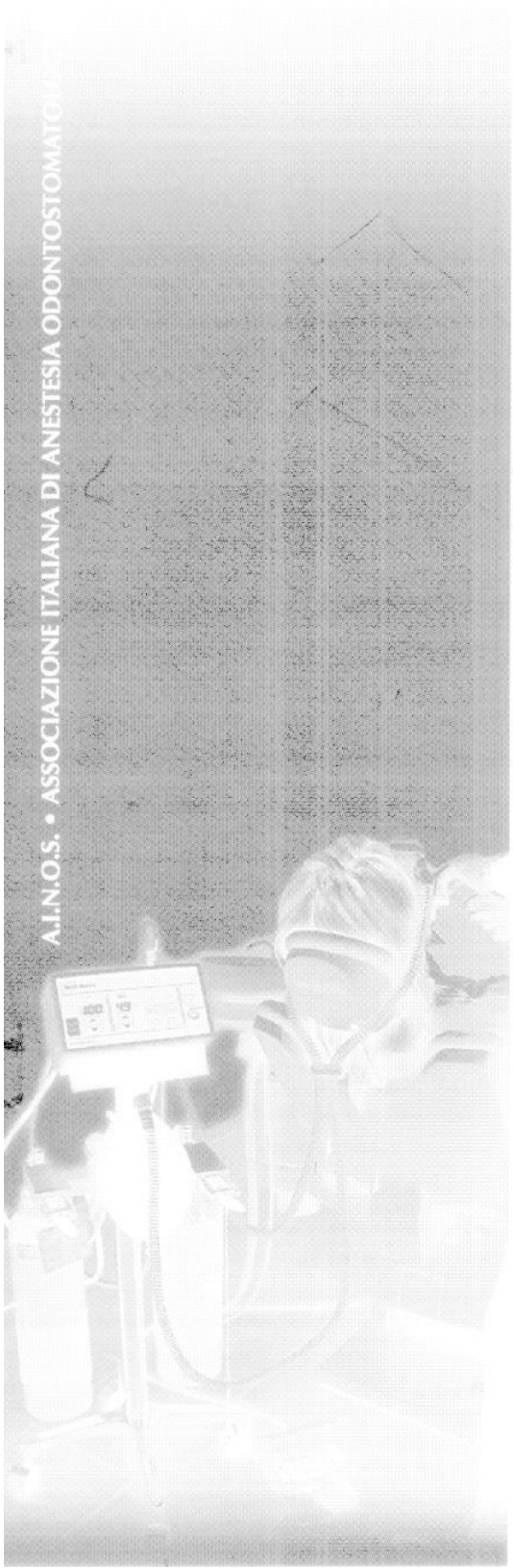

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THE USE OF MEPIVACAINE + BUPIVACAINE IN PROLONGED INTERVENTIONS OF ORAL SURGERY

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Summary

Two groups of 32 patients underwent prolonged intervention of oral surgery (implantology) under infiltration anesthesia and conscious sedation. Anesthesia induction was made with 2% mepivacaine + epinephrine and 0.5 bupivacaine + epinephrine (2.5 ml for each dental hemiarch in the first group). In the second group the same dose of bupivacaine used to induce local anesthesia was injected by infiltration in the operative wound to prolong the postoperative analgesia. All patients were instructed to identify at home the time of appearance of pain and the time of analgesic drug assumption. The results show that the preoperative infiltration of bupivacaine induces analgesia for 3.3 hours and that the additional infiltration of the operative wound at the end of the intervention increases the duration of analgesia up to 5 hours on average delaying at the same time the assumption of analgesic drugs.

Key words

Local anesthetics;
mepivacaine;
bupivacaine;
postoperative pain.

