Section: Anaesthesiology

Research

COMPARATIVE STUDY OF THREE DIFFERENT FORMULATIONS OF LOCAL ANAESTHESIA FOR CERVICAL EPIDURAL ANAESTHESIA DURING THYROID SURGERY

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Abstract

Background: CEA is a local anaesthetic with safe haemodynamic status, and maintain consciousness in patients during surgeries as compare to General anaesthesia (GA), because GA has many risk factors which impair the haemodynamic parameters. **Materials and Methods:** 60 (Sixty) patients were classified into three groups, admitted for thyroid surgery. They were randomly classified into 20 patients each group. Every patient was anaesthetised CEA technique. One group received 10 ml of lignocaine (1%), Bupivacaine (0.25%), Ropivacaine (0.5%). All patients were pre-medicated with Lorazepam (2mg), haemodynamic parameters intra-operatively and End of surgery were compared in all three groups. **Result:** Comparison of Demographic characters Baseline cardiopulmonary parameters in all three groups and haemodynamic parameters at 30 minutes during surgery and End of surgery were compared and found highly significant ANVOA and p value ($p<0.001$). **Conclusion:** Cervical Epidural technique is safe for thyroid surgery by using different local anaesthetics because haemodynamic parameter was stable without un-conscious of patients.

INTRODUCTION

Usually thyroid surgeries are conveniently performed under general Anaesthesia but due to adverse effects of cardiopulmonary, metabolic and immune status of the patients a preference of regional anaesthesia has been increased globally. Cervical Epidural Anaesthesia with conventional epidural dosage of local anaesthetics produced moderate restrictive pulmonary syndrome with subsequent oxygen de-saturation.[1,2] To minimize those adverse effects diluted concentration of Local anaesthetics have been success fully conducted the surgeries under cervical epidural anaesthesia (CEA).CEA was given in cervical plexus, brachial plexus and superior thoracic dermatomes. Additional advantages are low cost, reduced intra-operative blood loss, stable hemodynamic status, reduced stress response, post-operative analgesia and early ambulation of the patient.[3]

Previous studies have documented the efficacy and safety of CEA a sole anaesthetic technique for upper anaesthetic thoracic wall surgeries.[4,5] Hence patient's trial was under taken to compare the efficacy of three different formulations of local anaesthetics (Lignocaine bupivacaine and Ropivacaine) for thyroid surgeries under CEA.

MATERIALS AND METHODS

60 (sixty) patients admitted at GSL Medical College and Hospital Rajanagaram, Rajahmundry, Andhra Pradesh-533296 were studied.

Inclusive Criteria

ASA physical status I-III, aged between 35-40 years. Body mass Index 25 ±10 thyroid surgeries Viz subtotal thyroidectomy, lobectomy were selected for study.

Exclusion Criteria

Deranged coagulation profile history of allergy to total anaesthetics, retro-sternal goitre, cardiopulmonary diseases were excluded from studies.

Method

Patients were randomly classified into three groups. 20 patients in each group L.R. or B to receive 10 ml

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of lignocaine (1%) Ropvacaine (0.5%) Bupivacaine (0.25%) via cervical Epidural catheter respectively CEA (cervical Epidural Anaesthesia) technique was performed in all three groups of patients.

All patients were pre medicated with Lorazepam (2mg), 2 hours prior to the procedure on the arrival to operative room, standard monitors were attached and all patients were positional in the right lateral decubitus position with the neck fixed and chin on chest. The cervical epidural space was identified with on 18 gauges Tuohy epidural needle at C7-T1 inter space using the loss of resistance technique via a midline cephalad approach. A –19-gauge end holed catheter was introduced 4 cm into epidural space. After negative aspiration the catheter was tunnelled sub cedaneously and patients were laid supine. The cephalad position of the catheters tip was confirmed radio-logically using Iohexol dye (Iodine concentration 350 mg/ml, 0.5-1 ml). The test dose of prepared drug solution (3 ml) was injected via epidural catheter as per group allocation vitals (Breathing, SPO2, consciousness HR (Heart Rate), non-invasive blood pressure and electrocardiogram) were monitored for 5 minutes for any sign of deterioration. In the absence of such signs, the remainder of the mixture was administrated through the catheter. Any cases of failed CEA were managed by giving GA (general Anaesthesia) and excluded from study.

