

Knowledge of Dental Students in Relation to Local Anesthetics and Associated Complications

Conocimiento de Estudiantes de Odontología en Relación a Anestésicos Locales y Complicaciones Asociadas

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SUMMARY: Local anesthesia is the most frequently performed procedure for all dentists and, despite their possible complications, often aspects such as dosage, contraindications and systemic effects are neglected. The objectives of this study are to evaluate prospectively the knowledge of undergraduate students for the technical, dosage and indication of local anesthetics in daily dental practice, in addition to clinical observation of possible complications from anesthesia. Questionnaires were distributed to students asking about the procedure undertaken, anesthetic volume used, because of the choice of the anesthetic, anesthetic dosage calculation, habit of relating the patient's weight dosage with the dosage being applied, habit of observing the reflux in cartridge in the anesthetic infiltration act and adverse effects on patients, type of anesthetic technique performed and expected time to onset of action of the drug. At the end of this study, we intend to be a greater awareness of students (undergraduates) about the systemic effects of local anesthetics in patients, and possibly decrease the expenses of the institution with excessive use of anesthetic cartridges arising from incorrect anesthetic technique. The vast majority of undergraduate students have no knowledge about the type of anesthesia to be used, the amount to be administered and the anesthetic action time. The awareness of students about the dosage of anesthetics and their systemic problems, reduces waste and the cost of the institution by the indiscriminate use of anesthetics, thereby contributing to improve the clinical management of students at graduation.

KEY WORDS: Local anesthesia; Complications; Pain.

INTRODUCTION

Local anesthetics are drugs widely used in dentistry and have as mode of action the chemical blocking of the nervous path between the source of the impulse and the brain. The impulse, prevented from reaching the brain, can not be interpreted as pain by the patient (Malamed, 2005). The growing demand for drugs used in the clinic, in offices and by dental professionals shows that constant attention is needed to the drug therapy in training courses in Odontology (Antunes *et al.*, 2006).

There are several types of local anesthetics on the market, with or without adrenergic and non-adrenergic vasoconstrictor. The choice of the

type of anesthetic to be used in each patient occurs according to system conditions of the person (such as the presence of diseases, pregnancy and hypertension) and on the type of procedure being performed (long or short) (Davison *et al.*, 1997). Moreover, the maximum dose of the local anesthetic must be respected in order to avoid toxicity to the patient. The time required for the control of pain, the possibility of discomfort in the post-treatment period, the possibility of self-mutilation post-treatment period, the need for hemostasis during treatment and the clinical condition of the patient are important factors to be considered in selecting the local anesthetic (Malamed). Is of fundamen-

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tal importance that the dentist have full knowledge about the drug, its pharmacokinetics and pharmacodynamics, possible adverse reactions and calculating the maximum dosage allowed for each patient treated (Vasconcellos & Antunes, 2006).

The techniques of maxillary and mandibular anesthesia should be performed properly in achieving the goal of nerve block without generating complications inherent in this procedure. Most drugs used for pain suppression need to enter the bloodstream to achieve therapeutic levels before starting the clinical effect. Differing this mechanism of action, local anesthetics fail to provide adequate pain control when absorbed from your administration site for circulation (Moura *et al.*, 2007). At normal dental practice, intravascular injections should not occur. The completion of the reflux test before administering the local anesthetic reduces the incidence of intravascular injection of the anesthetic solution, and thus the incidence of adverse reactions attributed to overdose (Delgado *et al.*, 1999).

In addition to the reduction of anesthetic effect, intravascular injection can generate several complications in the central nervous system and cardiovascular system. It is possible that several adverse reactions occur at the same time, even when large or small volumes of anesthetic are injected intravascular (Webber *et al.*, 2001). The major complications of local anesthesia overdose are seizures, stroke, angina pectoris, postural hypotension, bronchoconstriction, reaction anaphylactic and myocardial infarction (Malamed).

Therefore, dentists have an obligation to meet the clinical diagnosis and proper treatment to the patient, being imperative to know the steps for basic life support (Malamed).

Given the above, it is necessary to check and analysis of knowledge of dental professionals in all undergraduate levels relative to indications, dosages and systemic complications associated with the use of local anesthetics in the various procedures of daily practice, that can not only make a careful evaluation and ethics of the degree of knowledge of the student, but also the quality of education of the given theme.

MATERIAL AND METHOD

A prospective, cross-sectional, in which administered questionnaires (Fig. 1; after references) that evaluated the knowledge and behavior of students in relation to dental anesthesia was performed. In addition, the researcher notes (Fig. 2; after references) held on the observations of the procedure that the volunteer performed.

