IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 16, Issue 2 Ver. I (February. 2017), PP 84-90
www.iosrjournals.org

Techniques of Local Anaesthesia

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Abstract: *Dental patients have become increasingly less tolerant of a dentist who hurts them. The control of intra- and postoperative pain presents an age-old challenge: Will there ever be a perfect local anesthetic technique? Through the past 3 decades, it appears that attempts to increase success rates, especially in the mandible with its dense, infiltration-resistant cortical bone, have accelerated[1].*
Keywords: *Local anesthesia, Extra oral and Intraoral Techniques.*

I. Introduction

Compared to general anesthesia with opioid based perioperative pain management, regional anesthesia can provide benefits of superior pain control, improved patient satisfaction, decreased stress response to surgery, reduced operative and postoperative blood loss, diminished postoperative nausea and vomiting, and decreased logistic requirements. This will review the most common local anesthetics and adjuncts used in the US military for the application of regional anesthetic techniques, with particular emphasis on medications used for peripheral nerve block (PNB) and continuous peripheral nerve block (CPNB)[2].

Basic Review Of Local Anesthetics

Local anesthetics are valued for the ability to prevent membrane depolarization of nerve cells.Local anesthetics prevent depolarization of nerve cells by binding to cell membrane sodium channels and inhibiting the passage of sodium ions. The sodium channel is most susceptible to local anesthetic binding in the open state, so frequently stimulated nerves tend to be more easily blocked. The ability of a given local anesthetic to block a nerve is related to the length of the nerve exposed, the diameter of the nerve, the presence of myelination, and the anesthetic used. Small or myelinated nerves are more easily blocked than large or unmyelinated nerves. Myelinated nerves need to be blocked only at nodes of Ranvier (approximately three consecutive nodes) for successful prevention of further nerve depolarization, requiring a significantly smaller portion of these nerves to be exposed to the anesthetic. Differential blockade to achieve pain and temperature block (A-d, C fibers) while minimizing motor block (A-a fibers) can be achieved by using certain local anesthetics and delivering specific concentrations to the nerve.

Local anesthetic structure is characterized by having both lipophilic and hydrophilic ends connected by a hydrocarbon chain. The linkage between the hydrocarbon chain and the lipophilic aromatic ring classifies local anesthetics as being either an ester (–CO) local anesthetic, in which the link is metabolized in the serum by plasma cholinesterase, or an amide (–NHC) local anesthetic, in which the link is metabolize primarily in the liver. The functional characteristics of local anesthetics are determined by the dissociation constant (pKa), lipid solubility, and protein binding. The pKa is the pH at which a solution of local anesthetic is in equilibrium, with half in the neutral base (salt) and half in the ionized state (cation). Most local anesthetics have a pKa greater than 7.4. Because the neutral base form of the local anesthetic is more lipophilic, it can penetrate nerve membranes faster. As the pKa of a local anesthetic rises, the percentage in the ionized state increases and the onset of the block is slowed. Once the local anesthetic has passed through the cell membrane, it is exposed to the more acidic axioplasmic side of the nerve, favoring the ionized state. The ionized form of the molecule binds the sodium channel and blocks conduction[3]. The potency of local anesthetics is determined by lipid solubility. As lipid solubility increases, the ability of the local anesthetic molecule to penetrate connective tissue and cell membranes increases, causing the increase in potency. The duration of action for local anesthetics is determined by protein binding. Local anesthetics with high affinity for protein binding remain bound to nerve membranes longer, resulting in an increased duration of action. Binding to serum a1-acid glycoproteins and other proteins decreases the availability of free drug in the blood, reducing the potential for toxicity in the primary organs. The free fraction of local anesthetic in the blood is increased in conditions of acidosis or decreased serum protein, thus heightening the potential for toxicity[4].

II. History

Local anesthetics have been in use in dental practice for more than 100 years. The advent of local anesthetics with the development of nerve blockade injection techniques heralded a new era of patient comfort while permitting more extensive and invasive dental procedures. A brief history and summary of the current local anesthetics available in the United States is provided, and some of the newest techniques for delivering local anesthetics are reviewed[4].

General guidelines for addressing difficulties encountered in anesthetizing patients are also discussed. Following the import of coca leaves to Europe, much research was conducted to elucidate the properties of the coca leaf extract. In 1859, Albert Niemann refined the coca extract to the pure alkaloid form and named this new drug “cocaine.” Niemann recognized the anesthetic effect of cocaine when he noted that “it benumbs the nerves of the tongue, depriving it of feeling and taste.”