After measuring the pulmonary variables at 30 minutes post CEA, drapes were applied and surgery was started. Monitoring was done through was the operation and vital were recorded on monitors every 5 minutes. the patients were kept in a state of conscious sedation with midazolam (mean dosage 0.04 mg/kg IV) throughout were monitored intermittently by vertical contract with the patient. Any intra-operative discomfort in the neck on request for rescue analgesic was managed by administrating epidural top-ups (4 ml) of studied drug solution as per group allocation post-operatively, epidural top-ups were given on complaint of the patient (score of ≥ 5 on a 10 point numerical score).

The block profile was evaluated at 5 minutes intervals for first 30 minutes after induction of CEA and at 1 hour intervals thereafter the level of sensory block was tested bilaterally (defining the loss of sensation to pin prick) in an ascending fashion starting from the T12 dermatome. The onset of sensory block was defined as time to loss sensation to pin prick in the C3 dermatome. The degree of upper limb motor block was assessed according to the follow scale 1=absence of motor block, 2= partial motor block (weakness appreciable but movement possible against resistance), 3- motor block almost complete (possible movement but not against resistance), 4- complete motor block (absence of movement) (6). The hemodynamic parameters (HR, MAP were recorded at baseline 30 min post CEA, and End of surgery. The pulmonary functions were measured by bed side spirometer. The recorded variable included vital capacity (VC) peak expiratory force (PEF) and function of vital capacity expired during the first second of a forced expiratory volume (FEV1) measured at baseline, 30 minutes post CEA and end of surgery.

Duration of study was 30th August 2021 to August 2022.

Statistical analysis

Comparison demographic characteristics. Base line cardio-pulmonary parameters, hemodynamic parameters and intra-operative respiratory parameters were compared in all three groups with ANOVA statistical parameters and p value was compared. The statistical analysis carried out in SPSS parameters SPSS software. The ratio of male and female was 1:2.

RESULTS

[Table1] Comparison of Demographic characteristics, Baseline, cardio-pulmonary parameters in three groups.

Comparison of Baseline PEF CL /Min in all three groups – 4.94 (± 0.95) in L group, 5.15 (± 0.65) in R group, 5.8 (± 0.56) in B group p<0.001

[Table2] Comparison of Intra-operative hemodynamic parameters HR in L group, 84 (± 9.48) in Base, 70.14 (± 9.22) 30 minutes Post-CEP, 71.46 (± 9.13) End of surgery In R group 81.06 (± 8.6) out 30 minutes post CEP, 69.30 (± 6.77)at the end of surgery, 75.02 F=81.17 and p<0.008 In B group Mean value of baseline 82.28 (± 9.81) 30 min post CER, 72.81 (± 9.07) and End of Surgery 75.85 (± 10.8) F=4.76 and p<0.001.

In MAP– L group– 104.7 (± 8.12) Baseline, 96.80 (± 6.12) at 30 minutes post CEP 97.70 (± 5.04) at End of surgery, F=8.922 and p<0.004.

- In R group 101.62 (±7.69) Baseline, 93.22 (± 6.55) 30 min CEP, 98.2 (± 9.02) End of surgery, F=5.84 and p<0.004 (p value is highly significant)
- In B group 102.7 (±6.46) Baseline, 94.2 (± 7.60) 30 min CEP, 99.48 (± 9.94) End of surgery, F=5.51 and p<0.001 (p value is highly significant)

[Table3] Comparison of Intra-operative respiratory parameters

- In FVCCL – In L group 3.08 (± 0.38) Baseline, mean value 2.58 (± 0.30) 30 min post CEA, 2.62 (± 0.37) End of surgery, F=12.4 and p<0.000
- In B group 3.17 (± 0.44) Baseline, 2.72 (± 0.35) 30 min post CEA, 2.86 (± 0.35) End of surgery
- PEF (L/min) – InL group 9.94(± 0.93) Baseline, 4.06(± 0.9) 30 min post CEA, 4.11(± 0.2) End of surgery, F=8.36 and p<0.001
- In R group 5.15(± 0.65) Baseline, 4.4 (± 0.77) 30 min post CEA, 4.58(± 0.86) End of surgery, F=4.83 and p<0.001

