Original Article

Unilateral superficial cervical plexus block as pre-emptive analgesia for hemithyroidectomy under general anaesthesia

P V Bhale[1*], Pannag Bhusan Dasmohapatra[2]

[1]Professor, [2]PG Student, Department of Anaesthesia, MGM Medical College, Aurangabad, Maharashtra, INDIA.
Email: pramod.bhale@gmail.com

Abstract

Background and Aims: Superficial cervical plexus block is effective in reducing. pain following thyroid surgeries. We studied the sensory block onset time and duration of analgesia time on adding dexmedetomidine to ropivacaine for unilateral superficial cervical plexus block(USCPB) in patients undergoing hemithyroidectomy. **Methods:** Forty American Society of Anaesthesiologists (ASA) Class I or II adult patients who were scheduled to undergo hemithyroidectomy were randomly allocated to the following groups to receive unilateral superficial cervical plexus block: 9ml 0.5% Ropivacaine (Group C) or 9ml 0.5% Ropivacaine + 1 mcg/kg Dexmedetomidine (Group D) as USCPBs before induction of general anaesthesia. The sensory block onset time, duration of analgesia, mean arterial pressure (MAP), heart rate (HR), and the incidences of side effects, such as hypotension and bradycardia were recorded. **Results:** The addition of dexmedetomidine to ropivacaine (Group D) shortened the sensory block onset time compared with the ropivacaine group (Group C) ($p < 0.05$). The duration of analgesia of cervical plexus block in Group D was significantly longer than that in Group C ($p < 0.001$). The Ramsay sedation score after extubation in Group D was significantly higher than that in Group C ($p < 0.05$). MAP level and HR level in Group D were significantly lower than that in Group C ($p < 0.05$). **Conclusion:** The addition of 1 mcg/kg dexmedetomidine to ropivacaine for cervical plexus block could shorten the sensory block onset time and extend the duration of analgesia, and increase the quality of analgesia than with 0.5% ropivacaine alone in patients undergoing hemithyroidectomy.

Keywords: Unilateral superficial cervical plexus block, Hemithyroidectomy, Ropivacaine, Dexmedetomidine, General anaesthesia, Pre-emptive analgesia.

[*]**Address for Correspondence:**
Dr. Professor, Department of Anaesthesia, MGM Medical College, Aurangabad, Maharashtra, INDIA.
Email: pramod.bhale@gmail.com

Received Date: 16/08/2016 Revised Date: 18/09/2016 Accepted Date: 12/10/2016

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	DOI: 20 October 2016

INTRODUCTION

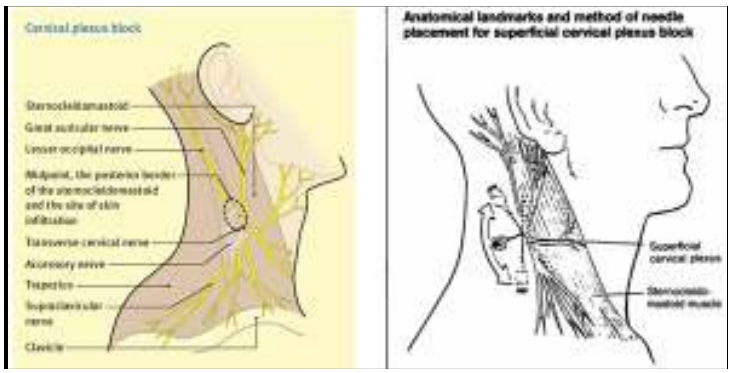
Superficial cervical plexus block (SCPB) has been found to be very effective in procedures of neck such as thyroid surgeries, clavicular surgery, carotid endarterectomy and tracheostomy. The use of regional anaesthesia in combination with general anaesthesia reduce the requirements for opioid analgesics and provide prolonged postoperative analgesia. Thyroid surgery is considered to be moderately painful with a mean postoperative pain score of 6.9 on a visual analog scale (VAS) from 0 to 10. Recent reports suggest that patients experience a significant amount of pain, especially in the early postoperative hours despite modern and less invasive surgical techniques. In addition, thyroid surgery is reported to be associated with a high risk of postoperative nausea and vomiting (PONV). Analgesics inducing nausea or vomiting, such as opioids or nefopam, should be avoided. We hypothesized that the unilateral superficial cervical plexus block will reduce the intraoperative anaesthetic requirements and prolong the postoperative analgesia in patients undergoing hemithyroidectomy. The aim of this study is to evaluate the intra- and postoperative analgesic efficacy of unilateral superficial cervical plexus block for hemithyroidectomy surgeries.