Introduction

Local anesthetics are widely used in dentistry for short and long interventions. In the latter, particularly in procedures of extraction of the third molar and in implantology, local anesthetics are frequently used in association with intravenous sedation (1; 2). For interventions supposed to be of long duration recently the use of long action anesthetics such as bupivacaine has been proposed. In regional blocks bupivacaine is about three times more potent than mepivacaine (3) and disturbances in nervous function are not electroneurographically observed during its use even when it is accidentally injected intravenously (4), while its hepatic toxicity is pratically nil (5). Bupivacaine exerts a longer duration analgesia on soft tissues compared to mepivacaine and its induction is similar to that of mepivacaine but its metabolism is fast (6). Its longer action is not due to retention in human organism but to its ability to bind to nervous tissues.
This study aims at adding further information on the use of bupivacaine in long duration interventions related to the appearance of pain and to the use of analgesics in the postoperative period.

Materials and methods

The study was conducted on a total of 64 patients undergoing implantology at the Dental Clinic, University of Padua. All patients were visited a few days before intervention to evaluate physical state, clinical state and preoperative anxiety. For that, Sykes et al. (7) questionnaire for clinical state evaluation, ASA (8) classification for physical state and a visual analogue of 10 cm for identification of the anxiety level were used. In such occasion the patient was informed of the perioperatory treatment and after obtaining his consent was asked to solve a questionnaire formulated to evaluate pain and analgesic effects of the postoperatively employed drugs.
The day of intervention. All patients were premedicated with chlordemethyldiazepam 30 min before intervention with oral doses of 1-2 mg depending on the level of anxiety shown during the preoperative visit. The level of sedation was evaluated by a numeric score of 0-10 where 10 was the highest level of sedation. The difference between the score reported by the patient and the highest level was compensated on the operating table with titred doses of diazepam through a venous way precedingly cannulated. After a topic anesthesia with EMLA cream, 2% mepivacaine with 1:100.000 epinephrine followed by 0.5% bupivacaine with 1:200.000 epinephrine was injected. The injected volume of bupivacaine was 2.5 ml for each dental hemiarch. In no case bupivacaine was injected in a nerve trunk of the upper or lower maxillary.

All patients underwent clinical and instrumental monitoring through intraoperative measurement of ECG, cardiac and respiratory frequency, non invasive arterial pressure and arterial saturation.

At the end of intervention 32 patients had been treated with an additional volume of 0.5% bupivacaine with epinephrine similar to that injected at the induction of paraperiosteal anesthesia. The other 32 patients were discharged with no additional bupivacaine. The discharge was made after comparing the Newman et al. (9) test with the preoperative one and evaluating the possibility of discharge of the patient, who was taken home by an accompanying person.

Instructions at home. Each patient was bound to observe what agreed upon at the preoperative visit and in particular the filling of the questionnaire and in case of postoperative pain the assumption of 1000 mg paracetamol + 60 mg codeine followed, if needed, by an additional dose of 500 mg paracetamol + 30 mg codeine.

The patient, in particular, had to introduce in the questionnaire the following data: 1st) the hour of recovery of the sensitivity at the site of the intervention; 2nd) the hour of stop of the feeling of paresthesia; 3rd) the hour of the first feeling of pain indicating the intensity on the visual analogue of 10 cm; 4th) the hour of taking the first dose of paracetamol/codeine; 5th) the hour of going to sleep.

The questionnaire also invited the patient to answer positively or negatively the following questions: 1st) if pain ended after taking paracetamol/codeine; 2nd) if nausea and/or vomiting ensued after taking the analgesic; 3rd) if pain reappeared after the end of the effect of the first dose of analgesic.

Each patient was also invited to tell whether he supposed to experience a pain intensity higher or lower than the one he had experienced.

The evening after the intervention. Each patient was informed in the preoperative visit that a dentist would have contacted him on the phone to know the result of the questionnaire.

Statistical analysis. Patients characteristics, data on the effect of the local anesthetic, postoperative pain, analgesic assumption and effects of anxiolysis from the end of the intervention were evaluated between groups by the F test for variance analysis. All other data were evaluated by the χ^2 corrected according to Yates. In all cases the minimum level of probability was $p<0.05$.

Results

Table 1 summarizes the physical and anthropometric characteristics and the anxiety levels in the two groups of patients. No difference was observed between the two groups.