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- In B group 5.08 (± 0.56) Baseline, 4.31 (± 0.58) 30 min post CEA, 4.54(± 0.72) End of surgery, F=8.02 and p<0.001
- FEV1 – In L group- 2.38 (± 0.44) Baseline, 2.03(± 0.24) 30 min post mean value, 2.07(± 0.27) End of surgery, F=6.79 and p<0.002
- In R group – 2.57 (± 0.40) Baseline, 2.03 (± 0.25)30 min post mean value, 2.26 (± .37) End of surgery, F = 12.2 and p<0.001 (p value is highly significant)
- In B group – 2.50 (± 0.36) Baseline, 2.10 (± 0.325) 30 min post mean value, 2.25 (±0.36) End of surgery, F = 6.77 and p<0.002 (p value is highly significant).

Table 1: Comparison of Demographic characteristics, Baseline cardio-pulmonary parameters in three groups (ANOVA TEST)

Parameter	Groups L Mean value (±SD)	Groups R Mean value (±SD)	Groups B Mean value (±SD)	Test statistic P value
Baseline HR beats/m	84.38 (± 8.50)	81.06 (±8.60)	82.28 (± 9.80)	F= 0.690 P=0.5015
Base line MAP mm/Hg	104.78 (± 8.12)	101.62 (±7.08)	102.73 (±6.46)	F= 0.9772 P=0.3826
Baseline FVC CL	3.07 (±0.38)	3.25 (±0.42)	3.17 (±0.45)	F= 0.9325 P=0.3995
Baseline PEF CL/min	4.94 (±0.95)	5.15 (±0.65)	5.8 (±0.56)	F= 7.3612 P=0.0014*
Baseline FEV1(2)	2.38 (±0.43)	2.57 (±0.40)	2.50 (±0.36)	F= 1.1675 P=0.3185
Duration of surgery (min)	95.3 (±13.90)	92.02 (±10.2)	95.20 (±12.02)	F= 0.4127 P=0.6257
Duration of Block (min)	10 (±5-10)	15 (10-20)	10 (10-15)	---
Spread of sensory Block (min) Upper Lower	C2 15 (T2-T8)	C2 T4 (T2-T9)	C2 T5 (T3-T9)	---
Minimum motor Block score	2 (1-3)	2 (2-3)	2 (1-2)	---

*Indicates significant difference

Statistically Groups L, Groups R and Groups B are comparable with respect to baseline HR values, MAP values, FVC CL values, FEV1(2) values and duration of surgeries (p>0.05) except baseline PEF values (P<0.01).

Table 2: (ANOVA TEST) Comparison of Intra-operative Hemodynamic parameters

Parameter	Group	Baseline	30-min post CEA	End of Surgery	Test statistic P value
HR (feats/min)	L	84 (± 9.48)	70.14 (±9.22)	71.46 (±9.13)	F= 13.5959 P=0.0000**
	R	81.06 (±8.60)	69.30 (±6.77)	75.02 (±11.58)	F= 8.1728 P=0.0008**
	B	82.28 (±9.81)	72.81 (±9.07)	75.85 (±10.8)	F= 4.7528 P=0.0123**
MAP (mm/Hg)	L	104.79 (±8.12)	96.80 (±6.12)	97.70 (±5.04)	F= 8.9229 P=0.0004**
	R	101.62 (±7.69)	93.22 (±6.55)	98.22 (±9.02)	F= 5.8408 P=0.0049**
	B	102.73 (±6.46)	94.27 (±7.60)	99.48 (±9.94)	F= 5.5109 P=0.0065**

**indicates high significance

Statistically very high significance reduction in HR and MAP values from base line to end of surgeries observed in all Group i.e. Group L, Group R and Group B (P<0.01).

