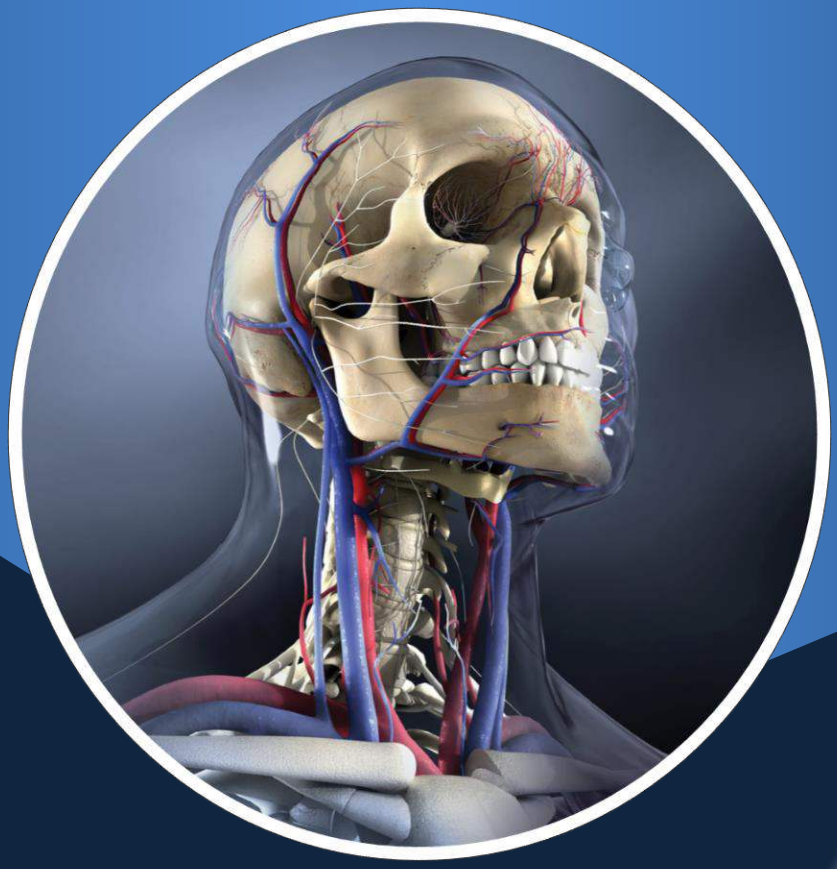
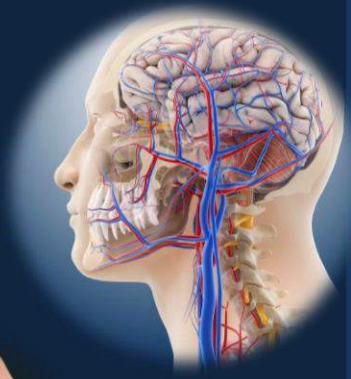


Oral Surgery

Third Stage







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Lecture 2

Introduction to Local Anesthesia

Many dental procedures, such as tooth extraction, are both **painful** and prolonged and should be performed without pain by using a local anesthesia.

Local anesthesia has been defined as "**loss of sensation** in a circumscribed area of the body caused by **inhibition** of the **conduction process in the peripheral** nerves".

An important feature of local anesthesia is that it produces this **loss of sensation without inducing loss of consciousness**. In this one major area, local anesthesia differs dramatically from general anesthesia.

Many methods are used to induce local anesthesia. However, only those methods or substances that induce a transient and completely reversible state of anesthesia have application in clinical practice.

Brief history:

Local anesthesia as it is known today began when a **German chemist (Albert Niemann-1860)** successfully isolated the active principle of **coca leaf**, he named it **cocaine. In 1898 professor Heinrich Braun** introduced **procaine** as the first derivative of cocaine which is known as the first synthetic local anesthetic drug. In 1940 the first modern local anesthetic agent was introduced and known as **Lidocaine** (trade name Xylocaine). It relieves pain during the dental surgeries and produces the desired anesthetic effect for several hours.

Terminology:

Pain: According to the **W**orld **H**ealth **O**rganization (**WHO**) pain is defined as an *"**unpleasant sensation that occurs from imminent tissue damage**"*. From a physiological perspective, pain is a warning system. During dental treatment, patients will experience pain as something unpleasant.

Analgesia: loss of pain.

Anesthesia: loss of sensation (**loss of pain and touch sensation**).

In dentistry, local anesthesia is used to permit the performance of surgery or other painful procedures with no pain.

Paresthesia: altered sensation (**tingling**), such as when a local anesthesia is **starting to work** or its **effect is wearing** off. Or when a **damaged nerve** is **regenerated**.

The **effect of local** anesthetics on **nerve fiber** has been shown to be dependent on:

1- The duration of exposure of local anesthesia

2- Concentration

3- Volume of the solution

Relative analgesia: is a sedation technique in which the **patient remains conscious** but **mental relaxation** is induced by inhalation of a mixture of **nitrous oxide and oxygen**.

Pain threshold: -a **point** at which the **patient feels discomfort** when exposed to painful stimuli.