The survey was conducted after approval by the Research Ethics Committee of FAESA (protocol number 36491514.4.0000.5059). All volunteers were informed about the research, were aware of the option of participation and signed an informed consent.

The inclusion criteria for the study participation were:

- 1) Graduate students of the Faculdades Integradas Espírito-Santenses (FAESA) who were able to perform outpatient clinical procedures;
- 2) The procedure should involve local anesthesia;
- 3) The patient should not be allergic to local anesthetics of the components;
- 4) Volunteers should sign the consent form.

The 53 students were interviewed once randomly in clinical surgery when they were performing a local anesthetic procedure.

Through the survey we found the anesthetic most widely used in clinical practice, the reason for choosing such substance if the student has positive reflux device (and if the students often use it before injecting the anesthetic in the patient), if there was intravascular injection during the anesthetic technique and if the patient had systemic problems.

During the procedure, patients were observed for the possible adverse effects post-anesthesia. We also noted the number of tubes used, whether or not the intravascular injection, the anesthetic technique used and if the student

Questionnaire

1) Which is the anesthetic that you use most often at the clinic?

a) 2% lidocaine with epinephrine b) Prilocaine 3% felypressin
c) Mepivacaine 3% without vasoconstrictor d) Other: _____

2) What is the reason for choosing this anesthetic?

Only one of the clinic Patients with systemic problems (please specify)
 Do not know Others: _____

3) Do you have the habit of asking the patient's weight to perform the calculation of the anesthetic?

Yes No Sometimes. When? _____

4) Do you have a syringe with device for positive aspiration?

Yes No

5) Do you often make positive aspiration before injecting the anesthetic into the patient?

Yes No Sometimes. When? _____

6) Do you notice if there was intravascular injection (presence of blood inside the cartridge) during their anesthetic technique?

Yes No

7) Does the patient have systemic problems? Which one?

Hypertension Arrhythmia Heart problems

Fig. 1. Questionnaire used in this research.

Record of the researcher

1) About the volunteer: Graduate Student. (Year) _____

2) Clinical observation of adverse effects after anesthesia?

Yes No

3) Type of procedure performed:

Dentistry Endodontics Surgery (tooth extraction)

4) Number of tubes used: _____

5) Note intravascular injection:

Yes No

6) Anesthetic technique used:

Infiltrative in the maxilla
 Block maxilar _____
 Block mandibular _____

7) Does the student waited for the anesthetic action before starting the procedure?

Yes No

Fig. 2. Document used to obtain the research record.

waited for the action of anesthesia before starting the procedure.

Data were tabulated in Microsoft Excel and the analysis was done after the making of a database of statistical data. It was used the proportions equality test between the response categories for each variable.

RESULTS

Regarding the most widely used anesthetic, lidocaine 2% with epinephrine was the most used (58.49% of the sample) followed by 3% Prilocaine felypressin (41,51% of the sample). There were no reports of use of Mepivacaine 3% without vasoconstrictor (Table I)

The reason for the choice of anesthetic was: 18.87% for being the only clinic (students were unaware of the presence of another anesthetic); 41.51% because the patients had systemic problems; 30.19% did not know the reason for the choice and 9.43% said that the choice was for any other reason not specified (Table I).

All students (100%) had carpule syringe with positive suction device, but only 79.25% reported performing the aspiration maneuver before injecting the anesthetic into the patient; 11.32% do not perform the aspiration technique and 9.43% occasionally perform the technique (Table II).

Most students (92.45%) observed if there intravascular injection. 7.55% do not make this observation. Among the systemic problems of cardiovascular origin, it was observed that 35.85% of treated patients had hypertension and 5.66% had heart problems.

Most students (71.7%) who participated in the survey were of fourth period, being in contact for the first time

in the clinic with local anesthesia and 28.30% of sixth period, having more experience. They were all students of clinical surgery, and 96.23% of the students performed extractions and 3.77% alveolar ridge regularization. The researchers noted, while it was held the procedure that there wasn't any post-anesthesia adverse effects in the sample.

Regarding intravascular injection, positive suction was observed in 15.10% of patients. (Table II). Regarding the anesthetic technique used, 14 (22.3%) were infiltrating the jawbone,

and 20 terminal blocks in maxilla, being 6.35% of nasopalatine technique, 14.30% block of the left posterior superior alveolar nerve and 11.10% of posterior superior alveolar right. 23 were in mandible, 36.50% pterygomandibular technique was used and 9.25% buccal anesthetic technique used was associated with pterygomandibular (Table III). In relation to the waiting time to start the procedure, 73.58% students waited for the action of anesthesia before starting the procedure, while 26.42% did not wait. The number of tubes used varied from a single cartridge to four tubes (Table IV).

