



UNIVERSIDADE FEDERAL DE UBERLÂNDIA
FACULDADE DE ODONTOLOGIA



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Prospective evaluation of endodontic treatments performed by undergraduate students in children and adolescents, a qualitative study in young molars.

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Trabalho de conclusão de curso apresentado a Faculdade de Odontologia da UFU, como requisito parcial para obtenção do título de Graduado em Odontologia

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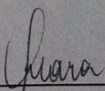


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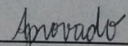
ATA DA COMISSÃO JULGADORA DA DEFESA DE TRABALHO DE CONCLUSÃO DE CURSO DO (A) DISCENTE **João Victor Soares Mendonça Vieira** DA FACULDADE DE ODONTOLOGIA DA UNIVERSIDADE FEDERAL DE UBERLÂNDIA.

No dia **31 de maio de 2019**, reuniu-se a Comissão Julgadora aprovada pelo Colegiado de Graduação da Faculdade de Odontologia da Universidade Federal de Uberlândia, para o julgamento do Trabalho de Conclusão de Curso apresentado pelo(a) aluno(a) **João Victor Soares Mendonça Vieira**, COM O TÍTULO: **"PROSPECTIVE EVALUATION OF ENDODONTIC TREATMENTS PERFORMED BY UNDERGRADUATE STUDENTS IN CHILDREN AND ADOLESCENTS, A QUALITATIVE STUDY IN YOUNG MOLARS"**. O julgamento do trabalho foi realizado em sessão pública compreendendo a exposição, seguida de arguição pelos examinadores. Encerrada a arguição, cada examinador, em sessão secreta, exarou o seu parecer. A Comissão Julgadora, após análise do Trabalho, verificou que o mesmo se encontra em condições de ser incorporado ao banco de Trabalhos de Conclusão de Curso desta Faculdade. O competente diploma será expedido após cumprimento dos demais requisitos, conforme as normas da Graduação, legislação e regulamentação da UFU. Nada mais havendo a tratar foram encerrados os trabalhos e lavrada a presente ata, que após lida e achada conforme, foi assinada pela Banca Examinadora.

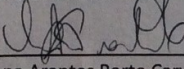
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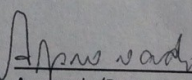
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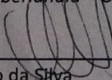
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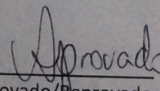
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
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
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Prospective evaluation of endodontic treatments performed by undergraduate students in children and adolescents, a qualitative study in young molars.

Summary:

Still today, caries is one of the biggest oral health problems, and the numbers become more worrisome in children and adolescents. For the second, there is not a large number of scientific researches for this age group, and as a consequence, they are neglected and in several occasions require endodontic treatment in molars (teeth most affected by caries disease in this group). The objective of this study is to generate clinical data regarding hebiatric patients, as well as to evaluate the quality of the endodontic treatments performed at the hebiatric clinic by undergraduate students. This paper presents a prospective analysis of endodontically treated young molars by undergraduate students at UFU, focusing on pre-clinical aspects, during treatment data, and clinical and radiographic follow-up, 12 and 24 months after the end of the treatment. We analyzed 75 teeth in patients from 6 to 18 years old. Most of the patients presented pain and periapical lesion prior to treatment, among them, the majority no longer presented pain and / or periapical lesion after treatment. We can conclude that in general, the treatments present good quality, operators with little technical ability did not reduce the quality of endodontic obturation and the outcome was the improvement of the patients' condition.

Key words: Endodontic, young molars, teenagers, rotary instrumentation, undergraduate students.