Table 2 shows the different postoperative data obtained from the questionnaire. The times corresponding to the first appearance of the pain symptoms and assumption of analgesic drug were significantly increased in the patients treated with bupivacaine infiltration of the operative wound. The first appearance of pain occurred on average after 5 hours and the first assumption of analgesic after 5.5 hours in the patients treated with bupivacaine. On the contrary in patients not infiltrated the times were considerably lower, i.e. 3.3 and 3.5 hours respectively. No difference was observed between the times of reappearance of the sensitivity at the site of the intervention and the appearance of sleep in the two groups of patients. No difference was also observed between the intensity of pain in the patients of both groups when it appeared in the postoperative period.

Table 3 shows the incidence of patients of the two groups who answered the questions of the questionnaire involving an affirmative or a negative answer. No statistically significant difference was observed between the two groups, although a lower number of patients infiltrated with bupivacaine did not experience any reappearance of pain after assumption of the analgesic and a higher number of patients thinking to experience pain of higher intensity among those infiltrated with bupivacaine at the end of the intervention was observed.

Discussion

Preceding studies (10; 11) showed that bupivacaine is four times more potent than equimolar lidocaine and can be used with a lower amount of vasoconstrictor. Both the local anesthetic ensure an adequate analgesia and can be indifferently used for clinical purpose, such as, for instance, the extraction of an included third molar. The main difference between the two compounds is the longer duration of the analgesic effect of bupivacaine. Laskin et al. (12) showed that postoperative analgesia after extraction of the lower third molar could have a duration of 300 to 700 min when the lower alveolar nerve was infiltrated and the reappearance of sensitivity occurred after 460-780 minutes, later than the average time needed for the reappearance of pain. For those reasons it does not seem to be necessary to use bupivacaine in short duration interventions for which no postoperative pain is foreseen, but it is indicated when the intervention is a long one and pain is expected in the postoperative period. In a study of Nespeca (13) it has been confirmed that 0.25-0.50% bupivacaine with 1:200.000 epinephrine, compared to 2% lidocaine with 1:100.000

Table 1. Physical anthropometric characteristics and anxiety levels in the two groups of patients. Means±SD.

	Patients without postoperative infiltration	Patients with postoperative infiltration
Patients (n)	32	30
Age (years)	49.2±9.3	54.5±12.5
Sex (♂/♀)	11/21	13/17
Weight (kg)	71.7±15.2	68.2±11.7
Height (cm)	165.8±7.9	167.5±7.3
a. b. p. (mm Hg)	131.4±19.7	135.6±21.3
c. f. (beats/min)	78.5±11.4	75.6±12.3
A.S.A. (1/2/3)	21/11	19/10/1
Anxiety		
V.A.S. <5 cm	2.5±1.3	3.3±1.2
V.A.S. >5 cm	7.9±1.7	7.3±1.4

Table 2. Times of postoperative reappearance of sensitivity, first pain sensation, and assumption of analgesic drugs and sleep appearance. Means±SD.

Postoperative times (minutes)	Patients without postoperative infiltration	Patients with postoperative infiltration	Analysis of variance and significativity
Reappearance of sensitivity	366.4±193.7	327.5±165.2	F=0.73 n.s.
Disappearance of paresthesia	360.1±162.8	316.3±172.0	F=0.75 n.s.
First pain sensation	200.0±137.0	283.4±169.6	F=5.63* p<0.05
Intensity of first pain (cm)	4.2±1.8	4.4±1.9	F=0.04 n.s.
First assumption of analgesic	210.7±135.2	318.6±169.9	F=6.88* p<0.05
Sleep appearance	186.1±69.4	226.9±114.3	F=1.89 n.s.

Table 3. Percent incidence of effects resulting in an affirmative or negative answer in the questionnaire.

	Patients without postoperative infiltration		Patients with postoperative infiltration	
	n.	%	n.	%
Pain appearance after analgesic	15	51.7	8	27.5
Pain disappearance after analgesic	27	93.1	27	93.1
Nausea	5	17.2	3	10.3
More pain	21	65.6	28	87.5
Less pain	4	12.5	2	6.2

epinephrine in the extraction of lower third molar induced a delay in the appearance of the postoperative pain and a lower consumption of analgesics in the first 24 hours. Laskin et al. (12) showed that 0.25-0.50% bupivacaine with or without epinephrine ensures a good analgesic effect during oral surgery indicating that the local anesthetic has the advantage that it can be used without vasoconstrictor when the latter is counterindicated. Since after the extraction of the lower third molar pain intensity is maximum after 3-5 hours from the end of the intervention (14) this means in our opinion that bupivacaine, particularly when injected at the end of the intervention, can ensure a total analgesia during a large part of the postoperative period.

