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Assessment of Bilateral Superficial Cervical Plexus Block Combined with General Anesthesia in Thyroid Surgery

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Abstract: ***Introduction: Pain and agitation are the most common side effects after thyroid surgeries which not only affect the recovery of the patient but also increase the hospital stay. With this background we decided to conduct the study in which we gave bilateral superficial cervical plexus block along with general anesthesia for thyroid surgeries. Method: 60 patients who were posted for routine thyroid surgeries were equally divided into 2 groups with 30 patients each (Group B and Group G). In group B (Cervical Plexus block + General anesthesia) we gave bilateral cervial plexus block by using 0.5% Bupivacaine 10ml after general anesthesia, in group G (General anesthesia) we didn't give any nerve block after general anesthesia. We observed Intra-operative and Post-operative analgesic requirement as well as hemodynamic stability of the patients. Result: Total analgesic requirements were significantly less in group B as compared to group G both in intra-operative as well as early post-operative period. There was decrease in the time spent by the patient in post-operative anesthesia care unit in group B as compared to group G. Conclusion: Bilateral infra-trochlear and infraorbital nerve blocks, using 0.5% Bupivacaine during General Anesthesia for thyroid surgeries will not only decrease the intraoperative and postoperative analgesic requirements but also increase the intraoperative & postoperative hemodynamic stability.***

Keywords: Bilateral Superficial Cervial Plexus Block, General Anaesthesia, Thyroid Surgery

1. Introduction

Thyroid disease is one of the major health problem in the world[1-3]. Hence, thyroid surgery is one of the most frequently performed neck surgeries. It is also the leading endocrine surgery took place world-wide [4]. Thyroid surgeries under general anaesthesia can usually be seen with mild to moderate post-operative pain, which can become severe post-operative pain in some instances. This requires appropriate pain management strategies as it can lead to emergence agitation, which may result into self-extubation causing severe complications such as bleeding, aspiration, hypoxia or re-operation. The post-operative phase can often involve significant discomfort, which arises from factors such as soft tissue trauma, irritation of laryngeal tissues, and the effects of compression bandage over neck.

Therefore, we have to use the high doses of narcotics to decrease pain, which may also produce certain side effects. However, these side effects can be avoided when regional nerve block techniques are added with general anaesthesia. In other words, Pre-emptive analgesia can be a good option, which will also produce effective post-operative analgesia. Acute to chronic pain is one of the commonest complaint in the post-operative period which may has serious adverse cardiovascular, pulmonary, metabolic and psychological outcomes [5–8]. Pain after thyroid surgery is significant severe in early post-operative hours. The mean score of post-thyroidectomy pain was 6.9 ± 1.7 on visual analoge scale and 90% of patients required opioid [9]. Despite paracetamol administration, 70% of patients initially having a score≥ 4 on numeric rating scale [10]. Recently, a study had shown that 93% of patients required upto 20 oral morphine equivalents [4]. In some cases also, simple analgesics such as paracetamol and NSAIDs) were found insufficient to manage pain after thyroidectomy [11].

The American Society of Anesthesiologist's guidelines for acute pain management during the perioperative stage recommend a multimodal analgesia approach, emphasizing the use of regional blockade techniques, when-ever applicable. Peripheral nerve blocks offer multiple advantages, such as reducing tissue edema, ensuring a more comprehensive range of anesthesia, and diminishing pain at the surgical site. Despite this huge implication and frequency of thyroid surgery, the significance of bilateral superficial cervial plexus block for thyroid surgery was not that much popular. In addition to the differences in the patterns of thyroid diseases in our population, it's suggested that pain severity and perception have a significant difference among populations[5]. Bilateral superficial cervical plexus block (BSCPB) can be used for managing intra-operative as well as post operative pain for thyroid surgery. Studies reported that the block allowed to reduce the anaesthetic requirement and provided prolonged post-operative analgesia. It also decreases pain score, rescue analgesic requirement and overall opioid requirement in the post-operative 24 hours [12–14]. Hence, it minimizes opioids related adverse effects[15]. BSCPB was found simple, safe, cheap and effective for intra as well as post-thyroidectomy pain management[16].

