Thyroid Surgery under Cervical Plexus Block - An Observational Study from West Bengal, India

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ABSTRACT

BACKGROUND

Thyroid surgery for small solitary nodule can be done under cervical plexus block. The purpose of this study was to evaluate patients in terms of haemodynamic changes, pain during surgery, conversion to general anaesthesia (GA), hospital stay and complications.

METHODS

This is an observational study conducted among 30 patients who were given 20 ml (10 ml lignocaine 1 % with adrenaline + 10 ml of ropivacaine 0.5 %) on the operating side for deep and superficial cervical plexus block and 10 ml (5 ml lignocaine 1 % with adrenaline + 5 ml of ropivacaine 0.5 %) on the opposite side for superficial cervical plexus block. During the waiting time an infusion of dexmedetomidine was started 1 mcg / kg body weight for the first 10 minutes and then 0.5 mcg / kg body weight throughout the operating time. Patients were followed up for 4 hours postoperative to assess requirement of analgesics and 24 hours for readiness of discharge.

RESULTS

Data was collected using MS Excel software. Paired t-test was done to find the significance. Among 30 patients, 5 patients had to be converted to general anaesthesia, rest 25 patients were haemodynamically very stable during surgery and there was no episode of bradycardia due to dexmedetomidine. Analgesia lasted for 3 - 4 hours and patients were very stable by 12 hours and converted to oral analgesics.

CONCLUSIONS

It is quite safe to perform surgery on thyroid nodules less than 10 cms in size under cervical plexus block using lignocaine and ropivacaine.

KEYWORDS

Cervical Plexus Block, Dexmedetomidine, Lignocaine, Ropivacaine, Thyroid Nodule

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BACKGROUND

Thyroid surgery was previously considered safer with general anaesthesia but now with new dimensions like monitored anaesthesia care and day care surgery being the norm, local anaesthesia (LA) is an alternative to general anaesthesia for most thyroid gland surgeries. This is possible mainly due to the newer intravenous drugs e.g., dexmedetomidine and local anaesthetic agents which allows effective sedation and analgesia that can be adjusted for level and duration of action. Local or regional anaesthesia (LA / RA) is mostly used for post-operative pain. With the advent of new drugs and various techniques of local anaesthesia, thyroid surgery can be done under cervical plexus block (CPB) also. CPB can also provide better post-operative pain relief than GA and in addition there are fewer side effects like sedation and nausea. Thyroid surgery under CPB is both cost effective and safer as the patient is conscious throughout the operative time and can communicate, so any complications can be detected early. Extensive monitoring has to be done during anaesthesia and surgical procedure to meet patients comfort and surgeon requirement. Over the last few years, there has been an increase in number of thyroid operations under local anaesthesia. Cervical plexus block and Infiltration anaesthesia are the two types of local anaesthesia given for thyroidectomy, both can provide good analgesia.[1] When given solely, they can avoid major side effects of general anaesthesia.[2] In addition, the analgesia continues in the post-operative period, the autonomic and endocrine stress of surgery is decreased leading to rapid recovery. Cervical plexus blocks are usually given only for postoperative analgesia which is used as a supplement for thyroid surgery done under general anaesthesia.[3,4,5] Careful patient selection and counselling is very important for doing any surgery under LA. Thyroid nodule less than 10 cm can be done effectively under cervical plexus block. Though various literature states that large thyroid tumours / Ca thyroid / multinodular thyroid was done under local anaesthesia, but our team found that conversion to general anaesthesia was frequent when nodules were more than 10 cm.[6,7]

We wanted to analyse the characteristics of patients undergoing surgery for a solitary small (< 10 cm) single nodule of thyroid under cervical plexus block supplemented with intravenous dexmedetomidine infusion.

Primary Objectives

1. To assess the degree of pain felt by the patients intraoperatively and 4 hours postoperatively, using the "Sounds, Eyes, and Motor (SEM) scale for measuring the comfort or discomfort".
2. To evaluate the haemodynamic changes due to pain.

