Neutrosophic Sets and Systems
{Special Issue: Impact of neutrosophy in solving the Latin American's social problems}, Vol. 37, 2020
University of New Mexico

Delphi Validation of Educational Talks on the Treatment of First Premolars Vertucci Type III

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Abstract. Endodontics is the science and art that treats the tooth and periapical tissue from a morphological, structural, physiological and pathological point of view, combining knowledge to comprehensively treat the tooth and surrounding tissues. Because of endodontics comprises the root canal treatment, sufficient knowledge of the internal root anatomy is required. However, this knowledge is not always taught with sufficient quality with respect to some teeth such as the upper first premolars with Vertucci type III classification, due to the complexity involved in this content. At the Faculty of Medical Sciences of Universidad Regional Autónoma de los Andes (UNIANDES) in Ecuador, it is proposed to hold a group of talks on these issues. This research aims to validate educational talks on the treatment of Vertucci type III first premolars. For this purpose, the Neutrosophic Delphi method is applied, which is an extension of Delphi method to the neutrosophic framework. Delphi method allows a group of experts to reach a consensus on a topic of research, in this case on the proposed talks. Neutrosophy is included to incorporate the indeterminacy that exists in experts' evaluation, as well as the use of linguistic terms to perform the evaluations, which is more appropriate when it comes from subjective evaluations carried out by humans.

Keywords: Neutrosophic Delphi, first premolar, Vertucci type III, Endodontics, educational talks.

1 Introduction

The term endodontics comes from the two Greek voices "endo" which means "inside" and "odonto" which relates to a tooth. Endodontics is the science and art that treats the tooth and periapical tissue from a morphological, structural, physiological and pathological point of view, combining knowledge to comprehensively treat the tooth and surrounding tissues. Considered as a branch of Dentistry that is responsible for the treatment of the dental vascular-nervous complex, as well as the etiology, diagnosis and prevention of different lesions that affect the pulp and periradicular level, [1, 2].

Under an internal conceptualization, endodontics requires sufficient elements to achieve its objectives. It is necessary to know all the small details that escape the human eye, through the meticulous and priority study of the external and internal morphology, managing to combine both, to obtain enough knowledge when treating pulp alterations and their repercussions on the periapical tissues and thus prevent future endodontic failures, and to offer better treatments to the patient. It acts directly and indirectly, including the removal of the dental pulp.

Briefly, endodontics is the way to remove infected tissue, which includes nerves and blood vessels, from the inside of the tooth and replace it with an inert material, in such a way that the infection is eliminated. Therefore, the removal of dental pulp and bacterial content is carried out to reach a healthy tooth.

This research will be based on the Vertucci classification that describes the internal root anatomy of upper premolars, taking into account type III, [3]. It can be observed with the help of the dental diaphanization technique that consists of making the soft tissues of the dental organ transparent in order to observe its internal anatomy, [4].

A premolar tooth is any tooth that erupts in the space left by a temporary molar. There are a total of 8 premolars, 4 in the mandible and 4 in the maxilla, two on each side respectively. They are the teeth that are immediately before the molars. Its function in chewing is fine grinding. They are not present in children. The upper premolars have a pentagonal crown with a greater vestibulopalatine dimension than the mesiodistal one. They have two

cusps: vestibular, larger and quadrangular in shape, and palatal, which is smaller. The upper first premolar contacts mesially the upper canine and distally the upper second premolar, [2].

Figure 1 represents the location of the premolars:

Figure 1: Graphical representation of the teeth. Premolars are in dark color. Source: Internet.

Figure 2 shows the dental morphology of the upper first premolar.

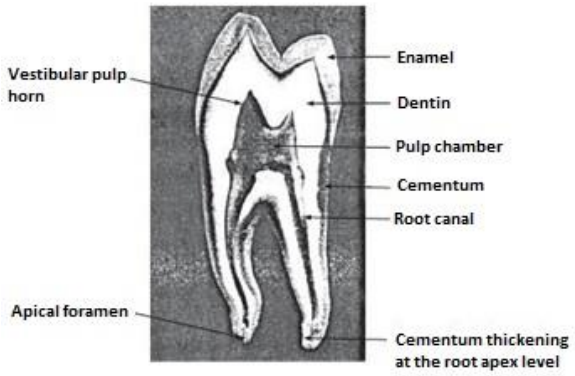

Figure 2: Dental morphology of the upper first premolar. Source [1].