MATERIAL AND METHOD

After ethical committee approval and informed written consent, 40 adult patients ASA physical status I-II scheduled for elective hemithroidectomy under general

How to site this article: P V Bhale, Pannag Bhusan Dasmohapatra. Unilateral superficial cervical plexus block as pre-emptive analgesia for hemithyroidectomy under general anaesthesia. *MedPulse – International Medical Journal.* October 2016; 3(10): 903-907. http://www.medpulse.in (accessed 24 October 2016).

anaesthesia were eligible for the study. Exclusion criteria include history of allergy to the drugs used, local sepsis, bleeding disorder, diaphragmatic motion abnormality, inability to understand the study protocol or pain scale and patients under medications that would influence autonomic or cardiovascular responses to the surgery. Patients were premedicated with midazolam (0.03 mg/kg IV). Patients were allocated randomly into two equal groups, to receive either 9ml 0.5% Ropivacaine (Group C) or 9ml 0.5% Ropivacaine + 1 mcg/kg Dexmedetomidine (Group D) as USCBs before induction of general anaesthesia. Using a three-point injection technique, 9 ml of the prepared mixture was injected using a 23-gauge needle, inserted at the midpoint of the sternocleidomastoid muscle, corresponding to the C3 transverse apophysis, in three directions. Six mL of the solution was injected up and down at the posterior border of the sternocleidomastoid muscle to block the occipital, auricular, and supraclavicular branches of the superficial cervical plexus and 3 mL was injected horizontally above the muscle to block the transverse cervical nerve. After establishing standard monitoring, anaesthesia was induced with pentazocine 0.5 mg/kg IV and propofol 2mg/kg IV. Orotracheal intubation was facilitated by the administration of atracurium 0.5mg/kg IV. Anaesthesia was maintained with isoflurane in a N2O/ O2 (50/50) mixture. Mean arterial blood pressure and heart rate were recorded after administration of block, every 5 min (the values during every hour of surgery were averaged to give a single mean value) and at 1 h after recovery. At the completion of surgery, isoflurane was discontinued and residual neuromuscular block was antagonized with neostigmine 0.05 mg/kg and glycopyrollate 0.01mg/kg. Visual analogue score were recorded at (1 h, 2 h, 6 h, 12 h, 24 h) postoperatively. Diclofenac sodium 75 mg i.v was used as a rescue analgesic when VAS score was more than 5. Postoperative monitoring of side effects related to the cervical plexus block were recorded (such as phrenic nerve block, brachial plexus block, vagus nerve block, Horner's syndrome). Any episodes of bradycardia (HR<40 beats/min), hypotension (MAP<65 mm Hg), nausea, vomiting, and excessive sedation were recorded during the first 24 h after surgery. The primary outcome was the duration of analgesia of cervical plexus block in both groups. The secondary outcomes include hemodynamic differences between the groups. The quality of analgesia and all adverse events related to surgery and the regional anaesthetic technique were also recorded.



Statistical Analysis

Results were expressed as mean ± SD, analyzed using tests of significance to identify the variables significantly to differences in different groups: Paired t– test, student t-test. We used Fisher's Exact Test to compare between numbers of patients in each group. Statistical significance was considered at the level of p<0.05.

RESULTS

Table 1: Demographic data associated with two groups

	Group D (n=20)	Group C (n=20)
Age (y)	33.30 ± 5.17	33.15 ± 6.71
Sex (F/M)	3/17	4/16
Weight (kg)	55.25 ± 3.95	53.65 ± 5.33
Duration of surgery (min)	109.13 ± 12.37	113.48 ± 11.84

Values are presented as mean standard error or number of patients. There were no significant differences between groups.

Table 2: Characteristics of superficial cervical plexus block

	Group D (n=20)	Group C (n=20)	p
Onset time of sensory block (min)	4.72 ± 1.15	6.64 ± 1.27	<0.05
Duration time of sensory block (min)	403.54 ± 16.18	249.52 ± 24.25	<0.001

Values are presented as mean standard error.

