International Journal Dental and Medical Sciences Research
Volume 5, Issue 2, Mar - Apr 2023 pp 739-744 www.ijdmsrjournal.com ISSN: 2582-6018

Comparison of 0.75% ropivacaine and 2% lignocaine for inferior alveolar nerve block in surgical removal of impacted mandibular third molars- a comparative split mouth clinical study.

Dr. S Bala subramanyam, *Dr. Hafsa Parveen R, Dr. D Naga Sujatha, Dr.D.Yesuratnam, Dr. B Manohar, Dr. Dhurubatha J.

**Corresponding Author : Dr.Hafsa Parveen R. Department of Oral and Maxillofacial surgery,Government Dental college and Hospital,Kadapa,Andhra Pradesh.*

Date of Submission: 05-04-2023 Date of Acceptance: 15-04-2023

ABSTRACT:

AIMS AND OBJECTIVES: The aim is to compare the anaesthetic efficacy of 0.75% Ropivacaine with 2% lignocaine with 1:2,00,000 adrenaline for inferior alveolar nerve block in surgical removal of impacted mandibular third molars.The objectives of the study are to compare Time of onset, Duration of soft tissue anaesthesia, Hemodynamic parameters (HR, BP), Profoundness of anaesthesia and Duration of postoperative analgesia.

MATERIALS AND METHODS: This is a Split-mouth study in which 20 patients with bilateral impacted mandibular third molars who required prophylactic and symptomatic removal were divided in to two groups ,Group A (0.75% ropivacaine) and Group-B(2% LWA).

RESULTS: The Time of onset of action, duration of soft tissue anaesthesia, duration of post operative analgesia were longer for 0.75% ropivacaine than 2% LWA. Thehemodynamic parameters (BP,HR) were relatively constant between two groups and within acceptable normal limits. The profoundness of anesthesia was found to be better in 0.75% ropivacaine group than 2% LWA .

CONCLUSION:In the surgical extraction of impacted mandibular third molars, 0.75% ropivacainewas found to be superior to 2% LWA for inferior alveolar nerve blocks.

KEYWORDS : Ropivacaine, Lignocaine with adrenaline (LWA), Inferior alveolar nerve block, Impacted mandibular third molars.

I. INTRODUCTION :

The success of any minor oral procedure depends on the efficiency of the local anaesthetic used and the skills of the clinician. The ideal Local anaesthetic should have an extended duration of action, good analgesic properties with negligible systemic toxicity.[1]Ropivacaine, a newer amide local anesthetic, safer derivative of Bupivacaine, is monohydrate hydrochloride salt of 1-propyl 20,60-pipecoloxylidide. Ropivacaine blocks impulse conduction in nerve fibres as it causes reversible inhibition of sodium ion influx.[2]Ropivacaine is less likely to penetrate large myelinated motor fibres owing to its less lipophilic nature; so, it acts selectively on the A delta and C nerves which transmit pain compared to Aβ fibres, which are involved in motor function.Ropivaciane is mainly excreted through the kidneys, around 86% of the drug is excreted in urine.[3] The less lipophilic nature ofRopivacaine attributes to less depressant effects of both isomers on cardiovascularsystem.[4]

In the recent times, **Ropivacaine** is gaining better clinical popularity attributable to its safer profile and equivalent potency compared to bupivacaine.[5]Ropivacaine is commercially available as 0.75%, 0.5%, 0.375%, and 0.25% concentrations. It has vasoconstrictor properties at lower concentrations, thereby avoiding the need of additional vasoconstrictor.[6]

The study presented here compares the anaesthetic efficacy of 0.75 % ropivacainewith 2% lignocaine with 1:2,00,000 adrenaline for inferior alveolar nerve block in surgical removal of impacted mandibular third molars.

