

## Non-injectable local anesthesia

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### ABSTRACT

Dental practitioners depend on the evolution of their field to provide patients with the highest quality, most advanced, and comfortable dental care. Cocaine was earlier demonstrated as a topical anesthetic. The synthetic formulation of cocaine both topical and injectable became possible. Intraoral anesthesia has evolved in the area of non-injectable delivery systems instead of providing anesthesia directly into the periodontal pockets without the need for an invasive injection. The aim of this article is to review non-injectable local anesthesia (NILA) in dentistry. Extensive searching in PubMed, Scopus index, and many databases was done. This result of this review is to find the overview of NILA in dentistry.

**KEY WORDS:** Cocaine, Dental practitioners, Non-injectable local anesthesia, Topical anesthesia

### INTRODUCTION

Oral well-being experts have since a long time ago utilized nearby sedative in conjunction with non-surgical periodontal debridement with a target to accomplish the greatest clinical results while giving ideal patient solace. For a considerable length of time, clinicians have been utilizing either injectable or topical anesthesia when torment control is required for scaling and root planning techniques. The utilization of “topicals” in this case has been particularly appealing as the needle-free anesthesia without the great desensitizing impacts of injectable anesthesia is to a great degree alluring for the clinician and the patient.<sup>[1]</sup> However, the conventional topical use of nearby sedatives frequently neglects to give the impact expected to complete debridement techniques easily. Dental specialists rely on the development of their field to give patients the most astounding quality, most exceptional, and agreeable dental care. Halsted first gave a subpara alveolar nerve square utilizing cocaine and bubbling water in 1884. Cocaine was also used as a topical analgesic for eye surgery by ophthalmologist Karl Koller in the same year.<sup>[2]</sup>

Once the substance personality of cocaine was recognized as a benzoic corrosive ester, the manufactured detailing of various analgesics both topical and injectable wound up noticeably conceivable.<sup>[9]</sup> To enhance clinical viability. Before the availability of the non-injectable local anesthesia (NILA), the choices for pain control during a dental hygiene visit were injectable. Injections of course are not favored by most individuals with one study showing that 25% of adults surveyed had a fear of dental injections and a second study showing that 55% of individuals reported severe pain from their last dental injection. Also, using injectable local anesthetics has the disadvantage of making the patient feel extremely uncomfortable if used in all four quadrants in one appointment, apart from the duration of anesthesia.

Furthermore, if practicing in an area where a dental hygienist cannot administer injections, the dentist must go to the hygiene room to administer the anesthesia. This is time consuming and disruptive. Topical anesthetics at least have the advantage of avoiding the need for an injection; however, if used for whole quadrants at a time, isolating them to that area for long enough to create anesthesia is difficult. Furthermore, successful anesthesia when topical anesthetics are used, especially for deeper periodontal pockets, is marginal at best. From this discussion and literature presentation, one could easily argue that there is the

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Website: [jprsolutions.info](http://jprsolutions.info)

ISSN: 0975-7619

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Received on: 06-07-2018; Revised on: 08-08-2018; Accepted on: 11-09-2018

need for a NILA that is specifically designed to be utilized within the periodontal sulcus to alleviate the pain associated with scaling and probing.

### Classification

In dentistry, local anesthesia is classified as either ester type or amide type compounds. Today, all injectable anesthetics, available in cartridge form, are amides.<sup>[3]</sup> Those not for injection are available in amides or esters and depending on the manufacturer and application methods that include traditional mucosal delivery (non-subgingival) or subgingival delivery.

### Ester

For intraoral use, benzocaine and tetracaine are the most common compounds found within the ester classification. Esters of NILA available in various formulations include gels, liquids, sprays, creams, ointments, and patches. Familiar brand names include Hurricane, Cetacaine, Ultracare, and Topex. Practitioners should consult each manufacturer to determine if traditional supragingival “topical” applications or noninjectable subgingival applications are available. Cetacaine, more recently available, is called HurriPak.<sup>[4]</sup> It is also a liquid containing 20% benzocaine. HurriPak comes in a jar and is packaged with disposable syringes and plastic tips that allow the introduction of the liquid into the periodontal sulcus.

The maximum recommended dose of HurriPak is 3 ml. As Cetacaine and HurriPak contain benzocaine, they are classified as ester-based anesthetics. Therefore, they are contraindicated for those with an allergy to para-aminobenzoic acid (PABA) a metabolite of ester local anesthetics. Since all ester anesthetics have PABA as one of their metabolites, allergy to one constitutes allergy to all ester anesthetics. As well, benzocaine has been shown to cause methemoglobinemia when used in high doses. It should also be noted that bleeding or abraded tissue (e.g., the periodontal sulcus for those with periodontal disease) might allow the systemic absorption of benzocaine more easily. This could contribute to a higher realized systemic dose and, therefore, increase the risk for methemoglobinemia, especially in the very small patient (young, children). With respect to benzocaine in both Cetacaine and HurriPak and pregnancy, it should be noted that benzocaine is considered by the Food and Drug Administration (FDA) in the United States as a Class C drug. This means that animal reproduction studies show an adverse effect on the fetus and there are no studies in humans but possible benefits might warrant the use of the drug in women who are pregnant despite the potential risk.<sup>[5]</sup>

### Amides

For those preferring amide type compounds, lidocaine and prilocaine, eutectic mixtures are available.