These superior cervical plexus block have been reported to facilitate pain management, reduce complications, and reduce anesthetic agent consumption after thyroid

procedures. Therefore, we decided to conduct a study with the aim of determining the effect of pre-emptive bilateral superficial cervical plexus block on thyroid surgeries under general anaesthesia.

2. Methodology

This Double-Blinded, Prospective, Randomized, Observational Controlled study was performed after taking permission from Institutional Ethics Committee of Military Hospital, Mhow, Madhya Pradesh. The study was conducted from August 2022 to July 2024 in our hospital. Patients aged between 18 to 60 years, having American Society of Anesthesiologists (ASA) physical status I and II, and undergoing elective thyroid surgeries (should be less than 2 hours) were included in the study. Patients with ASA status III & above, allergy to local anaesthetic drug, bleeding disorder, surgical time exceeded 2 hours, pregnancy or not willing to attend the study were excluded. After taking written informed consent, 60 patients were randomized using coin method and allocated into two groups (Group G or Group B).

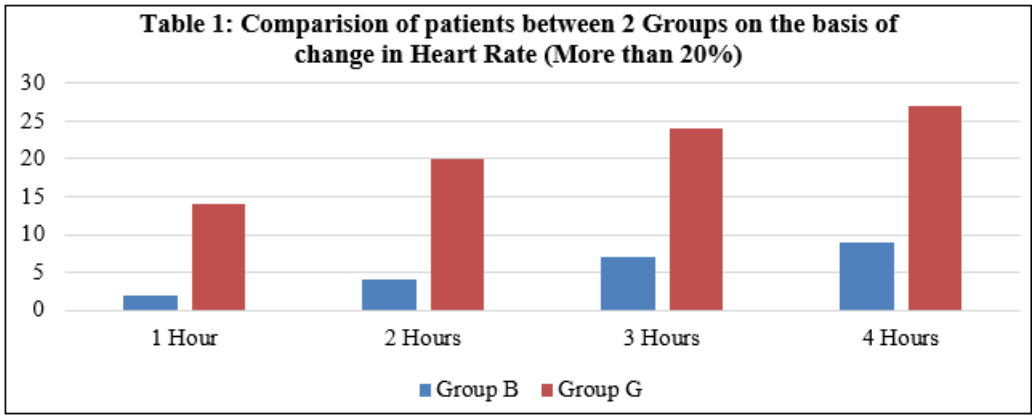
Patients in group B (n = 30) received bilateral Cervical plexus block with 10 mL of 0.5% Bupivacaine on both side of neck using USG guided technique after administration of General anaesthesia. Group G (n = 30) patients did not receive any block (control group). For blinding, gauze were applied on both sides of injection sites in patients in both groups. The patients were advised a fasting period of atleast 6 hrs. before surgery. In the pre-operative room, Intravenous access was secured. On arrival in the operating room, standard monitors including ECG, Non-invasive blood pressure and Pulse oximetry were applied and baseline values were recorded. All patients were given intravenously 0.2mg Inj. Glycopyrrolate, 1mg Inj.Midazolam before the induction of anaesthesia. General anaesthesia was induced following 3 min of preoxygenation with fentanyl 2 µg/kg and 3-5mg/kg Inj. Thiopentone given until response to verbal commands was lost. Succinyl choline 1.5-2 mg/kg was provided intravenously to assist tracheal intubation. Following induction of general anaesthesia, the pre-emptive nerve block was given on Group B.

For USG guided Superficial cervical plexus block, we placed the patient in supine position, with neck tilted on the opposite side. The skin is disinfected & transducer is placed on the lateral side of the nek, overlying the stenocleidomastoid (SCM) muscle at the level of midpoint (approx at the level of cricoid cartilage). Once the SCM has been identified, the transducer is moved posteriorly until the tapering posterior edge is positioned. Here we have to identified the brachial plexus &/or Interscalene groove. The cervical plexus is visible as a small collection of hypoechoic nodules immediately superficial to prevertebral fascia that overlies the interscalene groove. After identification of plexus, the needle is inserted and passed through the skin, platysma, & investing layer of deep cervical fascia, & the tip is placed adjacent to the plexus. Following negative aspiration, 10 ml of 0.5% Bupivaine is administered to envelop the plexus.