Resumo:

Ainda hoje a cárie é um dos maiores problemas de saúde bucal, e os números se tornam mais preocupantes em crianças e adolescentes. Para o segundo, não é encontrado um vasto número de pesquisas científicas para esta faixa etária, e como consequência disto, são negligenciados e por diversas vezes necessitam de tratamento endodôntico em molares (grupo de dentes mais afetado pela doença cárie neste grupo). Este trabalho tem como objetivo gerar dados clínicos referentes aos pacientes hebiátricos, bem como avaliar a qualidade dos tratamentos endodônticos realizados na clínica de hebiatria por alunos de graduação. Este, apresenta uma análise prospectiva de molares jovens tratados

endodonticamente por estudantes de graduação na clínica de hebiatria - UFU, com foco em aspectos pré-clínicos, durante o tratamento e acompanhamento clínico e radiográfico, 12 e 24 meses após conclusão do tratamento. Foram analisados 75 dentes em pacientes de 6 à 18 anos de idade. A maior parte dos pacientes apresentaram dor e lesão periapical anterior ao tratamento, dentre estes, a maioria não mais apresentava dor e/ou lesão periapical após o tratamento. Podemos então concluir que de forma geral os tratamentos apresentaram um boa qualidade, que operadores com pouca habilidade técnica não comprometeram a qualidade da obturação, e o desfecho final foi a melhora do quadro dos pacientes.

Introduction:

Mixed dentition is established in kids between 5 and 7 years old, and it is also when the first permanent molars erupt (Batchelor PA and Sheiham A, 2004)(1). These teeth present a series of hindrances that can directly influence in the development of caries, such as, difficulty of hygiene, the posterior position in the dental arch, lack of awareness from parents who very often do not know how to properly brush and floss.

Despite the reduction in the caries rate in Brazil, it is still a public health problem that mainly affects children and adolescents, sometimes leading to the need for endodontic treatment in permanent teeth of young patients to avoid extraction.

However, children and adolescents whose permanent molar teeth require endodontic treatment are sometimes neglected in public health services, leading to early tooth loss, and changes in occlusion, chewing and psychosocial damage (Sawyer et al., 2012)(2). Therefore, oral health education for the population with mixed dentition is fundamental, but adequate curative intervention is urgently required where pulp impairment due to caries has already been established. Since there has been such a high demand for this treatment, undergraduate students are encouraged and taught how to perform endodontic treatments for this age group and teeth group.

Although, there are retrospective (Santos *et al.*, 2010)(3) and prospective (Sigurdsson *et al.*, 2018)(4) studies that evaluate the prognosis of endodontic treatment in molars, these were not focused on the sample in this specific age group, represented by children and adolescents. Considering the difficulty in the mechanized instrumentation imposed by the greater diameter of the canals, greater porosity in the furcation region increasing the chances of periodontal-endodontic compromise, invasion of biological width by caries (crown lengthening was needed), sometimes the apex is

not completely closed, which may hinder the containment of the endodontic material in the limits of the root canal (Torabinejab *et al.*, 2017)(5), it is important to conduct clinical studies that evaluate the outcome of endodontic treatment in the mixed dentition age group (Clarke *et al.*, 2015)(6). Furthermore, such study can contribute to an improved endodontic treatment in children and adolescents.

It is also important to highlight that the quality of the molars treatment performed by undergraduate students supervised by a professor need to be evaluated (Coelho *et al.* 2017; Donnelly *et al.*, 2017; Ribeiro *et al.*, 2018) (7-9). The aim of this clinical study was to evaluate the endodontic treatment quality performed by undergraduate students, considering radiographic and clinical data, as well as its longevity in 6 to 18-year-old patients based on a 2-year post evaluation.

Materials and methods:

Study participants

This study received approval from the ethics committee of the Universidade Federal de Uberlândia, Brazil (5152/ 2015). All participants signed terms of informed consent. This prospective study performed endodontic treatments in molars of 6-18-year-old patients, concluded between 2015–2017. These were selected based on a list of patients provided by the University with need for endodontic treatment. Before the treatment, the patients selected were submitted to pulp sensitivity tests with cold, vertical and horizontal percussion, probing, periapical region palpation and radiographic analysis.