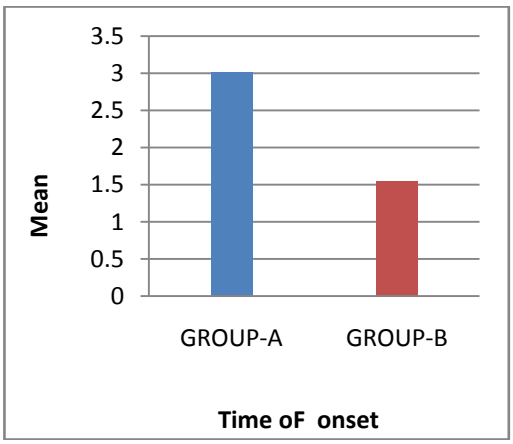
II. MATERIALS AND METHODS:

The present clinical study was conducted in 20 patients who required elective removal of bilateral impacted mandibular third molars, in the Department of oral and maxillofacial surgery, Government Dental College and Hospital, Kadapa, Andhra Pradesh between April 2021 to January 2022.This is a Split-mouth study in which bilateral impacted mandibular third molars on either side were divided into two groups- Group A and Group B. Group A included patients who were administered 0.75% ropivacaine on one side for IANB and Group B included patients who were administered 2%lignocaine with 1:2,00,000 adrenaline on other side for IANB. Each patient was given a brief description of the intended surgical procedure and requested to sign an

International Journal Dental and Medical Sciences Research
Volume 5, Issue 2, Mar - Apr 2023 pp 739-744 www.ijdmsrjournal.com ISSN: 2582-6018

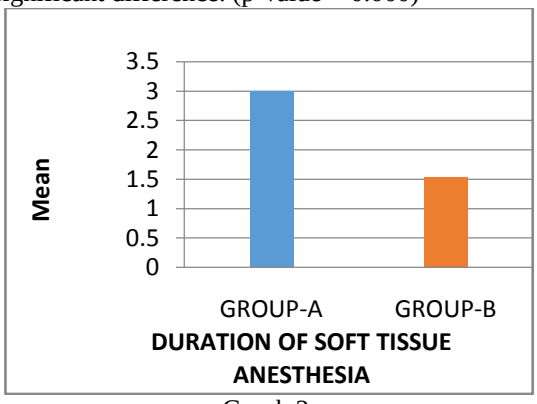
informed consent sheet. The standard surgical technique was followed under aseptic conditions.

CLINICAL PARAMETERS:1. Time of onset : It is the time from needle withdrawal to the onset of subjective signs and confirmed objectively using blunt probe. It is recorded using a digital stop watch in minutes.
2. Duration of soft tissue anaesthesia: It is measured from the time of onset of anaesthesia to the time of cessation of numbness of the homo lateral half of lower lip and tongue.
3. Hemodynamic parameters: It includes non-invasive measurement of the semi-supine positioned heart rate (HR) and systolic and diastolic blood pressure (SBP, DBP) pre-operatively at 15 min, 30 min, 60 mins,90 mins and 120 mins.
4. Profoundness of anaesthesia: It is measuredby assessment of pain intensityfelt during the following events incision, osteotomy, tooth sectioning of surgery using a visual analog scale (VAS) and verbal rating scale (VRS). A 10-point visual analog scale (VAS) was used to subjectively assess the pain scores where point 1 on the VAS indicates minimal discomfort and 10 indicates unbearable pain. The VRS consists of a list of 6-point scale phrases 0 - no pain,1 - just noticeable pain,2 - weak pain,3 - moderate pain,4 - severe pain5 - excruciating pain
5. Duration of postoperative analgesia:It is recorded from the time of completion of surgical procedure to the time when the pain intensity score reached a point ≥ 3 on VAS or when the patient consumed an analgesic postoperatively.
RESULTS: Out of 20 patients,13 (65%) were males and 7 (35%) were females with a mean age of 27.55 ± 5.49 years. The data was statistically analysed using repeated measure ANOVA test and independent 't' test. Results with $p < 0.05$ were considered statistically significant for the study.
Time of onset : Time of onset of action in group –A was 3.00 ± 0.43 minutes and in group – B was 1.53 ± 0.48 minutes.The data was analysed using independent 't' test.