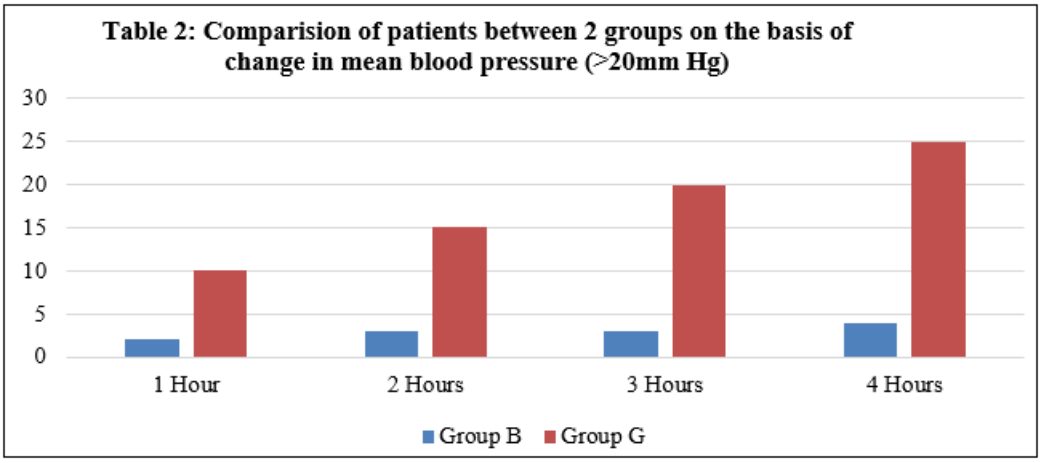
Anaesthesia was maintained with 1% Isoflurane & 33% Oxygen and 66% Nitrous oxide. Positive pressure ventilation was initiated with a tidal volume of 8 mL/ kg with an adjusted respiratory rate to maintain end-tidal carbon dioxide between 35 and 40 mmHg. The surgery was commenced 10 min later to allow for the full effect of the block. When the surgeon began skin suturing at the end of the surgery, Isoflurane administration was discontinued and the fresh gas flow rate was increased to 6 L/min of oxygen only. At the beginning of spontaneous breathing by the patient, the reversal of neuromuscular blockade was done with a standard dose of Neostigmine and Glycopyrrolate. The trachea was extubated when the patient spontaneously breathed with tidal volume 5–8 mL/kg and could respond to a verbal request. In the PACU, the quality of recovery was assessed using modified Aldrete scoring on arrival and then every 15 min until 60 min. On the same schedule, pain intensity was assessed using the pain Visual Analogue Scale (VAS), and the time taken for the first request of analgesia was noted (period from the PACU arrival to the first request made by the patient for rescue analgesics). Both for intraoperative & postoperative analgesia, we use Inj. Tramadol for mild to moderate pain and Inj. Fentanyl for severe pain. For any increase from 15%-20% in heart rate & blood pressure, we gave resuce analgesia. Patients having any complications like PONV, anxiety, etc. were noted.

3. Result

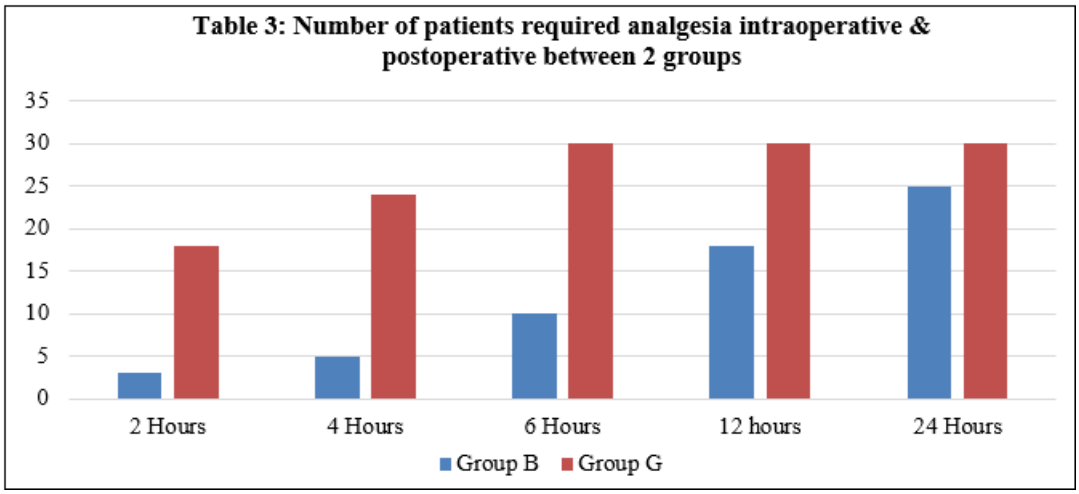
This study included 60 patients by Coin sampling method. Patient's demographic data were statistical non-significant with a p-value of more than 0.1. Mean age of patients were 34±0.8 years, Mean weight of patients were of 68±0.1 kgs, & Mean height of patients were 159±0.4cms. We had observed the analgesic requirement in both the groups, by measuring intraoperative & post-operative hemodynamic variation as well as post-operative VAS score. In table 1, we compared the mean heart rate during intra-operative & post-operative period. O hours is considered as time of induction. On comparing 2 groups, there was a very well differentiation of heart rate between 2 groups. As in group B, heart rate was very well maintained within normal range, with statistical significant (p-value< 0.003).



