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REVIEW ARTICLE

Role of Bupivacaine in Dentistry

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ABSTRACT

Since the introduction of cocaine in1884, local anesthetic have been use as mainstay of pain management .The contribution of local anesthetics to dentistry is vast as almost all branch in dental and medical field require them.They are available in many forms in the current era painless treatment is the most requirement and the local anesthetics have undergone various advances to provide this painless treatment . A review of current significant literature concerning bupivacaine hydrochloride (Marcaine) is presented with particular emphasis on clinical use in oral surgery. Bupivacaine provides increased duration of action and a favorable potency to toxicity ratio.

KEYWORDS: Local anesthesia; Dentistry; Classification, Pain Management; Bupivacaine

INTRODUCTION

Local anesthesia is the temporary loss of sensation or pain in one part of the body produced by a topically applied or injected agent without depressing the level of consciousness. Dental anesthetics fall into two groups: Esters (procaine, benzocaine) and amides (lidocaine, mepivacaine, bupivacaine, prilocaine and articaine). Esters are no longer used as injectable anesthetics. However benzocaine is used as a topical anesthetic. Amides are the most commonly used injectable anesthetics. Bupivacaine is one of the most common long-acting anesthetic agents used in maxillofacial surgery for more than past 30 years mainly to reduce the pain even after a surgical procedure is over. Several studies have been conducted regarding the toxicity and clinical safety of this agent compared to other local anesthetics.[1]

Bupivacaine has been used as a local anesthetic in medicine and dentistry for many years. The 2 main indications for its use in dentistry are lengthy procedures and utilized for intraoperative local anesthesia, post operative analgesia, treatment of chronic pain and management of postoperative pain, as in endodontic, surgical, and periodontal procedures, among others. Bupivacaine, a long-acting amide local anesthetic, is a chemical analogue of mepivacaine with high lipid-solubility and protein-binding characteristics. These properties contribute to bupivacaine's greater potency and anesthetic duration as compared to other local anesthetics used in dentistry. The prolonged anesthesia it produces has been shown to limit postoperative pain following third molar extractions and endodontic procedures. Bupivacaine 0.5% with 1:200,000 epinephrine provides a safe and valuable alternative to the anesthetic agents presently available in dentistry.[2]

Bupivacaine, marketed under the brand name Marcaine among others, is a medication used to decrease feeling in a specific area. It is used by injecting it into the area, around a nerve that supplies the area, or into the spinal canal's epidural space. It is available mixed with a small amount of epinephrine to make it last longer. It typically begins working within 15 minutes and lasts for 2 to 8 hours.[3]

Although the currently available long-acting local anesthetics for dentistry have minimal side effects in the doses usually employed, there are potential problems. Bupivacaine, for example, can cause significant cardiac depressant and dysrhythmogenic responses. Etidocaine has less pronounced effects on the cardiovascular system, but its use may be associated with inadequate control of intraoperative bleeding. A new long-acting local anesthetic, ropivacaine, appears to offer advantages over either of the currently used long-acting agents.

MECHANISM OF ACTION

Local anesthetics block the generation and the conduction of nerve impulses, presumably by increasing the threshold for electrical excitation in the nerve, by slowing the propagation of the nerve impulse, and by reducing the rate of rise of the action potential. In general, the progression of anesthesia is related to the diameter, myelination, and conduction velocity of affected nerve fibers. Clinically, the order of loss of nerve function is as follows: (1) pain, (2) temperature, (3) touch, (4) proprioception, and (5) skeletal muscle tone.[4]

The local anesthetic bupivacaine has recently been proposed to inhibit Na+ channels indirectly by making the resting potential less negative. To test this hypothesis we analyzed the effects of bupivacaine on voltage and current clamped nodes of Ranvier. Contrary to the hypothesis, the leak current and the resting potential were unaffected. The Na+ and K+ channels were, however, affected at relatively low concentrations (33 microM).[4]

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Steady-state activation curves were decreased without notable shift effects, whereas the Na+ inactivation curve was decreased and shifted in negative direction. The effect on the Na+ current was tentatively explained by a single-site, state-dependent binding model (Kd = 44 microM), while that on the K+ current was explained by two population-specific mechanisms, one open-state dependent (Kd = 550 microM) and one state independent (Kd = 59 microM). The binding stoichiometry was higher than 1:1 for the main sites of action. In conclusion, bupivacaine exerts its main anesthetic action on myelinated nerve axons by a direct modification of Na+ channels.[4]

The rate of systemic absorption of bupivacaine and other local anesthetics is dependent upon the dose and concentration of drug administered, the route of administration, the vascularity of the administration site, and the presence or absence of epinephrine in the preparation.

