



ORIGINAL ARTICLE

Diagnosis and management of allergic reactions to local anesthetics by dental students in pre-professional practices

Diagnóstico y manejo de reacciones alérgicas a anestésicos locales por estudiantes de odontología en prácticas preprofesionales

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ABSTRACT

Introduction: local anesthetics are used for different dental procedures, although allergic reactions are infrequent, the dental professional should be prepared to deal with any type of situation that may arise.

Objective: to analyze the level of knowledge on the diagnosis and management of allergic reactions to local anesthetics in the dental office of tenth semester students of the Dental Care Unit, UNIANDES.

Methods: An observational, descriptive, cross-sectional, descriptive study was carried out with tenth semester students in clinical practice in the Dental Care Unit of the Dentistry course at the Los Andes Autonomous Regional University, Ambato, Ecuador. The universe and the sample coincided, integrated by 75 students.

Results: it was determined that the students who were part of the study have a medium level of knowledge, with an average of 55 % of correct answers. In addition, it is evidenced that they have deficiencies in the procedure to be followed in case of an allergic reaction, since only 36 % know that adrenaline should be applied.

Conclusions: most of the students have a good knowledge of the diagnosis of allergic reactions, however, they have deficiencies in the management of this type of emergencies due to the lack of experience in the treatment of these. Emphasis should be placed on the study of the interventions that the dental professional should follow to provide patient safety in dental treatment.

Keywords: Local anesthetics; Diagnosis; Allergic reactions.

RESUMEN

Introducción: los anestésicos locales son utilizados para diferentes procedimientos odontológicos, aunque las reacciones alérgicas son poco frecuentes, el profesional de odontología debe estar preparado para atender cualquier tipo de situación que se genere.

Objetivo: analizar el nivel de conocimiento sobre el diagnóstico y manejo de reacciones alérgicas a anestésicos locales en la consulta odontológica de estudiantes del décimo semestre de la Unidad de Atención Odontológica.

Métodos: se realizó un estudio observacional, descriptivo de corte transversal con estudiantes de décimo semestre en clínica en la Unidad de Atención Odontológica de la carrera de Odontología, en la Universidad Regional Autónoma de los Andes, Ambato, Ecuador. El universo y la muestra coinciden, integrados por 75 estudiantes.

Resultados: se pudo determinar que los estudiantes que fueron parte del estudio tienen un nivel de conocimiento medio, con un promedio de 55 % de respuestas correctas. Además, se evidencia que tienen falencias en el proceder ante una reacción alérgica, ya que solo el 36 % conoce que se debe aplicar adrenalina. El tipo de anestésico que ocasiona más reacciones alérgicas el 45 % de los estudiantes conoce que es de tipo éster.

Conclusiones: la mayoría de los estudiantes tiene un buen conocimiento del diagnóstico de las reacciones alérgicas, sin embargo, tienen deficiencias en el manejo de este tipo de emergencias debido a la falta de experiencia en el tratamiento de estas. Se debe enfatizar en el estudio de las intervenciones que debe seguir el profesional de odontología para brindar seguridad al paciente en el tratamiento odontológico.

Palabras claves: Anestésicos locales; Reacciones Alérgicas; Procedimientos odontológicos.

INTRODUCTION

Local anesthetics are used in most dental procedures as a locally applied drug to temporarily numb the area to be treated, such as in dental extraction, minor oral surgery, surgical periodontal treatment and endodontics. These drugs are well tolerated and safe to use, so that adverse and allergic reactions are rare, occurring in approximately 1 % of the cases, taking into account that it is necessary to differentiate properly between an adverse and an allergic reaction.^(1,2)

The dental professional should have a solid knowledge of the types of anesthetics that are most recommended in practice. Also, when selecting the anesthetic, the patient's sensitivity should be taken into account, so careful preparation of the anesthetic, adequate tissue preparation and a meticulous technique should be carried out, since the risk of allergic reaction is always present in the administration of anesthesia.⁽³⁾