In Table 2, we compared the mean blood pressure during intraoperative & postoperative period. O hours is considered as time of induction. On comparing 2 groups, there was a significant difference in mean blood pressue between 2 groups. In group B, at different time interval blood pressure was not fluctuating from normal range, and it was statistically significant also (p-value< 0.003).



In table 3, we compared the analgesic requirement of patients both in intraoperative as well as postoperative period. 0 hour is considered as time of induction & time of cervical plexus block. During intraoperative period, only 3 patients required analgesic supplement in B group while a total of 18 patients required analgesic supplements in group G. And if we compared postoperative analgesic requirement, almost all 30 patients requires analgesic drug in group G while in group B, approx. 50% of the patients doesn't required analgesic drug upto 6 hours of surgery. Certain patients doesn't feel any pain upto 24 hours of surgery. We gave Inj. Tramadol for mild (VAS>3) to moderate (VAS 3-6) pain & Inj. Fentanyl for severe(VAS<7) pain duing postoperative period. For intraoperative period, we gave Inj. Tamadol as analgesic supplement. During postoperative period, patients of group G was having moderate to severe pain while patients of group B had only mild pain. 12 patients of group G had PONV while only 1 patient of group B had the same.



4. Discussion

During thyroid surgeries, the most common side effect is patient's discomfort along with intra-operative as well as post-operative pain. Thyroid surgical procedures can be associated with incidence of pain, bleeding and increased hospital stay, thereby delaying recovery. Multiple interventions are applied to the patient before, during and after surgery for the above reason's & the commonest be the combined use of Narcotic and NSAIDS. However, they can be associated with GIT and Neurological side effects, which may cause patient's discomfort.[17] Post-operative pain is characterized as acute inflammatory pain that originates with surgical trauma and typically resolves with tissue healing. When pain triggers, there is a release of catecholamines, which may precipitate cardiovascular incidents, undesirable neuro-endocrine or metabolic changes, thromboembolic events, pulmonary complications, and prolonged hospital stays.[18] After surgical procedures, pain becomes a significant factor influencing patient well-being. Early analgesic approaches or introduction of additional interventions, that aim to reduce the need for analgesics and improve patient well-being is become important.[19,20] Therefore, many patients often undergo treatment using a mix of non-opioid analgesic agents, or known as multimodal analgesia.[21] The main goal of this approach is to achieve a additive beneficial effect while reducing individual analgesic doses. This will not only helps in preventing adverse effects but also reduces dependence on opioids and its related side effects.[22,23] Commonly used non-opioid drugs included in multimodal analgesic strategies are Paracetamol, NSAIDs, Corticosteroids, Ketamine, Local anesthetics, and Gaba-pentinoids.[24]

Peripheral nerve blocks involve the injection of a local anesthetic drug near the nerve that serves the surgical area. These anesthetic drugs work by changing the sodium permeability of cell membranes, effectively halting nerve impulse transmission and leading to pain relief.[25] A distinctive feature of peripheral nerve blocks is their tendency to produce fewer side effects and complications, such as reduced swelling at the surgical site and lessened pain perception. With this background, we decided to conduct a study in which we gave bilateral cervical plexus blocks along with general anaesthesia for thyroid surgeries. This blocks not only provide the intra-operative hemodynamic stability but also decrease the post-operative overdose of intravenous analgesic drugs.[26] The efficacy of local anaesthetic infiltration technique combined with general anaesthesia during thyroid surgery has also shown decreased post-operative pain and opioid consumption. However, regional nerve blocks have an advantage over infiltration techniques due to various reasons, including reduced tissue distortion at the operative site and better pain control during handling of deeper tissues.