For a correct classification, an adequate general knowledge of the dental organs is needed, for this reason the professional must have not only a wide knowledge of the entire pulp cavity and of the internal root anatomy, but also of variations according to the age, systemic disorders, ethnic differences, race, etc. Such ignorance can generate a future failure in endodontic treatment.

Currently, the lack of knowledge of the upper first premolar anatomy at the time of conducting root canal treatment leads to its failure. This is not only due to the aforementioned ignorance, but also because of the complementary methods conventionally used such as radiographic examination do not fully help us to determine the possibility of variations that the upper first premolar may present in its internal anatomy.

The purpose of this research is to validate talks designed at the Universidad Regional Autónoma de los Andes (UNIANDES) in the Faculty of Medical Sciences, on the treatment and prevalence of upper first premolars with Vertucci type III classification. The talks aim to distinguish the possible variations and thus to obtain an optimal result in the root canal treatment, therefore they will allow a better preparation of the students regarding this treatment that requires a previous training of the endodontist.

These talks will be validated with the support of Delphi method, especially Neutrosophic Delphi, [5-7]. Delphi method is a structured communication technique, developed as an interactive systematic prediction method and based on a panel of experts, [8-16]. Its objective is to achieve a consensus based on discussion among experts. It is a repetitive process. It relies on the elaboration of a questionnaire that has to be answered by the experts. Once the information is received, another questionnaire derived from the previous one is carried out to be answered again. However, one limitation is that consensus among specialists may take time; therefore the convergence of this technique may be slow.

Neutrosophic Delphi extends the Delphi technique to the neutrosophic framework. This technique comprises the indeterminacy, which is typical in decision-making[17, 18]. Sometimes, experts do not know, are not sure, are indifferent or have no information in part of the subject they will make a decision. Here, due to the complexity of the decision to make, experts do not have the complete certainty about their evaluations. Moreover, the subject itself can be confuse to any specialist not enough trained. Hence, the way to design high quality didactic talks on this subject is a challenge to the academics.

This paper is structured into the following sections. Section of materials and methods, contains the main concepts of endodontics and neutrosophic Delphi. Section of results, contains the results of applying neutrosophic Delphi method to design the aforementioned talks. Final section shows the conclusions.

2 Materials and Methods

This section is split into two subsections. The first one contains some important concepts of endodontics and the Vertucci classification. In subsection 2.2, we explain the main concepts of neutrosophic Delphi.

2.1 Previous concepts of Endodontics

The pulp chamber is the internal space of the tooth that is in its coronary area. It is completely covered by dentin and houses the dental pulp, which may present the variations already mentioned above. It is oval, irregular and flattened in a mesio-distal direction. The pulp chamber is made up of the following structures, [1, 2]:

• Chamber roof

It occurs in the incisal or occlusal direction with variations due to the external anatomy so that the pulp horns are thus formed.

• Chamber soil

It will present itself in a rectangular form, especially in the posterior or multiradicular dental organs; otherwise, it occurs in the single-rooted teeth, which can only be differentiated by a slight narrowing that occurs at the cervical level.

• Side walls

They are named the same way as in the case of external anatomy, the free walls are generally concave. Its angles are rounded.

•Shape

It can be considered cubic in shape, with six faces called mesial, distal, buccal, palatine-lingual, ceiling and floor. The faces are not flat, but are generally concave and convex.

•Volume

It depends on the different variations that the dentin presents, whether due to reparative processes or another cause. Also according to age, the older the patient the more pulp chamber gradually reduce in size.

Since various authors do not fully determine an exact concept of root canals, we here refer to them as the means of union between the pulp chamber, the vascular-nervous complex and the dental support anatomy.

The radicular anatomy of this dental organ consists of two canals; the vestibular is the most visible at the time of treatment. The roots of these teeth appear in three fundamental forms:

1. Simple roots: a tooth with a single root.
2. Forked roots. It occurs as two separate roots.
3. Fused roots. They constitute roots that are fused.

According to Vertucci, it is classified into eight types. The first five types are the following:

• Type I: a single canal that runs from the pulp chamber to the dental apex.
• Type II: two canals that start from the pulp chamber and join to the end in a single canal near the dental apex.
• Type III: start and end two separate root canals.
• Type IV: initiates a single root canal that runs through the root to finish in a division before reaching the dental apex.
• Type V: initiates and ends three separate root canals.