Effective concentrations in dentistry are 2–5%. As with the esters, the purpose of the combination of drugs is to enhance clinical effectiveness. Amide products for intraoral use can be purchased in ointments, sprays, gels, liquids, and liquid gel–liquid at room temperature and gel at body temperature.<sup>[6]</sup> For practitioners wanting an amide packaged with armamentarium for subgingival application, the choice is more limited than within the ester classification. Oraqix (DENTSPLY Pharmaceutical), a thermosetting liquid gel containing 2.5% prilocaine and 2.5% lidocaine is available in Canada since 2010 and specialised for sub gingival applications. In addition to providing excellent tissue anesthesia and occasional pulpal anesthesia, this system has wide margins of safety, a known maximum safe dose and easily quantified volumes dispensed due to its packaging in cartridge form.<sup>[7]</sup> With the exception of Oraqix, all NILA products used intraorally, including those that are packaged with armamentarium for subgingival application, carry indications for general use on all accessible mucous membranes. Oraqix is indicated specifically for application in periodontal pockets for moderate pain during scaling and/or root planning and has received the Health Canada approval for this indication. Topical anesthesia is connected in a few ways: Ointments, gels, sprays, and adhesive fix.

Some topical sedatives have flavors, for example, natural product, mint, or air pocket gum. Most topical soporifics are indistinguishable medications from noninjectable analgesics. Be that as it may, topical sedatives ordinarily are more grounded. That is on account of not the greater part of the medication will work its way through the tissue.<sup>[9]</sup> One reason is to check whether you have any history of unfavorably susceptible response. Individuals can have a response to the soporific or different fixings, for example, flavorings and preservatives. Before numbing an area, your dentist will dry it with a gauze pad. Then, an applicator (usually a cotton swab) is used to hold the anesthetic on the area for 2–3 min. Topical anesthetics also can be applied in the form of a spray or adhesive patch topical anesthetics and numb the nerves 2–3 mm below the surface.<sup>[8]</sup> They usually are effective for 15–30 min. That is enough time for you to receive a shot or have stitches removed. Many of the anesthetics used in the dental office also are found in over-the-counter (OTC) products. These include gels to relieve mouth pain and sprays to relieve sunburn or a sore throat.<sup>[8]</sup>

Many common conditions cause oral pain or discomfort. Examples of these conditions include toothaches; tooth sensitivity; teething; minor oral mucosal injury or irritation; oral mucosal disorders, such as recurrent aphthous stomatitis (canker sores); herpes simplex labialis (cold sores/fever blisters); and xerostomia

(dry mouth). There are the products available for the self-treatment of each of these sources of oral pain and discomfort, including topical analgesics/anesthetics, toothpastes formulated for sensitive teeth, artificial saliva products for dry mouth, and oral mucosal protectants, as well as products that provide treatment of and relief from pain due to cold sores. Previously, the only Health Canada and FDA-approved anesthesia for dental procedures has been injectable anesthetic. We, now, have a NILA that delivers a degree of anesthesia that makes scaling and root planning comfortable for the majority of patients' procedures.

### **Cetacaine**

One of these products is liquid cetacaine, a well-known and efficacious topical anesthesia.

Cetacaine is a topical anesthetic comprised of a triple action formula benzocaine 14.0%, butamben 2.0%, and tetracaine hydrochloride 2.0%. Cetacaine unique triple formula delivers a fast-acting, long-lasting prescription topical anesthetic at the required site. Cetacaine produces anesthesia of all accessible mucous membranes except the eyes. The recent Canadian introduction of liquid cetacaine was in response to a strong need for alternative anesthesia for scaling and root planning.<sup>[10]</sup> Benzocaine is a fast acting widely used topical and local anesthetic with relatively shallow penetration. It is commonly used as a topical pain remover and is an active ingredient in many OTC anesthetic ointments. It is complemented by butamben, an intermediate-acting and penetrating agent, and by tetracaine, which is long-acting and more deeply penetrating.<sup>[11]</sup> The combination of active ingredients allows for fast onset anesthesia in the periodontal pocket (30 s) and extended continuing activity (30–60 min).

### **Benzocaine**

Benzocaine is an ester, a subordinate of the natural PABA corrosive and the liquor ethanol. Pain is caused by the incitement of sodium entering free nerve endings causing depolarization of the nerve toward the focal sensory system bringing about translation of agony. The esters of PABA fill in as a substance boundary to incitement by preventing the sodium from entering the nerve endings.<sup>[12]</sup> Cetacaine can be used during scaling, root planing, laser treatment and also pre-infusion topical. The points of interest and advantages are as follows:

- Diminished patient tension and expanded consistence
- Quick beginning of anesthesia (30–60 s) and managed impacts (30 s–1 h)
- Lessened seat time
- Site particular and simple to convey
- Clinician has control over sum apportioned - 0.4 ml might be utilized at one visit

- Capacity to finish full mouth debridement supporting one phase way to deal with periodontal therapy.

