Universidad Europea

GRADUATION PROJECT

Degree Dentistry

PERCENTAGES OF CASES OF PATIENTS THAT PRESENT POST-OPERATORY PAIN AFTER ENDODONTIC TREATMENT PROCEDURE IN ONE VISIT OR MORE THAN ONE VISIT.

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ABSTRACT

Introduction: The post-operative pain is a very prevalent adverse effect after an endodontic treatment. It is indeed of greater importance, that many associated factors can interfere in the incidence of this pain.
Objectives: The main objective was to establish percentages of patients suffering pain post-endodontic treatment. We established the potential association of risk and preventive factors with the incidence of post-operative pain.
Methodology: To collect our results, we distribute questionnaires addressed to 134 patients about characteristics of their endodontic treatment and rate their pain at different periods from 0 to 10. We direct a cohort studies, elaborating percentages, risk ratios and P-values of our results. We compared our results with previous published studies related to this subject.
Results: Results showed that 29% of patients did experienced pain between 1 hour and 1 day after the treatment whereas 3,7% suffered persistent pain after a week. 57% of symptomatic irreversible pulpitis referred pain, compared to 47% of patient retreated, 17% of necrotic pulp, and 11% of asymptomatic irreversible pulpitis. Regarding potential associated factors, being a woman OR = 1,53, being young OR = 0,48, being older OR = 0,75, mandibular teeth OR = 0,32, complexes anatomy OR = 3,33. Multiple visits treatment have not shown significantly more risk of pain than single visits one.
Conclusions: The number of patients integrated in our study did not permit elaborate concrete relationship between associated factors and post-operative pain. However, compared with previous studies, it suggested that we expect a prevalence of post-operative pain around 30%, that tends to decrease with weeks to 3-4% of persistent pain. Without sufficient significance, needing more studies, post-operative pain seems to be associated with female of middle age, multiple visits treatment, complicated posterior teeth anatomy, and symptomatic irreversible pulpitis diagnosis.

Key words : Pain after endodontic treatment, Postoperative Pain, Risk factors Post endodontic pain, Prevention post-endodontic pain, Single or multiple visits endodontic.

RESUMEN

Introducción: El dolor postoperatorio es un efecto adverso muy prevalente tras un tratamiento de endodoncia. De hecho, es de mayor importancia, saber que muchos factores asociados pueden interferir en la incidencia de este dolor.
Objetivos: El objetivo principal fue establecer porcentajes de pacientes que sufrieron de dolor post-tratamiento endodóntico. Establecimos la potencial asociación de factores de riesgo y preventivos con la incidencia de dolor postoperatorio.
Metodología: Recogemos cuestionarios dirigidos a 134 pacientes sobre las características de su tratamiento y calificamos su dolor de 0 a 10 y en diferentes periodos. Dirigimos estudios de cohortes, elaborando porcentajes, cocientes de riesgo y valores de P con alpa = 0,05.
Resultados: Los resultados mostraron que el 29% de los pacientes experimentaron dolor, hasta 24h después del tratamiento, mientras que el 3,7% sufrieron de dolor persistente después de una semana. 57% de las pulpitis irreversibles sintomáticas refirieron dolor, en comparación con 47% de pacientes retratados, 17% de pulpas necróticas y 11% de pulpitis irreversibles asintomáticas. En cuanto a los posibles factores asociados, ser mujer OR = 1,53, ser joven OR = 0,48, ser mayor OR = 0,75, dientes mandibulares OR = 0,32, anatomía compleja OR = 3,33. El tratamiento en múltiples visitas no ha mostrado un riesgo significativamente mayor de dolor que el de una sola visita.
Conclusiones: El número de pacientes integrados en nuestro estudio no permitió descartar una relación concreta entre los factores asociados y el dolor postoperatorio. En relación con estudios previos, esperamos una prevalencia de dolor postoperatorio alrededor del 30%, que tiende a disminuir con las semanas a un 3-4% de dolor persistente. Sin significación suficiente, necesitando más estudios, el dolor postoperatorio parece estar asociado con mujeres de mediana edad, tratamiento de múltiples visitas, anatomía complicada de los dientes posteriores y diagnóstico de pulpitis irreversible sintomática.

Palabras clave: Dolor post endodoncia, Factores de riesgo, Dolor post endodoncia, Prevención dolor post endodoncia, Una o múltiples visitas endodoncias.

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Introduction.

