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Research Article

A RANDOMIZED CLINICAL TRIAL COMPARING 0.75% ROPIVACAINE AND 2% LIDOCAINE WITH 1:200,000 ADRENALINE IN MINOR ORAL SURGERY

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A B S T R A C T

Background and Objectives: Ropivacaine is used uncommonly in dentistry in India despite its long duration of action, vasoconstriction, selectiveness for pain fibres and less cardiovascular toxicity. The present split-mouth study compared the clinical efficacy and cardiovascular toxicity of 0.75% ropivacaine (test arm) to 2% lignocaine with 1:200000 adrenaline (control arm) in third molar and orthodonti cextractions.

Methods: In this prospective, double-blind, randomized clinical trial, 105 patients were allocated to 3 groups. Group 1 required extraction of bilateral (B/L) maxillary premolars, group 2 of B/L mandibular premolars, and group 3 of B/L mandibular third molars having a comparative difficulty index. The choice of first local anaesthetic (LA) and first extraction was randomized and the same procedure was performed two weeks later with other LA on the opposite side. Intra-operatively, the onset of anaesthesia and analgesia, systolic and diastolic blood pressures (SBP, DBP), heart rate (HR), electrocardiogram (ECG) changes, and visual analogue scale (VAS) pain scores were recorded. Postoperatively, duration of anesthesia and analgesia were obtained.

Results: The onset of anaesthesia and analgesia were significantly slower with ropivacaine. The duration of anaesthesia in all three groups was significantly longer with ropivacaine(p value= 0.000). Duration of analgesia was significantly longer with ropivacaine in group 3 only (p value= 0.000). Mostly insignificant statistical difference was found with respect to SBP, DBP, HR and VAS pain score in all groups.

Conclusion: Ropivacaine, with a significantly longer duration of anesthesia and postoperative analgesia, is beneficial in minor oral surgical procedures.

INTRODUCTION

Despite advances in dental restorative techniques, simple extractions remains common, and the need to remove impacted teeth has remained a fixture in the repertoire of Oral and Maxillofacial Surgeons. Evidence based studies have suggested that impacted teeth that demonstrate pathology or are at high risk of developing pathology should be managed surgically.[1]In a study in North India, impacted teeth were present in 798 (16.8%) patients out of the 4750 patients examined.[2]Orthodontic dental extraction is also very common, with first premolars being the most frequently indicated.[3]

Effective intra-operative anesthesia and postoperative analgesia for minor oral surgical procedures require a LA with an extended duration of action, good analgesia, and negligible toxicity.[4]After removal of impacted third molars, pain peaks later post-operatively,[5]reaching its highest intensity at 6-8 hours[6]causing severe discomfort to the patient.[7] The most commonly used LA,[8]2% lidocaine with adrenaline, has an intermediate duration of action with pulpal anaesthesiaup to 60 minutes and soft tissue anaesthesia between 180-300 minutes[9,10] adding to the limitations of this LA for such longer procedures in Oral and Maxillofacial Surgery (OMFS),besides having undesirable effects on the cardiovascular system (CVS).[11]

Being a pure S (-) enantiomer[12], the newer amide, ropivacaine, is safer than bupivacaine with less central nervous system and CVS toxicity[13, 14] but with similar efficacy and vasoconstrictive properties at low concentrations.[10,15,16] It is less lipophilic than bupivacaine, which explains its selective blocking of pain transmitting Aδ and C fibres rather than larger, myelinated Aβ motor fibres, making it suitable for dentistry where a sensory blockade is required.[10,17, 18,19]

Through this study, author tries to emphasize that ropivacaine is a promising, underused LA in dentistry compared to lidocaine with adrenaline, for longer procedures, taking into consideration efficacy, safety and overall success of surgery.

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METHODOLOGY

After approval from the Institutional Ethical Committee, the study was conducted in the Department of OMFS at a dental hospital in Northern India. It was a prospective, double-blind, randomized, split-mouth clinical study among 105 American Society of Anesthesiology (ASA) grade I patients aged between 14-60 years, of either sex, not taking medications known to alter the perception of pain and undergoing elective extraction of B/L symmetrical maxillary or mandibular premolars for orthodontic purposes (group 1, n=35 and group 2, n=35, respectively) and those undergoing elective extraction of B/L symmetrical mandibular third molars (group 3, n= 35) with comparative difficulty index.

