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Efficacy of Local Anesthesia in Combination with Ketamine and without Ketamine in Third Molar Surgery: A Clinical Comparative Study

Arshiya Sanober[1*] Balreddy P[2] Sridhar Reddy B[3] N Prasad[4] Sanjeev Naik[5] Praveen[6]

[1]Senior Lecturer, Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Hyderabad, India.
[2]Professor and Head, Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Hyderabad, India.
[3]Associate Professor, Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Hyderabad, India.
[4]Associate Professor, Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Hyderabad, India.
[5]Assistant Professor, Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Hyderabad, India.
[6]Private Consultant, Department of Oral and Maxillofacial Surgery, Hyderabad, India.

ABSTRACT

Aim: Purpose of this study was to determine efficacy of lignocaine with subanesthetic dose of ketamine for relief of postoperative pain, swelling and trismus.

Methods: 30 patients underwent surgical extraction of mesioangular impacted third molar tooth. Patients were randomly divided into 2 groups. LGK group (lignocaine plus ketamine) and LGA (lignocaine) alone group. Patients received 5ml of anesthetic solution comprising of 2ml of LA and 3ml of saline in LGA group, and 2ml of LA 0.3mg/kg wt ketamine and saline in LGK group.

Results: Pain was significantly low in LGK group than LGA group (P value = 0-004). Mouth opening is significantly high in LGK group than in LGA group(P value= 0.0285) .Swelling is minimal in LGK group (P value= 0.082).

Conclusion: Combination of lignocaine with ketamine provides good analgesia with minimal postoperative swelling and significantly less trismus.

Keywords: Ketamine, Lignocaine, Pain, Swelling, Trismus.

INTRODUCTION

Surgical removal of impacted third molar is one of the most frequently performed procedures in oral and maxillofacial practice. It is associated with a moderate incidence of complications, around 10%, such as postoperative pain, swelling, and trismus. Reduction of this intraoperative and postoperative discomfort becomes essential for success of surgical practice.[1,2] Various adjuvants to local anesthetics have been used to prolong the duration of analgesia. These include non-steroidal anti-inflammatory agents, opioid analgesics, alpha-2-adrenergic agents, and ketamine.[3] In order to develop mechanisms based approaches to pain therapy, renewed interest has focused on the use of ketamine for treatment of acute and chronic pain. At small doses (0.1-0.5 mg/kg), ketamine has a noticeable analgesic action, which can be used to supplement local anesthesia with minimal side effects[4]. It is becoming increasingly clear that a distinction must be made between the use of high dose ketamine as an anesthetic agent and the use of low dose ketamine for analgesic. The addition of ketamine to a local anesthetic or other analgesics in peripheral or neuraxial anesthesia and analgesia

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***Correspondence Dr. Arshiya Sanober.**
Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Hyderabad, India.
Email: drarshiyaomfs14@gmail.com

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Fig 1: Impacted 3rd molar.

Fig 2: Ketamine Drug.

Fig 3: Facial swelling measurement.

Fig 4: Mouth opening.

improves or prolongs pain relief[5,6]. Lignocaine 2% with adrenaline 1:100,000 is regarded as the standard to which all other local anesthetics are compared.[1] In this study the efficacy of local anesthesia with ketamine and without ketamine in the third molar surgery is evaluated.

MATERIAL AND METHODS

30 patients of ASA I and II category between ages of 18 to 40 reporting to the department of oral and maxillofacial surgery , government dental college and hospital , Hyderabad for the surgical extraction of mesioangular impacted mandibular third molar were selected in the study(Figure 1). Study protocol was approved by institutional review board. Written consent was taken from patients. Study duration was from April 2014 to September 2014.

Patients with allergy to experimental drugs, history of systemic diseases and teeth associated with fracture were excluded from the study. Patients were randomly assigned into two groups LGA(Lignocaine) group and LGK(Lignocaine + ketamine) group. Patients in LGA group received 5ml of local anesthetic solution comprising combination of 2ml local anesthesia and 3ml of saline. Patients in LGK group received 5ml of local anesthesia, comprising combination of 2ml lignocaine plus 0.3mg/kg ketamine and saline (Figure 2). All side effects occurring during the procedure were assessed. After surgery, patients were asked to score overall pain on a point visual analog scale at 1, 3, 5 and 7 days after surgery.