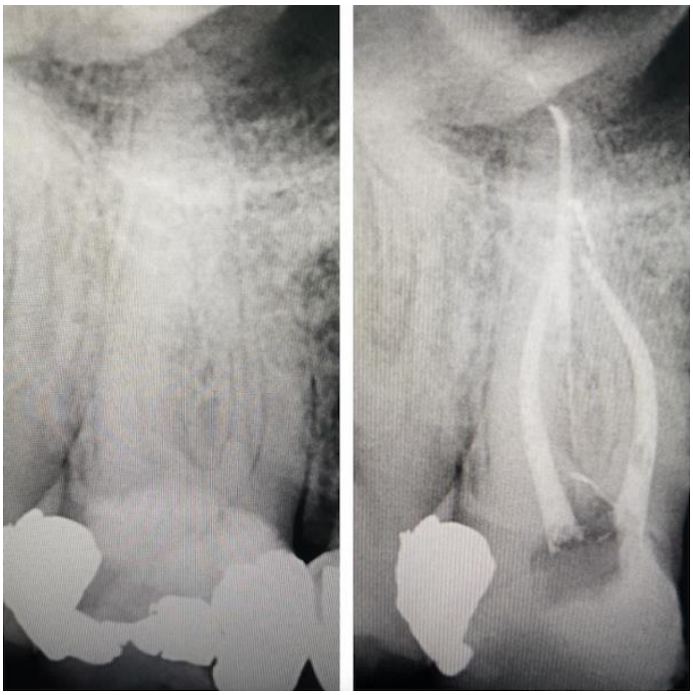
Root canal treatment (RCT) is a dental procedure performed in circumstances where the pulp of a tooth is irreversibly damaged. It will consist in cleaning and removing every vital tissues of the named tooth : blood vessels, nerves, and connective tissues, in order to preserve the constitutional part of the tooth in the mouth as dentine and enamel (1). Endodontic treatment can be needed after accidental situations as fissures, or following infiltrated fillings, extensive caries or even periodontal pathologies that lead to the bacterial infection of the pulp. It is the main cause of dental emergencies (2). This treatment can be challenging due to the various complications related to the complexity of the procedure. Those complications could be in relation with the establishment of the diagnosis, the access to the cavity, the instrumentation of canals, the obturation technique, or even the medications needed before, during, and after the treatment (3). RCT is one of the dental treatments which have shown the most important proportion of pain after treatment according to the last years studies. Most of these studies shows around 40%-50% of pain post-operatively, however only approximately 3 to 7% are considered persistent tooth pain (4). The incidence of more incisive complications as flare-ups are respectably low. The higher incidence of pain is associated with a low degree pain in a short term after treatment that should disappear in less than a week (5). The high prevalence of pain appearing after endodontic treatment induce the important relevance of studies on the subject. As explained followed, a lot of parameters can participate to the appearance of pain in each patient, it is of great importance to establish those factors to prevent as much as possible the discomfort of patients after a root canal treatment.

The purpose of this study is to establish the prevalence of post-operative pain (POP) in patients undergoing endodontic treatments in one and multiple visits. We will moreover intend to correlate the appearance of POP with associated factors.

Research question: What is the percentage of patients suffering from post-operative pain after endodontic treatment in one ore multiple appointments?

1.Diagnosis

Endodontic treatment is performed most of the time due to irreversible pulpar diagnosis when conservative treatment is not anymore considered. It is a treatment that consist in cleaning a tooth root canal from any organic and non-organic tissue, nerves and debris that could cause an inflammation and infection of radicular and peri-radicular tissues as shown in Figure 1 (6).



(Figure 1) Root canal treatment realized on a tooth 1.6. Dr. Shirley Dallo.

Following the AAE (American Association of Endodontics) guidelines in the section *"Glossary of Endodontic Terms"*, we can distinguish several pulpar diagnosis: Symptomatic Irreversible Pulpitis (SIP), Asymptomatic Irreversible Pulpitis (AIP), and Necrotic pulp (NP). We can moreover classified peri-apical diagnosis as Symptomatic and Asymptomatic Apical Periodontitis (SAP and AAP), and Acute or Chronic Apical Abscess (AAA and CAA) (7). To result to this diagnosis, the examination will be accompanied by several series of test that will be achieved on references teeth, comparatively to the pathological tooth; as a control tooth, can be used the proximal tooth or the contralateral tooth. The diagnosis will always be preceded by the analysis

of medical history and symptomatology of each patient individually, radiological complementary tests, associated with thermal test to cold and hot exposure as seen in Figure 2, percussion, and palpation of the tooth, as well compared to another vital tooth. (8) Various studies have shown different classifications of endodontics diagnosis used by specialists and general dentists all over the world differing from the original from the AAE, enhanced by the expansion and the development of new techniques like regenerative treatments. (9)

(Figure 2) complementary tests of endodontic examination (10).