L = Lignocaine

R = Ropivacaine

B = Bupivacaine

CEA = Cervical Epidural Anaesthetic

MAP = Mean Arterial Pressure

Table 3: (ANOVA test) Comparison of Intra-operative Respiratory parameters

Parameters	Groups	Baseline mean value (±SD)	30 min post CEA Mean value	End of Surgery mean value (±SD)	Test statistic P value
FVCCL	L	3.08 (±0.38)	2.58 (± 0.30)	2.62 (±0.37)	F= 12.4751 P=0.0000**
	R	3.25 (±0.42)	2.63 (±0.34)	2.76 (±0.42)	F= 13.6934 P=0.0000**
	B	3.17	2.72	2.86	F= 6.4609

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		(±0.44)	(±0.35)	(±0.42)	P=0.0030**
PEF (L/min)	L	4.94 (±0.95)	4.06 (±0.9)	4.11 (±0.2)	F= 8.3641 P=0.0007**
	R	5.15 (±0.65)	4.44 (± 0.77)	4.58 (±0.86)	F= 4.8353 P=0.0115**
	B	5.08 (±0.56)	4.31 (±0.58)	4.54 (±0.72)	F= 8.0229 P=0.0009**
FEV1 (L)	L	2.38 (±0.44)	2.03 (±0.24)	2.07 (±0.27)	F= 6.7942 P=0.0023**
	R	2.57 (±0.40)	2.03 (±0.25)	2.26 (±0.37)	F= 12.2593 P=0.0000**
	B	2.50 (±0.36)	2.10 (±0.32)	2.25 (±0.36)	F= 6.7754 P=0.0023**

**indicates highly significant

Statistically very high significance reduction in FVCCL, PEF and FEV1CL values from base line to end of surgeries observed in all Groups i.e. Group L, Group R and Group B (P<0.01).

FVC = Forced Vital Capacity

PEF = Peak Expiratory Force

PEV1 = Peak Expiratory Volume

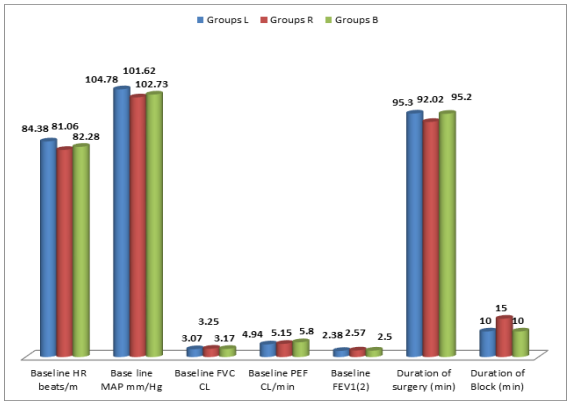

Figure 1: Comparison of Demographic characteristics, Baseline cardio-pulmonary parameters in three groups (ANOVA TEST)