The complete data of the patients (age, gender, address, and telephone) and of the endodontic treatment (treated tooth, preoperative periapical status, instrumentation and obturation techniques, and periapical radiographs of the filling) were registered in the patient's chart.

Endodontic treatment

Once the diagnosis was confirmed, the endodontic treatment was started performing opening and shaping, using headstrong files and gates-glidden drills to clean and shape the two first thirds of the canals. Then, the Protaper Next (Dentsply) system

was used, with the X1, X2 and X3 rotary files, irrigation with 2.5% NaOCl, and saline solution as a final wash. At the end of every session, except the final session, CaOH₂ was used as an intracanal dressing. Half of the patients were sealed with Sealer 26 (Dentsply) and the other with AH Plus (Dentsply). Regarding the limit of condensation, it was agreed that the gutta-percha cones had to be placed from 0 to 2 mm prior the apex. And all subjects had a final radiographic examination.

Clinical evaluation

After 12 and 24 months the patients were assessed by 4 highly qualified dentists, through clinical, radiographic and photographic evaluation according to the following criteria:

- Periapical healing;
- Post-treatment pain;
- New periapical lesion appearance;
- Presence of fistula;
- Tooth mobility;
- Type of sealer;
- Apical obturation limit;
- Condensation quality

Some pre-treatment factors were judged as being relevant to analyze the quality of the endodontic treatment itself. They include:

- Pain;
- Fistula;
- Periapical lesion;
- Number of interappointment medication changes;
- Accidents as file transportation, zip.

Radiographic evaluation

Initial periapical radiographs, performed shortly after obturation, were evaluated 12 and 24 months after endodontic treatment.

Analysis result:

The collected data was expressed qualitatively, in mean and percentage. A distribution organogram of the results was created. (FIG 1)

Results

From the total number of assessed patients (n = 60), it was reached a bigger number of treated teeth (n = 75) since it was common to have one patient with more than one tooth in need of endodontic treatment. Only 3 teeth were considered ineligible along the process because the tooth had to be extracted. Also, due to patients moving out to other cities, there was a lost to follow-up (n = 3).

The found data in the present study can be seen in table 1 and 2. The most relevant information can be found bellow:

- 78.6% of patients were in pain in the first appointment; 17.3% did not present any painful symptoms; and 4.1% was not possible to collect data.
- 8% of the cases presented fistula before the treatment; 89% did not; and 3% was not possible to collect data.
- 66.6% of the examined teeth presented periapical lesion in a radiographic analysis; 32% did not present any evidence of periapical lesion; and 1.4% was not possible to collect data.
- 33.3% of the patients underwent crown lengthening surgery, and 16% needed osteotomy.
- 46.7% of the teeth had their medicament changed once; 25.3% had it changed twice; 13.3% three times; 5.3% had their medicament changed four times or more; and 9.3% did not have medicament change.
- 6.6% of the teeth which underwent endodontic treatment, had operatory accident reported, such as, file fracture and canal ledge.
- 73.3% of the teeth were considered satisfactory obturated, considering the apical limit.

- 78.6% scored 1 (best) on the condensation quality evaluation; 17.3% scored 2 (satisfactory); 2.6% scored 3 (deficient); and 1.5% was not possible to collect data.
- 46.7% of the teeth were sealed with AH plus (Dentsply); 53.3% was sealed with Sealer 26 (Dentsply);.
- Only 8.8% of the teeth sealed with AH plus (Dentsply) did not heal, when referring to the periapical lesion, against 4.8% for the ones sealed with Sealer 26 (Dentsply).

Based on the data collected in the follow-up sessions, the results show:

- 87.8% of the teeth that presented previous periapical lesion, did not show radiographic signs of a periapical lesion any longer, or show significant diminishment on the lesion.
- Only 3 teeth had reoccurring lesions, representing 4%.
- 8% of the patients complained about after treatment pain.