1.1 Pulpar Diagnosis

1.1.1 Symptomatic Irreversible Pulpitis

Symptomatic Irreversible Pulpitis (SIP) is an inflammation of the pulp that will not be reversible. The patient will present symptoms that are easily recognizable like swelling and intense, continuous pain. SIP needs to be treated endodontically in a short period of time in order to save the structural part of the tooth and avoid any complications (11). During the diagnosis test, the patient will present exaggerated response to hot and cold stimulus for more than 20 seconds, pain during mastication and spontaneous pain. The pain will be related to the inflammation of A-delta and C fibers and followed by a response of nociceptors from the trigeminal nerve. This is the stimulation of those nociceptive nerves that permit to achieve a good pulpar diagnosis, based on

characteristics like time of exposure, intensity, and localization (12). To illustrate this concept: the type of pain that will be transcript by the patient could be stabbing and throbbing which would be originated by the fibers type A that are characterized by a very important conductivity. This type of pain is associated with a reversible pulpitis. However, if the pain is more continuous, intense, and irradiated it could be related to type C fibers stimulation, characterized by a slower conduction. In this situation we can suspect easily an irreversible pulpitis and the patient will suffer in a more extensive time space than the time of exposition to our stimulus (13). If the pulp is not treated, the inflammation will spread in the entire pulp and could lead to a necrotic pulp. After the expansion of the inflammation, the vital therapy will be less and less successful and the treatment of choice is removal of all pulpar tissue (14).

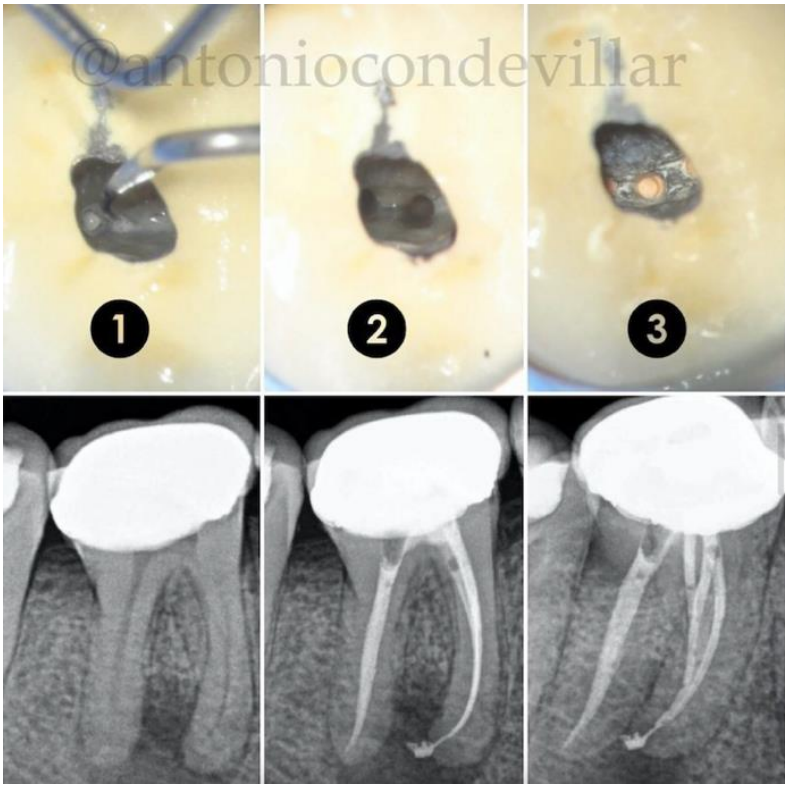
1.1.2 Asymptomatic Irreversible Pulpitis

Asymptomatic Irreversible pulpitis correspond to an irritation of the pulp in a patient who does not present any clinical symptoms nor pain before the clinical examination. It is often linked with extensive caries, trauma, and exposition of the pulp. The patient responds to the cold diagnostic test with a prolonged or exaggerated response. This pain would be related, as symptomatic irreversible pulpitis, to the unmyelinated fibers type C (13). This state is characterized as a chronic inflammation of the pulp, due to these extensive caries or infiltrations. Radiographically, it is often followed by an enlargement of the periodontal ligament in advanced state. In this situation the peri-apical state is often compromised (15). It is likely linked with periapical pathologies in a extended period of time, that can be difficult to diagnose on a periapical radiograph. The use of cone-beam computed tomography is for this reason more and more used in endodontic diagnosis (16).

1.1.3 Necrotic Pulp

A necrotic pulp is a definitive diagnosis concluded when the vitality of the pulp is completely compromised. It is an irreversible state that usually can be the consequences of a non-treated irreversible pulpitis. The diagnosis of a necrosis is made by the absence of sensibility responses, a change in the color of the teeth, and/or a possible pain to percussion or mobility. The presence of pain is significative of damage in an inflamed peri-apical tissue (15).

On the radiographic images, the periodontal ligament could be enlarged, there is a possible presence of extensive caries, or large restoration. The presence of calcification can be radiologically identifiable as shown in Figure 3. To stop the infection, the root canal treatment is of great importance. The endodontic treatment will be exercised to remove any source of bacteria or potential reinfection. When the teeth will be treated and sealed, canals will be free of any source of bacterias, however the tooth tissues will be less resistant, and the tooth more fragile (2).



(Figure 3) Treatment of RCT of a necrotic 4.6 with calcification of mesial roots. Dr. Antonio Conde Villar.