Secondary Objectives

1. To calculate the proportion of patients who were converted to GA.
2. To determine the complications if any, among the study subjects.
3. To evaluate the 24-hour readiness for discharge using the "Post anaesthesia Discharge Scoring System (PADS)" for determining home-readiness.

METHODS

This is an observational study conducted from June 2020 to November 2020 among euthyroid patients aged between 30 – 50 years of both sexes belonging to American Society of Anaesthesiologist (ASA I and II category) weighing 60 - 70 kg at general surgery OT of our institution, a Tertiary Care Medical College. Ethics committee approval was obtained bearing the reference number DHGMC / 2020 / 349 / 1. The type of local anaesthesia was discussed in detail once during pre-anaesthesia check-up (PAC) and also preoperatively with all patients and option for conversion to general anaesthesia any time during surgery was also given. The patient made their decision regarding the type of anaesthesia to be used during operation after fully comprehending the procedure. A written informed consent was taken from the patients.

Inclusion Criteria

The study was conducted on first 30 euthyroid patients of ASA I and II category, age 30 - 50 years of both sexes, weight 60 - 70 kg.

Exclusion Criteria

Patient refusal, nodule exceeding 10 cm, substernal extension of the nodule if suspected, allergy to local anaesthesia, obese short neck or diagnosis of obstructive sleep apnoea, reoperation, concomitant neck dissections if required, ASA III and more, coagulation profile deranged.

All cases were performed by a single surgeon team. Intervention and blocks have been given by co Anaesthetist expert in the field, principal investigator and co-investigator has just observed and noted the result.

All patients were premedicated with Lorazepam (2 mg) on the previous night. On arrival to the operative room IV cannulation was done in all patients with 18 - gauge needle, standard monitors were attached, and the patient was sedated with IV Midazolam - 2 mg.

Local anaesthetic drugs used were 20 ml (10 ml lignocaine 1 % with adrenaline + 10 ml of ropivacaine 0.5 %) on the operating side divided for deep and superficial cervical plexus block. (9 ml for deep and 11 ml for superficial). On the opposite side 10 ml (5 ml lignocaine 1 % with adrenaline + 5 ml of ropivacaine 0.5 %) for superficial Cervical plexus block only.

Since a motor block was not required, a lower concentration of local anaesthetic were used. Though there are many techniques regarding the superficial cervical plexus block, we have given the classical technique which is described as subcutaneous injection of the local anaesthetic

drug, which was found clinically effective for carotid endarterectomy.[8]

After proper antiseptic dressing, proposed cervical site for superficial and deep cervical plexus block was identified. For the deep cervical plexus block, the transverse process of C6 was palpated behind the clavicular head of the sternocleidomastoid muscle at the level just below the cricoid cartilage and a line was drawn connecting the mastoid process (MP) to the Chassaignac tubercle (transverse process of C6 vertebrae). The insertion sites over the C2, C3, and C4, were labelled, which are respectively located on the MP – C6 line 2 cm, 4 cm, and 6 cm, respectively, caudal to the mastoid process.

The skin was cleaned with an antiseptic solution, local anaesthetic was infiltrated subcutaneously along the line estimating the position of the transverse processes. 3 ml of local anaesthetic was given per level when the needle contacts the posterior tubercle of the transverse process where the spinal nerves at the individual levels are located just in front of the transverse process.[9]

Precautions taken were, the block needle was inserted between the palpating fingers and advanced at an angle perpendicular to the skin with slightly caudally oriented to prevent inadvertent insertion of the needle towards the cervical spinal cord. Before injecting the local anaesthetic, negative aspiration for blood was also checked. The onset time for this block is 10 – 15 min. The first sign of onset is decreased sensation in the distribution of the respective components of the cervical plexus.[9]

For the superficial cervical plexus block, a line extending from the mastoid process to C6 was drawn. The site of needle insertion was at the midpoint of this line. This is where the branches of the superficial cervical plexus emerge from behind the posterior border of the sternocleidomastoid muscle. Using a "fan" technique with superior-inferior needle redirections, the local anaesthetic was injected alongside the posterior border of the sternocleidomastoid muscle 2–3 cm below and then above the needle insertion site. The goal was to achieve blockade of all four major branches of the superficial cervical plexus. Superficial cervical plexus block was given with 11 mL of local anaesthetic (3 – 5 mL per each redirection / injection). Using the same technique superficial cervical plexus block was given on the opposite side with 10 mL of local anaesthetic (3 – 5 mL per each redirection / injection).