Discussion:

Considering the pre-existing periapical lesion, it has been shown that this is a factor that influences the postoperative pain and may also influence the prognosis of the treatment (Arslan *et al.*, 2017)(12). The high percentage of teeth with a preexisting lesion may be related to the fact that some of them have remained decayed for a long time, due to waiting for treatment in the public health sector, generating a long-term infectious condition in young teenagers with good immunological capacity (Banica *et al.*, 2015)(13). These large caries installed for a long time can also invade the biological width, which leads to the need for surgery, as occurred in 36% of the patients evaluated. This data is neglected in most studies involving endodontic treatment in molars, but it also impacts the number of sessions necessary to complete the treatment, as observed in this study, which presented a total of 43.9% of patients with more than one canal medication change.

Other reasons for multiple dressing changes, may be the loss of temporary sealing between sessions, the completion of procedures by dental students with little technical ability, and also the difficulty of patient cooperation and anxiety. Studies (Hendi *et al.*, 2018; Silva *et al.*, 2018)(10,11) show that one of the problems related to

endodontic treatment in molars is the occurrence of iatrogenies, which is even more worrying when the treatments are performed by operators with little clinical experience. Surprisingly, in this study, only 6.6% of the teeth, presented accidents commonly reported in other studies, such as instrument fractures within the canals (Caballero-Flores *et al.*, 2018)(14).

Another concern of this study refers to the apical limit of obturation, since many teeth, due to the age group, presented wide foramen, which can lead to eventual overflows. Although there is no consensus in the literature regarding the influence of the apical limit of obturation on apical repair (Guimarães *et al.*, 2018)(15) and postoperative pain (Shashirecha *et al.*, 2018)(16), it is recommended as appropriate that the apical limit of obturation is 0 to 2 mm shorter than the root length (Sjogren *et al.*, 1990)(17), and this was the adopted criteria.

Regarding the quality of lateral condensation, studies have considered this parameter more important than the apical limit of obturation to qualify endodontic success (Sinha *et al.*, 2018)(18). This is a step of extreme technical difficulty for beginners, especially when using the lateral condensation technique, which requires a higher degree of learning (Ricucci *et al.*, 2011)(6,19). The high percentage of obturation with adequate condensation may be related to the fact that part of the teeth were filled by the single cone technique, which is simpler to perform (Krug *et al.*, 2016)(20). When talking about the used sealer for obturation, a similar success rate was observed between AH Plus and Sealer 26, both resinous sealers, although Sealer 26 presents calcium hydroxide in its composition. Studies have shown that sealer may have influence on postoperative pain and repair, mainly when extrude beyond the apex on teeth with pre-existing periapical lesion (12).

Although the data presented were not submitted to statistical analysis, it is important to emphasize that 90% of the analyzed teeth presented classic and radiographic signs of periapical healing, which is an extremely satisfactory result when compared to the literature (Sigurdsson *et al.*, 2018)(4). Only 4% percent of the teeth showed a reappearance of the lesion after treatment demonstrated that the undergraduate students under supervision can perform good quality endodontic treatments in molars. In relation to postoperative pain, it was also observed low percentages of occurrence. Although these data cannot be compared to the literature due to the methodological

differences used for pain assessment (Freire *et al.*, 2018)(22) as well as the target public and evaluated tooth, our results are extremely favorable.

Radiographic evaluation has been used in several studies that evaluate endodontic treatment performed by undergraduate students (Alsulaimani *et al.*, 2015)(23). However, it is difficult to find among the scientific literature studies which focus on this specific age group, from 6 to 18 years old. This study evaluated periapical radiographic images, which despite all limitations are commonly used in public health services.

Conclusion:

Despite the limitations of the present study, it is possible to identify low percentage of postoperative pain and high occurrence of periapical healing in the cases evaluated, indicating that undergraduate students are able to perform satisfactory endodontic treatments on young molars.