Figure 3 contains the classification and percentage of types of canals found in the upper first premolar. Figure 4 represents Vertucci classification.

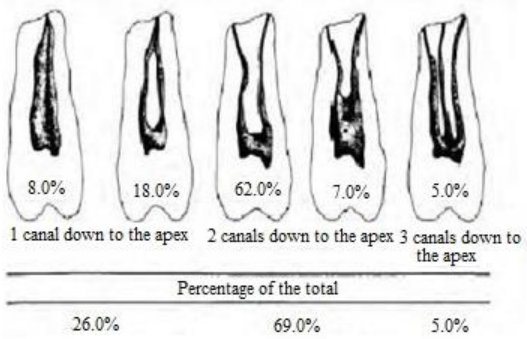

Figure 3: Classification and percentage of type of canals found in the upper first premolar. Source [1].

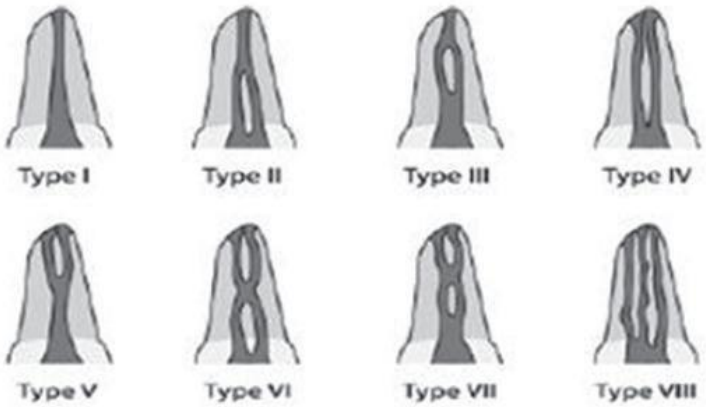

Figure 4: Graphical representation of the Vertucci classification. Source [1].

2.2 Neutrosophic Delphi method

This subsection contains a description of Delphi method, as well as the main concepts of Neutrosophy [19, 20] needed to apply the neutrosophic Delphi technique.

Delphi method is a structured communication technique; it is an interactive method for prediction, [8-16]. A group of experts evaluates the subject. They must achieve a consensus after a repetitive process of discussions. Questionnaires are answered by experts per iteration, in such a way that the information that is yielded from one questionnaire is used to create the next questionnaire.

Finally, the person responsible for the study will reach its conclusions from the statistical analysis of the obtained data.

Delphi is based on:

- Anonymity of the participants,
- Repeatability and controlled feedback,
- Group response in statistical form,
- Process

Before starting Delphi, a series of previous tasks are carried out, such as:

- Define the context and the time horizon in which we want to make the forecast on the subject under study.
- Select the panel of experts and get their commitment to collaborate. The chosen people must not only be highly knowledgeable about the subject on which the study is carried out, but must also present a plurality in their approaches. This plurality should avoid the appearance of biases in the information available on the panel.
- Explain to the experts what the method is about. In order to obtain reliable forecasts, as the experts will always know what is the objective of each of the processes required by the methodology.

A group of terms is usually used in this technique:

- Questionnaire: Document that is sent to the experts, including the results of previous circulations.
- Panel: Group of experts that takes part in Delphi.

The core of Delphi technique is a group of questionnaires. The first questionnaire can include questions worded in general form. In each subsequent phase, the questions become more specific because they are formed with the answers to the previous questionnaire.

Delphi technique comprises at least three phases:

1. A questionnaire is sent to a group of experts.
2. A summary of the first phase is prepared.
3. A summary of the second phase is prepared.

Three phases are generally recommended, but more phases can be used, as in the case of the Delphi study of security management.

The number of participating experts may vary from just a few to more than 100, depending on the scope of the issue. A range of 15-30 is recommended for a focal issue. As long as more experts participate, costs will also rise as well as the coordination required for the technique.

Below we explain some basic concepts of Neutrosophy [21-23].

Definition 1: ([24-28]) The *Neutrosophic set* N is characterized by three membership functions, which are the

truth-membership function T_A, indeterminacy-membership function I_A, and falsehood-membership function F_A, where U is the Universe of Discourse and $\forall x \in U$, $T_A(x), I_A(x), F_A(x) \subseteq]^-0, 1^+[$, and $^-0 \leq \inf T_A(x) + \inf I_A(x) + \inf F_A(x) \leq \sup T_A(x) + \sup I_A(x) + \sup F_A(x) \leq 3^+$.

