

Bupivacaine Anesthesia and Post-operative Analgesia in Oral Surgery

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Introduction:

Post-surgical pain is traditionally managed with the use of systemic analgesics. In oral surgery the period of post surgical pain is usually circumscribed and lasts for 8-12 hours. Following this time, acute pain abates and the patient no longer needs narcotic analgesics. These drugs are not without distressing side effects which at times may become severe, e. g. protracted nausea and vomiting, instability, ataxia, etc.

The availability of a long-acting local anesthetic prompted a study to see if post surgical pain would be decreased and the need for narcotic analgesics diminished.

Bupivacaine hydrochloride (Marcaine (R))*** is a water soluble long-acting amide-linked anesthetic related to mepivacaine and lidocaine. Marcaine causes anesthesia by stabilizing the neuronal membrane preventing initiation and transmission of nerve impulses. Its duration of action is prolonged.

This period can be further extended by the addition of 1:200,000 epinephrine. The prolonged anesthetic action appears to be related to its protein-binding which is greater than that of other related amide type local anesthetics. Marcaine is detoxified via conjugation with glucuronic acid in the liver. Caution is advised in administering large and repeated doses in patients with severe liver disease. Until further experience is gained in children younger than 12 years, Marcaine is not recommended for this age group.

A large number of studies have shown the effectiveness of the anesthesia achieved with Marcaine (Babst & Gilling 1978). Feldman and Nordenram (1966) compared Marcaine and Carbocaine in 212 patients undergoing surgical removal of impacted 3rd molar in the mandible. Duration of anesthesia for either Marcaine 0.25% or 0.5% was significantly longer than for Carbocaine. Nespeca (1976) studies Marcaine compared to lidocaine for a variety of oral surgical procedures. He reported a pronounced pain-free post surgical period. It would also appear from his data that the duration increased in proportion to the quantity of Marcaine

used, unlike the experience with lidocaine. Pricco (1977) evaluated 0.5% Marcaine with epinephrine 1:200,000. He found a range of 8 to 10 hours of anesthesia following mandibular block for bony wisdom tooth surgery. Helden et. al. (1974) working on the hypothesis of reducing post-operative pain by the use of long-acting local anesthetic showed no significant difference in consumption of systemic pain medication by patients receiving Marcaine, Carbocaine or Xylocaine. However, they did not experience the long-duration of anesthesia using 0.25% Marcaine with 1:200,000 epinephrine reported by others who used 0.5% with 1:200,000 epinephrine.

Laskin et. al. (1977) using bupivacaine of three different concentrations showed uniformly rapid onset, good analgesia during surgery for concentration 0.5% or greater and dose related increasing duration of anesthesia.

All studies have shown considerable individual variability in duration of anesthetic effect with bupivacaine.

A study was undertaken to compare bupivacaine HCL (Marcaine (R)) 0.5% plain, bupivacaine (Marcaine (R)) 0.5% with epinephrine 1:200,000 and mepivacaine (Carbocaine (R)) 3% in patients undergoing oral surgical procedures involving bone surgery.

The following data were recorded:

- (1) onset time to maximum surgical anesthesia,
- (2) duration of post-operative analgesia, (3) post-operative use of narcotic analgesics, (4) adequacy of anesthesia, (5) complications of surgery, and
- (6) side effects.

Materials & Methods:

69 healthy adults scheduled to undergo removal of impacted wisdom teeth or erupted teeth which involved surgical removal of adjacent bone (procedures expected to result in moderate to severe post-operative pain) were entered into the study. All were ASA I or II. The age range was 14 to 55 years. All signed consent forms prior to entrance into the study. Assignment to the three drug groups was randomized based on the alphabet. Each operative site was injected with the local anesthetic via mandibular nerve block and infiltration anesthesia. Disposable 3 ml syringes with 1-7/8" 25 gauge needles were used.* Onset time, anesthetic effectiveness, side effects and dosage were recorded by the surgeon. The patients were sent home with a prescription for eight doses of

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narcotic and analgesics (Codeine PO₄, 30 mg) to be taken only in the event of pain, and a stamped, addressed postcard to fill out, recording duration of analgesia, side effects and number of doses of oral analgesic taken. Within 24 hours each patient was contacted by phone and information concerning duration of anesthesia, pain medication required was recorded. Complications and healing were recorded at the return visit as well as questions related to duration of anesthesia, analgesia, and doses of medication consumed.