In a study carried out in Tacna-Peru, students of the Faculty of Dentistry were evaluated on the level of knowledge regarding medical emergencies, specifically the knowledge of the management of allergic reactions to anesthesia, where it was found that 59 % of the students did not have adequate knowledge of the diagnosis and management of this type of emergency, emphasizing the importance that every dentist should be clear about the actions to be followed in this type of case.⁽⁴⁾

In order to understand the diagnosis and management of allergic reactions, certain concepts should be reviewed to establish the best practices in the dental office. Local anesthetics are chemical substances that help to lose the sensitivity of a specific area of the body, in this case the oral area, which obstructs the conduction of the nervous impulse without causing a loss of consciousness, which is a difference with general anesthesia.^(5,6)

Local anesthetics can be classified into esters and amides, where we find that the derivatives of benzoic acid esters correspond to benzocaine, procaine and chlorprocaine, buticaine, cocaine, pepirocaine and tetracaine, these products have been shown to be more prone to cause allergic reactions; However, those of the amide group derived from diethylaminoacetic acid include lidocaine, mepivacaine, prilocaine and articaine presenting less allergenic features and high potency at lower concentrations.^(7,8)

Allergic reaction is understood as hypersensitivity mediated by immunological mechanisms, however, allergic reactions of the oral mucosa are not very common because they manifest a natural resistance to allergens, they provide antigens that cause an allergic reaction producing signs and symptoms. The hypersensitivity process can be of four types, however, in dentistry type I hypersensitivity reactions can occur which is mediated by IgE and type IV hypersensitivity reaction also known as cellular hypersensitivity.⁽⁹⁾

Among the most common allergic reactions derived from local anesthesia are the immunological reactions against antigens, due to an antigen re-stimulation, even when the patient presents a cellular immunology action before it; while atopic reactions are due to segregation of mediators from leukocytes and mast cells, with the appearance of immediate or semi-delayed allergic reaction.⁽¹⁰⁾

The diagnosis of allergic reactions to anesthetics begins with the patient's anamnesis, in order to establish in the patient's medical history details such as pathological antecedents, medications to which the patient is allergic and clinical history of procedures previously performed in which signs and symptoms of allergic reactions were verified.^(9,11)

In order to have a more accurate diagnosis of the cause of the allergic reaction according to the product, the dentist can refer the patient to a specialist to perform tests known as: prick tests or a patch test. It has been evidenced that skin tests can confirm the diagnosis, however, they tend to give false positives; therefore, the patch test is considered the most effective to reaffirm the sensitivity and identify the causal contact allergens since it has a delayed effect.⁽¹²⁾

The symptomatology of mild allergic reactions to local anesthesia are mostly pruritus, urticaria and the presence of skin rash; however, in severe cases, erythema, edema and even tachycardia are present, so the dental professional must act immediately by administering adrenaline, followed by the application of antiallergic drugs such as antihistamines to reverse the symptoms of the allergic reaction.⁽⁹⁾

Since the dental professional continuously handles local anesthetics for dental extractions, endodontic, periodontal and restorative treatments, he/she should have the necessary preparation to act in the event of an adverse reaction to anesthesia. Therefore, the importance of this study is highlighted, which allows students in the last semester of dentistry to identify the shortcomings in the development of skills that allow them to adequately face this type of emergency so that they can take action in this regard and thus provide quality care and gain the confidence of the users by the professionalism presented in the consultation room. For the present investigation we proposed to analyze the level of knowledge on the diagnosis and

management of allergic reactions to local anesthetics in the dental office of tenth semester students of the Dental Care Unit (UAO), UNIANDES.

METHODS

An observational, descriptive, cross-sectional, descriptive study was carried out with tenth-semester students in clinical practice at the Dental Care Unit (UAO) of the Dentistry course at the Universidad Regional Autónoma de los Andes, Ambato, Ecuador. The universe and the sample coincided, integrated by 75 students, the sample coincided by applying a non-probabilistic intentional sampling. The information obtained from the survey was analyzed and processed using Microsoft Excel 365, which allowed the presentation of the corresponding tables and graphs.