Patients having any history of allergy to LA; acute infections; taking monoamine oxidase inhibitors, tricyclic antidepressants, phenothiazines or vasodepressor drugs; pregnant or lactating patients, were excluded.

The allocation ratio was 1:1:1. The patients were selected based on clinical and radiographic examination. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

The main objectives of the study was to compare 2% lidocaine hydrochloride with 1:200,000 adrenaline(control arm) and 0.75% ropivacaine (test arm) in terms of onset and duration of anesthesia and analgesia, CVS effects (HR, DBP,SBP, ECG changes), VAS score[20] and any other adverse effects.

A total of 105 patients were enrolled in the study and were allocated to one of the three groups. Sample size was determined by the formula:

$n= 2 * [(Z1-\alpha/2 + Z1-\beta)/ES]2$
Where $ES= |\mu1 - \mu2|/\sigma$
and, $\mu1 - \mu2 = 2.73$, $\sigma = 7$, $Z1-\alpha/2 =1.96$, $Z1-\beta =0.84$

The Oral Surgeon enrolled participants and a staff nurse assigned participants to interventions. Both surgeon and patient were blinded to the local anesthetic being used. The choice of first LA and first extraction was randomized. Computer generated randomization was done by University's biostatistician using R-software and sampling with replacement to generate the random sequence.

Based on the random sequence, a well-trained staff nurse was assigned the duty of providing a 2 ml DispoVan single-use luer lock syringe preloaded with 2 ml of local anesthetic labeled either as LA- A or LA- B based on the local anesthetic agent used. The identity of A and B was disclosed only after the collection of data. Intra-operatively, the parameters were noted by an anaesthetist who was also blinded to the category of patient and drug being used.

In group 1 and group 2, comparative difficulty was established based on the comparable clinical and radiographic features and in group 3, it was based on the Pederson difficulty index.[21] After a detailed pre-anaesthetic evaluation, an informed consent was taken from those volunteering for the study. Pre-operatively, baseline HR, SBP, DBP (noninvasive) and ECG were recorded. VAS was noted with a deliberate 26 gauge (G) needle pinprick on the gingiva through the periosteum. After the patient rinsed with 0.2% chlorhexidine, the surgical site was prepared. A classic nerve block was performed using syringe with a 24 gauge needle under all aseptic precautions followed by extraction. For group 1, an infraorbital and greater palatine nerve block was performed with a LA volume of 1.2 and 0.5 ml, respectively. In group 2, an inferior alveolar and lingual nerve block with 1.5 ml and 0.2 ml, respectively and for group 3, an inferior alveolar, lingual and long buccal nerve block with 1.5 ml, 0.2 ml and 0.3 ml LA respectively was performed.

Intra-operatively, onset of anaesthesia in group 1 was assessed by noting tingling and numbness of the lower eyelid, side of nose, upper lip and posterior region of the palate on the respective side and in group 2 and 3 by tingling or numbness of the lower lip and tip of the tongue on the respective side. Onset of analgesia was noted as time at which the pinprick with a 26 G needle didn't induce any sensation starting and repeating every minute after a patient reported numbness in all three groups. The duration of anaesthesia was noted as the time from onset of anaesthesia to end of numbness and duration of analgesia was the time from the onset of analgesia till the onset of pain and need for analgesic in all three groups. The duration of anaesthesia and analgesia were both obtained on the follow up visit 24 hours later.HR, SBP, DBP, ECG and VAS pain score were obtained during and after injection every 5 minutes for 60 minutes. Intra-operatively, patients complaining of pain were given LA infiltration of that respective arm. Any anxious patient was given intravenous sedation with low dose midazolam (1-2 mg).Post-operatively all patients were prescribed tablet Piroxicam DT 20 mg starting only after the onset of pain. Patients were reviewed after 24 hours, 3 days and finally 7 days for suture removal. After 2 weeks, extraction on contralateral side was done.