Graph 1:

Duration of soft tissue anaesthesia :The duration of soft tissue anaesthesia in group-A was 345.50 ± 21.14 minutes and 95.50 ± 5.59 in group-B respectively.The data was analysed using independent 't' test. There was statistically significant difference. (p-value = 0.000)



Graph 2:

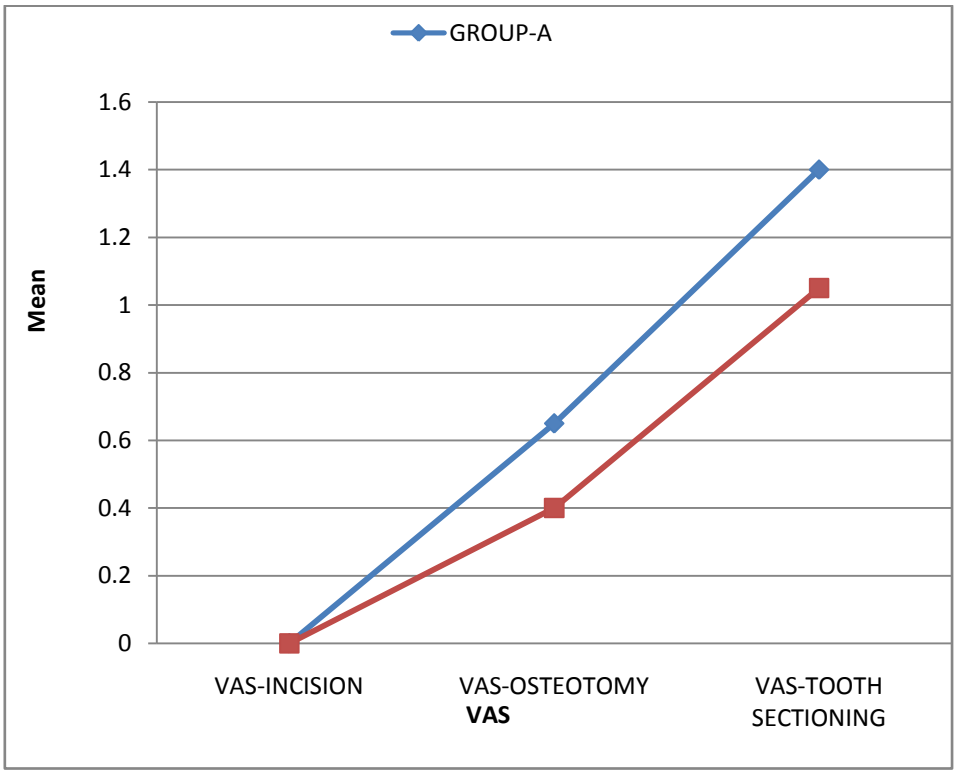
Hemodynamic parameters: The data was statistically analysed using repeated measure ANOVA test and independent 't' test. The mean Systolic blood pressure (SBP) pre operatively,at 15 mins,30 mins, 60 mins,90 mins and 120 mins was 120.20±7.30,130.75±6.74,123.50± 8.59,125.5±7.41,122±5.71,130.75±7.30 in group-A and in group-B were 122.25±8.34,130±6.28,127.75±4.72,129.75±6.17,128±4.7,122±8.33 respectively.On comparison of both groups, there was no statistically significant difference in SBP.

The mean Diastolic blood pressure (DBP) pre operatively,at 15 mins,30 mins, 60 mins,90 mins and 120 mins was 79.75 ± 6.17,85.25 ±5.25,80.25±4.99,79.5±2.23,79.5 ±3.59,81.5±3.28 in group-A and in group-B were 81±8.6.17,86.75 ± 4.94,85.5±4.26,86.75±4.94,86.5 ± 4.32,86.75±4.94 respectively. On comparison of both groups, there was no statistically significant difference in DBP.