INDICATION AND CONTRAINDICATIONS OF BUPIVACAINE

Indications: Production of local or regional anesthesia or analgesia for surgery, dental and oral surgery procedures, diagnostic and therapeutic procedures, and for obstetrical procedures (0.25% and 0.5% only). Only the 0.25% and 0.5% concentrations are indicated for obstetrical anesthesia. Experience with nonobstetrical surgical procedures in pregnant patients is not sufficient to recommend use of 0.75% concentration these patients. It is not recommended for children.[5]

Contra-indications: Bupivacaine is contraindicated in patients with hypersensitivity to the drug or its components, hypersensitivity to amide anesthetics, infection at injection site, OB paracervical block, OB anesthesia using 0.75% concentration, intravenous regional anesthesia, and intra-articular continuous infusion. Use with caution in patients with hypersensitivity to sulfites, liver impairment (the liver clears amides), kidney impairment, impaired cardiac function, heart block, hypovolemia, hypotension, and elderly, debilitated, or acutely ill patients.[5]

DENTAL AND MEDICAL USE OF BUPIVACAINE

Bupivacaine is a commonly used long-acting amide local anesthetic and is effective in the management of postoperative pain. Its long duration of action and superior ability to decrease pain and discomfort have been reported in published comparisons of lignocaine and articaine. Bupivacaine is therefore the drug of choice for postoperative pain control after removal of the third molars.[6,7]

Bupivacaine is indicated for local infiltration, peripheral nerve block, sympathetic nerve block, and epidural and caudal blocks. It is sometimes used in combination with epinephrine to prevent systemic absorption and extend the duration of action. The 0.75% (most concentrated) formulation is used in retrobulbar block. It is the most commonly used local anesthetic in epidural anesthesia during labor, as well as in postoperative pain management. Liposomal formulations of bupivacaine are no more effective than plain solutions of bupivacaine. bupivacaine have found its use in surface anesthesia, infiltration anesthesia, field block, nerve or conduction block. Lignocaine is used for regional and spinal anesthesia, where it is injected into the subarachnoid space, but bupivacaine is not used in regional anesthesia and spinal anesthesia because of excessive high plasma levels. They are used in all branches of dentistry from extractions, minor oral surgical procedures, endodontics, periodontics either by conduction nerve block or infiltration anesthesia.[8,9]

A Clinical study show the usefulness of bupivacaine in oral surgery .A clinical trial was conducted using Bupivacaine in 20 pt. undergoing the surgical removal of mandibular molar separate appointment.Result showed a marked reduction in post operative pain experience over the time and almost unanimous patient preference for Bupivacaine.

A clinical study on endodontic post operative pain. Long acting anesthesia, bupivacaine, on preventing post-operative pain associated with endodontic treatment, and to compare it with lidocaine. Data were analyzed using One-way ANOVA tests. Bupivacaine significantly decreased postoperative pain compared to lidocaine. Postoperative pain was directly related to preoperative pain. Women reported more pain, though significant difference in postoperative pain report was not found between different ages. In conclusion, a single dose of bupivacaine 0.5% used in infiltration anesthesia could be more effective in reduction or prevention of post-operative endodontic pain compared with lidocaine.

Bupivacaine has been used as a local anesthetic in medicine and dentistry for many years. The 2 main indications for its use in dentistry are lengthy procedures and management of postoperative pain, as in endodontic, surgical, and periodontal procedures, among others.[10]

The use of local anesthetics has become an important aspect of pain management in surgical settings and is currently recommended in pain management guidelines.

CONCLUSION

Long-acting local anesthetic like Bupivacaine has proved to be effective for the suppression of both intraoperative and postoperative pain and have been useful for lengthy dental treatments and for prevention of severe pain following many types of surgical procedures. Although Bupivacaine has minimal side effects in the doses usually employed, there are potential problems. Care must be taken during use of Bupivacaine as pain control agent in Dental setting.

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