The level of facial swelling was determined by a modification of tape measure method described by Gabka and Matsumara[7] preoperatively and 1, 3, 5, 7 days post operatively (Figure 3). Trismus was evaluated 1,3, 5 and 7 days postoperatively by measuring the distance between the mesial- incisal corners of the upper and lower right central incisors of maximum opening of jaws (Figure 4). The difference between the respective preoperative and postoperative measurements indicated the degree of trismus on that day. After surgery, the patients were free to use analgesic tablets and the maximum number of analgesics taken into count on 1st, 2nd, 3rd, 4th and 5th day.

Table:1: Comparision of post operative pain. Statistical analysis: Unpaired t test. Statistically significant if p<0.05.

	LGA		LGK		
Time of assessment	MEAN	SD	MEAN	SD	P Value
1st Day	5.93	0.96	4.53	1.41	0.004 S
2nd Day	3.87	0.74	3.73	0.88	0.658 NS
5th Day	1.87	0.74	2.27	1.03	0.234 NS
7th Day	0.60	0.51	0.40	0.51	0.289 NS

Table 2: Statistical analysis of analgesic between two groups: Mann-Whitney U test. Statistically significant if P<0.

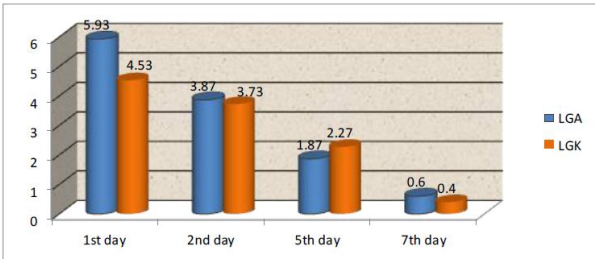
	LGA		LGK		
Time of assessment	MEAN	SD	MEAN	SD	P Value
Day 1	3.00	0.00	2.00	0.00	0.000 S
Day 2	3.00	0.00	1.93	0.26	0.000 S
Day 3	2.60	0.51	1.00	0.00	0.000 S
Day 4	2.00	0.00	1.00	0.00	0.000 S
Day 5	0.93	0.26	0.47	0.52	0.029 S

Table 3: Comparison of Maximum Mouth opening Pre Operatively and Postoperatively Statistical analysis unpaired t test statistically significant P<0.0.

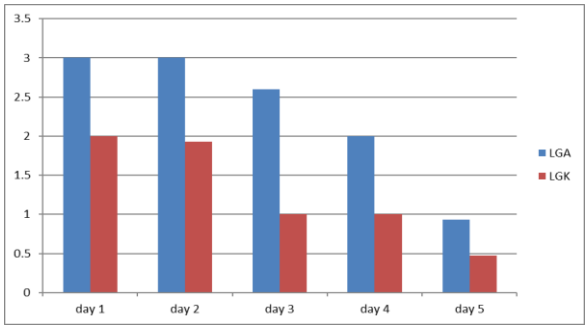
	LGA		LGK		
	MEAN	SD	MEAN	SD	P Value
Pre Operative	44.13	4.34	44.93	3.20	0.570 NS
1st Day	26.27	5.91	30.80	4.74	0.0285 S
3rd Day	29.07	6.24	34.27	2.60	0.0065 S
5th Day	33.53	5.55	36.73	2.66	0.054 NS
7th Day	38.73	5.20	40.33	3.50	0.331 NS

Table 4: Comparison of facial swelling pre operatively and postoperativel.