## **NILA IN PEDIATRIC DENTISTRY**

Children may be, especially, sensitive to the effects of dental anesthetics. This may increase the chance of unwanted effects, some of which can be serious, during treatment. When using a dental anesthetic for a child, be very careful not to use more of the medicine than directed on the label, unless otherwise directed by health-care professional. Dental medicines that contain benzocaine may be used in babies aged 4 months and older. One product that contains benzocaine (Orabase-B with benzocaine) may be used in children aged 6 years and older.<sup>[7]</sup> Most of the other non-prescription OTC medicines that contain a dental anesthetic may be used in children aged 2 years and older.<sup>[12]</sup> However, these other non-prescription products should not be used in infants or children younger than 2 years of age unless prescribed by a health-care professional.

### **Adverse Effects**

Adverse effects may result from hypersensitivity or allergy. Esters are associated with a higher incidence of allergic reactions, but allergies to amides have been described as virtually unknown.<sup>[13]</sup> More often, adverse effects are dose related, caused by excessive dosage or rapid absorption of the drug. Products void of an exact indication for use in periodontal pockets may require greater deliberation to ensure maximum effectiveness and safe practice.<sup>[14]</sup>

### **Liver Disorders**

Liver damage causes local anesthetic to build up in the blood. Most local anesthetics are biotransformed in the liver and broken down to products that can be eliminated from the body by the kidney. A history of liver disease may indicate that the liver's ability to degrade the drug is reduced. If the liver does not do its part, then the local anesthetic accumulates in the blood. In such cases, local anesthesia should be used judiciously and in consultation with the patient's physician.<sup>[15]</sup>

### **Genetic Factor in Patient (“Serum Cholinesterase”)**

Serum cholinesterase is an enzyme produced in the liver needed in the biotransformation of ester local anesthetics. If it is genetically missing, an overdose can result from increased blood levels.

### **Kidney Disorders**

If the kidneys cannot eliminate the by-products of local anesthetics, there can be toxic accumulations in the blood.

### **Pregnancy**

During pregnancy, kidney renal function can be disturbed. This can impair excretion and result in an

increased blood level of the local anesthetic.

As dental professionals, we would all agree on the importance of the regular removal of bacterial pathogens to minimize the risk of developing or aggravating periodontal disease. In the absence of regular care, chronic inflammation in the tissue leads to pathologic anatomic changes clinically detectable as periodontal pockets and alveolar bone loss. Our professional community is keenly aware of the burden placed on the body by a chronic inflammatory condition as the science continues to support the negative impact of periodontal disease on systemic health. A wide array of inflammatory cytokines, prostaglandins, and destructive enzymes are the culprits of critical interest to both the medical and professional communities.<sup>[16]</sup>

Periodontal therapy advances continue to emerge, even as periodontal disease remains the number one cause of adult tooth loss. Poor compliance and adherence to routine dental care may be to blame. About 40% of the population is apprehensive about dental visits, 20% is highly fearful, and 5% avoids oral health care completely. Getting an injection, having dental radiographs taken, the use of scalers and curettes, and the sight of the needle were identified as the dental stimuli evoking the highest negative perceptions. The resulting failure in compliance remains the main barrier to achieve excellence in treatment outcomes. From a patient and practice perspective, the exposure to negative and feared stimuli must be reduced to increase adherence to treatment protocols such as periodontal therapy and maintenance. Furthermore, periodontal maintenance is a strong contributor to practice success and income flow. Since the lack of compliance is a contributory risk factor, we then have the ethical responsibility of modifying this potential risk wherever possible. Chairside technologies have changed the way we practice dentistry and dental hygiene, tending to a commitment to a minimally invasive dentistry which affords greater patient comfort.<sup>[17]</sup> Whether compliance with treatment recommendations is a causal or contributory risk factor, it warrants our attention. We are in a new era of pain management; an opportunity to accomplish clinical periodontal scaling and root planning while addressing the vitally important issue of patient comfort with a novel approach.<sup>[20]</sup> The emergence of non-injectable anesthesia has gained attention and rapid integration into the chairside armamentarium.

#### Advantages of NILA

Product evaluators noted that the level of anesthesia was adequate for most patients and 88% rated it excellent or good and worthy of trial by colleagues.<sup>[18]</sup>

Cetacaine has an ability to enhance your dental practice by providing a non-injectable, safe, and cost-

effective anesthetic alternative for the majority of patients resulting in elevated comfort and increased compliance.<sup>[19]</sup> Providing a positive experience has a very powerful and sustaining effect on practice success.

## CONCLUSION

NILA is an inevitable aspect of dental practice. Most practitioners will experience it less often than they achieve success. Local anaesthesia has come a long way since its first use. To reduce the pain and anxiety of the patient, NILA was introduced. NILA along with modern technology and efficiency has considerably reduced the morbidity and mortality associated with dental anesthesia.

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Source of support: Nil; Conflict of interest: None Declared