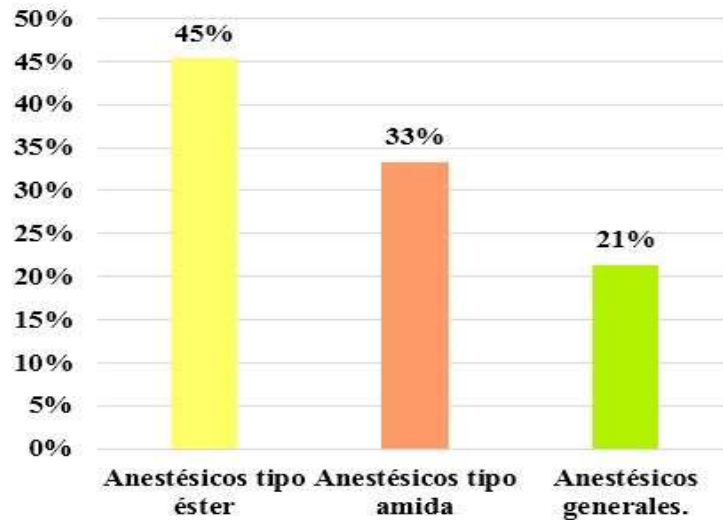
The variables used were: age, sex, type of anesthetics most frequently cause allergic reactions in dental procedures, methods for establishing the diagnosis, most common clinical manifestations caused by mild and severe allergies, expressed by the students surveyed, procedures with patients who report a history of allergy to local anesthesia, immediate procedure of the dentist in case of allergies due to local anesthesia, procedures with patients who refer allergic antecedents to local anesthesia, position in which patients and pregnant women with allergic reactions to local anesthesia should be placed according to the surveyed students, procedures in case of airway closure due to allergic reactions.

The information obtained from the survey was analyzed and processed using Microsoft Excel 365, which allowed the presentation of the corresponding tables and graphs. The principles of medical ethics and the aspects established in the Declaration of Helsinki were complied with. The study was approved by the Ethics Committee and the Scientific Council of the Institution. The data obtained will only be used for research purposes.

RESULTS

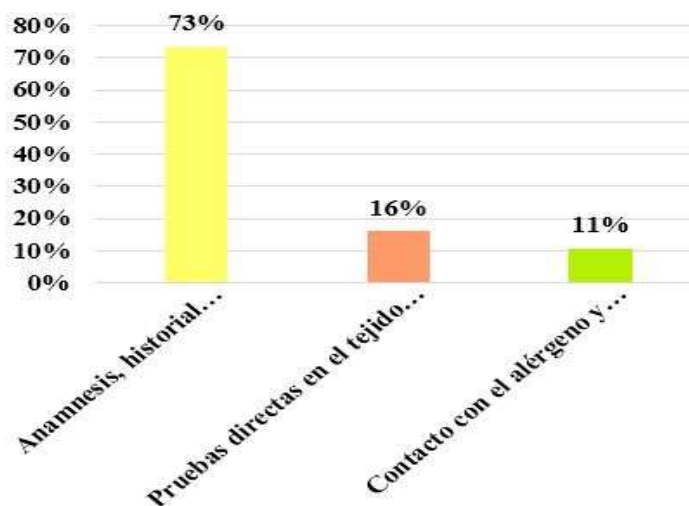
Sixty-four percent of the students are female; while 36 % belong to the male gender and, in addition, 64 % have an average age between 22 and 25 years; 20 % between 26 and 29 years; 12 % between 30 and 33 years and the remaining 4 % are older than 33 years.

Forty-five percent of the students indicated that ester-type anesthetics are the ones that mainly generate allergies during dental procedures, while 33 % and 21 % of the students mentioned amide-type anesthetics and general anesthetics respectively as the main triggers of allergic reactions (Graph 1).



Graph 1. Type of anesthetics most frequently cause allergic reactions in dental procedures.

It is observed that 73 % of the dental students mentioned anamnesis, medical history and symptomatology as the most accurate way to diagnose allergic reactions, 16 % pointed out direct tests on skin tissue and 11 % pointed out contact with the allergen and the appearance of symptoms. (Graph 2).