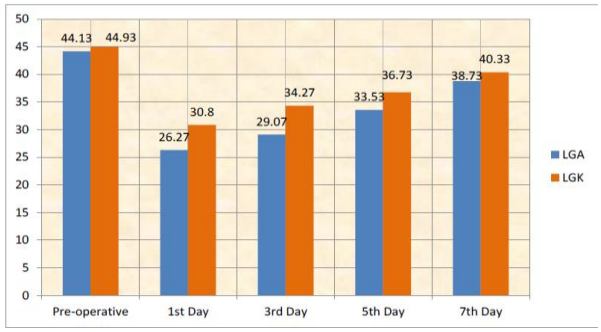
	LGA		LGK		
	MEAN	SD	MEAN	SD	P Value
Pre Operative	32.01	0.98	31.75	2.49	0.716 NS
1st Day	33.79	1.17	32.39	2.77	0.082 NS
3rd Day	33.36	1.23	33.02	2.26	0.278 NS
5th Day	32.25	3.16	32.31	2.47	0.959 NS
7th Day	32.52	1.49	31.75	2.55	0.323 NS



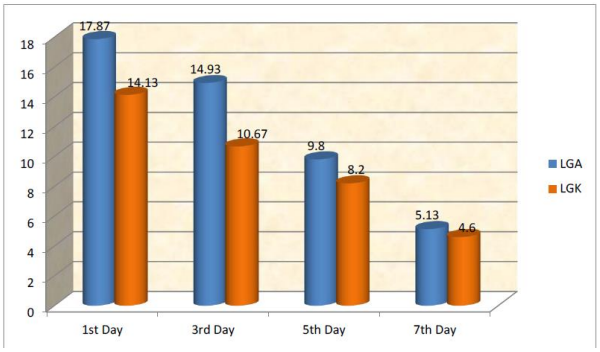
Graph 1: Comparison of post operative pain.



Graph 2: Post operative comparison of analgesics.



Graph 3: Comparison of post operative maximum mouth opening.



Graph 4: comparision of post operative facial swelling.

Descriptive statistical analysis was carried out. Results on continuous measurement are presented on mean ± SD (min - max) and results on categorical measurements are presented in number (%). Chisquare test and unpaired 't' test are used to assess the values.

RESULTS

Present study included 30 patients, 18 male and 12 female in which 8 males and 7 females were included in lignocaine with ketamine group with a mean age of 24.8±5.4. In lignocaine group, 10 males and 5 females with mean age of 25.6±5.2 were included. Parameters used for evaluation were pain, facial swelling and trismus. All parameters were statistically evaluated and a mean value along with standard deviation was obtained. Pain assessment was done in all patients at 1st, 3rd, 5th, 7th day postoperatively. At the 1st postopertive day, the

mean value of pain score was 5.93±0.96 and 4.53±1.41 for LGA and LGK group respectively which is statistically significant (p=0.004) (**Table.1, Graph 1**) Pain was significantly low in LGK group than in LGA group on 3rd and 5th day. Intensity of pain is less in both groups. Less pain in ketamine group is observed by less consumption of analgesic tablets than in lignocaine group alone**.(Table .2,Graph 2)**

Facial swelling showed no statistically significant difference between the two groups, swelling is maximum on 1st postoperative day and gradually decreased on the 7th postoperative day (**Table.4, Graph 4**). Mouth opening showed statistically significant difference on 1st and 3rd postoperative day. Mouth opening showed similar trend in both groups on 5th, 7th, day (**Table.3,Graph 3**). Minimal side effects were encountered in this study. Two patients in LGK group had giddiness, nausea and weakness. Patients were monitored for an hour and recovered without any medical intervention.

DISCUSSION

Surgical removal of lower third molars is often associated with pain, swelling and limited mouth opening. To increase patient satisfaction after third molar extraction it is necessary to avoid intra operative and post-operative discomfort associated with removal of a tooth. The addition of ketamine to local anesthetic agents has been reported to increase the duration of regional anesthesia and post-operative analgesia.[2] The present study compares the efficacy of lignocaine alone and lignocaine with combination of low dose ketamine with respect to postoperative pain, facial swelling and trismus after surgical extraction of lower third molar.

