

Comparison of effect of intra socket ketamine and tramadol on postoperative pain after mandibular third molar surgery

ABSTRACT

Aim: This study compared the analgesic efficacy of intra socket application of tramadol versus ketamine for preventing pain after mandibular third molar surgery.

Materials and Methods: Thirty patients who had undergone third molar surgery were randomly divided into three groups: Group T (tramadol 1 mg/kg), Group K (ketamine 0.5 mg/kg), and Group C (saline 2 mL). The treatment was applied to the extraction sockets using resorbable gel foam. Average time taken for the procedure was recorded. Pain was evaluated postoperatively using a visual analog scale (VAS) at 6 and 24 h postoperatively. Furthermore, the number of analgesics taken in the 1st 24 h was recorded. The relevant information was gathered and tabulated. IBM SPSS 2.0 was used to analyze the results and one-way ANOVA test was used to determine the statistical significance.

Results: The VAS scores after extraction were statistically higher in Group C than in either treatment group. Group K had the lowest pain intensity. During the 1st 6 h, patients reported statistically lower pain intensity scores in Groups K and T versus Group C. At 24 h, Group K had the lowest pain intensity and Group T had less pain than Group C. The number of analgesics taken in the 1st 24 h was highest in Group C.

Conclusion: This study shows that intra socket use of tramadol and ketamine can be used as effective alternatives for decreasing pain after third molar surgery.

Keywords: Analgesic efficacy, intra-socket drug delivery, ketamine, third molar surgery, tramadol

INTRODUCTION

Third molar surgery is the most common minor surgical procedure performed in the oral surgery. It has always been a challenge to control the postoperative pain and swelling.^[1,2] Tramadol is a centrally acting, synthetic opioid analgesic with low affinity for opioid receptors.^[3] It is structurally identical to the morphine and codeine.^[4] Tramadol has been used effectively to treat moderate-to-severe pain including terminal cancer pain, obstetrics, perioperative, and pain of coronary origin. It is also used in combination with acetaminophen to treat severe pain of dental origin where nonsteroidal anti-inflammatory drugs (NSAIDs) are contraindicated. Tramadol acts by modifying the transmission of pain impulses as the drug inhibits monoamine reuptake. It has less potential for addiction,^[5] also the side effects

caused by tramadol are more tolerable as compared to other opioid analgesics.^[6,7]

Ketamine is an anesthetic agent with analgesic efficacy at subanesthetic dosage. It is an effective analgesic for pain

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of nociceptive and neuropathic origin.^[8] The recommended route of administration of ketamine is intravenous or intramuscular; however, other routes of administration such as oral, intranasal, transdermal, rectal, intrathecal, and epidural are also advocated in the literature.

We aim to compare the analgesic efficacy of intra socket application of tramadol versus ketamine for preventing pain after mandibular third molar surgery.

MATERIALS AND METHODS

This randomized, comparative single-blinded study was carried out in the Department of Oral and Maxillofacial Surgery, Saveetha Dental College and Hospitals, Chennai, India. The ethical clearance was obtained from the institutional research board (IHEC/SDC/OSURG-1807/20/392). Informed consent was obtained from patients involved in this study.

A total of 30 patients were involved in this study who had undergone unilateral mandibular third molar surgery. The patients were randomly divided into three groups (group ketamine; group tramadol and group control). The mean age of the patients was 38.8 years (range 21–50 years). There were no specific criteria for gender of the patients. All the patients involved in the study were not on any other medication for the systemic illness. Furthermore, the patients did not have any history of sensitivity to the tramadol and ketamine. Patients with a history of analgesics taken within 24 h prior to the surgery were excluded from the study.

All the patients were operated by a single operator and the average time taken to perform the surgery was recorded. Maximum 2 ml of 2% lignocaine with 1:100,000 adrenaline was used and classical inferior alveolar nerve block technique was used for local anesthesia in Ward's incision was used for flap reflection and all the cases required bone cutting for the exposure of the tooth.

The solution was prepared by the assistant anesthetic nurse according to the dilutions mentioned above and applied to the extraction sockets on resorbable gel foam (1.5 cm × 1.5 cm in size) by the surgeon according to the previously divided groups; Group T (Tramadol 1 mg/kg diluted with saline to 2 ml), Group K (Ketamine 0.5 mg/kg diluted with saline to 2 ml), and Group C (saline 2 ml). The surgeon was blinded to the solution used. Pain after the surgical procedure was evaluated using a visual analog scale (VAS). The patients were asked to score the pain at the 1st, 6th and 24th h using

the VAS (1 = no pain; 2 = mild pain; 3 = moderate pain; 4 = severe pain; 5 = very severe pain). Patients were asked to record the number of analgesics (paracetamol 650 mg) taken after the third molar surgery. The total analgesics consumption during the 1st 24 h was recorded. There were no dropouts in the study.