International Journal Dental and Medical Sciences Research
Volume 5, Issue 2, Mar - Apr 2023 pp 739-744 www.ijdmsrjournal.com ISSN: 2582-6018

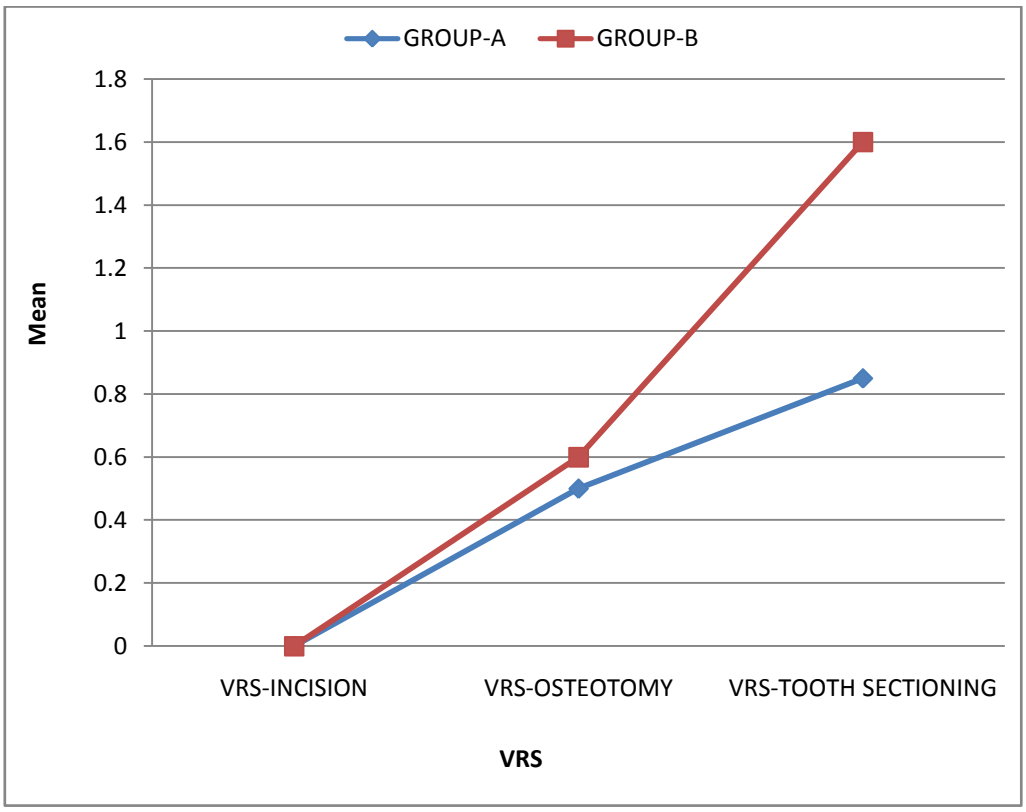
The mean Heart Rate (HR) pre operatively,at 15 mins,30 mins, 60 mins,90 mins and 120 mins was 80.6 ± 4.6,83.7 ±4.57,81.7±4.04,81.8±3.83,83.7 ±4.57,81.35±4.46 in group-A and in group-B were 81±8.6.17,77.6 ± 3.10,78.5±2.18, 78.5±2.18,77.6 ± 3.10,81±3.68 respectively.On comparison of both groups, there was no statistically significant difference in HR.

Profoundness of anaesthesia: VAS scores during incision, osteotomy and tooth sectioning were 0.00 ± 0.00, 0.65 ± 0.48 and 1.4 ± 0.50 respectively in group-A and in group-B the scores were 0.00 ± 0.00, 0.40 ±0.50 ,1.05 ± 0.68 respectively.On comparison of both the sides for profoundness of anesthesia using VAS scale,there was no statistically significant difference with p-value of 0.119,0.074 during osteotomy and tooth sectioning respectively.VRS scores during incision, osteotomy and tooth sectioning were 0.00 ± 0.00, 0.50 ± 0.51 and 0.85 ± 0.67 respectively in group-A and in group-B the scores were 0.00 ± 0.00, 0.60 ± 0.51, 1.60 ± 0.50 respectively. On comparison of both the sides for profoundness of anesthesia using VRS scale,there was no statistically significant difference with p-value of 0.537 during osteotomy. During tooth sectioning, there was statistically significant difference with p-value of 0.000.