1.2 Periodontal Diagnosis.

1.2.1 Symptomatic Apical Periodontitis.

The Symptomatic Apical Periodontitis (SAP) corresponds to an inflammation of periodontal and peri-apical tissues. During the examination, patients will respond positively to percussion and palpation. Usually there is also a painful response to the biting test (14).

Radiographically, it can be related to an apical radiolucency but not in 100% of cases. It is often linked to a pulpar damage as pulpitis lesions as mentioned previously (17). Different studies have shown that the apical infection of a tooth is caused generally by facultative anaerobes bacterias as Streptococcus and Actinomyces. However, the bacterial composition of the canals can lead to a more specific diagnosis of each clinical case: A study lead by J.Marinkovic in 2020 have shown that SAP was significantly more infected by Veillonella parvula and Fusobacterium nucleatum, known as obligated anaerobes bacterias. While Asymptomatic Apical Periodontitis (AAP), was predisposed to Streptococcus oralis (18). The final diagnosis of Symptomatic Apical Periodontitis led to the need of root canal treatment.

1.2.2 Asymptomatic Apical Periodontitis.

The Asymptomatic apical periodontitis is usually link to the destruction of the surrounded bone and periodontium. AAP is a chronic infection related to gram-negative anaerobic bacterias, often linked to the pulpar pathology of the tooth concerned (10). There is no symptomatology associated however periapical radiographies can reveal the presence of apical radiolucency. Recent studies on the prevalence of AAP associated with cardiovascular diseases have shown an important correlation between the development of oral infections and systemic diseases (19).

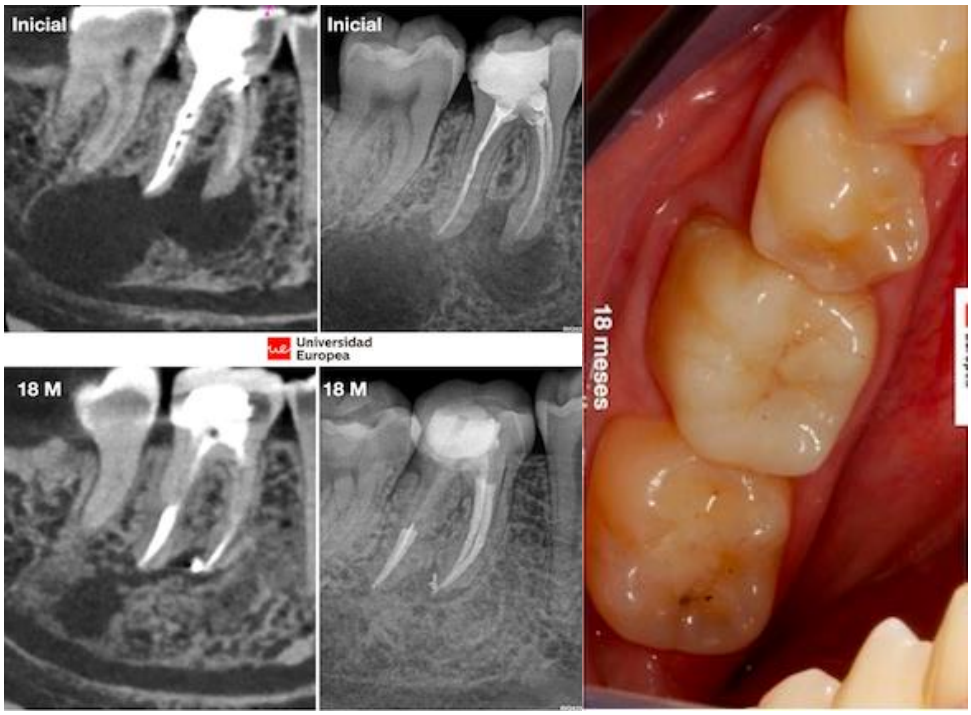
1.2.3 Chronic Apical Abscess.

After infection of the pulp leading to necrosis of the teeth, the appearance of Chronic Apical Abscess (CAA) is a very common outcome. It is associated with bone tissue

destruction that is shown radiographically by a radiolucent image on the apex. It can go with lights symptoms or none. A fistula can sometimes appear during the intraoral examination and a fistulopathy will be needed to associate it with the tooth of origin (14). The presence of chronic apical abscess is intimately linked with the formation of cortical fenestration, in the contrary of an Acute Apical Abscess that will show a peri-apical lesion without systematic cortical fenestration (20).

1.2.4 Acute Apical Abscess.

AAA is a reaction of the immune system to the pulpar gradual necrosis. It is very symptomatic, the patients will suffer spontaneous intense pain and swelling, the patient will frequently refer to a difficulty to open the mouth, sleep at night, and during mastication. This is very spontaneous and limiting state (21). Radiolucency as in Figure 4, and systemic symptoms of inflammatory response can be associated. The infection of peri-apical tissues is often related to bacterias as *"Fusobacterium, Parvimonas, Prevotella, Porphyromonas, Dialister, Streptococcus and Treponema* (18).



(Figure 4) Retreatment of a 4.6 with endodontic and periodontal lesions. Dr. Antonio Conde Villar.