See that, according to Definition 1, $T_A(x), I_A(x), F_A(x)$ are real standard or non-standard subsets of $]^-0, 1^+[$ and hence, $T_A(x), I_A(x), F_A(x)$ can be subintervals of $[0, 1]$.

Definition 2: ([24-28]) The *Single-Valued Neutrosophic Set* (SVNS) over U is $A = \{< x; T_A(x), I_A(x), F_A(x) > : x \in U\}$, where $T_A: U \to [0,1]$, $I_A: U \to [0,1]$, and $F_A: U \to [0,1]$, $0 \leq T_A(x) + I_A(x) + F_A(x) \leq 3$.

The *Single-Valued Neutrosophic number* (SVNN) is symbolized by $N = (t, i, f)$, such that $0 \leq t, i, f \leq 1$ and $0 \leq t + i + f \leq 3$.

Definition 3: ([24-28]**)** The *single-valued triangular neutrosophic number* $\tilde{a} = \langle (a_1, a_2. a_3); \alpha_{\tilde{a}}, \beta_{\tilde{a}}, \gamma_{\tilde{a}} \rangle$, is a neutrosophic set on $\mathbb{R}$, whose truth, indeterminacy and falsehood membership functions are defined below, respectively:

$$T_{\tilde{a}}(x) = \begin{cases} \alpha_{\tilde{a}}\left(\frac{x - a_1}{a_2 - a_1}\right), & a_1 \leq x \leq a_2 \\ \alpha_{\tilde{a}}, & x = a_2 \\ \alpha_{\tilde{a}}\left(\frac{a_3 - x}{a_3 - a_2}\right), & a_2 < x \leq a_3 \\ 0, & \text{otherwise} \end{cases} \quad (1)$$

$$I_{\tilde{a}}(x) = \begin{cases} \frac{(a_2 - x + \beta_{\tilde{a}}(x - a_1))}{a_2 - a_1}, & a_1 \leq x \leq a_2 \\ \beta_{\tilde{a}}, & x = a_2 \\ \frac{(x - a_2 + \beta_{\tilde{a}}(a_3 - x))}{a_3 - a_2}, & a_2 < x \leq a_3 \\ 1, & \text{otherwise} \end{cases} \quad (2)$$

$$F_{\tilde{a}}(x) = \begin{cases} \frac{(a_2 - x + \gamma_{\tilde{a}}(x - a_1))}{a_2 - a_1}, & a_1 \leq x \leq a_2 \\ \gamma_{\tilde{a}}, & x = a_2 \\ \frac{(x - a_2 + \gamma_{\tilde{a}}(a_3 - x))}{a_3 - a_2}, & a_2 < x \leq a_3 \\ 1, & \text{otherwise} \end{cases} \quad (3)$$

Where $\alpha_{\tilde{a}}, \beta_{\tilde{a}}, \gamma_{\tilde{a}} \in [0,1]$, $a_1, a_2, a_3 \in \mathbb{R}$ and $a_1 \leq a_2 \leq a_3$.

Definition 4: ([24-28]) Given $\tilde{a} = \langle (a_1, a_2, a_3); \alpha_{\tilde{a}}, \beta_{\tilde{a}}, \gamma_{\tilde{a}} \rangle$ and $\tilde{b} = \langle (b_1, b_2, b_3); \alpha_{\tilde{b}}, \beta_{\tilde{b}}, \gamma_{\tilde{b}} \rangle$ two single-valued triangular neutrosophic numbers and λ any non-null number in the real line. Then, the following operations are defined:

1. Addition: $\tilde{a} + \tilde{b} = \langle (a_1 + b_1, a_2 + b_2, a_3 + b_3); \alpha_{\tilde{a}} \wedge \alpha_{\tilde{b}}, \beta_{\tilde{a}} \vee \beta_{\tilde{b}}, \gamma_{\tilde{a}} \vee \gamma_{\tilde{b}} \rangle$
2. Subtraction: $\tilde{a} - \tilde{b} = \langle (a_1 - b_3, a_2 - b_2, a_3 - b_1); \alpha_{\tilde{a}} \wedge \alpha_{\tilde{b}}, \beta_{\tilde{a}} \vee \beta_{\tilde{b}}, \gamma_{\tilde{a}} \vee \gamma_{\tilde{b}} \rangle$
3. Inversion: $\tilde{a}^{-1} = \langle (a_3{}^{-1}, a_2{}^{-1}, a_1{}^{-1}); \alpha_{\tilde{a}}, \beta_{\tilde{a}}, \gamma_{\tilde{a}} \rangle$, where $a_1, a_2, a_3 \neq 0$.
4. Multiplication by a scalar number:

$$\lambda\tilde{a} = \begin{cases} \langle (\lambda a_1, \lambda a_2, \lambda a_3); \alpha_{\tilde{a}}, \beta_{\tilde{a}}, \gamma_{\tilde{a}} \rangle, & \lambda > 0 \\ \langle (\lambda a_3, \lambda a_2, \lambda a_1); \alpha_{\tilde{a}}, \beta_{\tilde{a}}, \gamma_{\tilde{a}} \rangle, & \lambda < 0 \end{cases}$$

5. Division of two triangular neutrosophic numbers:

$$\frac{\tilde{a}}{\tilde{b}} = \begin{cases} \langle \left(\frac{a_1}{b_3}, \frac{a_2}{b_2}, \frac{a_3}{b_1}\right); \alpha_{\tilde{a}} \wedge \alpha_{\tilde{b}}, \beta_{\tilde{a}} \vee \beta_{\tilde{b}}, \gamma_{\tilde{a}} \vee \gamma_{\tilde{b}} \rangle, a_3 > 0 \; and \; b_3 > 0 \\ \langle \left(\frac{a_3}{b_3}, \frac{a_2}{b_2}, \frac{a_1}{b_1}\right); \alpha_{\tilde{a}} \wedge \alpha_{\tilde{b}}, \beta_{\tilde{a}} \vee \beta_{\tilde{b}}, \gamma_{\tilde{a}} \vee \gamma_{\tilde{b}} \rangle, a_3 < 0 \; and \; b_3 > 0 \\ \langle \left(\frac{a_3}{b_1}, \frac{a_2}{b_2}, \frac{a_1}{b_3}\right); \alpha_{\tilde{a}} \wedge \alpha_{\tilde{b}}, \beta_{\tilde{a}} \vee \beta_{\tilde{b}}, \gamma_{\tilde{a}} \vee \gamma_{\tilde{b}} \rangle, a_3 < 0 \; and \; b_3 < 0 \end{cases}$$

6. Multiplication of two triangular neutrosophic numbers:

$$\tilde{a}\tilde{b} = \begin{cases} \langle (a_1b_1, a_2b_2, a_3b_3); \alpha_{\tilde{a}} \wedge \alpha_{\tilde{b}}, \beta_{\tilde{a}} \vee \beta_{\tilde{b}}, \gamma_{\tilde{a}} \vee \gamma_{\tilde{b}} \rangle, & a_3 > 0 \; and \; b_3 > 0 \\ \langle (a_1b_3, a_2b_2, a_3b_1); \alpha_{\tilde{a}} \wedge \alpha_{\tilde{b}}, \beta_{\tilde{a}} \vee \beta_{\tilde{b}}, \gamma_{\tilde{a}} \vee \gamma_{\tilde{b}} \rangle, & a_3 < 0 \; and \; b_3 > 0 \\ \langle (a_3b_3, a_2b_2, a_1b_1); \alpha_{\tilde{a}} \wedge \alpha_{\tilde{b}}, \beta_{\tilde{a}} \vee \beta_{\tilde{b}}, \gamma_{\tilde{a}} \vee \gamma_{\tilde{b}} \rangle, & a_3 < 0 \; and \; b_3 < 0 \end{cases}$$

Where, $\wedge$ is a t-norm and $\vee$ is a t-conorm.

Let $\tilde{a} = \langle (a_1, a_2, a_3); \alpha_{\tilde{a}}, \beta_{\tilde{a}}, \gamma_{\tilde{a}} \rangle$ be a single-valued triangular neutrosophic number, then,

$$S(\tilde{a}) = \frac{1}{8}[a_1 + a_2 + a_3](2 + \alpha_{\tilde{a}} - \beta_{\tilde{a}} - \gamma_{\tilde{a}}) \quad (4)$$

$$A(\tilde{a}) = \frac{1}{8}[a_1 + a_2 + a_3](2 + \alpha_{\tilde{a}} - \beta_{\tilde{a}} + \gamma_{\tilde{a}}) \quad (5)$$

They are called the score and accuracy degrees of $\tilde{a}$, respectively.