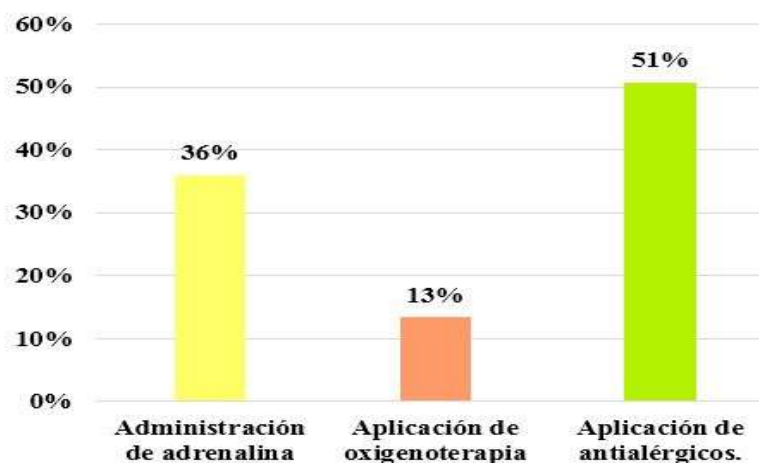
Graph 2. Methods to establish the diagnosis

Seventy-three percent of the students surveyed about the clinical manifestations of mild allergies caused by local anesthesia, stated that these are pruritus, urticaria and skin rash; while 15 % pointed out headaches, convulsions, pain, dizziness and 12 % indicated that only skin rash occurs. Regarding the clinical manifestations of severe allergic reactions to local anesthesia, 51 % indicated that these are erythema, edema and tachycardia; while 32 % indicated that the symptoms generated are urticaria, edema and severe skin rash and the remaining 17 % indicated vomiting, nausea and skin rash (Table 2).

Table 2. Most common clinical manifestations caused by mild and severe allergies, expressed by the surveyed students.

Clinical Manifestations	Mild allergic reactions	
	No.	%
Pruritus, Urticaria and Skin rash	55	73
Headache, Convulsions, Pain and Dizziness	11	15
Skin rash only.	9	12
	Severe allergic reactions	
Erythema, Edema, and Tachycardia	38	51
Vomiting, Nausea, and Skin rash.	13	17
Urticaria, Edema, and Severe rash.	24	32

Thirty-six percent of the students surveyed mentioned the administration of adrenaline as the dentist's immediate procedure in the presence of allergies due to local anesthesia; however, 51 % indicated the application of antiallergics and 13 % indicated that they should first apply oxygen therapy. (Graph 3).

**Graph 3.** Immediate action by the dentist in the event of local anesthetic allergies

When faced with a patient with a history of allergy to local anesthesia, 57 % of the students opted to use an alternative anesthetic, while 24 % of the students mentioned that they would opt to perform skin tests and the remaining 19 % indicated that they should not combine anesthesia with vasopressor.

It is observed that 52 % of the students surveyed know the position in which a patient with allergic reaction to local anesthesia should be placed, since they were inclined to the supine decubitus position; however, 28 % indicated decubitus and 20 % referred to the lateral position. In addition, 27 % of the students stated that, in pregnant women with allergic reaction to local anesthesia, the dentist should position her in left lateral decubitus, 40 % indicated right lateral decubitus and the remaining 33 % of the students indicated supine decubitus (Table 2).

Table 2. Position in which patients and pregnant women with allergic reactions to local anesthesia should be placed according to the students surveyed.

Positions of the patients in the dental chair	Patients	
	No.	%
Decubitus	21	28
Lateral	15	20
Supine decubitus	39	52
	Pregnant	
Left lateral decubitus	20	27
Right lateral decubitus	30	40
Supine decubitus	25	33

48 % (36/75) of the students mentioned that the first step when closing the airways due to allergic reactions is to place the patient in Trendelenburg position; however, 31 % (23/75) mentioned ventilation with bag mask and 21 % (16/75) indicated the application of oxygen.

