Can the diploïc techniques, used as a first intention, anesthetize teeth presenting pulpitis? - Retrospective study of 110 cases.

Diploïc anesthesia

Introduction
Anesthesia of teeth presenting pulpitis, reputed difficult, is generally performed by adding various techniques, for which we hope that the accumulation will enable clinical silence: for the maxilla "tuberositar anesthesia, followed immediately by an intraligamentary and finally an intrapulpal as soon as the chamber is opened", for the mandible "regional at the mandible or mental foramen followed immediately by an intraligamentary and intrapulpal as soon as the chamber is open.
Never an intradiploïc or intraligamentary first: intradiploïcs and intraligamentaries are incapable of resolving alone the problem of the anesthesia in a pulpitis" [5] (p.79)
Furthermore, the consensus, among practionners performing endodontics, is as follows: intra osseous anesthesias (they mean diploïc) used as a complement to nerve blocks drastically increase the anesthesia success rate for the treatment of teeth presenting a pulpitis. [1], [7] (p.367, p.269-271).
We can legitimately ask ourselves whether the anesthesias traditionally proposed as complements and which ensure the success of the anesthesia, could not produce, alone, the operatory silence required.

Material and methods
One hundred and ten consecutive patients, 59 men (53.6%) and 51 women (46.4%) of which the average age was of 45.6 years old (extremes 10-75 years) with an irreversible acute or chronic pulpitis on a definitive tooth, were subject to a retrospective study in three town based, omnipractic dental offices.

The diagnosis difference between acute pulpitis and chronic pulpitis was based on the notion of seniority and of recurrence of the appearance of the pulpal type pain.

Treatment of teeth presenting a pulpitis
It was performed either by an emergency pulpotomy treatment with opening of the pulpal chamber and partial pulp removal or by an endodontic treatment programmed with a pulpectomy and filling of the complete endodontic system in the same appointment (if the clinical conditions enabled to do so); a local anesthesia of lidocaïne 2% with 1/80.000 adrenaline or articaïne 4% with 1/100.000 adrenaline was administered systematically by diploïc anesthesia (transcortical or osteocentral anesthesia), excluding all other techniques.
A complementary anesthesia may have been performed by intraligamentary with anesthetic solutions dosed with 1/200.000 adrenaline.

Rapid description of the anesthetic techniques used
The transcortical technique [3]: it consists of placing the anesthetic in the diploë after having passed through the vestibular cortical at the mandible. (Schema 1, figure 1). For the maxilla, the access may be through the palate.
The osteocentral technique [6]: it consists of placing the anesthetic in the diploë by passing through the summit of the septum, in the middle, between the vestibular and lingual cortical. It requires the use of a special needle, longer (30G, 16mm) (Schema 2, figure 2).
The intraligamentary technique [7]: it consists of placing the anesthetic in the ligament of the tooth concerned. The latter, by passing through the lamina dura, especially at the apex, will produce an intraosseous anesthesia. (Schema 3, figure 3).

The material which was used is QuickSleeper, an injection device enabling the slow injection of the chosen anesthetic solution and the perforation of the cortical or interdental septum for the complementary intraligamentary anesthesias, thanks to the needle rotation.

The main criterion of judgement was the effectiveness of the diploïc anesthesia used alone in first intention enabling to correctly perform the endodontic treatment envisaged. If it were a question of only treating the emergency, the anesthesia was considered to be effective if it made it possible to perform without the slightest pain a pulpotomy. If the complete radicular treatment was planned, the anesthesia was considered to be effective if it made it possible to perform without the slightest pain a pulpectomy (not necessarily the definitive canal filling, sometimes impossible: apical bleeding, seepage, etc.). Finally, we have tried to evaluate whether anesthesia is easier to obtain on teeth with acute pulpitis or chronic pulpitis and whether the lower molars are worth their reputation of difficult teeth to desensitize.

The secondary criterions taken into account were the complete performance time of the anesthesia, the length of the treatment time obtained by the anesthesia.

Some medical counterparts of these anesthesias (of a local order) have been taken into account: gingival or bone necrosis, post operative pain at the injection point.

Results
One hundred and ten teeth were subject to this study, composed of 50 teeth (45.4 %) presenting chronic pulpitis and 60 teeth (54.6 %) with acute pulpitis.

A – Success of diploïc anesthesia
Diploïc anesthesias used in first intention enabled to complete the endodontic treatment envisaged in 77.3% of cases, all types of pulpitis considered. (Table I)
The anesthetic product injected contained 1/100.000 adrenaline in 49% of cases and 1/80.000 in 51% of cases (Table II).
In total, in all cases, the quantity injected in first intention never exceeded 1 cartridge, meaning 1.8ml.
The techniques used in first intention:
- 63 Osteocentrals (57.2%) and 47 transcorticals (42.7%)
- For the complementary anesthesia, in case of insufficiency of the diploïc techniques: 25 intraligamentaries.
It should be noted that in 6 cases out of 110, we could not perform the filling, for different standard reasons (bleeding, seepage, etc.). (Tables III and IV)

The complement by intraligamentary anesthesia concerned 15 teeth with chronic pulpitis (60%) and 10 teeth with acute pulpitis (40%): the tooth with chronic pulpitis appears to be more difficult to anesthetize compared to the tooth with acute pulpitis. (Table V)
It appears that the mandible teeth are not more difficult to anesthetize than maxilla teeth with the diploïc techniques. This element is to take into account with the figures quoted by Malamed, indicating that with the anesthesia techniques for the mandibular foramen performed by experienced practionners the success rate can vary, according to the authors between 75 and 80% [7]: p 228.