Let $\{\widetilde{A}_1, \widetilde{A}_2, \cdots, \widetilde{A}_n\}$ be a set of n SVTNNs, where $\widetilde{A}_j = \langle (a_j, b_j, c_j); \alpha_{\tilde{a}_j}, \beta_{\tilde{a}_j}, \gamma_{\tilde{a}_j} \rangle$ (j = 1, 2, …, n), then the *weighted mean of the SVTNNs* is calculated with the following Equation:

$$\widetilde{A} = \sum_{j=1}^{n} \lambda_j \widetilde{A}_j \quad (6)$$

Where λ_j is the weight of A_j, $\lambda_j \in [0, 1]$ and $\sum_{j=1}^{n} \lambda_j = 1$.

Two scales of measurement used in the method are summarized in Tables 1 and 2, see [6, 29, 30].

Linguistic terms	**SVTNN**
Extremely unimportant (EU)	⟨(0,0, 1); 0.00, 1.00, 1.00⟩
Not very important (NVI)	⟨(0, 1, 3); 0.17, 0.85, 0.83⟩
Not important (NI)	⟨(1, 3,5); 0.33, 0.75, 0.67⟩
Medium (M)	⟨(3, 5,7); 0.50, 0.50, 0.50⟩
Important (I)	⟨(5, 7,9); 0.67, 0.25, 0.33⟩
Very important (VI)	⟨(7, 9, 10); 0.83, 0.15, 0.17⟩
Extremely important (EI)	⟨(9, 10, 10); 1.00, 0.00, 0.00⟩

Table 1: Importance weight as linguistic variables and their associated SVTNN. Source: [6].

Linguistic term	**SVTNN**
Very low (VL)	⟨(0,0, 1); 0.00, 1.00, 1.00⟩
Medium low (ML)	⟨(0, 1, 3); 0.17, 0.85, 0.83⟩
Low (L)	⟨(1, 3,5); 0.33, 0.75, 0.67⟩
Medium(M)	⟨(3, 5,7); 0.50, 0.50, 0.50⟩
High (H)	⟨(5, 7,9); 0.67, 0.25, 0.33⟩
Medium high (MH)	⟨(7, 9, 10); 0.83, 0.15, 0.17⟩
Very high (VH)	⟨(9,10, 10); 1.00, 0.00, 0.00⟩

Table 2: Linguistic terms for evaluations associated with SVTNN. Source: [6].

3 Results

This section explains the design of educational talks on the treatment of first premolars Vertucci type III at the Faculty of Medical Sciences of UNIANDES, Ecuador. Twenty specialists were selected as experts to make the decision on this subject. Among them, there are academics that teach Endodontics in some faculties of the country, specialists in dental diaphanization technique, specialists in didactic, and some administrators of Medical Sciences in some universities of the country.

One professor of the Faculty with great experience and knowledge on the subject was selected as the moderator. He is the only one who knows the identity of experts, and he communicates with every one of them by e-mail. The first questions of the survey are general and the last ones are particulars. The first questionnaire corresponding to the first phase of the design is the following:

1. About the audience
   - 1.1. How many students per talk do you think is the optimal number?
   - 1.2. What group of students do you think is the most suitable to receive the talks? Why?
2. On the structure of the talks
   - 2.1. How many talks do you think are necessary to be effective?
   - 2.2. In your opinion, what is the weekly frequency that the talks should have to be effective?
   - 2.3. How many talks per year do you think should be held?
   - 2.4. How many hours do you think each talk should be?

2.5. Should the talks contain practical exercises and how would they be applied?
2.6. What is the ratio of theory to practice that these talks would need?
2.7. Assuming that the talks are classified into introductory talk(s), topic development talks and concluding talk(s), what do you think is the content that cannot be missing in each of these structures? How many talks do you think are appropriate for each part of the proposed structure?