It was determined that 89 % of the students surveyed have not had a patient with a history of allergy due to local anesthesia in their office, and the remaining 11 % indicated that they have treated this type of patient at some point in time. In addition, 68 % of the students indicated not knowing, nor having treated cases of allergies due to local anesthesia and the rest have not treated allergic reactions, but indicated different actions, distributed in 8 groups of 4 % each in relation to an action such as:

- Place the patient in an appropriate position, administer appropriate medication and refer to a general practitioner if necessary.
- Application of oxygen.
- Pregnant.
- Anaphylactic shock.
- Administer corticosteroids.
- Erythema of the anesthetized area, shortness of breath, swelling.
- Position the patient in the supine position, administer oxygen so as not to lose the airway, administer saline, trying to calm the patient.

- Check the patient if he/she has symptoms of allergic reaction, administer adrenaline or corticosteroids such as betamethasone.

There is an average knowledge of 55 % on the part of the dental students regarding the various aspects related to the procedures to be performed in cases of allergic reactions due to the administration of local anesthesia and regarding the symptomatology presented, as well as the types of allergic reactions (Table 3).

Table 3. Summary of the questionnaire based on whether the answers were correct and incorrect.

Questions	Correct	Incorrect
	%	%
1. What type of anesthetics are the ones that generally cause allergic reactions in dental procedures?	45	55
2. How do dentists diagnose allergic reactions?	84	16
3. What type of allergic reactions are caused by the application of local anesthesia?	81	19
4. What are the most common clinical manifestations of mild allergies caused by local anesthetics?	73	27
5. What are the clinical manifestations of severe allergic reactions?	51	49
6. What is the dentist's immediate course of action when faced with local anesthesia allergies?	36	64
7. What should the dentist do with patients who report a history of allergy to local anesthesia?	76	24
8. In what position should the dentist place the patient with allergic reactions to local anesthesia?	52	48
9. What action should the dentist take in the case of an allergic reaction to local anesthesia in the case of pregnant women?	27	73
10. What is the first procedure that the dentist should apply to restore patency in the event of airway closure due to allergic reactions?	48	52
11. What are the actions you are aware of to manage allergic reactions or indicate that you are not aware of?	32	68
AVERAGE	55	

DISCUSSION

This study shows that the diagnosis of allergic reactions is based on medical history, anamnesis and the presence of signs and symptoms; this is reiterated in a bibliographic review of Bogotá, which of 12 scientific articles, in 80 % of them, it is established that an allergic reaction to local anesthesia is diagnosed by reviewing medical history, through anamnesis and identification of allergic signs after contact with the suspected allergen.⁽¹³⁾

It is established in this study that local anesthesia generates immunologic and atopic allergic reactions. Within a literature review of Lima, 35 research articles were introduced, of which, in 70 % it is stated that local anesthesia causes hypersensitivity reactions originated by immunological reactions against the antigens, due to an over stimulation of the same, despite the fact that the person already has a cellular immunological action against them.⁽¹⁴⁾

In a study done in Mexico, it is specified that another allergic reaction provoked by local anesthesia are atopic reactions, whose appearance is immediate and its cause is centered on the excessive secretion of inflammatory mediators by leukocytes and mast cells.⁽¹⁵⁾

In the research, most of the students stated that the main clinical signs of mild allergic reactions to local anesthesia included pruritus, urticaria and skin rash. From a research founded in Quito, a clinical case was introduced with application of local anesthesia for correction of deep caries, causing the appearance of allergic signs 10 minutes after application, including general pruritus, urticariform lesions and facial allergic eruption, for which the dental procedure was suspended.⁽¹⁶⁾

On the other hand, it is established in this study that signs of severe allergic reactions include erythema, edema and tachycardia. In a review from Portoviejo, in which 30 scientific articles were included, it is stated that 75 % of them state that severe allergic reactions present edema symptomatology, with development of erythema, arrhythmias, although in the worst cases it is possible the development of tachycardia that should be treated immediately.⁽¹⁷⁾

