is recently being performed on a day case basis [2].

Non-steroidal anti-inflammatory drugs (NSAIDS) may not produce effective pain relief and at the same time may increase the risk of postoperative bleeding with the thyroid being a highly vascular organ. On the other hand, opioid analgesics may increase the risk of postoperative nausea and vomiting (PONV) or produce postoperative respiratory depression [1].

One of the well-established regional anesthesia modalities that can offer analgesia for thyroid surgery is superficial cervical plexus block, performed bilaterally [3]. The ventral rami of cervical nerves (C1-4) form the cervical plexus. The nerves pass laterally along the corresponding transverse process behind the vertebral vessels. The

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deep branches are purely motor, while the superficial ones are sensory supplying skin and subcutaneous tissues of the neck [4]. Some authors have reported that SCPB combined with general anesthesia for thyroid surgery has significantly reduced analgesic requirements [5,6]. However, other authors reported conflicting results [7]. Most of the published work that was done to assess the analgesic efficacy of SCPB in thyroid surgery, has adopted the landmark-based technique where local anesthetic mixture is injected based on anatomical landmarks without the use of ultrasound [3].

The superficial branches of the cervical plexus can be visualized and demonstrated with their relation to the surrounding structures and anatomy with the use of ultrasound machine. Ultrasound (US) guided SCPB has many privileges over the conventional landmark-based block, including the ability to witness the anesthetic mixture diffuse in the right intermuscular plane that has been targeted and to avoid injury of important nearby structures [4].

The aim of the present study was to evaluate and compare the analgesic efficacy and safety of pre-surgical (US) guided or landmark-based BSCPB versus systemic narcotics alone in thyroid surgeries.

2. Patients and methods

After approval of the ethical committee in charge sixty-nine adult euthyroid patients were consented to participate in this prospective, double-blind, randomized work at Ain Shams university hospital. The patients were ASA physical status I-II male or female, scheduled to undergo elective thyroid operations that will be carried out under general anesthesia. Abnormal thyroid functions, sub-sternal goiters or the need for lymph node dissection were all criteria for patients' exclusion. If narcotics or non-opioid analgesics were given to patients preoperatively, those patients were excluded from the study. Other exclusion criteria were: Patients who suffered coagulopathies or any other contraindication to regional anesthesia, age < 18 years, patients who have known allergy to local anesthetic drugs, pregnant females and patients who had to undergo emergency re-operations in the first day after surgery.

All patients included were allocated randomly (using computer-generated number lists and opaque sealed envelopes) into three groups: group US (n = 23) who received ultrasound guided bilateral superficial cervical plexus block (BSCPB); Group LM (n = 23) who received landmark-based BSCPB. Group US and LM received 12 ml 0.5% bupivacaine on each side of the neck, after general anesthesia was established and before proceeding with surgery. Group C (n = 23) who received general anesthesia with systemic narcotics and no block.

Pre-anesthetic evaluation including patient's history, examination and investigations was performed one day before surgery. All patients fasted overnight, were given 150 mg Ranitidine and 4 mg ondansetron slowly IV via an 18G cannula inserted peripherally before induction of general anesthesia. The patients were also premedicated with midazolam 0.02 mg/kg IV. A standard monitor and baseline vital readings were recorded. IV lactated ringer's solution infusion 6–8 ml/kg was started. The visual analogue score (VAS) was explained to all participants preoperatively.

Induction of general anesthesia was done using propofol 2 mg/kg, fentanyl 1 ug/kg, and atracurium 0.5 mg/kg for orotracheal intubation. Maintenance of anesthesia was done with isoflurane (1.2%) in an oxygen-air mixture (60/40%). Patients who showed more than 20% increase in systolic blood pressure (SBP) or heart rate (HR), compared to baseline readings, were given additional doses of fentanyl (0.5 mcg/kg) intraoperatively. Thyroid surgery was done according to a standardized procedure.

The block was done by a well-trained anesthesiologist, after induction of general anesthesia and before proceeding with surgery in groups US and LM.

2.1. Ultrasound guided BSCPB

The following equipment was prepared: Honda electronics HS-2100 portable ultrasound machine with linear probe 6–12 MHz, sterile sleeve, and gel. Regional anesthesia tray with sterile towels, gloves and gauze packs. Two 20 ml syringes containing the anesthetic mixture. A 2.5-in., 23-gauge needle attached to extension tube. The block was performed with the patient lying supine and head turned to the contra lateral side. The transducer was situated transversely over the lateral aspect of the patient's neck, after skin sterilization, at the middle of the posterior edge of the sternocleidomastoid (SCM). The transducer was displaced backwards to identify and visualize the tapering posterior edge of the muscle in the middle of the view captured on the screen. The plexus appears as nodules that are hypoechoic below the prevertebral fascia and immediately above the inter-scalene groove. The needle was introduced from the posterior aspect, with an in-plane technique, through the skin and platysma adjacent to the plexus, deep to SCM, under the prevertebral fascia and above the inter-scalene groove. After negative aspiration, 12 ml of local anesthetic was deposited in this plane, just behind the posterior border of SCM. The local anesthetic spread was witnessed in the right plane (Fig. 1).

2.2. Landmark-based BSCPB

Patient positioning was the same as ultrasound guided block. Same equipment was prepared as in the ultrasound guided block but without the ultrasound. Landmark was the posterior border of the SCM, point of injection was at the midpoint of the posterior border of SCM – this is usually at the level of the cricoid cartilage. The needle was inserted to half the depth of the muscle and 8 ml of local anesthetic (LA) were injected cephalic and caudal at the posterior border of the SCM to block the supraclavicular, occipital and auricular branches. Additional local anesthetic was injected transversely above the muscle to anesthetize the transverse cervical nerve, to give a total volume of 12 ml of the prepared LA solution on each side. The depth of mixture injection was not >5 mm to prevent spread to phrenic or recurrent laryngeal nerve.

The onset of action for this block is 10–15 min. Intraoperatively, systolic blood pressure (SBP) and heart rate (HR) were noted: (a) at the time of skin incision (around 15 min from the block) then (b) every 15 min till the end of surgery. The duration of surgery and fentanyl requirements were also recorded. At the end of the surgical procedure, reversal of neuromuscular block was done, and assessment of vocal cord mobility by laryngoscopy was performed before extubation. All patients were transferred to post anesthesia care unit (PACU).

Postoperative analgesia was evaluated by: (a) VAS (visual analogue score), (b) total postoperative pethidine consumption, (c) time to first rescue analgesic request. The VAS was noted when the patients were transferred to PACU, then every four hours for the first 24 h. The VAS was assessed during three phases: at rest, while swallowing and during lateral neck rotation. The VAS is a horizontal line 10 cm in length, where 0 cm means no pain and 10 cm means the worst pain ever. The patient marks on the line the point that represents their pain. Patients with VAS 3 or more at rest or VAS 4 or more whilst swallowing or lateral neck rotation were given rescue analgesic medication in the form of pethidine 0.5 mg/kg IV.

Total postoperative pethidine (mg) given in the first 24 h and time to first rescue analgesic demand (minutes) were measured. Incidence of PONV in the first 24 h was recorded. Nausea and

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