Statistical Analysis

The data was tabulated on an excel spreadsheet and was analyzed using a commercially available statistical software package (Ver.19.0, IBM SPSS Chicago).

RESULTS

The number of participants were 35 in each group. The trial extended over 18 months, commencing in August 2019 and was completed after intervention and follow up of 105 patients in March 2021. (Diagram 1).

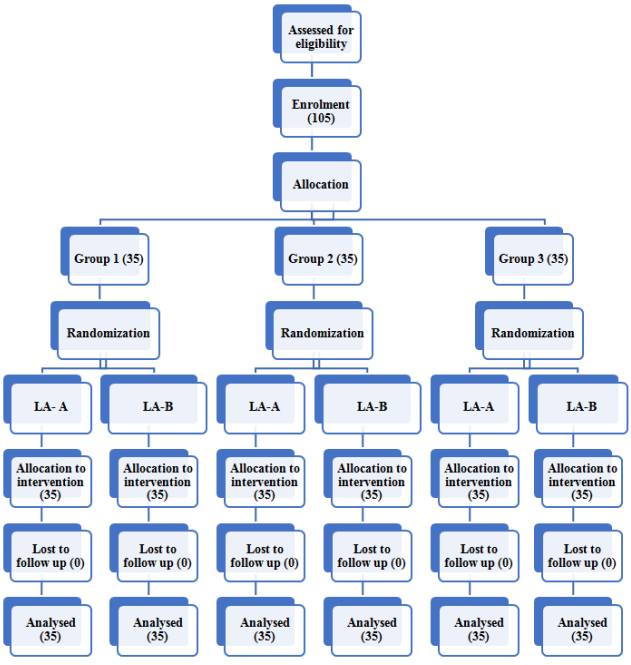

Diagram 1 Flow of study.

The onset of anaesthesia was slower in the patients receiving ropivacaine with statistically significant difference in groups 1 (p value= 0.019) group 2(p value=0.000) and group 3(p value=0.000)(Table A.2). Similarly, the onset of analgesia was slower in patients receiving ropivacaine with statistically significant difference in all the three groups (p value=0.000) (Table 1).

minutes in group 3.(Table 2) With respect to diastolic blood pressure (DBP), there was no statistically significant difference between test and control in group 1, while statistically significant difference was found between test and control with respect to DBP at 0,10,20,25,45,50 and 60 minutes in group 2 and DBP at 15,20,25,30,35,40,45,50,55 and 60 minutes in group 3. (Table 3)

Table 1 The mean values of onset and duration of anaesthesia and analgesia

Parameter	Test / control	N	Group 1			Group 2			Group 3		
			Mean	Standard Deviation	p-value	Mean	Standard Deviation	p-value	Mean	Standard Deviation	p-value
Onset of anaesthesia	Test	35	93.14	57.53	.019*	117.86	49.09	.0001**	239.54	150.49	.0001**
Onset of anaesthesia	Control	35	61.74	30.93		66.83	30.16		98.89	29.58	
Onset of analgesia	Test	35	267.57	149.84	.0001**	329.34	128.97	.0001**	417.54	157.94	.0001**
Onset of analgesia	Control	35	126.54	73.32		141.86	77.35		201.26	95.57	
Duration of anaesthesia	Test	35	26112.00	8406.10	.0001**	31210.29	8601.44	.0001**	26509.71	5930.07	.0001**
Duration of anaesthesia	Control	35	7460.57	3372.64		6824.57	2995.53		5892.00	3755.18	
Duration of analgesia	Test	35	10620.00	13312.66	.156	9802.29	12935.43	.150	20720.57	5921.65	.0001**
Duration of analgesia	Control	35	6735.43	6680.99		6193.71	6080.86		5192.66	3630.81	

Table 2 Comparison of mean systolic blood pressure (SBP) in mm Hg.