NMDA receptors participate in the development and maintenance of what can be called "pathologic pain" after tissue injury, increased pain perception as a result of pain sensitization, in part from synaptic plasticity[8-10]. Pain therapy can be improved using intraoperative and postoperative ketamine in a variety of surgical procedures and anesthetic techniques. Ketamine, an NMDA receptor antagonist has a potent analgesic effect at sub anesthetic doses. Dal et al[11] have investigated the efficacy of peritonsillar infiltration of ketamine for post-operative pain relief in children, reporting that the perioperative administration of low dose ketamine intravenously or by peritonsillar infiltration provides effective pain relief without side effects in children undergoing adenotonsillectomy. Erhan et al[12] have reported that ketamine infiltration into the tonsillar region is an easy and effective way of providing a high level of analgesia for pain management after tonsillectomy. Tan et al[13] have found that perincisional, subcutaneous ketamine infiltration can suppress post-operative pain and decrease post-operative early analgesic requirement.[2,12]

In the present study combination of lignocaine and ketamine provided adequate analgesic effect, which is demonstrated by less use of analgesic tablets in ketamine group. Hence ketamine has been suggested as an adjuvant along with lignocaine for profound analgesia. Recent evidences show that caudal co administration of ketamine 0.5mg/kg with 0.25% bupivacaine in children produced better post-operative analgesia than bupivacaine alone after lingual herniotomy.[3] Adding small dose of ketamine to a multi modal regimen provides better post-operative analgesia than one without ketamine, thus reducing analgesic consumption. Concomitant use of multimodal regimen of ketamine with lignocaine is an effective and safe method of post-operative pain management.[14]

In our study, there was no statistically significant difference in postoperative swelling. This is contradictory to the study conducted by Tulin Satilmis[2]. Yuasa and Sugiura[15] stated that the short term outcome of third molar surgery (swelling, pain) also differs depending on patient characteristics (age and gender) and preoperative index of difficulty. So in this present study mesioangular impacted third molar with minimal difficulty index is taken into consideration, so less swelling is anticipated. Study conducted by Mazer et al,[16] on anti-inflammatory action of ketamine where several recent invitro studies demonstrated that ketamine suppressed the production and release of various cytokines, for example ketamine inhibited the leukocyte production of TNF alpha, IL6 ,IL8 and nitric oxide and significantly suppressed oxygen radical generation of isolated human neutrophils. Anti-inflammatory effects of ketamine are mediated

by adenosine. Ketamine administration causes release of adenosine in the periphery and adenosine through A2AR reduces the systemic inflammatory response by inhibition of secretion of pro inflammatory cytokines as well as leukocytic activation and recruitment.[16]

Mouth opening is good in LGK group compared to LGA group. Mouth opening showed similar trend in both groups on 5th and 7th days. These results are in accordance with studies conducted by Satilmis T et al[2]. Side effects such as nausea, vomiting, hallucinosis, nystagmus, excitation and photophobia have been reported for ketamine, depending on the dosage[11,17]. A decrease in drug-related side effects (sedation, pruritus, or adverse psychological reactions) has also been found which could reduce the required drug doses as stated by few studies[18,19]. But in our study, no significant side effects were noticed. The biggest concern over the use of ketamine is its potential to affect ICP (intracranial pressure) secondary to its ability to increase cerebral blood flow by 30% to 60%. It is currently contraindicated in head injury (due to both increased oxygen consumption and increased intracranial pressure associated with ketamine).[20]