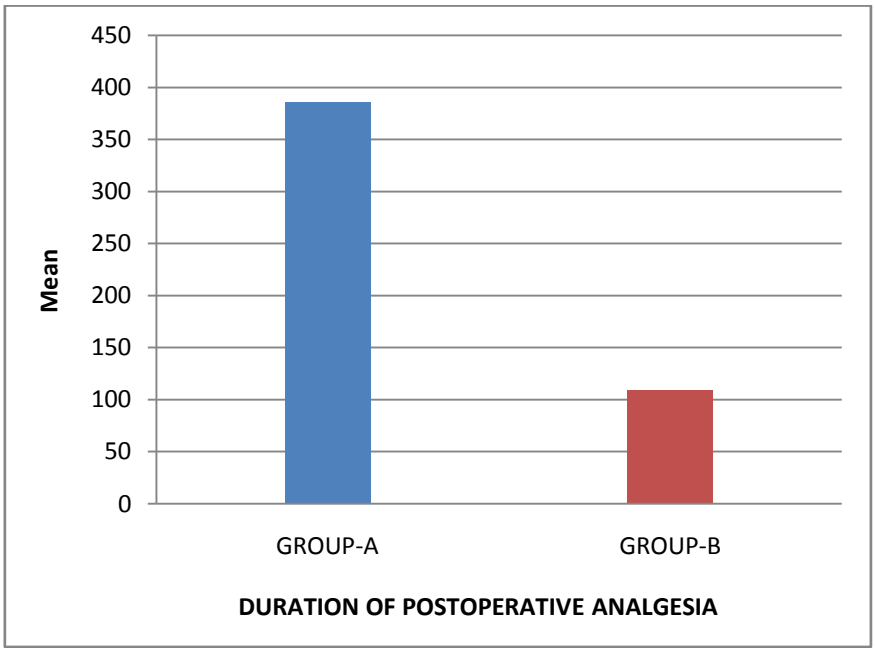
Graph 3 :

International Journal Dental and Medical Sciences Research
Volume 5, Issue 2, Mar - Apr 2023 pp 739-744 www.ijdmsrjournal.com ISSN: 2582-6018



Graph 4 :

Duration of postoperative analgesia :The mean duration of post operative analgesia in group-A was 385.50 ± 22.58 minutes and 108.75 ± 5.82 minutes in group – B.(p value 0.000)



Graph 5:

III. DISCUSSION :

Ropivacaine, a pure S-(–) enantiomer, was identified after the finding of optically active isomers of the mepivacaine family. Its toxicity was specifically and extensively examined before it was introduced to the market in **1996.**Unwanted side-

effects have been discovered to be extremely rare throughout Ropivacaine's fast and widespread usage in the clinic.[6]Ropivacaine is increasingly being utilised for both regional nerve blocks and epidural anaesthesia. Due to little information on the efficacy of ropivacaine in dentistry, it has not been approved for dental procedures in manufactured dental cartridges until now.

Time of onset and duration of any Local Anesthetic is dependent on dissociation constant (pKa), Lipid Solubility, Protein Binding and Vasoactive activity. pKa of ropivacaine is (8.1) higher than lignocaine (7.9). Ropivacaine (2.8) is less lipophilic than lignocaine (4) with less penetration in large myelinated fiber so clinically it will block sensory fibers (Aδ,C) rather than motor fibers (Aβ)[7].In the present study, the Time of onset of action in group –A was longer (180 ± 25.8 seconds) than in group – B (91.8± 28.8 seconds). **Varun Reddy et al.(2019)**[5] in their study showed onset of action for 0.75% ropivacaine for IANB is 104.1 ± 17.7 secs and 68.6 ± 20.4 secs for lignocaine with adrenaline.**Milos tijanic et al.(2019)**[8] showed onset of 0.75% ropivacaine for Inferior Alveolar Nerve Block is 151.50 ± 80.93 seconds and 89.80 ± 27.91 for lignocaine with adrenaline.**K.N. Rajpari et al.(2021)**[7]in their study observed onset of action was longer for 0.75% ropivacaine (101.84 ± 16.92 secs) as compared to Lignocaine With Adrenaline (218 ± 21.51 secs).In above studies, results were similar to our present study.