Parameter	Test / control	N	Group 1			Group 2			Group 3		
			Mean	Standard Deviation	p-value	Mean	Standard Deviation	p-value	Mean	Standard Deviation	p-value
SBP0	Test	35	113.14	12.03	.991	113.14	8.12	.272	125.17	9.81	.850
SBP0	Control	35	113.69	10.90		114.54	8.97		124.91	13.49	
SBP5	Test	35	113.60	11.06	.580	115.63	8.50	.530	125.11	12.65	.572
SBP5	Control	35	115.20	11.02		116.43	9.60		126.63	13.80	
SBP10	Test	35	113.11	14.83	.359	113.09	9.91	.004**	127.91	10.33	.793
SBP10	Control	35	112.11	15.99		116.89	10.22		127.94	14.63	
SBP15	Test	35	111.11	13.15	.318	112.49	10.02	.003**	127.86	12.45	.098
SBP15	Control	35	113.00	13.41		117.20	10.24		131.23	15.67	
SBP20	Test	35	111.06	13.74	.592	111.26	9.35	.0001**	126.83	12.09	.092
SBP20	Control	35	113.23	12.46		116.57	7.97		129.74	14.76	
SBP25	Test	35	111.63	11.91	.146	111.14	9.79	.001**	127.51	12.50	.011*
SBP25	Control	35	114.17	10.34		116.71	10.02		131.94	12.21	
SBP30	Test	35	112.03	14.02	.603	112.31	9.77	.001**	125.77	14.47	.008**
SBP30	Control	35	113.60	12.15		117.29	10.56		130.77	13.50	
SBP35	Test	35	111.94	11.21	.436	112.97	8.29	.004**	121.37	22.14	.016*
SBP35	Control	35	113.63	10.99		117.37	11.21		129.34	13.11	
SBP40	Test	35	110.74	12.42	.133	111.80	9.04	.003**	126.00	11.48	.017*
SBP40	Control	35	113.69	11.19		116.26	9.55		130.66	12.76	
SBP45	Test	35	109.83	12.41	.320	110.54	9.76	.005**	125.37	11.60	.018*
SBP45	Control	35	112.00	13.06		115.43	11.12		129.57	14.01	
SBP50	Test	35	109.09	13.82	.147	112.14	9.71	.057	123.94	12.26	.023*
SBP50	Control	35	112.74	12.78		115.23	10.08		129.11	13.07	
SBP55	Test	35	110.26	13.74	.299	111.74	10.52	.011*	122.54	11.27	.0001**
SBP55	Control	35	112.49	12.23		116.06	10.81		129.31	12.72	
SBP60	Test	35	110.89	14.02	.432	111.34	9.79	.0001**	123.17	10.38	.0001**
SBP60	Control	35	112.89	13.22		116.51	9.35		129.34	13.12	

The duration of anaesthesia was longer in the patients receiving ropivacaine with statistically significant difference in all three groups (p value=0.000) (Table 1). There was statistically insignificant difference with respect to duration of analgesia in group 1 (p value= .156) and group 2 (p value= .150), while statistically significant difference was found with respect to duration of analgesia between test and control in group 3 (p value = .000). (Table 1) The SBP in group 1 was found to be comparable between test and control, while statistically significant difference was found between test and control with respect to SBP at 10,15,20,25,30,35,40,45,55,and 60 minutes in group 2 and SBP at 25,30,35,40,45,50,55 and 60

No statistically significant difference was found with respect to heart rate (HR) between test arm and control arm in all three groups. (Table 4) There were no ECG changes noted at any point in the study in any group and in any arm. The Visual Analogue Scale(VAS) pain score was comparable between the test and control arm in all three groups with no statistically significant difference. (Table 5)

Table 3 Comparison of mean diastolic blood pressure (DBP) in mm Hg.