Deep needle insertion of the needle was avoided. The goal of the injection was to infiltrate the local anaesthetic subcutaneously and behind the sternocleidomastoid muscle. (e.g., > 1 – 2 cm).[9] After 10 minutes, anaesthesia was checked in the regions supplied by the cervical plexus by pin prick method.

During the waiting time, an infusion of dexmedetomidine was started 1 µg / kg body weight for the first 10 minutes and the 0.5 µg / kg body weight throughout the operating time. After 15 minutes, the surgeon was asked to check for anaesthesia once again and after proper antiseptic dressing and draping, operation was started. Patient was able to respond to verbal commands throughout the operation. If patient complained of pain, dexmedetomidine infusion was increased by 0.1 µg / kg but if pain was intolerable, patient was converted to general anaesthesia.

Position of the patient and operative field preparation was done as in surgery under general anaesthesia, but the draping was done in such a way to expose patient's mouth and nose to allow continued communication and spontaneous breathing. If required, supplemental oxygen was given at 2 litre / min flow via nasal cannula. Continuous communication with the patient assured the surgeon about the safety of the procedure and also if there was any inadvertent injury to the recurrent laryngeal nerves.

During OT, blood pressure (BP), heart rate (HR), oxygen saturation (Spo2) and the Ramsay Sedation Score was measured at 5-minute interval.[10]

Score Response

1. Anxious or restless or both
2. Cooperative, orientated and tranquil
3. Responding to commands
4. Brisk response to stimulus
5. Sluggish response to stimulus
6. No response to stimulus

Post op, the patient was asked about the pain score during OT and pain score was followed up to 4 hour post-operatively. For pain during operation the "Sounds, Eyes, and Motor (SEM) scale for measuring the comfort or discomfort" was used[11.] If score was 2, Dexmedetomidine infusion was increased and if score was 3, patient was converted to GA (Table 1)

Parameter	Comfort 1	Mild Discomfort 2	Moderate Discomfort 3	Severe Discomfort 4
Sound	No sound	Non-specific sound	Verbal complaint, louder sound	Verbal complaint, shouting and crying
Eye	No sign	Dilated eyes without tears (anxiety sign)	Tears, sudden eye movements	Crying, tears covering the face
Motor	Relaxed body and hand status	Muscular contraction, contraction of hands	Sudden body and hand movements	Hand movement for defence, turning the head to opposite side

Table 1. Sounds, Eyes and Motor (SEM) Scale for Measuring the Comfort or Discomfort

Statistical Analysis

Data was calculated using Excel software. Paired t-test was done to find the significance.

RESULTS

30 patients were considered for study, but 5 patients had to be converted to general anaesthesia either due to inadequate block or surgeons decided to extend the incision and explore the opposite side of thyroid lobe. The demographics and baseline haemodynamics were

comparable in all patients. Surgery in all cases lasted between 60 - 90 min.

Basal SBP ± SD / DBP ± SD	Different Time Intervals	BP at Different Time Intervals - SBP ± SD / DBP ± SD	Significance
127.28 ± 9.84 / 78.16 ± 7.74	At skin incision and platysma incision	12.64 ± 14.25 / 76.88 ± 7.57	P > 0.05
	Deep fascia opened vertically	124.80 ± 12.38 / 78.16 ± 7.78	P > 0.05
	Pre-tracheal fascia opened, thyroid gland mobilised and removed	122.48 ± 11.09 / 78.5 ± 6 7.01	P > 0.05
	Wound closure	124.16 ± 8.12 / 77.92 ± 6.51	P > 0.05
	Post op 1hr	121.92 ± 9.61 / 79.36 ± 6.04	P > 0.05
	Postop 2 hrs	121.04 ± 12.11 / 80.08 ± 8.13	P > 0.05
	Postop 3 hrs	124.56 ± 10.63 / 79.36 ± 8.93	P > 0.05
	Postop 4 hrs	126.64 ± 8.40 / 79.04 ± 7.44	P > 0.05