2. Pain after endodontic treatment.

The pain post-operative is a very frequent secondary effect undesired after an endodontic process. It can be initiated by physiological or pathological inflammation during the formation of the tissue lesion or during the reparation process of peri-radicular area (22). This undesired pain can be prevented mainly by following rigorously a protocolar technique and methodology during RCT. However, a lot of risk factors are of high relevance considering the good post-operative recovery of patients. Several studies have shown that this pain can be influence notably by the gender, the age, the type of teeth, and obviously, the final pulpar and periapical diagnosis and the presence or not of pain or peri-apical lesion before the treatment (23). The Post-Operative Pain (POP) is described as an acute and most of the time reversible consequence of an inflammatory process. It is sometimes a persistent lesion of the nerves, that become a chronic pain. The identification of risk factors is essential to the specific, pharmacological, and individual diagnosis of the patient (24). In any dental treatments, the pain is a very relative factor. It is a consequence that is very difficult to standardize objectively. The experience of pain is individual and depends on various psychological and physical factors depending on the individual previous experiences, the personality, the genetic, the age, and the anxiety of the patient, the pain can be perceived differently from a patient to another. In most of the research, the pain is scaled in a methodic technique that used numerical, visual, and verbal techniques. One of them is the VAS scale technique. A lot of studies have correlated the perception of pain with the anxiety and apprehension of the patient before treatment and. The level anxiety has even show relationship with the response to treatment and final outcomes of the RCT (25).

3. Risk factors.

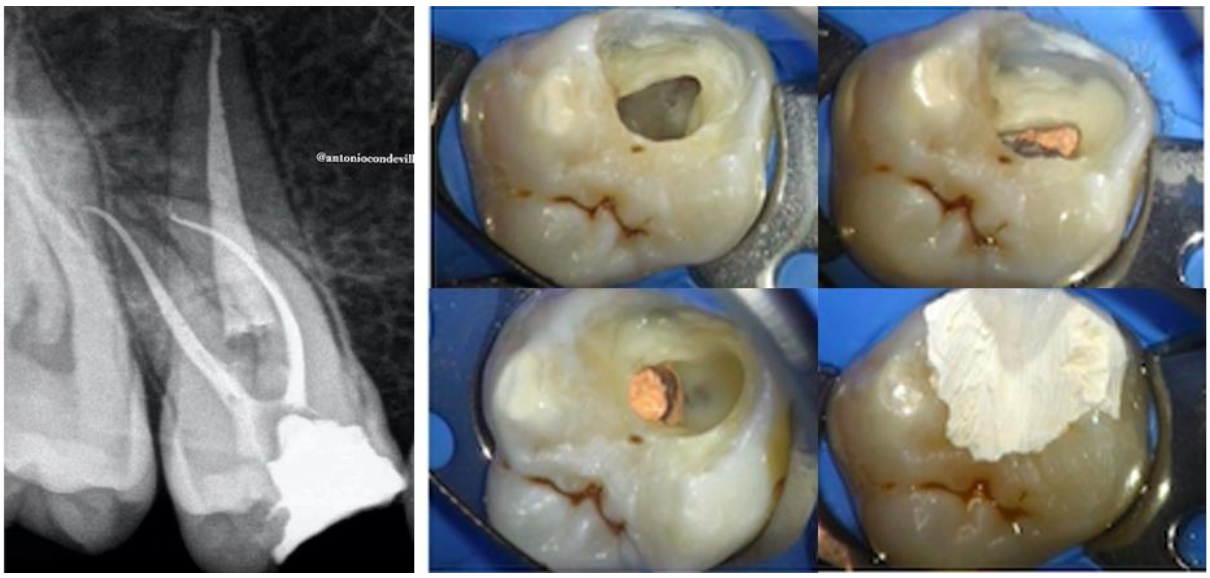
3.1 Age and gender of the patients.

The age of the patient undergoing endodontic treatment could have following several studies, an effect on a subsequent postoperative pain (POP). This parameter can be due to the sensitivity of each patient, the calcification of teeth in elderly patients, or even the relationship with stress in younger patients or patients that did previously experienced pain after root canal treatment of another tooth (3). Being a female or a male is also the subject of much research related to pain or discomfort after endodontia. It seems that female reports a more important incidence of POP than men. this correlation can be related to the perception of the pain, the hormonal discordance between men and women and are not at this day understood (26). It is important to take into consideration that in a parameter such as the age or the sex, different characteristics needs to be highlighted as the medical history of the patient (24).