Parameter	Test / control	N	Group 1			Group 2			Group 3		
			Mean	Standard Deviation	p-value	Mean	Standard Deviation	p-value	Mean	Standard Deviation	p-value
DBP0	Test	35	75.49	7.30	.277	75.80	6.64	.038*	83.40	8.28	.646
DBP0	Control	35	76.37	8.21		77.80	7.10		83.71	8.47	
DBP5	Test	35	75.94	7.77	.379	77.66	6.64	.185	85.20	8.17	.210
DBP5	Control	35	77.26	7.78		78.94	8.00		86.06	8.71	
DBP10	Test	35	75.54	7.52	.576	76.03	6.50	.009**	87.43	8.88	.807
DBP10	Control	35	75.86	8.14		79.06	7.60		87.94	7.91	
DBP15	Test	35	73.80	7.13	.354	76.17	7.68	.227	86.34	8.86	.029*
DBP15	Control	35	74.66	8.45		77.69	7.34		89.26	10.42	
DBP20	Test	35	73.86	7.17	.190	75.89	6.46	.002**	85.97	8.95	.037*
DBP20	Control	35	75.63	7.57		78.91	7.39		89.23	10.07	
DBP25	Test	35	74.29	5.75	.289	75.66	6.58	.003**	86.40	8.26	.007**
DBP25	Control	35	75.83	7.26		80.09	7.77		89.80	8.69	
DBP30	Test	35	74.43	7.06	.155	75.66	6.39	.069	88.17	10.12	.032*
DBP30	Control	35	76.94	7.97		78.34	10.24		90.74	8.46	
DBP35	Test	35	75.11	6.37	.238	76.89	6.20	.224	85.51	9.83	.003**
DBP35	Control	35	76.89	7.30		78.89	7.73		90.26	8.48	
DBP40	Test	35	76.60	6.00	.368	77.14	6.02	.319	85.60	9.05	.023*
DBP40	Control	35	77.54	7.06		78.40	7.37		89.00	7.51	
DBP45	Test	35	76.00	6.23	.418	75.34	5.53	.001**	84.83	9.00	.010**
DBP45	Control	35	75.40	7.36		79.23	8.27		88.00	8.26	
DBP50	Test	35	74.80	6.90	.634	76.63	6.23	.040*	84.43	9.73	.010**
DBP50	Control	35	74.11	8.12		78.77	6.89		87.86	7.86	
DBP55	Test	35	74.71	6.13	.970	77.60	5.65	.163	84.06	9.10	.003**
DBP55	Control	35	75.00	7.22		79.37	8.47		87.97	8.60	
DBP60	Test	35	75.17	7.25	.656	75.69	6.02	.025*	84.23	9.58	.002**
DBP60	Control	35	75.71	7.30		79.11	8.88		88.74	8.58	

Table 4 Comparison of mean heart rate (HR) in beats per minute

Parameter	Test / control	N	Group 1			Group 2			Group 3		
			Mean	Standard Deviation	p-value	Mean	Standard Deviation	p-value	Mean	Standard Deviation	p-value
HR0	Test	35	81.37	8.91	.147	90.29	12.24	.544	88.11	12.20	.951
HR0	Control	35	79.71	10.92		87.97	10.29		87.77	14.47	
HR5	Test	35	81.77	8.73	.241	88.77	11.58	0.197	88.86	12.61	0.858
HR5	Control	35	79.91	10.67		86.23	9.38		88.51	14.42	
HR10	Test	35	81.20	9.15	.893	85.57	11.48	.367	86.69	10.51	.331
HR10	Control	35	81.49	11.22		86.69	9.96		88.57	14.47	
HR15	Test	35	80.03	9.05	.613	85.00	11.74	.627	87.77	10.44	.889
HR15	Control	35	79.26	9.64		85.60	11.57		87.34	13.02	
HR20	Test	35	80.94	10.15	.206	84.83	11.19	.816	86.97	11.59	.746
HR20	Control	35	79.11	11.62		85.54	11.93		87.74	13.09	
HR25	Test	35	81.51	9.57	.205	86.37	12.13	.394	86.94	11.40	.555
HR25	Control	35	79.31	11.52		84.63	10.90		85.91	12.25	
HR30	Test	35	80.29	9.95	.285	86.57	12.60	0.124	87.40	12.88	0.448
HR30	Control	35	78.29	10.84		83.74	10.73		86.00	12.35	
HR35	Test	35	79.00	8.36	.955	86.06	12.01	.734	86.54	14.24	.701
HR35	Control	35	79.03	10.40		84.34	10.34		86.57	11.13	
HR40	Test	35	80.94	7.98	.248	86.03	11.05	.922	85.69	9.93	.155
HR40	Control	35	79.20	11.19		84.91	11.07		88.14	12.69	
HR45	Test	35	80.57	8.69	.205	86.91	9.40	.754	85.60	10.66	.268
HR45	Control	35	78.54	10.38		85.83	9.64		87.69	11.89	
HR50	Test	35	81.03	8.75	.170	83.97	11.00	.851	85.77	9.08	.193
HR50	Control	35	79.17	10.73		83.86	10.55		87.91	13.12	
HR55	Test	35	79.09	7.96	.611	83.46	9.02	0.774	85.40	10.67	0.201
HR55	Control	35	78.40	10.45		84.03	10.20		87.74	11.82	
HR60	Test	35	79.17	8.19	.571	84.66	8.63	0.83	84.71	10.59	0.599
HR60	Control	35	79.97	10.43		84.29	9.36		85.71	12.85	