3. About the specialists who should do the talks
   3.1. What should be the minimum scientific and teaching categories of the teachers who do the talks?
4. Location conditions where to hold the talks
   4.1. Under what material conditions should the talks take place?
5. Ways of evaluating the quality of the talks
   5.1. What is the most appropriate way that you consider the quality of the talks should be evaluated?
   - No need to be evaluated.
   - Evaluating the teacher who teaches them.
   - Evaluating the students who receive the talks.
   - Assessing both, teachers and students
6. Content of the talks
   6.1. Do you think that the topic of internal root anatomy of upper first premolars should be covered? In what talk and to what degree of complexity?
   6.2. Do you consider it is necessary to introduce talks on clearing as a learning method to reinforce the internal study of dental organs? In what way, theoretical or practical?
   6.3. Do you consider that instrumentation techniques should be generalized in all dental organs in the talks?
   6.4. Do you think that the issue of the use of tomography in complex cases to locate ducts should be addressed?
   6.5. Do you consider that the use of periapical radiography should be explained to ensure accurate detection of the ducts?
   6.6. Do you think that the topic of canal preparation in the upper first premolar should be covered?

Each of the questions belongs to a topic that is specified in each previously written index, which are items from 1 to 6. Each sub-item contains the question asked to the specialists. As we can see, the questions asked are open in order to design the most popular variants within the answers.

Additionally, each of the experts was asked to evaluate items 1 to 6 on their importance in the EU, NVI, NI, M, I, VI, EI linguistic scale that appears in Table 1, which will be relevant in the second phase of the design.

The moderator sends the questionnaire to the experts. Previously, they were informed about the objective and importance of this study and they have given their approval to participate in the design. Once the questionnaires have been completed, the moderator analyzes the answers, which are diverse, and elaborates the possible designs of the talks, grouping the closest proposals, and then asking to the same specialists who select from these proposals which one they prefer. Additionally, as an advanced step, we have the results of the evaluation of the experts about each of the previous items; these results are summarized in Table 3.

Linguistic terms/Item	**1**	**2**	**3**	**4**	**5**	**6**
Extremely unimportant (EU)	0	0	0	0	0	0
Not very important (NVI)	0	0	0	0	1	0
Not important (NI)	0	0	0	4	10	0
Medium (M)	0	0	0	6	7	0
Important (I)	1	3	0	9	1	0
Very important (VI)	2	15	1	1	1	0
Extremely important (EI)	17	2	19	0	0	20

Table 3: Frequency of assessment (in every cell) with linguistic terms (by row) of every item number (by column). Source: Authors.

Each linguistic term in Table 3 was associated with its respective SVTNN in Table 1 and with the help of Equation 5, they were converted to a single numerical value. Then, we calculated the mean of these numerical values for each item, according to the results of Table 3. These results were the weights assigned to each item according to its importance, which were normalized and the following result was obtained:

$w_1 = 0.207608$, $w_2 = 0.179736$, $w_3 = 0.212793$, $w_4 = 0.110873$, $w_5 = 0.074600$, and $w_6 = 0.214390$. Where, w_i represents the weight of item i = 1, 2, 3, 4, 5, 6.

According to the results of the survey, the moderator determined that there are mainly three types of talks, each of which summarizes the idea of a subgroup within the expert group. These educational talks designs are denoted by C_1, C_2, C_3. Which were forwarded to each expert with the intention of re-evaluating them. The new

questionnaire with closed questions is explained below. Now consisting of six points, one for each item. Some details are omitted to maintain the simplicity of this exposition.

Note that for each item there are given options denoted by (a), (b), and (c). (a) corresponds to C_1, (b) to C_2 and (c) to C_3.

1. About the audience:
   (a) It must be a graduate group. In the widest possible number of students to receive it each time.
   (b) It must be a group of high degree college students. With a small number of students receiving it every time.
   (c) It must be a group of middle degree college students. With a small number of students receiving it each time.
2. On the structure of the talks
   (a) There should be few talks with a large number of hours of duration (approximately 8 hours per meeting), in a short weekly frequency (about three weekly), for a period of 15 days (six in total). A talk should be included having at least one practical activity.
   (b) There should be an average amount of talks in total (between 10 and 15), with a small amount of hours per talk (3 hours), spaced in time (no more than 2 per week). At least three practical talks should be included.
   (c) Idem that (b).
3. About the specialists who should do the talks
   (a) Minimum must have a PhD or MSc with more than 10 years of experience.
   (b) Idem that (a).
   (c) At least teachers of the subject of Endodontics, who receive special preparation.
4. Conditions for talks
   (a) Specialized classrooms with computers connected to the internet and Wi-Fi, as well as laboratories where to perform the practices.
   (b) The classrooms where regularly students receive their classes.
   (c) Idem that (b).
5. Ways of evaluating the quality of the talks
   (a) It is enough to evaluate the students with a simple theoretical and practical examination at the end of the talks, as a last activity.
   (b) Only students should be evaluated.
   (c) No evaluation is required.
6. Content of the talks
   (a) The talks should include all the proposed content in depth.
   (b) The talks should include all the proposed contents in a didactic way, which is more motivational than to achieve a deep knowledge of the topic.
   (c) Idem that (b).