In the summer of 1884, Carl Koller, a junior resident in the University of Vienna Ophthalmological Clinic, conducted experiments to test the topical anesthetic properties of cocaine on the corneas of various lab animals and on him self. He found that the drug rendered the corneas insensitive to pain. In September of that year, Koller performed the world’s first operation using local anesthesia induced by topical cocaine on a patient undergoing glaucoma correction[4].

The noted American surgeon William Halsted was the first person to inject cocaine for nerve conduction blockade, performing infraorbital and inferior alveolar nerve blocks for dental procedures in November 188414.

In 1903, Heinrich Braun reported that epinephrine could be used as a “chemical tourniquet” when added to a solution of cocaine by producing localized vasoconstriction to slow the rate of vascular uptake, and thus reducing the required dose of cocaine. In 1905, Alfred Einhorn and his associates in Munich reported their discovery of procaine, an ester-based synthetic local anesthetic.5 Procaine was immediately accepted as a safe substitute for cocaine. Some historians consider the discovery of procaine to mark the beginning of the modern era of regional anesthesia. Several other ester-type local anesthetics were subsequently developed and remained in wide use in the United States throughout most of the 20th century. In 1943, Nils Löfgren, a Swedish chemist, synthesized a new amide-based local anesthetic agent, derived from xylidine, and named it “lidocaine.”6 Lidocaine was more potent and less allergenic than procaine and the other ester-based anesthetics. Since Löfgren’s discovery of lidocaine, several other amide anesthetics have been developed for use in dental procedures: mepivacaine, prilocaine, bupivacaine, etidocaine, and articaine. The advantages of the amide-based anesthetic agents, particularly their very low rate of allergenicity as compared to the ester-type anesthetics, led to their gradual and complete replacement of the ester-based anesthetics in dental use. The last ester anesthetics packaged in a dental syringe cartridge were discontinued in the mid-1990s[4].

III. Techniques Of Regional Analgesia For The Maxillary Nerve And Its Subdivisions

Transmission in nerve fibers of the second division that innervate the oral cavity may be interrupted by the following approaches[6]:

Intraoral Techniques

- Local infiltration of nerve endings
- Block of the terminal branches
- Anterior and middle superior alveolar nerve block (infraorbital)
- Posterior superior alveolar nerve block (zygomatic)
- Nasopalatine nerve block
- Anterior palatine nerve block
- Maxillary nerve block

Extraoral Techniques

A. Anterior and middle superior alveolar nerve block (infraorbital)
B. Maxillary nerve block

Intraoral techniques

NERVE BLOCK	NERVE ANAESHETISED	AREA ANAESHETISED	ANATOMICAL LANDMARK	INDICATION
Anterior and middle superior	Infraorbital, anterior and middle superior alveolar nerves, inferior palpebral, lateral nasal, superior labial	Incisors, cuspids, bicuspids, mesiobuccal root of the first molar including bony supporet and soft tissue, upper eyelid, lower eyelid, portion of nose of the same side	Infraorbital ridge, infraiorbital depression, supraorbital notch, infraorbital notch, anterior teeth, pupils and eyes	When anterior and middle superior nerves to be blocked. May be performed five upper anterior teeth of the same sideof the median line
Posterior superior alveolar nerve block	Posterior superior alveolar nerve	The maxillary molars, exception of the mesiobuccal root of the first molar, buccal alveolar process of maxillary molars, periosteum, connective tissue, mucouse membrane.	Mucobuccal fold, Zygimatic process of the maxilla, Infratemporal surface of the maxilla, Anterior boarder and coronoid process of the ramus of the mandible, Tuberosity of the maxilla.	For operative procedures of the molar teeth and supporting structure.
Nasopalatine nerve block (incisive block)	Nasopalatine nerve	Anterior portion of the palate and overlying structure back to the cuspid area,	Central incisor teeth, incisive papilla in the midline of the palate	To supplement the block of anterior and middle superior nerves, To augment analgesia of the six maxillary incisors, To complete anaesthesia of the nasal septum.
Anterior palatine nerve block	Anterior palatine nerves as it leaves the greater palatine foramen	Posterior portion of the hard palate and overlying stuctures up to the first bicuspid area on the side injected.	Second and third maxillary molars, Palatal gingival margin of second and maxillary molars, Midline of the palate, A line approximately 1cm from the palatal gingival margin toward the midline of the palate.	For palatal anaesthesia to be used in conjugation with the posterior superior alveolar nerve block. For surgery of the posterior portion of the hard palate.
Maxillary nerve block	Entire maxillary nerve and all its subdivisions peripheral to the site of the injection.	Maxillary teeth of the affected side. Alveolar bone and overlying structure. Hard palate and portionof	Hight tuberosity technique- same as for the posterior superior nerve block. Greater palatine canal	For extensive surgery. When local infection is present. For diagnostic or therapeutic purpose such