Table 2. Blood Pressure Changes with Different Time Intervals

Basal HR ± SD	Different Time Intervals	Heart Rate at Different Time Intervals HR ± SD	Significance
79.62 ± 2.12	At skin incision and platysma incision	76.64 ± 0.27	P > 0.05
	Deep fascia opened vertically	89.20 ± 0.24	P > 0.05
	Pre-tracheal fascia opened, thyroid gland mobilised and removed	83.76 ± 0.45	P > 0.05
	Wound closure	83.76 ± 0.04	P > 0.05
	Post op 1hr	82.40 ± 0.32	P > 0.05
	Postop 2 hrs	81.44 ± 1.33	P > 0.05
	Postop 3 hrs	81.04 ± 1.42	P > 0.05
	Postop 4 hrs	82.00 ± 1.63	P > 0.05

Table 3. Heart Rate Changes with Different Time Interval

Of the initial 30 patients, 2 patients showed signs of extreme discomfort so they were changed to GA as we concluded the block was inadequate. 2 patients were not responding to stimulus, so they were intubated as they were desaturating. On 1 patient, surgeons decided to explore further due to bleeding and was thus converted to GA. Of the rest 25 patients, 15 patients were anxious or restless or both before the start of OT, at the dressing and draping stage. 5 patients were cooperative and orientated and 5 patients were responding to commands and stimulus. Patients were checked every 5 minutes and results were noted down every 15 minutes. With the maintenance dose of Dexmedetomidine, all patients settled down and average 20 had a Ramsay Sedation Score (RSS) of 3 throughout the operating time and rest had a score of 2. All patients were calm and cooperative and responding to verbal command. 1 or 2 patients at some point of time showed a brisk response to stimulus. All patients responded to verbal stimulus. (Table 4)

Ramsay Sedation Score	1	2	3	4	5	6
0 min	15	5	5			
15 min		4	19	2		
30 min		4	20	1		
45 min		4	19	1		
60 min		3	20	2		
1 hr 15 min		4	19	1		
1hr 30 min		4	20	1		

Table 4. Ramsay Sedation Score

For the Sounds, Eyes, and Motor (SEM) scale for measuring the comfort or discomfort the patient showed comfort (Score 1 — 15 patients) or mild discomfort (score 2 - 10 patients) with nonspecific sounds. Dexmedetomidine dose was increased by 0.1 µg / kg body weight till the patient was comfortable again. (Table 5.)

Parameter	Comfort 1	Mild Discomfort 2	Moderate Discomfort 3	Severe Discomfort 4
Sound	15 No sound	8 Non-specific sound		
Eye	15 No sign	Dilated eyes without tears (anxiety sign)		
Motor	10 Relaxed body and hand status	10 Muscular contraction, contraction of hands		

Table 5. Sounds, Eyes, and Motor (SEM) Scale for Measuring the Comfort or Discomfort

There was no incidence of pulse rate below 50 or hypertension (Table 2 and Table 3). Post op rescue analgesia used was aqueous solution of Diclofenac Sodium - 75 mg IV.

In the case of thyroid and parathyroid surgery, there is a risk of bleeding, so we kept and observed each patient for pain and bleeding for 4 hours after the operation in high dependency units (HDU) and then shifted them to ward. Patients were usually fit enough to be discharged on the same day but some patients required an overnight stay. Post-anesthesia Discharge Scoring System (PADS) for determining home-readiness was used. Patient scoring more then 9 was fit for discharge.[12] 11 patients were discharged on the same day but due to transport issues at night, 7 patients were reluctant to go home. 2 had slight bleeding at the incision site and 3 patients complained of nausea and pain in abdomen probably due to Diclofenac Na. 2 patient had hoarseness of voice so were kept in observation. All these patients were discharged on the next day in the evening. Mean duration of hospital stay was 36 hours.