The moderator forwards these three proposals to the experts and asks them to evaluate sub-items (a), (b), and (c), using the linguistic terms in Table 2, answering the question of how successful the expert evaluates option (a), (b) or (c) as a proposal for talks, in the linguistic scale VL, ML, L, M, H, MH, and VH.

For each expert's answers, the linguistic values were converted into their respective SVTNN, and then they were converted into numerical values using expression 5. $O_{ij(a)}$, $O_{ij(b)}$, and $O_{ij(c)}$ denote the numerical values representative of options (a), (b), and (c) within item i = 1, 2, 3, 4, 5, 6, evaluated by expert j = 1, 2,..., 20.

$O_{ij} = \frac{O_{ij(a)}+O_{ij(b)}+O_{ij(c)}}{3}$ is calculated.

A threshold value was set to $th = 2$ to determine that there is agreement between experts.

The standard deviation between j values of O_{ij} was calculated using formula (7).

$$\sigma_i = \sqrt{\frac{1}{19}\sum_{j=1}^{20}\left(O_{ij} - \bar{O}_i\right)^2} \qquad (7)$$

Where $\overline{O}_i = \frac{\sum_{j=1}^{20} O_{ij}}{20}$.

If $\sigma_i > th$ there is no enough consensus among experts on item i, therefore a next round is necessary. Although it is more inefficient, this research considered passing to the next round for all items in case at least one of them satisfies $\sigma_i > th$, since there is a close relationship between options (a), (b) and (c) within the different items.

In case of agreement, evaluate each option by $O_{(a)} = \frac{\sum_{j=1}^{20}\sum_{i=1}^{6} w_i O_{ij(a)}}{20}$, $O_{(b)} = \frac{\sum_{j=1}^{20}\sum_{i=1}^{6} w_i O_{ij(b)}}{20}$, and $O_{(c)} = \frac{\sum_{j=1}^{20}\sum_{i=1}^{6} w_i O_{ij(c)}}{20}$. The option (a), (b), or (c) with the highest value is selected.

If there is no consensus, the moderator sends the results of each round to each of the experts, including on which items there was consensus and which did not. Experts are asked to reconsider their responses.

Table 4 summarizes the standard deviation using formula 7, for each round and item, according to experts' assessments.

Round/Item	1	2	3	4	5	6
First	1.3472	1.4608	1.7842	2.0269	2.2711	1.8687
Second	1.3472	1.4608	1.7842	1.8272	2.1870	1.7999
Third	1.3472	1.4608	1.7842	1.7708	1.8395	1.7999

Table 4: Standard deviations for each round and item. Source: Authors.

According to the results in Table 4, items 4 and 5 did not satisfy the condition $\sigma_i \leq 2$, thus, two more rounds were needed to fulfill the condition of agreement. The results were $O_{(a)} = 4.1804$, $O_{(b)} = 5.4703$, and $O_{(c)} = 5.6817$.

Therefore, design denoted by C_3 is the one preferred by experts.

Conclusion

This paper validates educational talks on the treatment of first premolars Vertucci type III at the Faculty of Medical Sciences at Universidad Regional Autónoma de los Andes. Twenty experts expressed their opinions about the characteristics of the talks, using the neutrosophic Delphi technique. The first phase consisted in interviewing experts with open questions about the talks. The second phase contained closed questions on three possible designs proposed from the results of the first phase. Three rounds were necessary to obtain a final consensus, which is that the talks should be addressed to students of middle courses of the Faculty, with few students receiving it each time, between 10 and 15, with a small amount of hours per talk, spaced in time, and at least three practical talks should be included. Neutrosophic Delphi, allowed us to deal with the indeterminacy of decision-making and to evaluate based on linguistic terms rather than numbers. This subject is important in a dentists' curriculum, but it has a high degree of difficulty, thus, these talks will positively influence the quality of future specialists' practices.

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Received: March 17, 2020. Accepted: July 20, 2020