Table I. Rationale choice of anesthetic for the procedures; Anesthetics used in the clinic FAESA.

Reason for choosing the anesthetic	Students (%)	Anesthetic of choice	Students (%)
Only one in clinical	18.87%	Lidocaine 2% with epinephrine	58.49%
Patient with systemic problems	41.51%	Prilocaine 3% felypressin	41.51%
They do not know	30.19%	Mepivacaine 3% without vasoconstrictor	0%
Other reasons	9.43%		

Table II. Habit of performing aspiration maneuver before injecting the anesthetic; Presence of blood within the cartridge upon aspiration.

Performs aspiration before Injecting anesthetic?	Students (%)	Intravascular injection	Patients (%)
Always	79.25%	Yes	15.10%
No	11.32%	No	84-90%
Sometimes	9.43%		

Table III. Anesthetic technique used in each patient for the procedure (extraction/alveolar ridge regularization).

Anesthetic technique	Use of technique (%)
Infiltrative maxillary	22.30%
Nasopalatine	6.35%
Left posterior superior alveolar	14.30%
Right posterior superior alveolar	11.10%
Pterygomandibular	36.50%
Buccal	9.52%

Table IV. Number of tubes used in each patient for the procedure (extraction / alveolar ridge regularization).

Number of tubes used	Number of procedures (%)
A cartridge (1)	20.75%
Two tubes (2)	49.06%
Three tubes (3)	24.53%
Four tubes (4)	5.66%

DISCUSSION

The pain control in patients is a subject of broad interest, as in dentistry there are many procedures that cause discomfort and that associated with the psycho-emotional factor may enhance the pain (Antunes *et al.*). However, observing the results of this study and other similar studies, as Antunes *et al.* and Silva *et al.* (2010). It is remarkable to note that this knowledge still needs to be improved.

Different types of anesthetics salts can be chosen for use in the dental clinic, with or without a vasoconstrictor. In general, dentistry practitioners choose a local anesthetic solution to perform all

procedures. However, the same choice is not always satisfactory, taking into account the different clinical needs and the various problems of systemic patients (Soares *et al.*, 2006). Is important that this choice is made based on the type of procedure to be performed and the systemic condition of the patient.

In our sample, the most widely used anesthetic was 2% lidocaine with epinephrine. Due to being a low-cost anesthetic and having sufficient action time for minor surgical procedures, this is a good option for patients who do not have cardiovascular problems and who will undergo extractions (Malamed). The association with an adrenergic vasoconstrictor allows a vasoconstriction favorable for surgical procedures. In turn, 3% prilocaine with felypressin has a less potent vasoconstrictor but allows use with greater security in cardiac patients, especially when dealing with the operator being a graduate student who often misses the anesthetic technique for lack of experience. Prilocaine allows that a larger number of tubes are used for these patients, at the expense of lidocaine with adrenaline.

With the large number and availability of local anesthetics in the Brazilian market, undergraduate students and dentists today have a range of options of anesthetics to be used with the specific properties required for the various daily clinical procedures and specific needs of each type of patient (Antunes *et al.*).

The fact is that despite the choice of anesthetic, reasons are clear among the students interviewed, 30.19% did not know the reason for the choice of local anesthetic used for procedures performed. Those who claimed to know the reasons of choice, often presented inconsistently. Students claimed the following statements for choice: "Best choice according to the systemic condition of the patient."; "The patient has no problem"; "When the patient has no systemic problems I use this anesthetic."; "It is the most suitable anesthetic."; "Because the teacher said that when the patient has no problem using this anesthetic.".

Antunes *et al.* in a comparative study on the knowledge of undergraduate students at

FOP / UPE found that the reasons for the choice of anesthetic solution were for 35.2% the one that was available, 15.9% by appointment of the teacher, 6.3% drug to be standard and 1.1% for being the most used. These results also draw attention to the student's knowledge deficit.

A survey was conducted to assess the knowledge of students of the fourth and the fifth year of a dentistry program at a private college. Also by means of a questionnaire were evaluated 287 students of Dentistry Course. From it was concluded that only 76.13% knew lidocaine, prilocaine 69.34%, 55.05% mepivacaine, 57.14% bupivacaine. In this work it was also clear how little students know about local anesthetics (Tenis, 2001).