DISCUSSION

Cervical plexus blocks are usually given for postoperative analgesia in thyroid surgery that are done under general anaesthesia. We observed that thyroid surgery can be safely performed solely under cervical plexus block using the local anaesthetics chosen for this study. Various literature states that large thyroid tumours were done under local anaesthesia, but our team found that conversion to general anaesthesia was frequent when nodules were more than 10 cm. In our study, only 1 thyroid nodule done was 9.3 cm, rest average diameter was 5 - 6 cm with 5 in the 6 - 7 cm range. The blood pressure, heart rate and pain were well controlled. Operations of small thyroid nodules do not need general anaesthesia and patient can be safely discharged on the day of surgery after an observation period of 8 - 10 hours. Cervical epidural is another option for thyroid surgery. Risk of epidural venipuncture, migration of local anaesthetic solution into subarachnoid space, failed epidural puncture, bloody epidural tap and chances of respiratory compromise are the side effects of cervical epidural. Other risk of cervical epidural is there may be considerable fall in post-induction cardiorespiratory parameters, though these effects are clinically insignificant and well tolerated in individuals with

no pre-existing cardiorespiratory disease.[13,14] A proportionately higher risk of hypotension and arrhythmias have been documented in this technique. Motor block is an undesirable side-effect of cervical epidural anaesthesia (CEA) which may increase the need for assisted ventilation by causing the paresis of respiratory muscles.

Thyroid surgery was done under local anaesthesia by the surgeons with local anaesthesia given by the surgeons but there had been some discomfort due to the absence of any sedation during the operating time, also as the local anaesthesia is administered in the incision line first and then infiltrated in to superior and inferior skin flap and also at different layers, the amount of drug used is more than that given in the cervical block.[15,16,6]

Dexmedetomidine helps in overcoming the discomfort due to the posture and also the pressure symptoms felt by the patients during mobilization of the gland. These were some of the intra-operative problems encountered in previous studies.[7] Though some studies have added dexmedetomidine to the local anaesthetics used for the block, but we preferred giving it intravenously (IV) and got better results.[17] A moderate decrease in pulmonary functions may occur in cervical epidural due to partial phrenic nerve block but these changes are not so relevant in cervical plexus block. We did not find any notable SpO2 drop or any other discomfort in our patients.[18,19,20]

Our patients were ASA1 and ASA II with no respiratory disease. There was absolutely no motor block and patients were sedated with Midazolam 2 mg IV before giving the block to allay anxiety. Dexmedetomidine caused conscious sedation with no respiratory depression. Sedation score was maintained at 2 or 3. Patients were ASA I and II healthier and so we expected less anxiety before surgery, amnesia for the surgical experience, a rapid return to normal (normal mentation with minimal pain and nausea) after surgery, and therefore lower expenses. With local anaesthesia and Dexmedetomidine combination, patients usually awaken within hours after anaesthesia and can often move themselves in the recovery unit. These combinations of anaesthetics and techniques minimise the use of expensive drugs while expediting recovery with nearly no compromise on the quality of recovery. Our patients were usually fit enough to be discharged on the same day making the process cost effective.[21]

The decreased stay is related mainly to the smaller number of physiological changes associated with local anaesthesia, early recovery, and absence of any life-threatening complications in our patients. No significant difference was noted in the complication rates and time taken for thyroidectomy under local anaesthesia when compared to those done under general anaesthesia. None of the patients suffered recurrent laryngeal nerve injury.

CONCLUSIONS

Thyroid nodules of size less than 10 cms can be safely operated under cervical plexus block. Limitation of our study was that all our patients were ASA I and II with no chronic diseases such as asthma, diabetes, hypertension or epilepsy and there was no comparison population. Further research can be done on ASA III and IV patients and in patients where general anaesthesia is difficult. As in our study only 1 thyroid nodule was 9.3 cm, rest average diameter was 5 - 6 cm with 5 nodules in the 6 - 7 cm range. Further studies needed to be done with nodules approximately 10 cms or more in size.

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