The patient who feels minimal discomfort from painful stimuli is having high pain threshold

Many factors influence this response such as fear, apprehension and fatigue, all of which **lower the pain threshold**.

Premedication: -is the use of to reduce **drugs** a **patient's apprehension** prior to operative treatment.

Sedation techniques: involve the administration of a **sedative** to reduce anxiety in the conscious patient, usually, **given by I.V route**.

Properties (requirements) desirable for ideal local anesthetic:

1. It should **not be irritating** to the tissue to which it is applied.
2. It should **not cause any permanent alteration** of nerve structure.
3. Its systemic toxicity should be low.
4. The **time of onset of anesthesia should be as short** as possible.
5. The **duration of action must be long enough** to permit completion of the procedure.
6. It should be relatively **free from producing allergic reactions**.
7. It should be stable in solution and should readily undergo biotransformation in the body.
8. It should be **sterile**.

Of paramount importance is **systemic toxicity**, because all injectable and most topical local anesthetics are eventually **absorbed** from their site of administration into the **cardiovascular system**.

Several of the more potent injectable local anesthetics (e.g., procaine, mepivacaine) prove to be relatively ineffective when applied topically to mucous membranes. To be effective as topical anesthetics, these drugs must be applied in concentrations that prove to be locally irritating to tissues while increasing the risk of systemic toxicity.

Lidocaine, on the other hand, is effective anesthetic when administered by injection or topical application in clinically acceptable concentrations.

Clinical duration of action does **vary considerably** among **drugs** and also **among different preparations of the same drug**, as well as by the **type of injection administered** (e.g., nerve block vs. supraperiosteal). The duration of anesthesia necessary to complete a procedure is a major consideration in the selection of a local anesthetic.

Uses or indications of local anesthesia

Local anesthesia is indicated in **almost all the dental procedures**, it is used to render the teeth, the supporting tissues and associated structures insensitive to painful stimuli.

A. Diagnostic:

Administration of LA can be a useful way of finding the source of patient's pain. An example of this is the **pain of pulpitis** which can be very difficult for both the patient and the dentist to isolate because of its tendency to be **referred** to other parts of the mouth or face, so LA can **differentiate between maxillary and mandibular sources**, and even **between individual upper teeth provided they are not immediately adjacent**.

Another example is a patient with **myofacial pain** who is convinced that an **upper tooth is causing the problem**, LA may help this patient and the surgeon in this situation to eliminate the tooth as the cause of pain and may thus avoid unnecessary treatment.

B. Therapeutic:

LA can constitute part of a treatment for **painful conditions**, for example, the use of **block technique to eliminate the pain of dry socket**. **Blocks** of the inferior alveolar nerve, mental nerve or infraorbital nerve can also be used for the treatment of trigeminal neuralgia when pain breakthrough.

C. Preoperative:

The provision of **pain-free operation** is by far the most common use of LA providing an effective and safe method for almost all outpatient **dentoalveolar surgical procedures**. It can in **conjunction with sedation techniques** allows **more difficult procedures** to **be carried out without** the additional risks of **general anesthesia** and this is **particularly** of value in patients with significant **cardiovascular** or **airway diseases**.

D. Adjunct to General Anesthesia:

Local anesthesia is also given to patients **undergoing oral and maxillofacial** surgery **under general anesthesia** this serves the following purposes:

1. It **reduces** the **depth of general** anesthesia needed.
2. It **reduces** the **arrhythmia during surgery** when significant stimulation is taking place, for example when a tooth is being elevated.
3. It provides **local homeostasis** to the operative site.
4. Provides **immediate postoperative analgesia**.

E. Postoperative

After surgery with either local or general anesthesia the continuous effect of the anesthesia is the most beneficial way of reducing patient's discomfort, it helps to reduce or even eliminate the need for a **stronger systemic analgesic**.

Contraindications of local anesthesia

These can be divided into **two groups**:

1- Absolute contraindications:

A. History of allergy to local anesthetic agent

Local anesthetic agents belong to the **same chemical group should not be used.** However, LA agents in the different chemical group can be used. For example, if the patient gives a history of allergy to an **amide local** anesthetic agent, an **ester LA** agent should be used.

B. History of allergy to <u>other constituents</u> of the local anesthetic solution

When the patient has a history of allergy to any of the constituents of the LA solution, it should be avoided, a different type of solution should be used.

2- Relative contraindications*:*

A. Uncooperative patient such as medically retarded patient.

B. Presence of **acute inflammation** or **suppurative infection** at the site of injection, to **avoid the spread of infection** (with the passages of the needle) from the abscess area to the deeper tissue.

C. Patient with a significant medical disease such as **cardiovascular** disease, **hepatic dysfunction**, **renal dysfunction**, clinical **hyperthyroidism**, etc.

D. Major surgical procedures (needs to be done **under general anesthesia**).

Advantages of local anesthesia

1. **Less expensive** than general anesthesia (GA).
2. **No special preparation** of the patient is needed as in GA.
3. **No complicated apparatus** is needed.
4. **Less complication** rate than GA.
5. The patient **remains awake** with no need for aftercare.
6. Can be **used if GA is contraindicated** (the patient is unfit for GA).
7. Anesthetist and other additional trained personnel are not required.
8. The technique is not difficult to master.