Duration of soft tissue anaesthesia depends on the protein binding capacity, Lipid Solubility and Vasoactive activity. Protein binding capacity of ropivacaine (94%) is higher than lignocaine (64%). It mainly binds to α1-acid glycoprotein.[7] In the present study, the duration of soft tissue anaesthesia was longer in group-A (345.50 ± 21.14 minutes) than group-B (95.50 ± 5.59 minutes).**Varun Reddy et al.(2019)**[5] in their study observed that duration of soft tissue anaesthesia for 0.75% ropivacaine was 355±53.07 mins and 91.2 ± 20.3 min for lignocaine with adrenaline.**Milostijanic et al.(2019)**[8] in their study observed that duration of anaesthesia for 0.75% ropivacaine was 412.17 ± 110.24 minutes and 216.13 ± 47.69 for lignocaine with adrenaline. **K.N. Rajpari et al.(2021)**[7] in their study observed that duration of action was longer for 0.75% ropivacaine (343.55 ± .44 mins) as compared to Lignocaine With Adrenaline (175.20 ± 18.02 mins).All these findings were inline with our study.

The use of **plain ropivacaine 0.75%** solution as a local anesthetic is of particular interest,since it has vasoconstrictor properties that improve the surgical field and offers long-lasting anesthesia. Moreover, it may be a good option for patients in whom local anesthetic with vasoconstrictor is contraindicated.[9]In the present study, the **hemodynamic parameters** (SBP,DBP,HR) were relatively constant between two groups and within acceptable normal limits.**Bansal v et al.(2016)**[10]**,Milos tijanic et al.(2019)**[8] **and Varun Reddy et al.(2019)**[5] had shown no significant difference in cardiovascular parameters in 0.75% ropivacaine versus lignocaine with adrenaline group. All these findings were inline with our study.

Profoundness of anaesthesia was assessed subjectively.In the present study, the intraoperative profoundness of anesthesia using VAS and VRS scales was found to be better in 0.75% ropivacaine group than lignocaine with adrenaline group. **Meechan et al.(2002)**[11]**, Oliveira NE et al.(2006)**[12]**, Vikhram K et al.(2014)**[13]**, Bhargava D et al.(2013)**[14]**, Budharapu et al.(2015)**[1]**,Vito Crincoli et al.(2015)**[15]**, Varun Reddy et al.(2019)**[5]**, Milos tijanic et al.(2019)**[8] showed ropivacaine was potent in reducing intra-operative pain as compared to Lignocaine With Adrenaline as found in our study.

Duration of postoperative analgesia: Previous studies have reported that Post-operative pain reaches its peak between the time interval of 6 and 12 hours after the procedure, when patients would still be under the anesthetic effect of ropivacaine. In the present study, the mean duration of post operative analgesia in group-A was (385.50 ± 22.58 minutes) longer than in group – B (108.75 ± 5.82 minutes).**Brkovic et al.(2015)**[16] observed statistically significant difference in time of the first pain appearance in ropivacaine (369.4 ± 178.2 minutes) compared to lignocaine (190.0 ± 131.8 minutes).**Varun Reddy et al.(2019)**[5]in their study found the duration of postoperative analgesia to be 109.33 ± 30.45 min and 424.33 ± 75.37 min in Lignocaine and Ropivacaine respectively. Our findings were consistent with the above studies.

Few in vitro studies have demonstrated the anti-inflammatory activity of ropivacaine. It reduces leukocyte migration and also release of lipoxygenase products; corroborating with the preventive analgesic effects of ropivacaine 0.75% injection.[9]

IV. CONCLUSION :

Our findings could be advantageous for oral and maxillofacial surgical procedures that require a local anaesthetic with minimal cardiovascular risk and without a vasoconstrictor to provide anaesthesia for long procedures. The use of

analgesics can be suspended after operative period, in the absence of any post-surgical complications.

REFERENCES :

[1]. Budharapu A, Sinha R, Uppada UK, Subramanya Kumar AV. Ropivacaine: a new local anaesthetic agent in maxillofacial surgery. Br J Oral Maxillofac Surg. 2015 May;53(5): 451–454.