Extraoral techniques

A. Anterior and middle superior alveolar nerve block (infraorbital block)

Technique-

This procedure should be carried out under aseptic conditions. This implies that the dentist should complete a surgical scrub, use sterile gloves, and surgically prepare the field.

a) Using the available landmarks, the dentist should locate and mark the position of the infraorbital foramen. The skin and subcutaneous tissues should be anesthetized by local infiltration.

b) A 172-inch, 25-gauge needle attached to an aspirating syringe is inserted through the marked and anesthetized area. Directing the needle slightly upward and laterally facilitates its entrance into the foramen, which opens downward and medially.

c) With a slight, gently probing motion the foramen is located and entered to a depth not to exceed Vs inch. After careful aspiration, 1 ml of anesthetic solution is slowly injected.

When the infraorbital nerve block by means of the extraoral approach is being performed, the needle passes through the following structures: Skin Subcutaneous tissue Quadratuslabiisuperioris muscle When the needle is in position for this injection, the important structures near it are the facial artery and vein, which, since they are very tortuous, may lie on either side of the needle[10].
B. Maxillary nerve block

Technique-

a) This procedure should also be carried out under aseptic conditions. This implies that the dentist should complete a surgical scrub, use sterile gloves, and surgically prepare the field.

b) The midpoint of the zygomatic process is located and the depression in its inferior surface is marked. With a 25-gauge hypodermic needle, a skin wheal is raised just below this mark in the depression, which the dentist identifies by having the patient open and close the jaw.

c) Using a 4-inch (8.8 cm), 22-gauge needle attached to a Luer-Lok type of syringe, one measures 4.5 cm and marks with a rubber marker.

d) The needle is inserted through the skin wheal, perpendicular to the median sagittal plane (skin surface) until the needle point gently contacts the lateral pterygoid plate. The needle should never be inserted beyond the depth of the marker. The needle is withdrawn, with only the point left in the tissue, and redirected in aslight forward and upward direction until the needle is insertedto the depth of the marker. After carefulaspiration, 2 or 3 ml of a suitable anesthetic solution is slowly injected. Care should be exercised to aspirate after each 0.5 ml of the solution is injected[10].

When the maxillary nerve block is being executed by means of the extraoral approach, the needle passes through the following structures: Skin Subcutaneous muscle Masseter muscle Mandibular notch External pterygoid muscle When the needle is in contact with the lateral pterygoid plate, the following important structures are near it: Superiorly, the base of the skull.

IV. Techniques Of Regional Analgesia For The Mandibular Nerve And Its Subdivisions

Intraoral techniques

A. Classical inferior alveolar nerve block
  1. Closed-mouth approach
B. Mandibular nerve block
C. Lingual nerve block
D. Buccinator (long buccal) nerve block
E. Mental nerve block
F. Incisive nerve block
G. Block of terminal branches
H. Local infiltration

Extraoral techniques

A. Mandibular nerve block
B. Mental and incisive nerve block
C. Local infiltration

Intra oral technique:

		the soft palate. Upper lip, cheek, side of the nose, and lower eyelid.	technique- Same as for locating greater palatine foramen to block the anterior palatine nerve.	as tics or nuralgiasa of the maxillary division of the fifth nerve.
Inferior alveolar nerve block	Inferior alveolar nerve and its subdivisions, mental nerve, incisive nerve, the lingual and buccinators nerves	Body of the mandible and an inferior portion of the ramus, Mandibular membrane and underlying tissue anterior to the first mandibular molar	Mucobuccal fold Anterior border of the ramus of the mandible. External oblique ridge. Retromolartiangle. Internal oblique ridge. Pterygomandibular ligament. Buccal sucking pad. Pterygomandibular ligament. Buccal sucking pad. Pterygomandibular space.	Analgesia for operative on all the mandibular teeth. Surgical procedures on the manmdibular teeth and supporting structure anterior to the first molar. Surgical procedures on the manmdibular teeth and supporting structure posterior to the second bicuspid