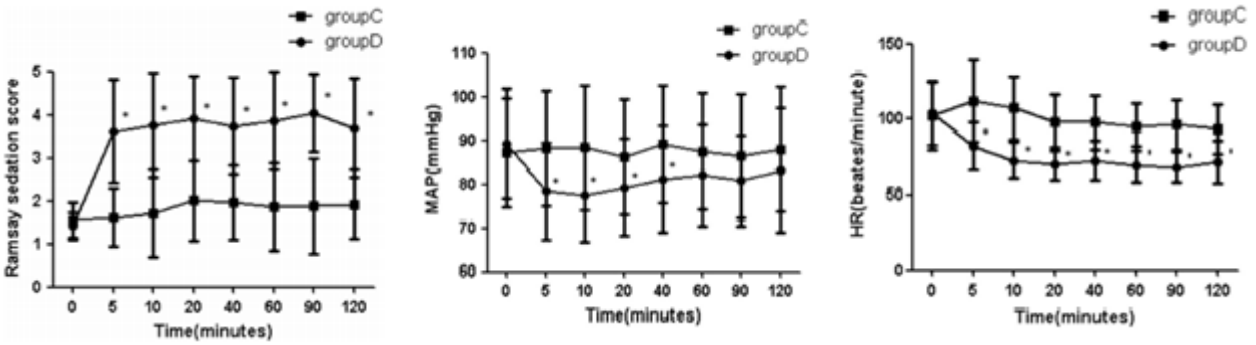


Figure 1: The Ramsay sedation score for the groups after extubation. Asterisks indicate time points of a statistically significant difference ($p < 0.05$) when the groups were compared.

Figure 2: Mean arterial pressure (MAP) for the groups after administration of block. Asterisks indicate time points of a statistically significant difference ($p < 0.05$) when the groups were compared.

Figure 3: Heart rate (HR) for the groups after administration of block. Asterisks indicate time points of a statistically significant difference ($p < 0.05$) when the groups were compared.

RESULTS

The Demographic data were similar in each group (Table 1). The Sensory block onset time in Group D is shorter than in Group C; the difference was statistically significant (Table 2, $p < 0.05$). The Sensory block duration time in Group D is longer than in Group C; the difference was statistically significant (Table 2, $p < 0.001$). The Ramsay sedation score at 5, 10, 20, 40, 60, 90, and 120 minutes after extubation in Group D was significantly higher than in Group C. (Fig. 1, $p < 0.05$). The Mean Arterial Pressure(MAP) level in Group D at 5, 10, 20, and 40 minutes was significantly lower than in Group C (Fig. 2, $p < 0.05$). The Heart Rate(HR) in Group D at 5,10, 20, 40, 60, 90, and 120 minutes was significantly lower than in Group C. (Fig. 3, $p < 0.05$).

DISCUSSION

The main result of our study demonstrated that the addition of 1 mg/kg dexmedetomidine to ropivacaine for cervical plexus block can shorten sensory block onset time and extend the duration of analgesia. Administering the block prior to the incision as pre-emptive analgesia is more effective because an analgesic treatment initiated before, as opposed to after the surgical procedure, protects the central nervous system from the deleterious effects of noxious stimuli, and the patient from the resulting allodynia and increased pain[9]. Ropivicaine was chosen for its lesser cardiac toxicity compared with bupivacaine[8]. Aunac and colleagues have demonstrated the safety of ropivacaine 0.5% for combined superficial and deep cervical plexus block in thyroid surgery[6]. Meanwhile, study Group D had more hemodynamic stability than Group C. The Ramsay sedation score was higher in Group D, so we predict that the local area use of dexmedetomidine also can produce sedation. Although dexmedetomidine is commonly used as an intravenous agent, interest in the addition of perineural dexmedetomidine to local anaesthetic is increasing. In a volunteer study, perineural dexmedetomidine with 0.75% ropivacaine prolonged block of ulnar nerve by 60%, while systemic administration of 20 µg dexmedetomidine resulted in only 10% prolongation of the same, suggesting the peripheral effect of dexmedetomidine when added to the local anaesthetic[8]. Esmaoglu *et al*[3] and Ammar and Mahmoud[10] showed that the use of dexmedetomidine was safe as an addition in local anaesthetic for brachial plexus block. Another study[11] carried out on volunteers showed that dexmedetomidine could be used as an additive to local anaesthetics for various regional anaesthetic techniques, while simultaneously prolonging perineural nerve block. Dexmedetomidine is well known as a highly selective a2 adrenoreceptor agonist shown to have both sedative and analgesic effects[12-14]. Its intravenous role has been well recognized as sedative, analgesic and anxiolytic without any respiratory depression[15,16]. It is well known that in peripheral myelinated and nonmyelinated fibers, membrane hyperpolarization develops that can produce sensory effects and pain during or after stimulation and mainly results from the activation of the sodium-potassium pump after the transient influx of sodium ions[17]. Dalle *et al*[18] found that clonidine (an a2 adrenoreceptor agonist) enhances the sensory blockade by blocking the inhibiting hyperpolarization activated cation current to enhance the level of hyperpolarization and thus inhibits subsequent action potentials. Another effect may be the mechanism of a2 adrenoreceptor agonist in peripheral nerve by reducing release of norepinephrine and causing a2 receptor independent inhibitory effects on nerve fibre action potentials. The use of clonidine in peripheral nerve blocks has been reported to be safe and beneficial (it prolongs the duration of anaesthesia and

