Diploïc Anesthesia for mandibular teeth

The dilution gradient participates in the reduction of the anesthetic ingredient concentration; the power is therefore significantly decreased. Which are therefore the elements influencing the dilution gradient? Study

The first notion is a physico-chemical notion. It's the dilution gradient which defines itself as a “progressively decreasing variation, from a maximum point, of the concentration of a substance in a biotope, a cell or an organism” (Larrousse). This dilution gradient intervenes when one injects a liquid into a substrate already containing a liquid. This is what we do when performing an anesthesia. This notion concerns all injections, including nerve blocks. This fact suggests that the active ingredient concentration is inversely proportional to the cube of the distance separating the injection from the target (Fig.1). This variable evolves extremely rapidly (Fig.2).

ELEMENTS INFLUENCING THE DILUTION GRADIENT

- The quantity injected: the more quantity of product is injected, the more the peripheral maximum dilution gradient will be rejected far from the site of injection.
- The liquid mass: its the quantity of physiological (cellular, extracellular and vascular) contained in the tissue in which the injection is made. The more liquid there is in a tissue, more the active ingredient dilution will be important and inversely.
  - The blood flow and the vasoconstrictor: the vasoconstrictor slows down the blood circulation around the injection point and acts on the blood flow. The active ingredient being “mixed” with a smaller quantity of physiological liquids is more concentrated, as less diluted. The presence and the vasoconstrictor concentration participate in the reduction of the dilution gradient. It therefore increases the active ingredient concentration and thus the power and length of the anesthesia.

BIOLOGICAL CHARACTERISTICS

It should be noted that the liquid mass and the blood flow are physiological characteristics of the tissue that we are going to inject into. The three levers that the practitioner can action and that will enable to produce a more or less powerful anesthesia are: the distance from the injection point to the target.

The vasoconstrictor concentration

The quantity injected

The following formula (Fig.3) gives the concentration of anesthetic ingredients depending on the biological characteristics of the tissue and of the elements on which the practitioner can intervene. The second notion to take into consideration is of a histological notion. They are the Volkmann or intercommunicating canals. They join the Havers canals together and make the communication between the medulla and the periosteum. It is the latter that depend on whether an infiltration is successful and not the thickness of the cortical.

MANDIBULAR INFILTRATION

How do these elements therefore function when performing a mandibular infiltration? When injecting a cartridge by infiltration, a part migrates through the intercommunicating canals to anesthetize the spongy bone (diploë) and eventually the tooth. We understand that fundamentally we have just performed an intraosseous anesthesia. If one understands that an infiltration is in fact an intraosseous anesthesia, we realize that in fact all anesthesias are intraosseous, except for nerve blocks. The anesthesia terminology must therefore be updated as shown in the diagram of figure 4.

INTERCOMMUNICATING CANALS

If the dilution gradient is too important (more voluminous mandible), the buccal anesthesia is insufficient (Fig.5), one will therefore have to perform a lingual complement to obtain around the apex a less important dilution gradient and an extra infiltration may also have to be performed, even an injection in the mental foramen. If, as shown on the diagram of figure 5, we perform an osteocentral (Fig.6), we understand that for

"Osteocentral is the most powerful as it places the anesthetic as close as possible to the apexes"

INTERCOMMUNICATING CANALS

The concentration of active ingredients is inversely proportional to the cube of the distance between the injection site and the target.

You need to increase the quantity injected, increase the vasoconstrictor concentration and reduce the distance between the apex and the injection point. This is the strategy that must be adopted, especially in the case of teeth with pulps. The only difference between a child and an adult is the bone volume. Children have the same Volkmann canals, is subject to the dilution gradient, can present either healthy or inflammatory tissues. The principals that we have described for adults are therefore identically applicable to children, if only that the quantity injected will rarely exceed one quarter of a cartridge.

Osteocentral and transcortical anesthesias enable:

- To free oneself from anatomical variations (mylohyoid, lingual and digastric nerves)
- To anesthetize teeth with pulpitis by using a solution at 1/80000, without any risk.
- To eliminate the complementary lingual anesthesia, without anesthetizing the cheek or the lip.

Osteocentral is the most powerful as it places the anesthetic as close as possible to the apaxes (Fig.7).