In conclusion, the combination of lignocaine and sub anesthetic dose of ketamine during surgical extraction of impacted 3rd molar with minimum difficulty index can produce good anesthesia and analgesia with significant minimal swelling, pain and trismus. Further randomized studies with high difficulty index of impacted molars might produce more definitive results with the same combination groups. For future study with more sample size, the evaluation of ketamine as an adjunct to local anesthesia appears to be a priority given the promising results and the ease with which such a regimen could be implemented.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Miloro M: Peterson's Principles of Oral and Maxillofacial Surgery(ed 2). Canada, BC Decker Inc, 2004. p. 92-93, 110-112, 138
2. Satilmis T, Garip H, Arpact E, et al: Assessment of combined local anesthesia and ketamine for pain, swelling and trismus after surgical extraction of third molars. J Oral Maxillofac Surg. 2009; 67: 1206-12
3. Panjabi N, Prakash S, Gupta P, and Gogia A.R. Efficacy of Three Doses of Ketamine With Bupivacaine for Caudal Analgesia in Pediatric Inguinal Herniotomy. Reg Anesth Pain Med. 2004;29:28-31
4. Kohrs R, Durieux M. Ketamine: Teaching an Old Drug New Tricks. Anesth Analg. 1998;87:1186-93
5. Azevedo VM, Lauretti GR, Pereira NL, Reis MP: Transdermal ketamine as an adjuvant for postoperative analgesia after gynecological abdominal surgery using lidocaine epidural blockade. Anesth Analg 2000; 91:1479–82 21.
6. Abdel-Ghaffar ME, Abdulatif M, Al-Ghandi A, Mowafi H, Anwar A: Epidural ketamine reduces postoperative epidural PCA consumption of fentanyl/bupivacaine. Can J Anaesth 1998; 45:103–9
7. Utsun Y,Erdogan O ,Esen E, et al:Comparision of the effects of 2 doses of methyl prednisolone on pain ,swelling , trismus after third molar surgery.Oral surgery Oral med Oral patholOral radio Endod 96:535,2003
8. Petrenko AB, Yamakura T, Baba H, Shimoji K: The role of N-methyl-Daspartate receptors in pain: A review. Anesth Analg 2003; 97:1108–16
9. Cairns BE, Svenson P, Wang K, Hupfeld S, Graven-Nielsen T, Sessler D, Berde CB, Arendt-Nielsen L: Activation of peripheral NMDA receptors contributes to human pain and rat afferent discharges evoked by injection of glutamate into the masseter muscle. J Neurophysiol 2003; 90:2098–105
10. Willert RP, Woolf CJ, Hobson AR, Delaney C, Thompson DG, Aziz G: The development and maintenance of human visceral pain hypersensitivity is dependent on the N-methyl-D-aspartate receptor. Gastroenterology 2004; 126:683–92

11. Dal D,Celebi N,Elvan EG,et al .The efficacy of intravenous or peritonsillar infilteration of ketamine for post operative pain relief in children following adenotonsillectomy.Paediatr Anaesth 17:263,2007

12. Erhan Ol,Goksu H,Alpay C,et al ketamine in post-tonsillectomy Pain .int J Pediatr O torhinolaryngool 71;735,2007

13. Tan Ph,Cheng JT,Kuo CH,et al :Periincisional subcutaneous infilteration of ketamine suppresses post operative pain after circumcision surgery.Clin J Pain 23:214 2007

14. Chia Y.Liu K, Liu Y C,Chang H,Wong C.S, Adding ketamine in a multimodal patient –controlled Epidural regimen reduces post operative pain and Analgesic consumption.Anesth Analog 1998,86:1245-9

15. Yuasa H ,Sugiura M : Clinical post operative findings after removal of impacted mandibular third molars:Prediction of post operative facial swelling and pain based on preoperative variables.Br J Oral Maxillofacial Surg 42:209,2004

16. Julia Mazer et al involvement of adenosine in the anti inflammatory action of ketamine Anesthesiology 2005,102:1174-81

17. Launo C,Bassi C ,Spagnolo L,et al :Pre emptive ketamine during general anesthesia for postoperative analgesia in patients undergoing laproscopic cholecystectomy.Minerva Anestesiol 70:727,2004

18. Taura P, Fuster J, Blasi A, Martinez-Ocon J, Anglada T, Beltran J, Balust J, Tercero J, Garcia-Valdecasas JC: Postoperative pain relief after hepatic resection in cirrhotic patients: The efficacy of a single small dose of ketamine plus morphine epidurally. Anesth Analg 2003; 96:475–80 26.

19. Togal T, Demirbilek S, Koroglu A, Yapici E, Ersoy O: Effects of S() ketamine added to bupivacaine for spinal anaesthesia for prostate surgery in elderly patients. Eur J Anaesthesiol 2004; 21:193–7

20. Hougaard K, Hansen A, Brodersen P.The effect of ketamine on regional cerebral blood flow in man.Anesthesiology 1974:41:562-567: ketamine as street drug.