3.2 Teeth and arch type.

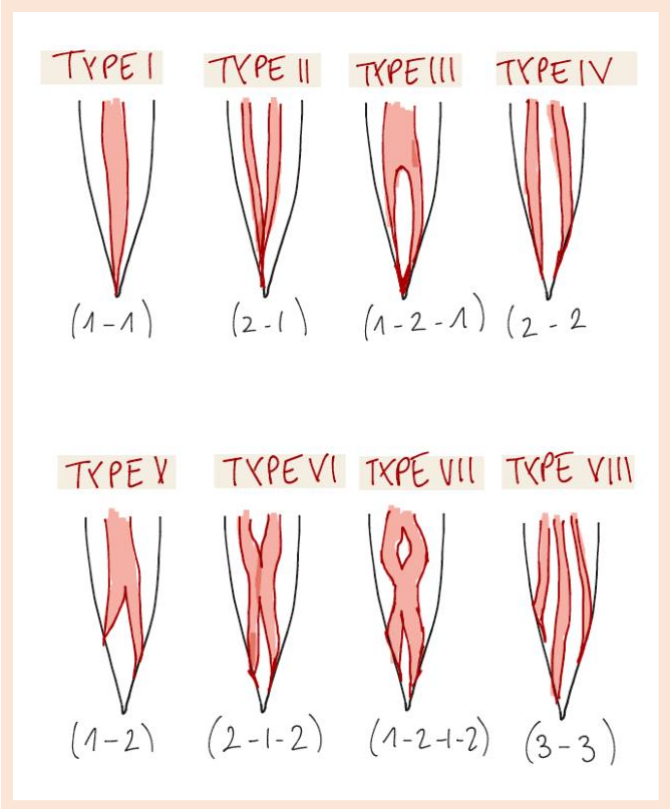
The correlation between the teeth type, the arch, or the localization of the teeth is a risk factor that is highly controversial following various studies. These results could be related to the composition of bones that varies from superior arch to inferior arch, the anatomy of the cortical bone, the presence or not of bone destruction before the treatment, and the healing process relatively different between both arches. Mandibular bone possesses a less dense osseous tissue. Studies have shown that maxillary bone had a slower healing process than mandibular one that appear to be provide of a better bone regeneration process (27). The complexity of the anatomy of the teeth is also very considered during endodontic treatment. The number of canals, the orientation of the roots, and the possible lateral canals in a single root are factors of complexity of the treatment procedures, as illustrate in Figure 5. It can lead to undesirable consequences and complications. The knowledge of possible roots

anatomical classification is indeed of great relevance. The most used classifications are Weine's classification and Vertucci's classifications shown in Figure 6. (28)

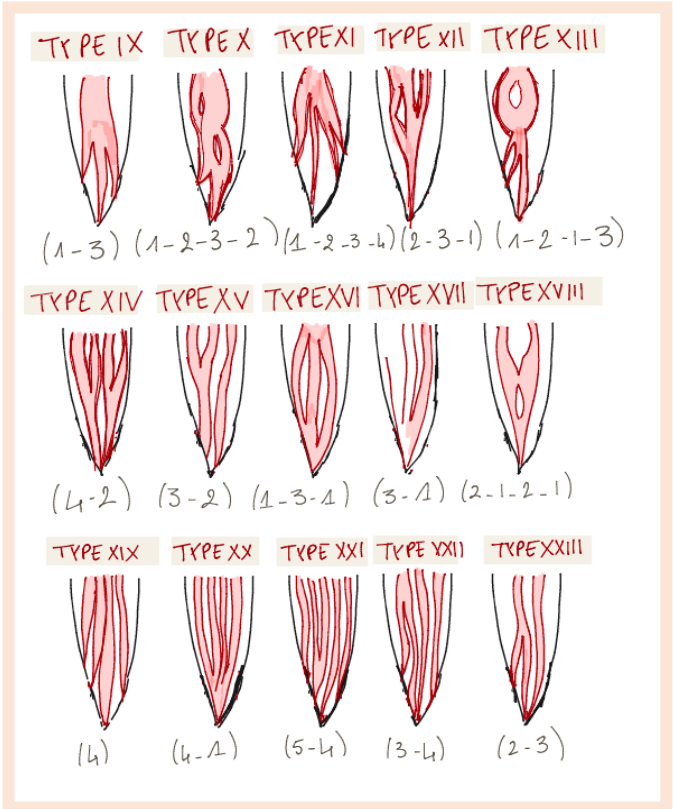


(Figure 5) Root canal treatment of a first maxillary molar with complex anatomical roots. Treatment. Dr.Antonio Conde Villar.

Weine's classification.



Vertucci's classification.



(Figure 6) Weine's and Vertucci's classification of roots anatomy *(28).*

3.3 Pulpar diagnosis.

The initial diagnosis is an essential risk factor altering the issues of the treatment. Essentially due to the inflammatory process involving each endodontic diagnosis. Depending on the pulpar and periodontal diagnostic, patients can be very symptomatic before treatment. The pre-operative pain influences the incidence of post-operative pain appearance. Before the endodontic treatment, if pain was already present, the amount of pathogens in the pulpar tissue is more important, those bacterias are more predisposed to cause post-endodontic pain. During the endodontic treatment, the persistence of the pathogenic bacterias in the peri-radicular area can cause a more extensive inflammatory reaction after the root canal treatment. In most of the studies, symptomatic teeth have shown a higher risk of pain than asymptomatic diagnosis (29).