Based on this research, it is determined that the immediate action of the dentist in case of allergic reactions due to local anesthesia is the application of antiallergic drugs; being refuted by a study done in Riobamba, which states that it is extremely important that the first action of the dentist in case of allergic reactions after the application of local anesthesia is the administration of adrenaline to avoid complications or that the allergy becomes acute and then the intake of antiallergic drugs such as antihistamines to counteract the allergic effects.⁽¹⁸⁾

It is pointed out in this research that the dentist should inject alternative anesthetics and not combine anesthesia with vasopressor in people with allergic history; This is reiterated in a bibliographic review of Colombia, in which out of 25 articles, at least 70 % mention that the anesthetic alternatives in patients with allergies to local anesthesia are diphenhydramines, being antihistamines that are part of the antiallergics; in addition, it is important not to combine anesthetics, as this would cause severe allergic reactions.⁽¹⁵⁾

On the other hand, in this section it is stated that the dentist should place the patient with allergic reaction due to local anesthesia in the supine decubitus position; being reiterated in an analysis from Chile, in which a clinical dental case of a patient submitted to local anesthesia with immediate allergic reaction was integrated, for which the dentist immediately opted for the supine decubitus position to improve the oxygenation level, the adequate return of blood flow to the heart and brain.⁽¹⁶⁾

In a survey made in Quito, as in the present one, 363 dental students were introduced, of which 84,1 % mentioned that in cases of pregnant women with allergic reactions to local anesthesia, the dentist should place them in the left lateral decubitus position, because it helps to avoid uterine pressure in the vena cava, improving the blood return to the heart, increasing its oxygenation and allowing a better placental irrigation.⁽¹⁷⁾

Identifying within this analysis that in the event of airway closure due to allergic reactions, the dentist should place the patient in Trendelenburg position, being ratified in a literature review in Chile, with participation of scientific articles, of which, in 65 % it is stated that the Trendelenburg position in cases of airway obstruction due to severe allergic reactions, facilitates venous return and therefore the passage of blood flow, avoiding a total closure of the airways.⁽¹⁸⁾

Additionally, it is determined that the great majority of dental students have not attended any case of allergic reaction due to local anesthesia. In a section carried out in Peru, it is evidenced that allergies caused by local anesthetic administration are not so common and there is one case for every 20 patients attended; however, their attention should be carried out by a professional who knows the procedure to follow in order to avoid complications.⁽¹⁸⁾

From this research and from a study founded in Mexico, it was identified that in 80 % of the scientific articles, it is stated that the main actions that a dentist should apply in cases of allergic reactions due to local anesthesia are: position the patient in supine decubitus to improve the blood flow to the heart; administer adrenaline and antiallergic drugs; in pregnant women the left lateral decubitus position should be maintained; while in severe cases oxygen should be applied to avoid closing the airways.^(6,14)

Finally, it should be noted that the dentist's actions when faced with allergic reactions in his patients due to local anesthesia are extremely important, since the identification of the symptoms, the immediate suspension of the dental procedure, the evaluation of airway compromise, the administration of adrenaline, the adequate positioning of the patient to avoid cutting off the blood flow and, in severe cases, the immediate transfer of the patient to medical centers depend on this.⁽¹⁸⁾

CONCLUSIONS

The correct diagnosis and management of allergic reactions to local anesthetics in dentistry was based on scientific evidence. It was determined that they are uncommon allergic reactions and are most frequently caused by ester type anesthetics and the dentist's management should start with a correct anamnesis and recognition of the clinical manifestations in order to place the patient in supine decubitus and apply adrenaline. It was identified that the level of knowledge of the tenth semester dental students is average, since they have a good command of how to establish the diagnosis, but they have shortcomings in the management of this type of emergency due to the lack of experience in the treatment of these emergencies. It is therefore recommended that these students be exposed more to hypothetical clinical emergency situations so that they can develop the ability to deal with them correctly.

Conflict of interest

The authors declare that there is no conflict of interest.

Authors' contribution

All authors participated in the conceptualization, formal analysis, project management, writing - original draft, writing - revision, editing and approval of the final manuscript.

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