References:

1. Batchelor PA, Sheiham A. Grouping of tooth surfaces by susceptibility to caries: a study in 5– 16 year-old children. *BMC Oral Health* 2004, 4:2
2. Sawyer M, Afifi RA, Bearinger LH, Blakemore SJ, Dick B, Ezech AC, & Patton GC (2012). Adolescence: a foundation for future health. *The Lancet*, 379, 1630-1640. doi:10.1016/S0140-6736(12)60072-5.
3. Santos SMC, Soares JA, Costa GM, Júnior MB, Moreira AN, Magalhães CS. Radiographic Parameters of Quality of Root Canal Fillings and Periapical Status: A Retrospective Cohort Study. *JOE - Volume 36, Number 12, December 2010.*
4. Sigurdsson A, Garland RW, Le TK, and Rassoulian SA. Healing of Periapical Lesions after Endodontic Treatment with the GentleWave Procedure: A Prospective Multicenter Clinical Study. *JOE - Volume 44, Number 3, March 2018.*
5. Torabinejad M, Nosrat A, Verma P, and Udochukwu O. Regenerative Endodontic Treatment or Mineral Trioxide Aggregate Apical Plug in Teeth with Necrotic Pulps and

Open Apices: A Systematic Review and Meta-analysis. JOE - Volume 43, Number 11, November 2017.

6. Clarke P, Jones ADC, Jarad F, Albadri S. Technical outcome of root canal treatment on permanent teeth in children: a retrospective study. *Eur Arch Paediatr Dent* (2015) 16:409–415

7. Coelho MS, Card SJ, Tawil PZ. Safety Assessment of Two Hybrid Instrumentation Techniques in a Dental Student Endodontic Clinic: A Retrospective Study. *Journal of Dental Education - Volume 81, Number 3. 2017.*

8. Donnelly A, Coffey D, Duncan HF. A re-audit of the technical quality of undergraduate root canal treatment after the introduction of new technology and teaching practices. *International Endodontic Journal* 50, 941–50. 2017.

9. Ribeiro DM , Réus JC, Felipe WT, Pacheco-Pereira C, Dutra KL, Santos JN, Porporatti AL & De Luca Canto G. Technical quality of root canal treatment performed by undergraduate students using hand instrumentation: a meta-analysis. *International Endodontic Journal*, 51, 269–283, 2018.

10. Hendi SS, Karkehabadi H , Eskandarloo A. Iatrogenic Errors during Root Canal Instrumentation Performed by Dental Students. *Iranian Endodontic Journal*;13(1): 126-131. 2018.

11. Silva PZ, Ribeiro FC, Xavier JMB, Pratte-Santos R, Demuner C. Radiographic Evaluation of Root Canal Treatment Performed by Undergraduate Students, Part I; Iatrogenic Errors. *Iranian Endodontic Journal*;13(1): 30-36. 2018.

12. Arslan H, Guven Y, Karatas e, and Doganay E. Effect of the Simultaneous Working Length Control during Root Canal Preparation on Postoperative Pain. *JOE - Volume 43, Number 9, September 2017.*

13. Banica AC, Popescu SM, Mercurt V, Busuioc CJ, Gheorghe AC, Trasca DM, Braila AD, Moraru AI. Histological and immunohistochemical study on the apical granuloma. *Rom J Morphol Embryol* 2018, 59(3):811–817.