Several patients in each drug group received general anesthesia, with local anesthetic injection performed at the end of surgery. These patients were evaluated for all parameters other than onset time and anesthetic effectiveness.

Onset time was determined by pricking the operative site with a sharp instrument beginning 5 minutes after injection.

Those patients receiving blocks at more than one site for a multiple surgical procedure were evaluated for onset time at each site, but for duration only once (the site with shortest duration).

At the end of the study, mean onset times, durations and post-op analgesic medication doses taken were calculated for each drug and the Student's t-test used for analysis of variance of pairs of means.

Results:

15 patients ranging in age from 15 to 47 years received Marcaine 0.5% plain, 10.0 to 17.5 mg per injected quadrant. (Fig. 1).

32 patients ranging in age from 14 to 55 years received Marcaine 0.5% with epinephrine, 7.5 to 22.5 mg per injected quadrant. The majority of sites were injected with 10 mg. (Fig. 1).

22 patients ranging in age from 17 to 55 years received Carbocaine 3%, 45 to 114 mg per injected quadrant. The majority received 60 mg per site. (Fig. 1).

Onset time to maximal surgical anesthesia averaged 8.3 minutes for Marcaine plain (range < 5 to 15 minutes), 8.1 minutes for Marcaine with epinephrine (range < 5 to 15 minutes) and 6.5 minutes for Carbocaine (range < 5 to 10 minutes). Only the onset time for Marcaine plain was statistically significantly longer than that of Carbocaine at $p < .10$ level. (Fig. 2).

Duration of post-operative analgesia averaged 5.8 hours for Marcaine plain (range 3 to 9 hours), 7.0 hours for Marcaine-epi (range 4 to 11 hours) and 2.9 hours for Carbocaine (range 1 to 5 hours). Both Marcaine plain and Marcaine-epi durations were significantly longer than that of Carbocaine at $p < .001$ level. (Fig. 3).

Patients receiving Marcaine plain and Marcaine with epi required only 2.8 and 2.3 doses respectively of post-op narcotic analgesic on the average, compared