The carpule syringe suction device is mandatory for all undergraduate students of the institution, where our research was conducted, given the importance of this maneuver to prevent accidents and complications arising from anesthesia. The aspiration maneuver technique allows us to observe if the solution is being injected into a blood vessel. There are several side effects that intravascular injection can cause, such as seizure, stroke, angina pectoris, postural hypotension, bronchospasm, anaphylactic reaction and heart attack (Malamed). Despite having the syringe allowing reflux, not all students reported to have the habit of performing positive aspiration before injecting the anesthetic. However, the results of this research in relation to this question were more encouraging than compared to other studies in which the awareness of students was even lower, as in the studies of 2006 Antunes *et al.* and Silva *et al.*

It is remarkable that among the students who perform the reflux, there is a greater concern about the previous aspiration in anesthesia by blocking the inferior alveolar nerve. It is known that an accidental intravascular injection can occur anywhere, but in some anatomical regions there is a greater likelihood of this occurrence. In the oral cavity, the anesthesia most frequently with positive aspiration is the blocking of inferior alveolar nerve. Blocking techniques are based on a

thorough knowledge of anatomy. The dentist should know exactly the route taken by a nerve trunk and the points of easier access to then deposit the anesthetic (Vasconcelos *et al.*, 2007). In most cases, the greatest difficulty of the students is not remembering the head and neck anatomy studies, seen at the beginning of academic life. Students who do not realize the prior aspiration are usually unaware of the complications arising from the intravascular injection.

Among the adverse effects that may occur after local anesthesia, reported in the literature are neurological complications, facial nerve paralysis, transient blindness, post-injection paresthesia, Horner syndrome, transient paralysis of combined cranial nerves (III, IV and VI), sudden deafness and unilateral paralysis of the VI pair (Crean & Powis, 1999), drug interactions causing serious systemic problems (Moore *et al.*, 1999), convulsion, stroke, angina pectoris, postural hypotension, bronchospasm, anaphylactic reaction, myocardial infarction (Vasconcelos *et al.*, 2002), tissue necrosis, lockjaw, emphysema, bruising, infection and allergies (Arantes & de Souza, 1990). In this study, no patient experienced adverse reactions in the procedures carried out by the students interviewed.

The number of anesthetic cartridges used in the procedure may reflect errors of anesthetic technique. In our survey, most students (69.81%) succeeded on the anesthesia using up to two

tubes. This finding indicates that students have the technical knowledge, but they have a tendency to worry more about the technique (Arantes & de Souza) (cessation of pain) and end up giving less attention to the theory that is of most importance, as the previous aspiration and choice the ideal anesthetic. The time for the anesthetic onset of action was respected by most students, which also contributes to the use of a smaller number of tubes.

It is important that the dentist be aware that dentistry is not merely a practical profession. The knowledge acquired even in academic life should always be updated and put into action. Undergraduate students should be encouraged to acquire and recall the theoretical knowledge before each clinical activity.

CONCLUSION

Most undergraduate students have no knowledge of the type of anesthetic to be used, the amount to be administered and the time of anesthetic action. The awareness of the students about the dosage of anesthetics and about their systemic problems reduces the possibility of unwanted effects in patients, decreases the volume of anesthetic needed, while minimizing waste and the cost of the institution by the indiscriminate use of anesthetics, thereby contributing, in improving the clinical management of students at graduation.

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RESUMEN: La anestesia local es uno de los procedimientos más desarrollados por dentistas presentando algunas posibles complicaciones, a menudo asociados a dosis, contraindicaciones y efectos sistémicos. El objetivo de esta investigación fue evaluar prospectivamente el conocimiento de estudiantes de odontología respecto de los aspectos técnicos, dosis e indicaciones de anestésicos locales en la práctica odontológica diaria junto a la observación de posibles complicaciones. Fueron utilizados cuestionarios preguntando sobre procedimientos, volumen de anestesia, elección del anestésico, cálculo de dosis, relación de dosis con peso, hábito de observación del tubo de anestésico infiltrado y su efecto adverso, tipo de técnica anestésica y tiempo esperado para la acción de la droga. Al finalizar la investigación, se intentó alertar a estudiantes sobre el efecto sistémico de anestésicos locales y la posible disminución de costos asociados por excesivo uso de anestésico con técnicas inadecuadas. La mayoría de los estudiantes tuvieron conocimiento sobre el tipo de anestésico utilizado, la cantidad administrada y el tiempo de acción. La atención de los estudiantes sobre la dosis de anestésico y sus posibles complicaciones reduce los costos a la institución por el uso indiscriminado de anestésicos y contribuye a mejorar la conducta clínica de los estudiantes de pregrado.

PALABRAS CLAVE: Anestésico local; Complicaciones; Dolor.

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