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total desensitization</td>
<td>85</td>
<td>77.3%</td>
</tr>
<tr>
<td>Treatment possible following complement</td>
<td>25</td>
<td>22.7%</td>
</tr>
<tr>
<td>Failure</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>110</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 1 Characteristics of the anesthesia success and failure
TABLE 2 Quantity of anesthetic injected

<table>
<thead>
<tr>
<th>Quantity injected (in standard cartridges of 1.8ml) expressed in quarters of a cartridge</th>
<th>Number of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4 cartridge</td>
<td>2</td>
<td>1.8%</td>
</tr>
<tr>
<td>1/2 cartridge</td>
<td>16</td>
<td>14.5%</td>
</tr>
<tr>
<td>3/4 cartridge</td>
<td>14</td>
<td>12.7%</td>
</tr>
<tr>
<td>1 cartridge</td>
<td>78</td>
<td>70.9%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>110</td>
<td>100%</td>
</tr>
</tbody>
</table>

TABLE 3 Frequency of the results depending on the acts performed

<table>
<thead>
<tr>
<th>Act performed</th>
<th>Success</th>
<th>With complement</th>
<th>Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete endodontic treatment programmed</td>
<td>80</td>
<td>25</td>
<td>0</td>
</tr>
<tr>
<td>Emergency treatment by pulpotomy</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

TABLE 4 Frequency of the results depending on the pathology being treated for the teeth which required a complement.

<table>
<thead>
<tr>
<th>Half treated</th>
<th>success</th>
<th>with complement</th>
<th>failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maxilla : 44 teeth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>number</td>
<td>Percentage</td>
<td>number</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>77.3%</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Mandible : 66 teeth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>number</td>
<td>Percentage</td>
<td>number</td>
</tr>
<tr>
<td></td>
<td>51</td>
<td>77.3%</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

TABLEAU 5 Frequency of the results depending on the teeth treated.

It would therefore appear that the diploïc techniques enable to make abstraction to the anatomical risks associated with mandibular foramen anesthesia techniques and with the practionner.

B – Performance time and length of the anesthesia.
The average performance time was determined at 2 minutes & 58 seconds; this takes into account the time spent between the first mucosa injection and the moment the syringe is put down. The treatment can be performed immediately.
The length of the work time produced by the anesthesia is on average 36 minutes & 8 seconds, all type of intervention included. These work times are of course inferior to the real length of the anesthesia.

It is of 11 minutes for emergency pulpotomies and of 37 minutes & 20 seconds for the complete endodontic treatment programmed, all teeth included. No complement was necessary during the treatment.

C – Undesirable side effects linked to the anesthesias.
No gingival or bone necrosis were observed at the injection point.
No vasovagial episodes were observed.
Only a few observations evoked:
- Labiomental anesthesia: 15 cases out of 46 expressed (32.6%)
- Tachycardia felt by the patient during the injection: light in 31.3% of cases and non existent for 65.7% of patients where this parameter was expressed.

Discussion
The length of the anesthesia obtained being relatively short – however sufficient in this study to enable the performance of the planned treatment – imposes a preparation of the therapeutic act. The advantage entailed by the immediateness of the anesthesia must be taken advantage of straight away, there must not be any time wasted between the end of the anesthesia performance and the beginning of the endodontic treatment, the practionner must therefore have all of the necessary equipment at hand. The prevision of a relatively long act (programmed radicular treatment of a multi-rooted tooth, long roots, problematic catheterism) entails the obligation to adapt ones anesthesia technique especially by envisaging the increase of the quantity injected at the beginning of the treatment (one must absolutely try and avoid reinjection to prevent risks of tachyphylaxis) by using an anesthetic solution with a higher adrenalin concentration.

Conclusion
Based on the information gathered throughout this retrospective study concerning the anesthesia of 110 teeth presenting irreversible pulpitis:
- Diploïc anesthesia (transcortical or osteocentral) used alone in first intention enable the endodontic treatment of teeth presenting acute or chronic pulpitis in 77.3% of cases.
- In the case of insufficiency of the diploïc techniques, a complement in the form of an intraligamentary ensures the complete success of the anesthesia in all cases.
- The mandible teeth do not present a higher failure rate than the maxilla teeth.
- The mandible molars do not present a higher failure rate than the other teeth.
- It would appear that teeth with acute pulpitis are harder to anesthetize than teeth with acute pulpitis.
- It is the initial pathological status of the tooth which is a predictability factor for anesthesia difficulty and not the type of tooth.
- The rapidity of the action of diploïc anesthesias makes them the technique of choice for emergency treatment.

This simple observation study on a series of patients is a first essential step to work out more precise studies bringing forward a higher level of proof. These complementary studies would only be easily obtainable in a study and research university hospital.

Bibliography
1- BIGBY J, READER A, NUSSTEIN J, BECK M, WEAVER
6- GREAUD P Y, PASQUIER E, VILLETTE A. L’anesthésie ostéocentrale : une nouvelle technique en anesthésie dentaire. Inf Dent 2008 ; n°14

Answers
1) False - 2) True - 3) False - 4) True - 5) False.

Evaluation test

With diploïc anesthesias, acute pulpitis is harder to anesthetize than chronic pulpitis?
  _True _ False

Diploïc anesthesias enable to make abstraction to anatomical variations?
  _True _ False

With diploïc anesthesias, the mandibular teeth are harder to anesthetize than the maxilla teeth?
To anesthetize a tooth presenting a pulpitis with diploïc anesthesia, one must use an anesthetic product with a minimum of 1/100,000 adrenalin concentration?

True  False

A diploïc anesthesia performed at the mandible never produces a labiomental anesthesia.

True  False