FIGURE 1: DOSES OF ANESTHETIC INJECTED PER SITE

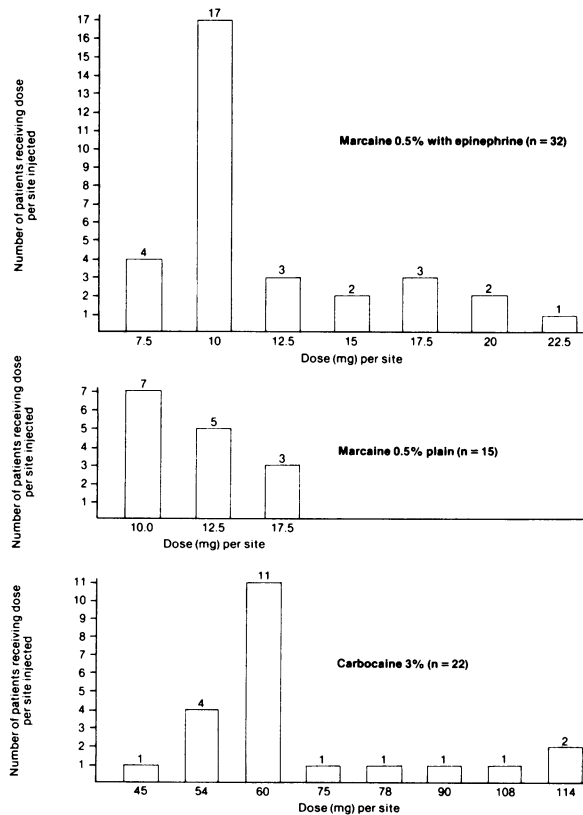


Figure 1

FIGURE 4: POST-OPERATIVE ANALGESIC DRUG DOSES TAKEN

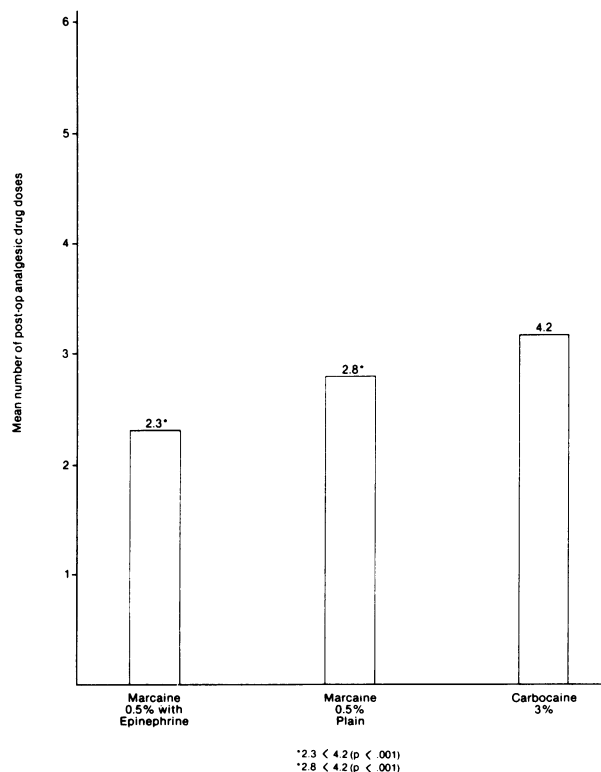


Figure 4

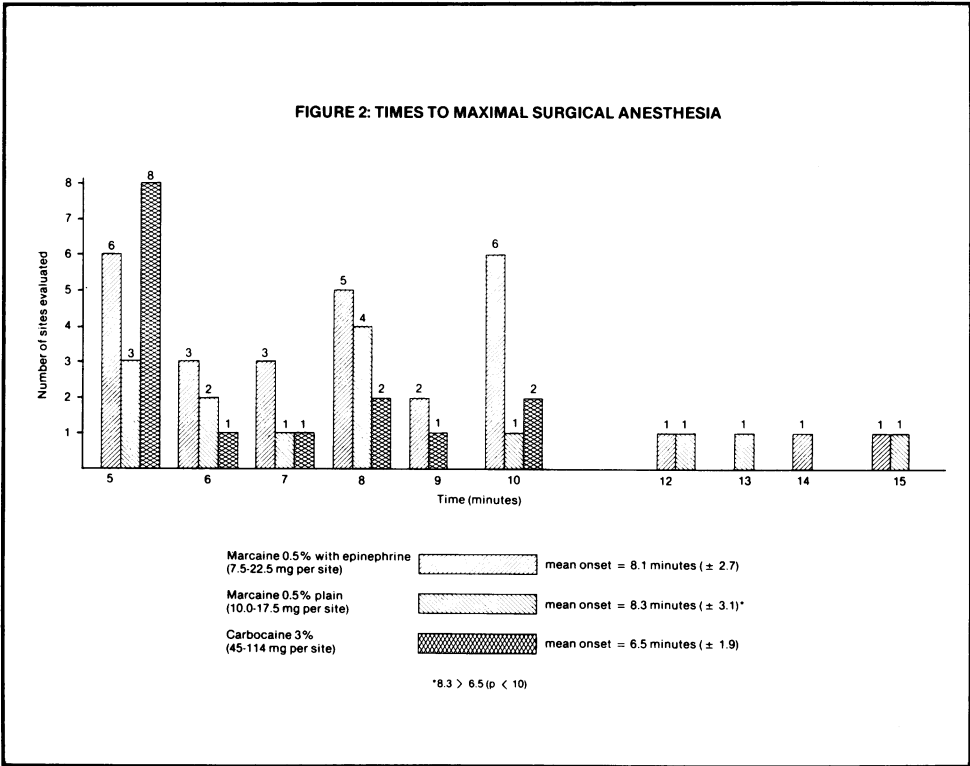


Figure 2

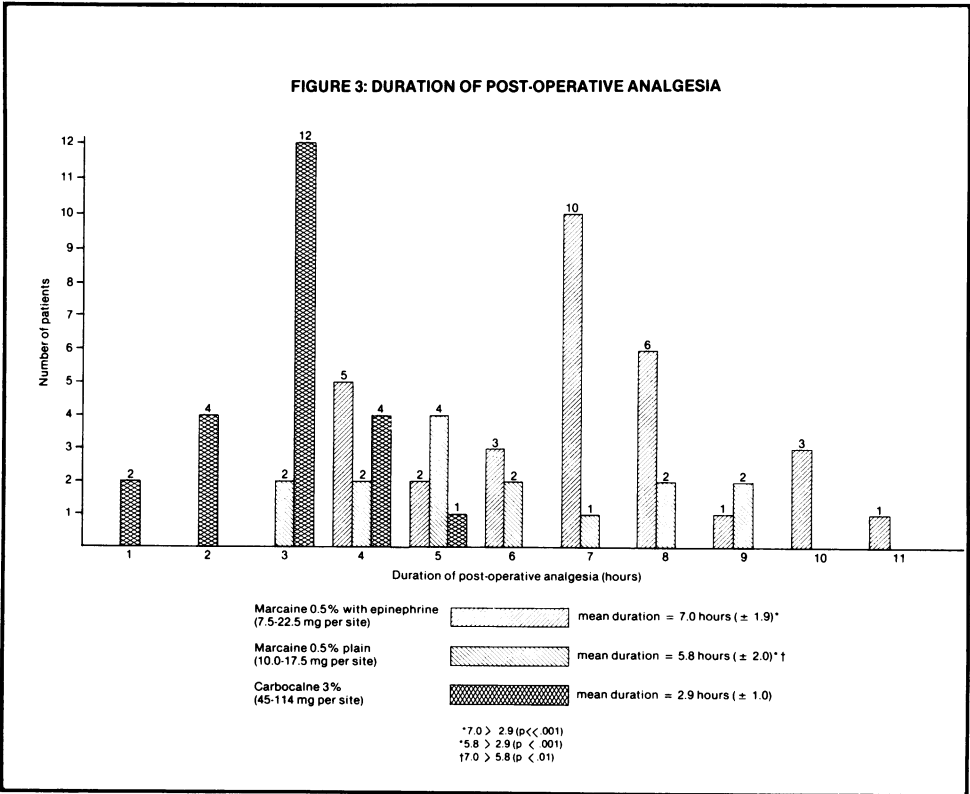


Figure 3

with 4.2 doses for Carbocaine patients. Both Marcaine groups required significantly fewer analgesic doses than Carbocaine patients at $p < .001$ level. (Fig. 4).

Summary of Results:

	n	Onset (mean)	Duration (mean)	Doses of Analgesic Medication (mean)
Carbocaine 3%	22	6.5 mins.	2.9 hours	4.2
Marcaine 0.5% plain	15	8.3 mins.	5.8 hours	2.8
Marcaine 0.5% with epi 1:200,000	32	8.1 mins.	7.0 hours	2.3

There were no side effects noted with any drug. Anesthesia was adequate for all patients. There were no complications attributable to the local anesthetic.

Conclusions

Marcaine 0.5% with or without epinephrine 1:200,000 produced significantly longer duration of post-operative analgesia and significantly fewer required doses of narcotic analgesics than Carbocaine 3% in approximately equipotent doses in out-patients undergoing painful oral surgical procedures. Time to surgical anesthesia was slightly shorter with Carbocaine but this difference was not clinically significant. Both Marcaine and Carbocaine were well tolerated. There

were no side effects or complications in any drug group and anesthesia was adequate in all cases. There was a significantly longer duration of anesthesia with epinephrine-Marcaine formulations: a mean of 7 hours versus 5.8 hours.

Marcaine 0.5% with or without epinephrine is a safe, effective and useful local anesthetic in oral surgery and affords clinically important longer duration of pain relief in out-patient procedures normally associated with severe post-operative pain.

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Note added in proof: Subsequent to this study, concentrations of 0.75% Marcaine were used for similar surgeries and achieved longer mean periods of anesthesia.



Horace Wells Award to Dr. Spiro

The first annual "Horace Wells Award" by the New York State Dental Society of Anesthesiology was presented to Stanley R. Spiro DDS, FACD in December 1978. (left) by Dr. Bernard Scheuer, (right) president of the New York State Component.