DISCUSSION

For minor oral surgeries like removal of impacted molars, cyst enucleation and fracture reduction and fixation under LA, etc.[22] a longer duration of anaesthesia and effective postoperative analgesia are required to ensure the patient's comfort.

Ropivacaine, with a duration of action between 6-7 hours, fulfill such requirements,[19] and it has the advantage of sensory-motor differentiation and higher threshold for CNS and CVS toxicity (1.5-2.5 fold). [13,23]

2% lidocaine with adrenaline, the gold standard against which all other LA's are compared,[9,24,25,26]isn't suitable for such long procedures[9] and also adrenaline has undesirable side effects,

making it contraindicated in patients with unstable heart diseases, uncontrolled hyperthyroidism and diabetes mellitus, etc.[11]In the present study, 0.75% ropivacaine (test drug) was compared with 2% lidocaine with 1:200,000 adrenaline (control drug), and was found to provide safe and effective intra-operative anaesthesia and superior post-operative analgesia.

Twenty patients in group 1, twenty one patients in group 2 and one in group 3 who received the test drug did not require post-operative analgesia. These findings were similar to many studies[26,27] and could be due to the longer duration of analgesia by ropivacaine and less traumatic surgery in groups 1 and 2. In all three groups, there was a statistically significant difference in duration of analgesia between test and control arm.

Table 5 Comparison of mean visual analogue scale (VAS) pain score

Parameter	Test / control	N	Group 1			Group 2			Group 3		
			Mean	Standard Deviation	p-value	Mean	Standard Deviation	p-value	Mean	Standard Deviation	p-value
VAS0	Test	35	6.09	1.36	.662	5.66	1.83	.475	6.77	1.55	.780
VAS0	Control	35	5.91	1.29		5.34	1.61		6.86	1.44	
VAS5	Test	35	1.09	1.01	.074	.91	1.31	.831	1.89	1.37	.727
VAS5	Control	35	.80	1.08		.83	.89		1.74	1.12	
VAS10	Test	35	.20	.47	.490	.23	.49	.564	1.20	1.32	.840
VAS10	Control	35	.29	.57		.17	.38		1.17	1.38	
VAS15	Test	35	.14	.49	.888	.14	.60	.285	1.14	1.61	.670
VAS15	Control	35	.11	.47		.03	.17		1.09	1.46	
VAS20	Test	35	.14	.85	.450	.06	.24	.157	1.51	2.67	.573
VAS20	Control	35	.34	1.21		0.00	0.00		1.17	1.82	
VAS25	Test	35	.29	1.23	.832	.03	.17	.317	.94	1.94	.885
VAS25	Control	35	.43	1.65		0.00	0.00		.94	1.80	
VAS30	Test	35	.17	.62	.891	.03	.17	.317	.91	2.23	.681
VAS30	Control	35	.17	.71		0.00	0.00		.60	1.06	
VAS35	Test	35	.11	.40	.748	.03	.17	.317	.86	2.10	.671
VAS35	Control	35	.14	.49		0.00	0.00		.89	1.62	
VAS40	Test	35	.06	.24	.655	.03	.17	.317	.80	2.06	.780
VAS40	Control	35	.09	.28		0.00	0.00		.57	1.24	
VAS45	Test	35	.09	.37	.581	0.00	0.00	.317	.69	1.73	.473
VAS45	Control	35	.14	.49		.03	.17		.40	.77	
VAS50	Test	35	.06	.24	1.000	0.00	0.00	.317	.40	1.14	.426
VAS50	Control	35	.06	.24		.06	.34		.31	.76	
VAS55	Test	35	.06	.24	.655	0.00	0.00	.317	.31	1.13	.425
VAS55	Control	35	.09	.28		.06	.34		.40	.88	
VAS60	Test	35	.06	.24	.655	.03	.17	1.000	.20	.63	.092
VAS60	Control	35	.09	.28		.03	.17		.37	.69	