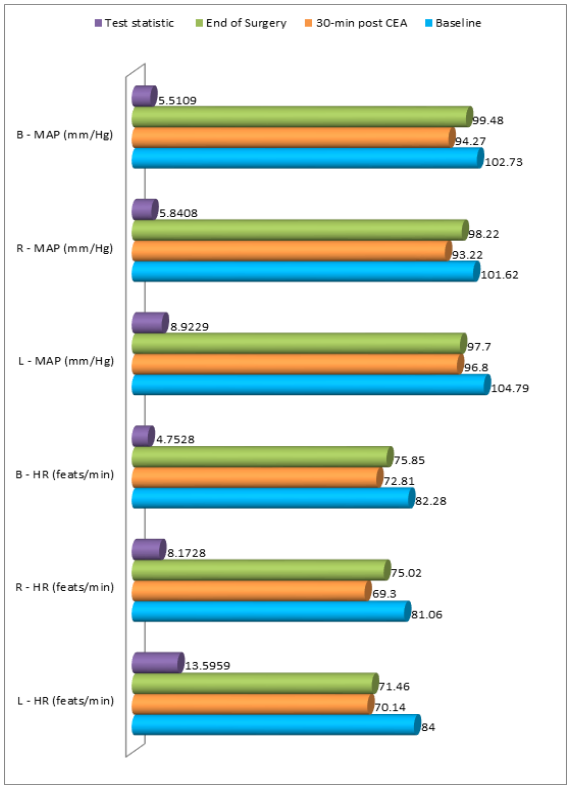

Table 2: (ANOVA TEST) Comparison of Intra-operative Hemodynamic parameters

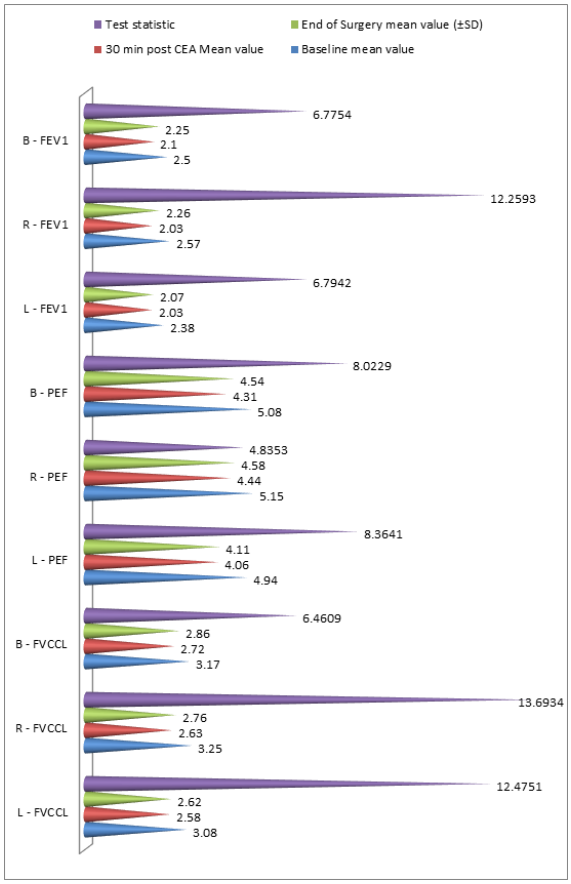

Table 3: (ANOVA test) Comparison of Intra-operative Respiratory parameters

DISCUSSION

Present comparative study of three different formulations of local anaesthetic for cervical Epidural Anaesthesia of local anaesthesia for cervical Epidural Anaesthesia during thyroid surgery in Andhra Pradesh Population. Comparison of demographic characteristics Baseline, cardiopulmonary parameters and duration had significant results [Table1]. Comparison of intra-operative hemodynamic parameters at baseline at 30 minutes of CEA of surgery in all three drugs had

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significant p value (p<0.001) [Table2]. Comparative study of respiratory parameters in at patients with different local anaesthetic drugs had significant p value (p<0.001). These findings are more or less in agreement with previous results.[7,8,9]

Present study indicates that thyroid surgery can be safely preformed under CEA using local anaesthetics. Blocked of the sympathetic fibres originating in cervical and thoracic region is deemed to occur during CEA (10). During CEA, moderate decrease in pulmonary function is known to occur due to partial phrenic nerve blockage and temporary paralysis to Inter costal muscles such experiments were also conducted in lower animal to confirm the blockage of phrenic nerve.[11]

Motor block is an undesirable side effect of CEA which may increase the need for assisted ventilation by causing paralysis of respiratory muscles. To minimize the side effects diluted concentration of local anaesthetics (lignocaine 1%) and bupivacaine 0.25% has been successful tested in previous studies to conduct surgeries under CEA.[12]

In CEA techniques circulatory hemodynamic, heart rates variability, spirometry parameters, diaphragm function remained stable after surgery and during surgery also Decrease in post-operative complications and improvement in patient's satisfaction because CEO surgeries had decreased blood loss and patients can resume his normal health early due to small quantity of blood loss.

CONCLUSION

In the present study it is concluded that, CEA technique is more safety than GA. Although there is considerable fall in post-induction cardio respiratory parameters. These effects are clinically insignificant and well tolerated in individuals with no pre-existing cardio respiratory disease. This study demands same clinical trials in large number of patients to confirm the promising alternative anaesthetic management in thyroid surgeries.

Limitation of Study

Owing to tertiary location of research centre and small number of patients and lack of latest techniques, we have limited findings and results.

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