The data were tabulated and analyzed using IBM SPSS version 2.0 software. Nonparametric data were analyzed using descriptive statistics measuring frequency and percentage. One-way ANOVA test was used to determine the statistical significance. The study was considered to be statistically significant if the probability was < 0.05 ($P < 0.05$).

RESULTS

Thirty patients were involved in the study. Each group included ten patients. Overall mean age of the patients was 25.17 ± 4.5 years [Table 1]. Furthermore, there was no significant difference between the time taken for the surgery. The mean time taken for completion of the procedure from the time of administration of anesthesia was 28.33 ± 8.02 min [Table 1].

The VAS scores at 1st h after the third molar surgery in all groups did not show significant difference; however, VAS scores 6th and 24th h were statistically higher in Group C than Group K and Group T [Table 2]. The total consumption of analgesics was significantly greater in Group C than in Groups T and K groups ($P = 0.05$) [Table 3]. The Group K showed lesser VAS scores. Furthermore, the total analgesics taken in 24 h were lesser in Group K than Group T and Group C.

DISCUSSION

Mandibular third molar surgery is a procedure routinely performed in oral and maxillofacial surgery and it is

Table 1: The mean age of the patients involved in the study and average time taken to perform each surgery

	Mean	Median	Mode	SD
Age of the patients	25.17	25.00	21	4.564
Time taken for surgery	28.33	27.50	20	8.023

SD: Standard deviation

Table 2: Mean visual analog scale scores at 1st, 6th, and 24th h

Groups	Number of patients	Mean	SD	SE
Ketamine	10	1.00	0.000	0.000
Tramadol	10	1.00	0.000	0.000
Control	10	1.20	0.422	0.133
Total	30	1.07	0.254	0.046

SD: Standard deviation, SE: Standard error

Table 3: ANOVA test for comparison of total analgesics taken in 24 h between ketamine, tramadol, and control group

Total analgesics taken	ANOVA test				
	Sum of squares	df	Mean square	Test value	Significance
Between Groups Groups K, T, and C	5.067	2	2.533	3.242	0.055

associated with postoperative pain, swelling, and discomfort. Furthermore, the pain experienced in surgical removal of the mandibular third molars is considerably greater than that of the normal extractions as it involves bone cutting. It is very important to control the postoperative pain. NSAIDs and opioid analgesics are routinely used for pain management postoperatively in third molar surgeries.

Tramadol is a synthetic opioid analgesic, which acts centrally and has low affinity for opioid receptors.^[3] It modifies the transmission of pain stimuli by inhibiting the reuptake of monoamines. Similar studies have examined pre- or post-operative administration of tramadol after surgery of the impacted third molar. Authors have proved that the single intravenous dosage of tramadol was more effective than the oral administration to control the pain experienced after third molar surgery in a previous study.^[3]

Pozos *et al.*, evaluated the analgesic effects of systemic and local (into the surgical site) tramadol along with the placebo after extraction of an impacted mandibular third molar under local anesthesia. The study proved that the local injection of tramadol increased the duration of anesthesia and the systemic use of tramadol provided improved analgesia after removal of impacted third molar. Other studies have also shown that the intramuscular tramadol in combination with the injection of tramadol into the surgical site considerably decreased the requirement for the rescue analgesia.^[9] Some authors have evaluated the analgesic efficacy of tramadol after the dentoalveolar procedures which involved bone cutting.^[7] This study showed that the use of tramadol provided complete analgesia without any unacceptable side effects.

Ketamine is a well-known general anesthetic and when given in low doses it has analgesic^[10] and anti-inflammatory effects. It is the only anesthetic that shows analgesic, hypnotic and amnesic effects. It is a phencyclidine derivative that acts by blocking N-methyl-D-aspartate receptors.^[11] It produces a state of dissociative anesthesia resulting from electrophysiological dissociation between the limbic and cortical systems. When used correctly, it is a very useful and versatile drug.^[12]

In one of the studies by Slatkin *et al.*, it was reported that the ketamine decreased pain in a patient with radiation-induced

oral mucositis; the ketamine was prescribed as an oral rinse. Topical use of ketamine is also advocated in the literature to control the pain after tonsillectomy to reduce the need for rescue analgesia.^[13,14]

The local application of tramadol and ketamine after third molar surgery is an effective alternative for decreasing pain. In this study, we have evaluated the efficacy of intrasocket application of tramadol and ketamine to control pain following third molar surgery. According to the VAS scores obtained in this study, ketamine has shown more analgesic efficacy when compared to tramadol.

CONCLUSION

Intrasocket application of ketamine and tramadol is effective to control the postoperative pain after mandibular third molar surgery and can be used as an alternative method for pain control. Within the limits of this study, we can also conclude that ketamine was more effective than tramadol it also reduces the gastric disturbances which are generally caused after oral administration of NSAIDs. However, only a few studies have evaluated ketamine in postoperative pain in third molar surgeries, further studies are needed.

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Conflicts of interest

There are no conflicts of interest.

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