Comparison of local anaesthetic effects of tramadol with prilocaine for minor surgical procedures

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Background. Recent studies have shown that a local anaesthetic action of tramadol 5% was able to induce a sensory block to pinprick, touch, and cold similar to that of lidocaine 1%. The aim of this study was to compare the local anaesthetic effects of tramadol hydrochloride with prilocaine.

Methods. Sixty ASA I or II patients, undergoing excision of the cutaneous lesions under local anaesthesia, were included in the study. Patients were randomly assigned to receive either 1 ml of tramadol 5% (Group T, n=30) or 1 ml of prilocaine 2% (Group P, n=30) intradermally, in a double-blinded fashion. The degree of the burning sensation and pain at the injection site was documented. Sensory block was assessed 1 min after injection. The patient was asked to report the degree of sensation and to grade touch and pinprick sensation. Two minutes after drug administration, incision was performed and intensity of pain, felt by the patient was evaluated on a four-point scale (0–3). Any local adverse effects were recorded.

Results. There was no difference in the quality of block between the two groups. Side effects were noted in both groups with a significant increase in the incidence of local reaction (rash) in Group T (seven patients) when compared with Group P (one patient) (P<0.05). Seven patients in Group T vs four patients in Group P complained of burning at the injection site (P>0.05).

Conclusions. Intradermal tramadol 5% can provide a local anaesthesia similar to the prilocaine but the incidence of local adverse effects is higher.

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Tramadol is a racemic mixture consisting of two isomers with different spectrums of activity.¹ It causes activation of both opioid and non-opioid (descending monoaminergic) systems, which are mainly involved in the inhibition of pain.² The effect of the non-opioid component of tramadol is mediated through α2-agonistic and serotoninergic activities, by inhibiting the re-uptake of norepinephrine and 5-hydroxytryptamine and, possibly, by displacing stored 5-hydroxytryptamine from nerve endings.³

The local anaesthetic effects of opioids have been demonstrated in both clinical and laboratory studies.⁴ Tramadol, which is a weak opioid and selective for the µ-receptors, was recently shown to have a local anaesthetic action on peripheral nerves.⁵⁷

In this study, we aimed to compare the properties and side effects of local anaesthesia produced with either tramadol or prilocaine in surgery of the cutaneous lesions.

Methods
Sixty ASA physical status I–II patients, aged 18–57 yr, were included in this study. Informed consent was obtained from all participants and the Ethics Committee of the ZKU Research Hospital. All patients were to undergo elective day-case excision of small (<1 cm) lesions, without premedication. The exclusion criteria included any known allergy, contraindications to any of the test drugs, and pregnancy.
Patients were randomly assigned to receive either 1 ml of tramadol 5% (Contramal, Abdi Ibrahim Ltd, Istanbul, TR) (Group T, n=30) or 1 ml of prilocaine 2% (Citanest 2%, AstraZeneca Ltd, Istanbul, TR) (Group P, n=30) in a double-blinded fashion. The drugs were prepared in an unlabelled syringe by an anaesthetist not involved in the patient care and data collection, and was given for injection to the surgeon who was unaware of the content of the syringe. The same surgeon performed all the injections with a 25-gauge needle mounted to the syringe.

Immediately after injection (considered as time zero) and at 60 s intervals, the sensory block was assessed by using 22-gauge, short-beveled needle. The patient was asked to score the sensation of pinprick and light touch by the anaesthetist who was unaware of the given medication. The grading system was 0=no pain, 1=mild pain, 2=moderate pain, 3=severe pain for pin prickle, and 0=no light touch, 1=mild light touch, 2=moderate light touch, 3=severe light touch for light touch. Cold sensation was assessed by using a cube of ice. Surgical incision was performed 2 min after injection of local anaesthetic agent. The pain reported by the patient during incision was ranked from 0=no pain to 3=severe pain, incision impossible.

The patient was monitored by non-invasive arterial pressure measurement, heart rate, pulse oximetry, and ventilatory frequency. Local reactions (0=no reaction, 1=mild rash, 2=erythema, 3=urticaria) and injection pain (0=no pain, 1=mild pain, 2=moderate pain, 3=severe pain) were also recorded.

The data were analysed and compared using the Student’s t-test, $\chi^2$ and Fisher’s exact $\chi^2$ tests. A $P$-value <0.05 was considered statistically significant.

**Results**

Group T comprised 30 patients (13 males, 17 females), aged between 18 and 57 (mean 41.6 (12.1)) yr. Group P was composed of 30 patients (16 males, 14 females), aged between 18 and 57 (mean 38.3 (12.6)) yr. There were no significant differences.

No difference in the quality of block was recorded between the groups. Onset of the sensory block in the two groups was similar. Pinprick, light touch, and cold sensations were lost within 1 min and no pain during surgery was recorded in both groups (Figs 1 and 2).

Side effects were noted in both groups with a significant increase in the incidence of local reaction (rash) in Group T when compared with Group P ($P<0.05$) (Fig. 3). Seven patients in Group T vs four patients in Group P complained of burning at the injection site ($P>0.05$) (Fig. 3). All complaints resolved during the 15 min follow-up period spontaneously. Systolic and diastolic arterial pressure, heart rate, oxygen saturation, and ventilatory frequency remained stable; no differences were noted between the groups.

**Discussion**

Opioids such as diamorphine, meperidine, fentanyl, and sufentanil have local anaesthetic effects in *in vitro* studies. The weak opioid, tramadol, is a centrally acting analgesic selective for $\mu$-receptors. Recent studies have revealed the local anaesthetic action of tramadol. In a
A double-blinded, placebo-controlled study, intradermal injections of tramadol and lidocaine in healthy volunteers produced a local anaesthetic effect. In our study, we compared the local anaesthetic effectiveness of tramadol 5% with that of prilocaine 2% injected intradermally in the excision of lesions smaller than 1 cm. We obtained a local anaesthetic effect with tramadol similar to that of prilocaine for small lesions.

Nerve conduction effects of opioids have been demonstrated in both clinical and animal studies. Blockage of neural conduction in dorsal root axons may be the result of either specific opioid receptor-mediated mechanisms, or of non-specific membrane effects. The latter can be produced by a variety of chemical compounds, including peptides, alcohols, barbiturates, anticonvulsants, and narcotics. 

Tramadol, like codeine, has a methyl group substitution on the phenol moiety, which explains its weak affinity for opioid receptors. Unlike that of codeine, the analgesic effect of tramadol is also mediated via indirect modulation of the central monoaminergic inhibitory pain pathways. Clinically, it has been demonstrated that the local anaesthetic effect of opioids cannot be reversed by naloxone suggesting that this effect is more likely mediated by a non-opioid receptor dependent mechanism.

Acalovschi and colleagues reported that, in differential sensory block during i.v. regional anaesthesia (IVRA), cold sensation decreased more than pinprick, and touch sensation was most resistant to block. In our study, no difference was seen between cold, pinprick, and light touch sensations with tramadol given intradermally.

A major disadvantage of the use of tramadol as a local anaesthetic is the increased frequency of side effect. Previous studies have demonstrated that using tramadol in IVRA was associated with a skin rash distal to the tourniquet, suggesting histamine release. Both tramadol and meperidine have a local irritating effect, which overrides the anaesthetic effect on the sensory nerves. In this study, we also determined that the incidence of pain or burning sensation at the injection site was significantly greater in the tramadol group compared with the prilocaine group.

In conclusion, tramadol 5% has a local anaesthetic effect similar to prilocaine 2% when used intradermally. However, prilocaine has significantly fewer local side-effects.

References