analgesia) by Singelyn *et al*[19,20]. Dexmedetomidine is a selective a2 adrenoreceptor agonist similar to clonidine; its effect on the peripheral nerve may be the same as or more potent than that of clonidine. In studies on humans, Esmaoglu *et al*,[3] Kaygusuz *et al*,[4] and Rancourt *et al*[21] showed that dexmedetomidine was safe when used as an addition to local anaesthetic for brachial plexus block and posterior tibial nerve sensory blockade. Esmaoglu *et al*[3] and Kaygusuz *et al*[4] also showed that when dexmedetomidine is used as an addition to local anaesthetic, it can provide faster onset and longer duration for brachial plexus block, but resulted in some side effects, such as hypotension and bradycardia. On the basis of our discussions, we assumed that the addition of dexmedetomidine to the local anaesthetic for cervical plexus block could provide the same effect as that of the study by Esmaoglu *et al*[3]. In our study, the addition of dexmedetomidine (1 mcg/kg) to local anaesthetics extended the duration of anaesthesia and increased the quality of analgesia, and patients were sedated and arousable, thus avoiding the use of intravenous sedatives that may induce respiratory depression. The possible mechanism is that the dual role of dexmedetomidine of the central and peripheral, which include slight intravenous effect that cause by the tissue capillary absorption and its direct effect on the peripheral nerves. Dexmedetomidine has a double effect, playing an central sympatholytic role and activating the vagus nerve to lower plasmas catecholamine levels which can lower blood pressure BP and HR, providing stable hemodynamics. However, it also has a dosage related inhibition for BP and HR. Esmaoglu *et al*[22] showed some side effects such as hypotension and bradycardia in their test group (100 mcg of dexmedetomidine added to levobupivacaine for brachial plexus block), along with its effects such as sedation and anxiolysis. In our study, HR in Group D was lower than that of the Group C, but the incidence of bradycardia was lower than that recorded in the study by Esmaoglu *et al*[22] (2/20 vs. 7/30); the difference may be because the dose of dexmedetomidine (1 mcg/kg vs. 100 mcg) was lower in our study, and was tolerant and reversible without adverse effects to the patients. In conclusion, USCPB is an effective technique to reduce analgesic requirements during and after hemithyroidectomy surgeries. The addition of 1 mcg/kg dexmedetomidine to ropivacaine for cervical plexus block can decrease sensory block onset time and extend the duration of analgesia, and increase the quality of analgesia. Our data suggest that it is possible to manage pain after thyroid surgery with regional anaesthesia. Further studies are needed to determine the safe optimal dose of dexmedetomidine adding to local anaesthetics for cervical plexus block.

