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TOPICAL LOCAL ANAESTHETIC AGENTS

Sharayu Shanmathi*

Address: B4, Kalash apartments, No.69, First main road, SHastri nagar, Adyar, Chennai-20,

Email: sharayu234@gmail.com

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Abstract

Localanesthetic is a drug that causes reversible local anesthesia and a loss of nociception. When it is used on specific nerve pathways (nerve block), effects such as analgesia (loss of pain sensation) and paralysis (loss of muscle power) can be achieved. Local anaesthetic is also often used during minor surgical procedures such as: a filling or wisdom tooth removal, minor skin surgery, such as the removal of moles and warts and verrucas, a biopsy - where a sample of tissue is removed for closer examination under a microscope, Local anaesthetic is also sometimes used for more major types of surgery. Side effects can include: a numb tongue (during dental procedures) ,dizziness, blurred vision, twitching muscles.

Key Words: local anaesthetic, nociception, analgesia.

Topical Anaesthesia:

Topical anaesthesia contains local anaesthetic

For example, gels for mouth ulcers sometimes contain small amounts of benzocaine, which numbs the area around the ulcer.

Eye drops used before some types of eye surgery, such as cataract removal, also contain topical anaesthetic and help numb the eye surgery

Many options to deliver anesthesia have developed over the last several decades. Administration of topical anesthetics to control pain associated with procedures such as laceration repair may avoid the need for infiltrative local anesthesia injections and associated pain from the injections. Topical anesthesia also avoids the risk of wound margin distortion that exists with infiltrative injection administration.

Mechanism of action (2,3,4)

Topical anesthetics reversibly block nerve conduction near their site of administration, thereby producing temporary

loss of sensation in a limited area. Nerve impulse conduction is blocked by decreasing nerve cell membrane permeability to sodium ions, possibly by competing with calcium-binding sites that control sodium permeability. This change in permeability results in decreased depolarization and an increased excitability threshold that, ultimately, prevents the nerve action potential from forming

The principal methods currently in use are inhalation, intravenous and oral although other methods are occasionally used.

Inhalation sedation(1)

A titrated mixture of up to 70% nitrous oxide may be administered. Clinical monitoring of patient colour, respiration and pulse is sufficient, and adult patients need not be accompanied home afterwards. This is the technique of choice in children felt to be candidates for sedation.

I.V. Sedation

This is commonly achieved with a titrated benzodiazepine, although a patient- or target-controlled infusion of propofol has gained some popularity over recent years. Clinical monitoring must be supplemented by pulse oximetry and blood pressure readings. Facilities must be available to administer oxygen or ventilation if needed. Patients must be recovered appropriately and be accompanied by a responsible adult.

Oral sedation

Temazepam and midazolam are useful. Monitoring and recovery requirements are as for i.v. sedation.

Absorption (5,6)

Skin absorption is highly variable. These agents may exist either as solid or only superficially absorbed through intact skin. Eutectic mixtures results in liquids that melt at lower temperatures than their single components and permits higher concentrations of anesthetics, which results in superior dermal anesthesia for intact skin. Other methods of increasing skin penetration include liposomal preparations, iontophoresis, and transdermal patches.

Usage (7,8,9)

Topical anesthetics are used to relieve pain and itching caused by conditions such as sunburn or other minor burns, insect bites or stings, poison ivy, poison oak, poison sumac, and minor cuts and scratches.

Topical anesthetics are used in ophthalmology and optometry to numb the surface of the eye (the outermost layers of the cornea and conjunctiva) to:

Perform a contact/applanation tonometry.

Perform a Schirmer's test

Remove small foreign objects from the uppermost layer of the cornea or conjunctiva.

In dentistry, topical anesthetics are used to numb oral tissue before administering a dental local anesthetic due to the entry of the needle into the soft tissues of the oral cavity.

Some topical anesthetics (e.g. oxybuprocaine) are also used in otolaryngology.

Benzocaine or lidocaine are typically used for this purpose as they are available OTC (lidocaine is more powerful than benzocaine).

Adverse effect (10,11,12,13)

Burning or stinging may occur local to the administration site.

Oral viscous lidocaine may cause systemic toxicity, particularly with repeated use in infants or children.

CNS: High plasma concentration initially produces CNS stimulation (including seizures), followed by CNS depression (including respiratory arrest). The CNS stimulatory effect may be absent in some patients, particularly when amides (eg, tetracaine) are administered. Solutions that contain epinephrine may add to the CNS stimulatory effect.