The onset of anaesthesia in test arm was slower in all three groups. This finding correlates with that of many studies.[7,26,27,28, 29]Lidocaine has a lower dissociation constant, (pKa = 7.7)[30]closer to the physiological values of tissue (pH=7.4) than that of ropivacaine (pKa=8.1). This enables more lidocaine molecules to penetrate the nerve faster per unit of time as compared to ropivacaine which can explain this difference.

In all three groups, the duration of anaesthesia with test drug was significantly longer and this finding too is consistent with many studies.[4,10,26,27] However, in contrast, Ranjan *et al*[7]found no significant difference in this respect, in patients undergoing mandibular thirdmolar extraction.

The onset of analgesia in all three groups was slower in patients receiving the test drug and the difference was statistically significant when compared to control. Similar results were reported by Tijanic M *et al*[27], despite selectiveness of ropivacaine for pain fibres.

Intra-operatively in group 3, only 6 out of 35 patients receiving the test drug required additional block as compared to 12 out of 35 patients receiving the control drug. A longer duration of action by ropivacaine and differential sensory blockade of A delta and C fibers could explain this difference. But Tijanic *et al*[27] found no significant difference in supplemental block requirement while comparing these two drugs.

Higher pKa and selective action of ropivacaine on the pain transmitting A delta and C fibres due to their less lipophilic nature accounted for prolonged post-operative effect with 0.75% ropivacaine.[17]

No significant difference was found in most patients while comparing SBP and DBP in test arm and control arm of all three groups probably due to limited amounts of the anesthetic used and careful steps to avoid intravascular injection. Statistically significant difference was found with respect to values of SBP and DBP in group 2and group 3, with higher values in control arm, perhaps due to adrenaline. Similar findings were found by Bhudarapu *et al*[4] but many past studies[10,26,27]found no significant difference while comparing these hemodynamic parameters.

Difference in heart rate (HR) between test arm and control arm in all three groups was found to be comparable. This is similar to most other studies[4,10,26,27]. Similar to Bansal *et al*[10], the present study showed no electrocardiogram (ECG) changes in all three groups. Higher values of visual analogue scale pain score for (VAS) in both test arm and control arm of group 3 patients can be explained by longer duration and greater surgical trauma during the procedure. However, similar to other studies[10,26], no statistically significant difference was found between test and control arms in all three groups.

Limitations

Ropivacaine is costlier as compared to 2% lidocaine with 1:200000 adrenaline. It is available in 20 ml vials with no preservatives and thus could not be used subsequently leading to the wastage of the drug. It was found that past dental history played a significant role, as patients undergoing extractions for the first time in this study were more anxious. Additionally, an electric pulp meter to record the onset of pulpal anaesthesia instead of using soft tissue analgesia and anesthesia would have given more accurate readings. lastly it may not act as a safer option in children who may be more prone to self inflicting injuries due to prolonged numbness.

CONCLUSION

Ropivacaine can be beneficial in longer oral surgical procedures because of a longer duration of anesthesia and analgesia and can be a safe alternative in dentistry for procedures like surgical extraction of an impacted tooth, enucleation of cyst, fracture reduction, intermaxillary fixation etc.

Conflicts of interest: None.

Compliance with Ethical Standards: The study was approved by institutional Ethical committee vide letter no. PUIEC/2019/163/A-1/01/03 dated 27.08.2019 CTRI registration number - CTRI/2019/03/018170

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