lingual nerve block	Lingual nerve	Anterior two thirds of the tongue and the floor of the oral cavity. Mucosa and perosteum on the lingual side of the mandible	Same as inferior alveolar nerve block	Surgical procedures of anterior two third of the tongue. Floor of the mouth. Mucous membrane on the lingual side of the mandible.
Long buccal nerve	Buccinators nerve	Buccal mucous membrane and mucoperiosteum of the mandibular molar area.	External pblique ridge. Retromolar triangle.	Surgery on the buccal mucosa and to supplement the inferior alveolar nerve block.
Mental nerve block	Mental nerve	Lower lip. Mucous membrane in the muccolabial fold anterior to the mental foramen	Mandibular bicuspids	Surgery of lower lip or mucos membrane in the mucolabial fold anterior to the mental foramen.
Incisive nerve block	Incisive nerve, Mental nerve	Mandible and overlying labial structures anterior to the mental foramen. Bicuspids, cuspids, and incisors of the affected side. Lower lip of the affected side	Same as for mental nerve block	For surgery of labial mandibular structures anterior to the mental foramen and the lower lip

V. Closed-Mouth Approach To Mandibular Nerve Block

Techniques for closed mouth techniques.

A. With the patient seated comfortably in the dental chair, the operator stands to the patient's right side and slightly to the front.

B. The patient is instructed to occlude the teeth.

C. The operator retracts the patient's lips exposing the maxillary and mandibular teeth on the right side.

D. The syringe (with a 1% inch, 25-gauge needle attached) is aligned parallel to the occlusal and sagital planes but positioned at the level of the mucogingival junction of the maxillary molars.

E. The needle penetrates the-mucosa just medial to the ramus and is inserted approximately 1V2 inches.

F. Following negative aspiration, the contents of the dental cartridge are slowly deposited.

G. Successful anesthesia will be determined by instrumentation of the inferior alveolar nerve and its subdivisions—the mental and incisive nerves plus the buccinator and lingual nerves. Care must be taken to ensure that the needle is inserted as closely as possible to the medial surface of the ramus. Allowing the needle to be advanced too far medially is likely to result in the deposition of the solution on the medial side of the pterygomandibular space and sphenomandibular ligament resulting in inadequate anesthesia or an unsuccessful nerve block[16].

Open mouth technique

In1973 Gow-Gates described a true mandibular nerve or trigeminal division III block administered by means of the intraoral approach using intraoral and extra oral landmarks to deposit the anesthetic solution at the neck of the condyle. A single anesthetic injection provides hard and soft tissue anesthesia of the mandible to the midline.

Gow Gates Technique

A. Patient is placed in the supine position (although semirecumbentposition may also be used.)

B. Operator is positioned to the right and slightly in front of patient.

C. Patient keeps mouth open widely and remains in that position until the injection is completed. This position moves the condyle anteriorly, thus facilitating the injection.

D. An imaginary line is drawn from the comer of the mouth to the intertragic notch of the ear.

E. The anterior border of the ramus is palpated, and the tendon of the temporal muscle is identified.

F. Operator visually aligns the intraoral and extra oral landmarks, and the needle is introduced through the mucosa just medial to the temporal tendon and directed toward the target area on a line extending from the corner of the mouth to the intertragic notch. The degree of divergence of the external ear to the head is used as a guide to the lateral flare of the ramus. Needle insertion should parallel the degree of flare of the ear.

G. The needle should be advanced until the fovea region of the condylar neck is contacted. Depth of insertion should not exceed 25 to 27 mm.

H. If bone contact is not established, the needle should be withdrawn slightly and redirected after checking landmarks.

I. The entire contents of the dental cartridge should be injected only after establishing proper needle placement (for example, bone contact).

J. After the operator withdraws the needle, the patient is to keep the mouth open for 20 to 30 seconds to allow adequate bathing of the nerve trunk that has been straightened by opening the mouth.

K. Because of the large diameter of nerve trunk and distance from injection site (about 1 cm), onset of anesthesia will occur in 5 to 7 minutes. A wavelike pattern of anesthesia starts in the ramus and progresses steadily forward to include the molars, premolars, and anterior teeth in sequence[17].