14. Caballero-Flores H, Nabeshima CK, Binotto E, Machado MEL. Fracture incidence of instruments from a reciprocating single file system by students in an endodontic graduate programme: A cross-sectional retrospective study. *International Endodontic Journal*. 2018.
15. Guimarães MRFSG, Samuel RO, Guimarães G, Nalin EKP, Bernardo RT, Júnior ED, Cintra LTA. Evaluation of the relationship between obturation length and presence of apical periodontitis by CBCT: an observational cross-sectional study. *Clinical Oral Investigations: Springer-Verlag GmbH Germany, part of Springer Nature* 2018.
16. Shashirekha G, Jena A, Pattanaik S, Rath J. Assessment of pain and dissolution of apically extruded sealers and their effect on the periradicular tissues. *J Conserv Dent*. 2018 Sep-Oct; 21(5): 546–550.
17. Sjogren UIF, Hagglund B, Sundqvist G, and Wing K. Factors Affecting the Long-term Results of Endodontic Treatment. *The American Association of Endodontists*. Volume 16, number 10, October 1990.
18. Sinhal TM, Shah RP, Jais PS, Shah NC, Hadwani KD, Rothe T, et al. An In vitro comparison and evaluation of sealing ability of newly introduced c-point system, cold lateral condensation, and thermoplasticized gutta-percha obturating technique: A dye extraction study. *Contemp Clin Dent* 2018;9:164-9.
19. Ricucci D, Russo J, Rutberg M, Burluson J, and Spångberg LSW. A prospective cohort study of endodontic treatments of 1,369 root canals: results after 5 years. *OOOOE - Volume 112, Issue 6, Pages 825–842*. 2011.
20. Krug R, Krastl G, Jahreis M. Technical quality of a matching-taper single-cone filling technique following rotary instrumentation compared with lateral compaction after manual preparation: a retrospective study. *Clin Oral Invest*. 2016.
21. Ricucci D, Roças IN, Alves FRF, Loghin S, and Siqueira Jr JF. Apically Extruded Sealers: Fate and Influence on Treatment Outcome. *JOE - Volume 42, Number 2, February* 2016.

22. Freire MCM, Nery NG, Jordão LMR, Abreu MHNG. Individual and contextual determinants of dental pain in adolescents: evidence from a national survey. *Determinants of dental pain in adolescents. Oral diseases.* 2019.

23. Alsulaimani RS, Al-Manei KK, Alsubait SA, AlAqeely RS, Al-Shehri SAM, Al-Madi EM. Effects of Clinical Training and Case Difficulty on the Radiographic Quality of Root Canal Fillings Performed by Dental Students in Saudi Arabia. *Iranian Endodontic Journal* 2015;10(4): 268-273.

Figure 1. Assessed teeth organogram.

