Comparison of Local Anesthetic Efficiency of Tramadol Hydrochloride and Lidocaine Hydrochloride

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Purpose: This study investigated the local anesthetic efficiency of tramadol versus lidocaine hydrochloride in maxillary infiltration anesthesia.

Materials and Methods: This study was a randomized double-blinded study involving 50 healthy volunteers. In the experimental part of this study, each volunteer received a buccal 0.5-mL injection of tramadol hydrochloride 25 mg on one side and a buccal 0.5-mL injection of vasoconstrictor-free lidocaine hydrochloride 20 mg on the other side. No other treatment was performed. After the injections, total duration of anesthesia, start and finish times of anesthesia, soft tissue (sensory) innervation, depth of anesthetic, possible side effects, and satisfaction levels were recorded from all volunteers.

Results: There was no relevant difference between solutions for total anesthesia duration and peak values. However, statistically, the effect of lidocaine started and ended early. The efficacy of tramadol was markedly more effective in the gingiva and skin, especially at 15 and 20 minutes, compared with lidocaine. Both anesthetic agents were well tolerated by the volunteers.

Conclusion: Tramadol hydrochloride can be a good alternative to local anesthetic agents and beneficial to support anesthesia during long operations.

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Local anesthetics are agents that reversibly interfere with neural conduction and are widely used to provide pain control in dental treatments, especially tooth extraction. Most local anesthetics are effective in general, but the anesthetic solution used should provide the best fit for the patient's systemic condition and should allow for the best possible surgical procedure.[1]

Although various local and regional techniques can be used for local anesthesia in oral surgery, one of the most widely used methods is local infiltration anesthesia. This method is widely used for mandibular and maxillary teeth extraction and almost all types of dental surgical procedures. Because dentists use these agents extensively in daily practice, they should be aware of the contents of these anesthetic agents, the maximum dose amounts, the mechanism of action, the complications seen, and the relative advantages and disadvantages of various anesthetic agents.[2,3]

Although many chemical agents have been developed and produced for local anesthetic purposes, only a certain number of substances are in current use. Cocaine was the first drug used as a local anesthetic

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agent. However, because of its serious side effects, researchers searched for safer drugs. In the previous century, many safe local anesthetics were introduced, such as lidocaine in 1948, mepivacaine in 1957, prilocaine in 1960, and bupivacaine in 1963.[4] Of these anesthetic agents, lidocaine hydrochloride (lidocaine HCl) is one of the most widely used agents in dentistry. Lidocaine HCl provides fast relief, has excellent anesthetic effects, and has minimal allergenicity.[5] For this reason, lidocaine HCl is assumed to be the safest local anesthetic for dental procedures. However, some recent in vitro studies have shown that opioids, such as diamorphine, meperidine, fentanyl, and sufentanil, also have anesthetic effects.[6,7] One of these opioids is tramadol hydrochloride (tramadol HCl), which is known for its strong analgesic activity and has been used in medicine for many years.

Tramadol HCl is a centrally acting, synthetic analgesic. Despite being a weak opioid in the analgesic class, it is an interesting drug that has opioid and nonopioid action mechanisms and is bidirectionally effective. The risk of respiratory depression at the analgesic dose is minimal and does not suppress the hypoxic respiratory response. Although nausea and vomiting are the most common side effects, the risk of developing addiction or resistance is rather low compared with other analgesic agents.[8,9]

In recent years, the intradermal administration of tramadol was observed to have a local anesthetic effect.[10] When used with mepivacaine, it also was found to extend the brachial plexus blockade.[11] It also was reported to increase the effectiveness of articaine in inferior alveolar nerve anesthesia during dental treatments.[12,13] These findings suggest that, in addition to its known mechanisms, tramadol has additional properties, such as local anesthetic or peripheral effects. Moreover, some studies suggested that tramadol HCl can be used as a local anesthetic because of its neurotransmission blocking effect.[14,15]

However, an overall review of the literature yielded no reports that described the efficacy of tramadol alone (without epinephrine) as a local anesthetic agent in dentistry, especially for oral surgery, and there were no reports comparing it with other agents. Thus, in this study, the authors measured the efficacy of the anesthetic use of pure tramadol to determine the degree to which it can be used in daily practice compared with other local anesthetic agents. Therefore, this study could pave the way for further studies on this subject and fill this gap in the literature.

Materials and Methods

This double-blinded randomized pilot study was conducted on 50 healthy volunteers 21 to 26 years old at the Department of Oral and Maxillofacial Surgery of the Faculty of Dentistry at Gaziantep University (Gaziantep, Turkey). All volunteers were informed about the study in detail before enrollment and signed a consent form. This study followed the Declaration of Helsinki on medical protocol and ethics and the regional ethical review board of the Gaziantep University clinical research ethics committee approved the study (May 5, 2018; approval number 204).

The exclusion criteria were a systemic disease, drug allergy, pregnancy, breastfeeding, smoking habit or alcohol consumption, being under medical treatment with drugs, or acute or chronic infection in the mouth and maxillofacial region. Before the experimental part of the study, local infiltration anesthesia was performed to help volunteers better evaluate postinjection pain, pressure, and numbness sensations.

Participants were assigned sequential numbers in the order in which they were enrolled and received their allocated treatment according to a computer-generated randomization schedule prepared before the start of the study. The study had a randomized split-mouth design and tramadol and lidocaine solutions were prepared by an independent researcher who was not involved in the research procedure. The 2 solutions were similar in appearance and a standard dental aspirating syringe fitted with a 27-gauge 1.5-inch needle was used for injections. Buccal infiltrative anesthesia was performed under sterile conditions by the same surgeon after bone contact was measured at a 45° angle from the deepest point of the vestibular sulcus along the alignment of the bilateral maxillary canine and first premolar and after aspiration control. Each volunteer received 0.5 mL of tramadol HCl 25 mg on one side and buccal infiltration anesthesia was performed with 0.5 mL of vasoconstrictor-free lidocaine HCl 20 mg on the other side. Neither the clinician nor the volunteer knew which solution was injected to which side. Buccal local infiltrative anesthesia was applied with at least 2 weeks' duration between injections to minimize the misinterpretation of the injection of the 2 agents by the volunteer. After injections, all variables were recorded by the same investigator.

VARIABLES AND METRICS

After infiltration anesthesia with the 2 solutions, the following measurements were obtained.

Duration of Anesthesia From Start to Finish and Total Anesthesia

The durations of when the anesthetic effect began to occur, reached the maximum level, began to decrease, reached the end of numbness, and reverted to normal sensation were recorded with a stopwatch