Cardiovascular: High plasma levels typically depress the heart and may result in bradycardia, arrhythmias, hypotension, cardiovascular collapse, and cardiac arrest. Local anesthetics that contain epinephrine may cause hypertension, tachycardia, and angina.

Gag-reflex suppression may occur with oral administration.

Other body systems can also experience adverse effects.

Transient burning sensation

Skin discoloration

Swelling

Neuritis

Tissue necrosis and sloughing

Methemoglobinemia

topical anaesthesia in dentistry (14,15,16)

The commonly used local anaesthetic solutions are:

Lidocaine 2% plain

Used for blocks and infiltrations; however, effectiveness of analgesia is limited and of brief duration. Maximum adult safe dose is 4×2.2 ml cartridges or 3 mg kg^{-1} . The addition of 1:80 000 epinephrine prolongs effectiveness to over 90 min and increases maximum adult safe dose to 10×2.2 ml cartridges or 7 mg kg^{-1} .

Prilocaine 3% with felypressin 0.03 IU ml^{-1}

Used for blocks and infiltrations, effective analgesia over 90 min, predisposes to methaemoglobinaemia, avoid in pregnancy. Maximum adult safe dose 9×2.2 cartridges or 6 mg kg^{-1} .

Articaine 4% with epinephrine (1:100 000)

Currently recommended for infiltration only. It has rapid onset (<2 min) with exceptional ability to penetrate dense mandibular cortical bone. It is ideal where blocks are contraindicated. Maximum safe adult dose 7 mg kg^{-1} .

Bupivacaine 0.25–0.5% plain

Used for blocks and infiltrations where up to 8 h of anaesthesia is required. Maximum safe dose 2 mg kg^{-1} .

Benzocaine

Ethyl aminobenzoate (benzocaine) is an ester local anesthetic. It is available in up to 20% concentrations. It is poorly absorbed into cardiovascular system. It remains at the site of application longer, providing a prolonged duration of action. Localized allergic reactions may occur following prolonged or repeated use and it is reported to inhibit the antibacterial action of sulfonamides.

Not known to produce systemic toxicity in adults but can produce local allergic reactions. However, the Food and Drug Administration announced in April 2011 that “Topical benzocaine sprays, gels and liquids used as anesthesia during medical procedures and for analgesia from tooth and gum pain may cause methemoglobinemia, a rare but serious and potentially fatal condition. Children younger than 2 years appear to be at particular risk. In the most severe cases, methemoglobinemia can result in death. Patients who develop methemoglobinemia may experience signs and symptoms such as pale, gray or blue colored skin, lips and nail beds; headache; lightheadedness; shortness of breath; fatigue; and rapid heart rate.

Most of the cases reported were in children younger than 2 years who were treated with topical benzocaine gels for the relief of teeth pain. The signs and symptoms can occur after a single application or multiple applications and can begin within minutes and hours of application.

The armamentarium necessary to administer local anesthesia is the carpule, needle and syringe

Conclusion: Topical anesthetics are applied in several ways:

Ointments

Gels

Sprays

Adhesive patch

Topical Anesthesia is used to numb your gums or other tissues before an injection, so that you can't feel the needle glide in.

Studies have shown that application of topical anesthetic to the injection site for 2 to 3 minutes leads to profound soft-tissue analgesia.

The patch is a small adhesive strip that contains lidocaine. It is placed in the mouth for up to 15 minutes. The area usually gets numb in 2 to 5 minutes. The effect lasts for about 30 minutes after the patch is removed.

The patch works at least as well as lidocaine ointment. It's also somewhat safer because less of the anesthetic enters the bloodstream. The blood level is about half of that produced by applying lidocaine ointment. It's just over one-tenth of what you get from a typical shot.

Anesthetic Gels are fast acting with no systemic absorption. It provides temporary relief of pain during procedures, including local anesthetic injections, periodontal curettage, impression taking, scaling, intra-oral radiographs, root planning and prophylaxis. The gel comforts patients with ulcers, wounds or other minor mouth irritations

Anesthetic Spray is great for use on a large area that requires anesthesia. Containing 20% benzocaine the spray works quickly and effectively – approximately 15 to 20 seconds.

Uses

To prevent or reduce the pain caused by a numbing shot

To prevent people from gagging. The "gag reflex" may occur during an X-ray or when a tray is placed in the mouth to take an impression or give a fluoride treatment.

To decrease discomfort during scaling and root planing or the removal of stitches

To relieve pain from dry socket. This problem sometimes occurs after tooth extraction.

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Corresponding Author:

Sharayu Shanmathi*,

Email:sharayu234@gmail.com