Certain studies had investigated the effectiveness of Bilateral Superficial Cervical Plexus Block (BSCPB) in thyroid surgery and reported that it was effective in minimizing Pain scores, Opioid and total analgesic consumption and prolonging analgesia duration [27-30]. A meta-analysis of 14 studies incorporated 1154 patients revealed Cervical Plexus Block significantly reduced analgesic requirement, VAS scores and lengthen time to first analgesic requirement [31]. BSCPB was found significantly associated with nearly shorter post-operative hospital staying days (2.4 ± 0.6 vs 4.7 ± 1.6; $p < 0.05$)[27]. In-contrast, some studies denied the effectiveness of BSCPB. The block had failed to demonstrate reduction in pain scores and opioid consumption. But longer time for first analgesic request was observed. They explained the result by pain arising from deeper and muscular structures, pain from positioning and wound drainages[32]. Despite these, pain after thyroidectomy was known to have large superficial component [33].

Different drug regimens, volumes, techniques of injections and duration of postoperative follow-up (36 h) might be possible causes for these contradictory conclusions[34]. Another study has concluded equi-vocal as BSCPB reduced pain intensity and analgesic requirement but could not provide optimal pain relief alone since 65% of patients need additional analgesia [35]. Performing the block after the surgery might have effect on this equi-vocal outcome. In another study, hospital stay and postoperative analgesic consumption were comparable even if patients in the block group had lesser VAS scores. These differences might be due to 4 days follow-up [36]. In a recent Egyptian study that compared landmark and ultrasound-guided techniques found no difference in effectiveness and safety[37]. However, another study has concluded that an ultrasound- guided technique had superiority and explained by direct visualization of the nerves, adjacent structures and needle movement that results in faster, denser and longer block[39]. Performing regional nerve blocks and administration of multi-modal analgesics prior to surgical incision are helpful in reducing intra- and postoperative opioid consumption, primary hyperalgesia, central sensitization and chronic pain [39-41].

In combination with gabapentin, BSCPB has prevented delayed neuropathic pain at 6th postoperative month [42]. Thyroidectomy without Plexus Block was three-times likely associated with neuropathic pain compared to thyroidectomy with Plexus Block[43]. Wound infiltration is effective choice of analgesia after thyroid surgery. But compared to Cervical Plexus Block, the later was found more effective. Time to first analgesia were 162 ± 124 min vs 544 ± 320 min vs 860 ± 59 min in control, wound infiltration and BSCPB groups respectively; $p < 0.001$ [44]. This analgesic duration was very long compared to our finding. This difference might be due to drug regimen as they used 15 ml of 0.5% bupivacaine and in the current study 10 ml of 0.25% bupivacaine. Two recent RCTs have declared that wound infiltration lacks effectiveness for treating pain after thyroidectomy; even in addition of adrenaline [45-46].

In our study, BSCPB along with general anaesthesia, not only decrease the time to PACU discharge following thyroid surgical procedures but also had a useful effect on post-operative pain management. Although the group receiving Cervical Plexus Block had a significantly longer mean time to first analgesia (8±4 hours versus 2±2 hours) when compared with the control group, the mean time to PACU discharge and the incidence of PONV was comparable between the groups and did'nt show early recovery. Our findings suggest that BSCPB administered to patients undergoing thyroid surgeries provide effective pain control

with minimal complications and reduce the dependence on peri-operative opioids. Our study also has the following limitations. The sensory testing was not done before surgery as the BSCPB were performed under general anaesthesia. Besides, post-operative sensory assessment of block was also hampered by the presence of surgical bruising and dressing.

5. Conclusion

Bilateral superficial cervical plexus block is effective in reducing the amount of general anesthetic agents required during thyroidectomy. It also significantly lowers the severity of post-operative pain during the first 24 hrs. and also shortens the hospital stay.

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