[2]. Hansen TG. Ropivacaine: A pharmacological review. Expert Rev Neurother 2004;4:781-91.

[3]. Kuthiala G, Ropivacaine Chaudhary G. A review of its pharmacology and clinical use. Indian J Anaesth. 2011 Mar;55(2):104–110.

[4]. Graf BM, Abraham I, Eberbach N, Kunst G, Stowe DF, Martin E. Differences in cardiotoxicity of bupivacaine and ropivacaine are the result of physicochemical andstereoselective properties. Anesthesiology 2002;96:1427-34.

[5]. Reddy KV, Jadhav A, Bhola N, Mishra A, Dakshinkar P. Is 0.75% ropivacaine more efficacious than 2% lignocaine with 1:80,000 epinephrine for IANB in surgical extraction of impacted lower third molar? Oral Maxillofac Surg. 2019 Jun;23(2): 225–231.

[6]. Ruetsch Y A. BöniT.andBorgeat A. From Cocaine to Ropivacaine: The History of Local Anesthetic Drugs. Current Topics in Medicinal Chemistry 2001, 1, 175-182

[7]. Kamil N. Rajpari ,Neelam N. Andrade , TruptiNikalje. Comparison of anaesthetic efficacy of ropivacaine (0.75% & 0.5%) with 2% lignocaine with adrenaline (1:200000) in surgical extraction of bilateral mandibular 3rd molars using IANB:a prospective, randomized, single blind study. Journal of Oral Biology and Craniofacial Research 11 (2021) 263–268.

[8]. Tijanic M, Buric N. A randomized anesthethic potency comparison between ropivacaine and bupivacaine on the perioperative regional anesthesia in lower third molar surgery. J Cranio-Maxillo-Fac Surg. 2019 Oct;47(10):1652–1660.

[9]. Klinger de Souza Amorim, Anne Caroline Gercina, Filipe Mazar Santos Ramiro et.al. Can local anesthesia with ropivacaine provide postoperative analgesia in impacted mandibular third molars extraction? A randomized clinical trial. Oral Surg Oral Med Oral Pathol Oral Radiol,2020. S2212-4403(20)31239-6.

[10]. Bansal V, Kumar D, Mowar A, Bansal A. Comparison of ropivacaine 0.75 % and lignocaine 2 % with 1:200,000 adrenaline in dental extractions: single blind clinical trial. J Maxillofac Oral Surg. 2018 Jun;17(2):201–206.

[11]. Meechan JG. A comparison of ropivacaine and lidocaine with epinephrine for intraligamentaryanesthesia. OralSurg Oral Med Oral Pathol Oral RadiolEndod. 2002;93: 469–473.

[12]. Oliveira NE, Lima Filho NS, Lima EG, Vasquez EC. Effects of regional anesthesia with ropivacaine on arterial pressure and heart rate in healthy subjects. Eur J Oral Sci. 2006 Feb;114(1):27–32.

[13]. BalaVikhram K, Muthusekhar MR. Comparison the anaesthetic efficacy of 0.75% Ropivacaine and 2% Lignocaine both with 1:200000 adrenaline in extraction of maxillary and mandibular teeth. Int J Dent Health Sci. 2014;1(5):705–716.

[14]. Bhargava D. , Chakravorty N., Rethish E., Deshpande A. Comparative Analysis of the Anesthetic Efficacy of 0.5 and 0.75 % Ropivacaine for Inferior Alveolar Nerve Block in Surgical Removal of Impacted Mandibular Third Molars. J. Maxillofac. Oral Surg. 2013.

[15]. Crincoli V, Favia G, LImongelli L, Tempesta A, Brienza N. The effectiveness of ropivacaine and mepivacaine in the postoperative pain after third lower molar surgery. Int J Med Sci. 2015;12(11):862–866.

[16]. BozidarBrkovic,Miroslav Andric, DejanCalasan et.al. Efficacy and safety of 1% ropivacaine for postoperative analgesia after lower third molar surgery: a prospective, randomized, double-blinded clinical study. Clin Oral Invest.2016.