The mean intensity of pain observed in the two groups of patients in our study was slightly higher than the maximum intensity described by Hyrkäs et al. (15) after extraction of the lower third molar in patients with 3 ml of 0.5% bupivacaine with epinephrine injected in the nerve trunk and with 1.8 ml by infiltration. Such intensity evaluated through a 10 visual analogue corresponds to the average of 2.5 cm while in our patients the mean intensity was of about 4.0 cm in both groups. Preceding studies of Manani et al. (16) showed that after interventions of implantology the pain intensity corresponded to an average of about 2.0 cm. The difference between the results obtained in the two studies probably depends on the different criteria of pain evaluation that in the present study involved the telephone interview on the day following the intervention, when the patient was able to better memorize the pain experienced during the surgical procedure. These results confirm in any case that implantology interventions can cause levels of pain intensity higher than those induced by the extraction of the third molar and hence need a correct planning of the postoperative treatment of pain by administration of analgesics in due time or by a preventive administration of them. Our study did not consider nerve trunk blocks but rather soft tissues infiltration and the technique of paraperiosteal infiltration. With the latter we observed that the times of appearance of pain and paresthesias occurred before those reported by other authors after nerve trunk infiltration (17). This depends on the high liposolubility (partition coefficient ethanol/water = 27.5 higher than that of mepivacaine which was of 0.8) and on the protein binding (96%) higher than that of all other local anesthetics used in dentistry, which justify the higher duration of the analgesic effect when the local anesthetic was injected in the immediate proximity of a nerve trunk.

The end of the local anesthetic effect of bupivacaine coincided with the assumption of paracetamol and codeine. The percentage of patients who had to take pain killer drugs was in both groups 91%, while the percentage of patients who manifested a reappearance of the pain symptoms was almost identical in both groups. This means that bupivacaine does not interfere with the incidence of the postoperative pain but rather with its duration. Since the patients of both groups received an additional infiltration of bupivacaine at the time of the induction of the block this treatment was responsible for a slower recovery of analgesia also in patients not treated with postoperative infiltration of bupivacaine. The times of appearance of the first pain sensation in the control group, although on average similar to those observed by Malamed (18) after paraperiosteal infiltration with 2% mepivacaine + 1:100.000 epinephrine, are different for the observed oscillations much higher in our patients (600 minutes) than the maximal ones observed after infiltration with bupivacaine and epinephrine alone (240 minutes) by Malamed (18). These results confirm the validity of the use of bupivacaine as an additive local anesthetic together with another local anesthetic in delaying the onset of the postoperative pain.

Our results show that the pre- and postoperative infiltration with bupivacaine does not substitute for the postoperative pharmacological analgesia. The suppression of postoperative pain must be obtained mainly through the inhibition of prostaglandin synthesis by pre- and postoperative non steroid antinflammatory drugs (NSAID) administration associated with local anesthetics of long duration (19; 16). The obtained results also confirm the efficacy of paracetamol+codeine and the low incidence of side effects observed in the two groups of patients, although this association is responsible for a higher incidence of headache, drowsiness and gastrointestinal disturbances compared to the treatment with NSAID not associated with a morphine-like drug (19). The patients of both groups showed drowsiness after the end of the intervention and an almost identical incidence of nausea attributed to the administered analgesic. In agreement with Cooper (20) and on the basis of the present results we think that the postoperative analgesic treatment started more precociously in relation to the presumed onset of the acute postoperative pain would have induced a delay in the appearance of the first pain symptoms and probably a better compliance with the postoperative analgesic treatment due to the higher postponement of the onset of the postoperative pain, especially in the patients infiltrated with bupivacaine at the end of the intervention.

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