REFERENCES

1. Motamed C, Merle JC, Yakhou L, *et al*. Intraoperative i.v. morphine reduces pain scores and length of stay in the post anaesthetic care unit after thyroidectomy. Br J Anaesth 2004; 93: 306–7
2. Panzer O, Moitra V, Sladen RN. Pharmacology of sedative-analgesic agents: dexmedetomidine, remifentanil, ketamine, volatile anaesthetics, and the role of peripheral mu antagonists. Anesthesiol Clin 2011;29:587e605.
3. Esmaoglu A, Mizrak A, Akin A, Turk Y, Boyaci A. Addition of dexmedetomidine to lidocaine for intravenous regional anaesthesia. Eur J Anaesthesiol 2005;22: 447e51.
4. Kenan Kaygusuz, Iclal Ozdemir Kol, Cevdet Duger, Sinan Gursoy, Hayati Ozturk, Ulku Kayacan. Effects of adding dexmedetomidine to levobupivacaine in axillary brachial plexus block. Curr Therapeutic Res 2012;73:103e11.
5. Plunkett AR, Shields C, Stojadinovic A, Buckenmaier CC. Awake thyroidectomy under local anaesthesia and dexmedetomidine infusion. Mil Med 2009;174: 100e2.
6. Aunac S, Carlier M, Singelyn F, De Kock M. The analgesic efficacy of bilateral combined superficial and deep cervical plexus block administered before thyroid surgery under general anesthesia. Anesth Analg 2002; 95: 746–50
7. Brummett CM, Amodeo FS, Janda AM, Padda AK, Lydic R. Perineural dexmedetomidine provides an increased duration of analgesia to a thermal stimulus when compared with a systemic control in a rat sciatic nerve block. Reg Anesth Pain Med 2010;35:427e31.
8. Marhofer D, Kettner SC, Marhofer P, Pils S, Weber M, Zeitlinger M. Dexmedetomidine as an adjuvant to ropivacaine prolongs peripheral nerve block: A volunteer study. Br J Anaesth 2013;110:438-42
9. Al-Mujadi H, A-Refai AR, Katzarov MG, Dehrab NA, Batra YK, Al-Qattan AR. Preemptive gabapentin reduces postoperative pain and opioid demand following thyroid surgery. Can J Anaesth. 2006;53:268–273
10. Ammar AS, Mahmoud KM. Ultrasound-guided single injection infraclavicular brachial plexus block using bupivacaine alone or combined with dexmedetomidine for pain control in upper limb surgery: A prospective randomized controlled trial. Saudi J Anaesth 2012;6:109.
11. Marhofer D, Kettner S, Marhofer P, Pils S, Weber M, Zeitlinger M. Dexmedetomidine as an adjuvant to ropivacaine prolongs peripheral nerve block: a volunteer study. Br J Anaesth 2012;109:923e7.
12. Kauppila T, Kemppainen P, Tanila H, Pertovaara A. Effect of systemic medetomidine, an alpha 2 adrenoceptor agonist, on experimental pain in humans. Anesthesiology 1991;74:3e8.
13. Venn RM, Bradshaw CJ, Spencer R, Brealey D, Caudwell E, Naughton C, *et al*. Preliminary UK experience of dexmedetomidine, a novel agent for postoperative sedation in the intensive care unit. Anaesthesia 1999;54:1136e42.
14. Baba Y, Kohase H, Oono Y, Fujii-Abe K, Arendt-Nielsen L. Effects of dexmedetomidine on conditioned

pain modulation in humans. Eur J Pain 2012;16: 1137e47.
15. Aantaa R. Dexmedetomidine, a novel alpha 2-adrenergic agonist. A review of its pharmacodynamic characteristics. Drugs Future 1993;10:49e56.
16. Frangoulidou E, Kuhlen R, Marenghi C. Sedative agents and respiratory depression: a unique profile of dexmedetomidine. In: International congress and symposium Series-Royal Society of Medicine, vol. 221. Royal Society Of Medicine Services LTD; 1998. p. 41e50.
17. Malmberg AB, Hedley LR, Jasper JR, Hunter JC, Basbaum AI. Contribution of a2 receptor subtypes to nerve injury-induced pain and its regulation by dexmedetomidine. Br J Pharmacol 2009;132:1827e36.
18. Dalle Carine, Schneider Markus, Clergue François, Bretton Christine, Jirounek Petr. Inhibition of the Ih current in isolated peripheral nerve: A novel mode of peripheral antinociception? Muscle Nerve 2001;24:254e61.
19. Singelyn FJ, Gouverneur JM, Robert A. A minimum dose of clonidine added to mepivacaine prolongs the duration of anaesthesia and analgesia after axillary brachial plexus block. Anesth Analg 1996;83:1046e50.
20. Singelyn F, Dangoisse M, Bartholomée S, Gouverneur JM. Adding clonidine to mepivacaine prolongs the duration of anaesthesia and analgesia after axillary brachial plexus block. Reg Anesth 1992;17:148.
21. Rancourt MPM, Albert NT, Côté M, Létourneau DR, Bernard PM. Posterior tibial nerve sensory blockade duration prolonged by adding dexmedetomidine to ropivacaine. Anesth Analg 2012;115:958e62.
22. Esmaoglu A, Yegenoglu F, Akin A, Turk CY. Dexmedetomidine added to levobupivacaine prolongs axillary brachial plexus block. Anesth Analg 2010;111:1548e51.

Source of Support: None Declared
Conflict of Interest: None Declared