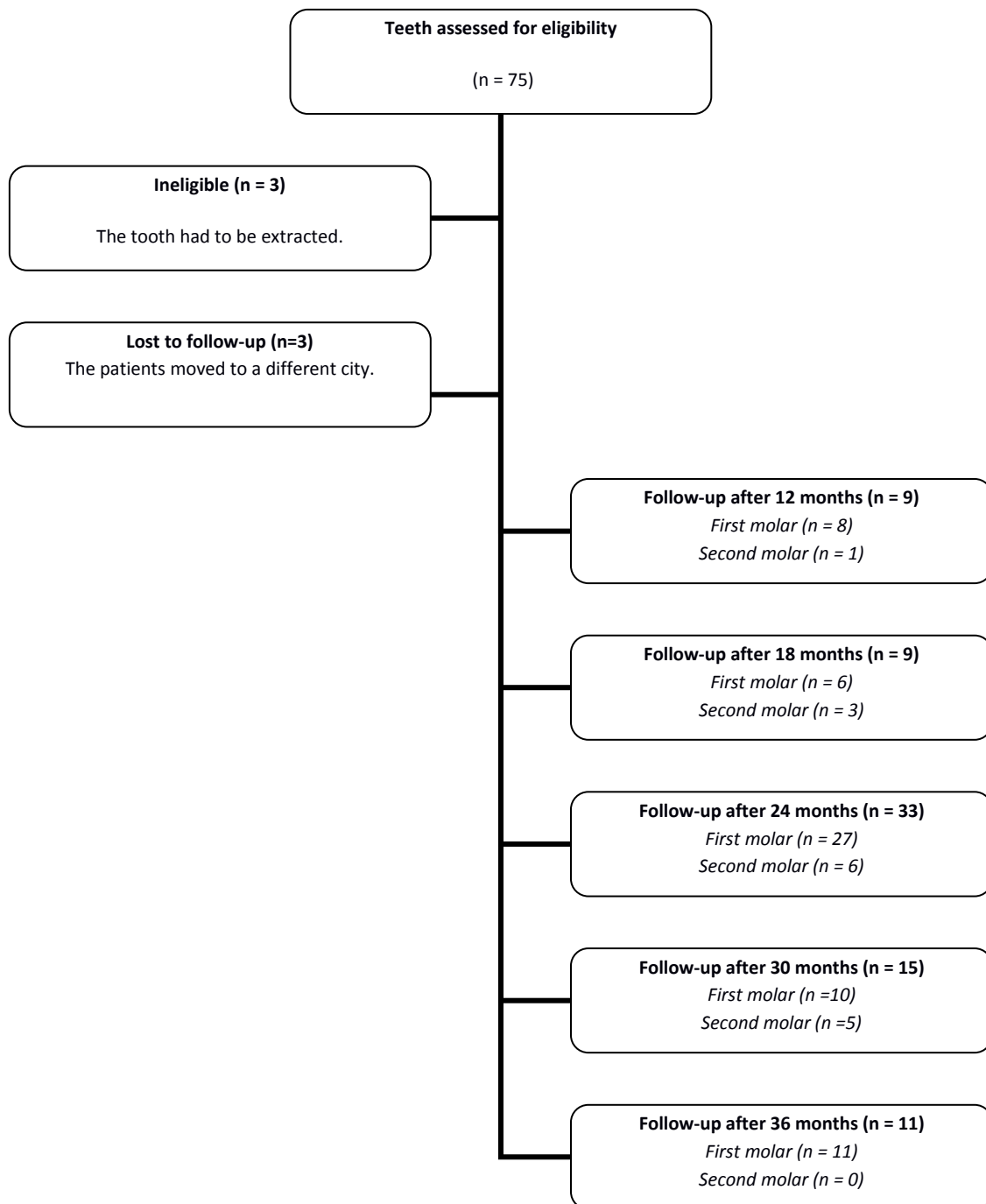


Table 1. Main characteristics of the endodontic treated teeth

Parameters		Response	n	%
Pulpal conditions	Pain	No pain	13	17.3%
		Provoked	32	42.7%
		Spontaneous	30	40.0%
	Vitality test	Positive	14	18.7%
		Negative	61	81.3%
Periodontal conditions	Mobility	Yes	7	9.3%
	Vertical percussion	Positive	33	44.0%
	Horizontal percussion	Positive	32	42.7%
	Furcation involvement	Yes	19	25.3%
	Invasion of biologic space	Yes	16	21.3%
	Marginal bone loss	Yes	3	4.0%
	Widening of PLS	Yes	32	42.7%
Periapical conditions	Fistula	Yes	6	8.0%
	Apical palpation test	Positive	6	8.0%
	Incomplete rhizogenesis	Yes	7	9.3%
	Periapical lesion	Yes	53	70.7%

Table 2. Main features of the endodontic treatments

Treatment / Procedure		n	%
Endodontic			
Type of endodontic filling material	AH Plus	35	46.7%
	Sealer 26	40	53.3%
Number of changes of intracanal medication	No change	7	9.3%
	One	35	46.7%
	Two	19	25.3%
	Three	10	13.3%
	Four	3	4.0%
	More than four	1	1.3%
Apical limit of root canal filling	Satisfactory	55	73.3%
	Overfilling	10	13.3%
	Underfilling	10	13.3%
Radiographic condensation quality	Score 1	60	78.6%
	Score 2	13	17.3%
	Score 3	2	2.6%
Restorative			
Surgical crown lengthening	Yes	26	34.7%
Periodontal osteotomy	Yes	12	16.0%