3.4 Endodontic method and obturation methods.

During RCT there is a risk of extrusion of debris by the apex of the teeth. The endodontic method used during the treatment will influence the probability and the number of debris that will be extruded in the peri-radicular area (10). Concerning the instrumentations, Ni-ti rotatory Instrumentation and Crown-Down techniques associated with a lot of irrigation have shown in many studies the ability to reduce the number of debris apically and the followed peri-reticular inflammation. Some studies have shown that reciprocating instrumentation is less effective to prevent flare-ups and other peri-apical complications than a rotatory choice (5). These results have shown controversial conclusion in other studies, where the duration of the pain was found longer in rotatory instrumentation even if the incidence was lower (4). Another study of 2016 presents a significantly decrease in incidence of POP with a Wave-one instrumentation compared to a manual or ProTaper instrumentation (22). Moreover, RCT with patency well operated also reduce the incidence of rest of debris and obturation of the apical foramen. A study from Shubham and al. in 2021 have demonstrated that a not well maintained apical patency have a direct correlation with

the incidence of post-operative pain while in a well maintained patency group, the main risk factors of post-operative pain would be the presence of pre-operative pain, the type of tooth treated or the number of visits (30). The condensation technique has a very important place in the endodontic protocol to assure the complete sealing of the canal and avoid the leakage followed by possible bacterial infection. Many studies are comparing the quality of sealing between a cold lateral condensation of gutta-percha, and the vertical condensation of the canal by hot gutta-percha. Most of them could not conclude that a technique was better than the other, even if most of them were identifying a better adaptation to the dentine tubules using hot vertical condensation. The study conducted by Bestoon F. In 2016 have shown that the vertical fluid condensation and Nd:YAG laser soft guttapercha would lead to a more condensate gutta-percha in the canal lengths and a better adaptation to the canal walls then cold lateral condensation, and by this mean, prevent from apical leakage and possible post-endodontic pain (31).

Some new studies have also demonstrated the impact of irrigation techniques on the pain post-treatment: Negative apical pressure techniques show less appearance of pain than conventional needle irrigation as mentioned in Figure 7 (32). On the other hand, studies of 2021 have shown that the type of solutions during the irrigation was not associated significantly with the appearance or post-operative pain, on the contrary to the time of preflaring, and the filling of canals (23).

(Figure 7) Endodontic treatment of a 3.7 with C-shaped canal. Irrigation with negative pressure and warm vertical obturation. Dr. Antonio Conde Villar.

A very important parameter in terms of endodontic techniques related to pain after treatment would be the use or not of complete isolation. The risk of bacterial infraction has been significantly higher in endodontic treatment without isolation than with complete isolation as shown in Figure 8. The same conclusion has been found considering the lack of a good temporary restoration during multiple visits treatment (33).

(Figure 8) Endodontia under complete isolation. Dr. Shirley Dallo.

3.5 Number of visits.

The treatments done in one or several visits is a problematic very present and controversial in studies of endodontic pain and complications. A multiple appointments treatment has benefits on the follow-up of the debridement and permits check-up of the pain appearance before obturation of the teeth.

However, the risk of inter-appointment infection is higher due to the temporary sealing of the canals. The necessity of a second appointment depends of each individual case, the complexity of the treatments and every parameters that we mentioned before leading us to choose a multiple visit appointment over a unique visit treatment (34).

4. Prevention and medication related.

4.1 Antibiotics

Antibiotic prophylaxis is known as a good preventive strategy to inhibit the appearance of pain after endodontic treatment. Indeed, flare-ups and other complications following RCT is associated with the infection of peri-radicular tissues by bacterias during or after the treatment. However due to the augmentation of bacterial resistance the systematic use of antibiotic has become very contentious, and a lot of studies have shown very controversial results to prophylactic use in healthy patients (29). Indeed, a study conducted by S.Shamszadeh in 2021, have shown that the use of antibiotics in a prophylactic goal in order to prevent PEP was not significantly recommended, and had no significant effect on the potential post-operative swelling, neither post-endodontic pain (35). However it is important to considerate the importance of antibiotic prophylaxis in patients with risk of infective endocarditis. Those patients are regrouped in the following conditions: Prosthetic valves, previous infective endocarditis, congenital heart disease involving valvopathy, rheumatic heart diseases, and heart transplant patients (36). Concerning the endodontic non-surgical treatment, it have been agreed by most of the recent research that the antibiotic prophylaxis was not obligated but recommended (37).