Extra oral technique:

Mandibular nerve block

1. Nerve anaesthetized.

- Mandibular nerve and subdivisions
- Inferioalveolarnerve
- Buccinator nerve
- Lingual nerve
- Mental nerve
- Incisive nerve
- Area anaesthetized

Techniques-

The technique is essentially the same as that used for the block of the maxillary nerve, with the exception that a marker is placed on the needle at a measured distance of 5 cm. After the needle contacts the lateral pterygoid plate, it is withdrawn exactly as in the maxillary block; however, when reinserted, the needle is directed upward and slightly posterior. The technique for the extra-oral block of the mandibular nerve is essentially the same as that for the maxillary block, except that the needle is directed upward and posteriori so that the mandibular nerve is contacted as it exits from the foramen ovale[19].

VI. Conclusion

The success of the contemporary dental practice largely hinges on the use of local anesthesia for ensuring patient comfort and safety. Aperiodic review of anesthesia techniques is important for keeping abreast of recent developments in dental pain control. The review should include an introduction to new anesthetics or delivery devices as well as a discussion of complications of local anesthetics and their administration. Infection control and sterility should be maintained during all anesthetic procedures. Local anesthetics are widely used to manage acute, chronic, and cancer pain and for diagnostic purposes. They have effects in addition to preventing sodium entry into axons that appear to contribute, at least in some instances, to their pain-relieving action.

Bibliography

[1]. G. Meechan for How to overcome failed local anaesthesia, British Dental Journal 1999; 186: 15–20.
[2]. Kenneth m. Hargreaves for local anesthetic failure in endodontics: mechanisms and management, endodontic topics 2002, 1, 26–39
[3]. Finder for adverse drug reactions to local anesthesia, dent clin n am46 (2002) 747–757 al reader for successful local anesthesia,
[4]. Boris bentsianov for facial anatomy, doi:10.1016/j.clindermatol.2003.11.011
[5]. Dr Hilary Edgcombe for Local Anaesthetic Pharmacology, Critical Care 2005 15: 247-254
[6]. Ryan G. Brandt for Efficacy off Local Anestheicsiin Clinical Dentistry, The University of Michigan 2005
[7]. James e. Heavner for local anesthetics, current opinion in anaesthesiology 2007, 20:336–342
[8]. Holger g. Gassner for surgical anatomy of the face, arch facial plast surg. 2008;10(1):9-19
[9]. Steven schwartz for local anesthesia in pediatric dentistry, crest® oral-b®at dentalcare.com continuing education course, revised january 6, 2012
[10]. Peter M. Prendergast for Anatomy of the Face and Neck, DOI 10.1007/978-3-642-21837-8_2, © Springer-Verlag Berlin Heidelberg 2012
[11]. Daniel E. Becker for Local Anesthetics: Review of Pharmacological Considerations, 2012 by the American Dental Society of Anesthesiology
[12]. Adeelamalik for efficacy and performance of various local anesthesia modalities for cataract surgery, malik, j clinic experiment ophthalmol 2013, s:1
[13]. Lyon lee for local anesthesia & analgesia, veterinary surgery i, vmed 7412 richard l.
[14]. A. Mclure for review of local anaesthetic agents, minervaanestesiol 2005;71:59-74
[15]. Ryan g. Brandt for effffiicacy of local anesthetics in clinical dentistry.
[16]. Olusegunisaacalatise for open hemorrhoidectomy under local anesthesia for symptom atichemorrhoids; our experience in ile –ife, nigeria, [afr j health sci. 2010; 17:42-46]
[17]. Paige a. Ackerman for anesthetic.
[18]. Jackie locke for local anaesthetics. Anthony s. Mennito for local anesthetic review, october 2012 the academy of dental learning &osha training
[19]. Lantz gc. For local anesthesia in veterinary dentistry, j vet dent 20(3), pp 181 – 186, 2003.
[20]. Hand book of local anesthesia, stanleymalamed, fourth edition
[21]. Heerachang for maxillary and mandibular anesthesia techniques, columbia university college of dental medicine
[22]. J. G. Meechan for how to overcome failed local anaesthesia, british dental journal, volume 186, no. 1, january 9 1999.
[23]. Louis habbema, for safety of liposuction using exclusively tumescent local anesthesia in 3,240 consecutive cases, dermatolsurg 2009;35:1728–1735 _ doi: 10.1111/j.1524-4725.2009.01284.