4.2 Non-Steroidal and Steroidal anti-inflammatory Drugs. (NSAIDs and SAIDs)

4.2.1 Indications

While using antibiotic to prevent pain have been very controversial, the use of NSAID or SAID after the treatment when the patient responds positively to pain. NSAIDs have anti-inflammatory and analgesics property that can relieve patients from the pain by reducing the inflammatory response. Some studies have shown that the administration of NSAIDs or SAIDs before the treatment in one single dose helps the regulation of the inflammatory response and would prevent further secondary effects (29). Nevertheless other studies brought the disadvantages that suppressing or reducing the

inflammatory response could lead to a slower healing of tissues. The administration of systemic steroids has been found in different studies as very effective in patients with pulpar necrosis and peri-apical signs associated (38). However, the consistent use of those steroids should be limited to only necessary cases, studies about POP have shown that most cases of pain following endodontic treatment would not last more than 72h without the need of medication. In those studies, the persistent pain would be in most of the patient controlled with nonsteroidal drugs. Controversially to most of the past century studies, new studies have been stipulated that the use of steroidal drugs after endodontic pain would not be as much effective as it was considered in the past (39). Contrary to other dental treatment as extraction or oral surgeries, the endodontic pain would be mostly related to the chronic inflammation of the apical and peri-apical tissues that would lead to the activation of the cytokine network. By this fact, the continuous inflammation would lead to the increase of nociceptors and change of the functioning of local pain system, this modification could reduce the desired effect of steroidal drugs and their analgesic effect (38).

4.2.2 Contraindications.

Regarding the steroidal anti-inflammatory drugs, there is a limited factor to its used regarding certain specific patients. Glucocorticoids are contraindicated for patients presenting intestinal, or gastric ulcers, any fungal infections, intestinal pathologies like diverticulitis. Patients with renal pathology should also be excluded to steroidal treatment, as well as patients presenting diabetes mellitus, hypertension, or osteoporosis. Some studies have also shown that psychotic problems as schizophrenia should be a contraindication to the use of those anti-inflammatory drugs as it could increase the psychotic stress of the patients. Those specific patients set apart the possible secondary effects of Steroidal and Non-steroidal anti-inflammatory drugs are basically related to the posology intake, the appearance of adverse effect would relate to an abusive dose and frequency of intake.(39)

4.3 Intra-canal medications.

In the last 20 years, in a lot of studies, the administration of intra-canal medications, like Calcium Hydroxide, to reduce post-operative pain has been found very effective. Intra-canal medications help reducing bacterial irritant intra-pulpar and can lead to better outcomes and less sides effects after treatment. Steroids can also be used as intra-canal medication, but the clear effect of this pathway have not been proved already (40).

4.4 Procedures prevention.

More than systemic or local medication, some predisposition during the treatment can be considered to improve the outcome and reduce the incidence of pain postoperative. The aseptic instrumentation is essential to prevent the infection of the pulpar and peri-radicular tissue of bacterias. The techniques used should be chosen to prevent the minimum of debris by the apex of the roots and to remove the maximum irritants. Instrumentation should respect the 1-2mm retreat of the working lengths. And finally, to be careful with the risk of NaOCl tissue damage accidents that can happen if the needle is placed too far in the canal, or the pressure is not sufficiently light and insert with up-down movements (40). According to the study conducted by Cardenas Bahena A. and Sanchez-Garcia S, the risk is even higher that the most commonly found sodium hypochlorite, with concentration of 2.5% and 5.25%. These concentrations would not be recommended and could higher the risk of accidents (41).

II. Objectives.

The principal objective of our study will be to establish the percentage of patients with post-operative pain after an endodontic treatment in one or multiple visits. The aim of this research is to illustrate the prevalence of pain postoperative treatment in endodontic non-surgical treatment. The hypothesis correlated would be that the prevalence of postoperative pain in our research is corroborant with prevalence found in dental literature. The null hypothesis (H0) would be that the prevalence of postoperative pain in one or multiple visits endodontic treatment do not corroborate the dental literature founding. The secondary objective of our study will be to establish the correlation between post-operative pain in endodontics and associated factors.

The null hypothesis (H0) related to this objective would be that there is no relationship between the apparition of pain after endodontic treatment and the initial associated factors of each case.

III. Materials and methods.

Our study is orientated on the prevalence of post-operative pain and secondarily to factors associated with it; We directed a cohort study, to develop an analytical, descriptive, and prospective study on a specific group of patients. We are expecting from our results to lead us to approximately 50% of the patients responding positively to the presence of pain after their endodontic treatment. Moreover, this study will let us appreciate the different links between pain and preventive or risks factors already established in dental literature. The purpose of this study is to evaluate the important risk of pain after treatment in patients of an endodontic specialists' clinic.

This investigation will lead us to understand the incidence of pain after treatment, correlated to possible risk factors, as well as the potential relationship with preventive factors. These results could help to understand and potentially, reduce de probability of pain appearance in the future of endodontics. Our investigation is based on an anonymous questionnaire as presented in ANNEX 1, both addressed to patient and to

their endodontic (PG). We concentrated this survey on a specific clinic of the Community of Madrid specialized in endodontics treatments.

The questionnaire submitted to the patients and the dentists was previously approved by the Management of the Department of Dentistry under the code OD.011/2223 (cf. ANNEX 1).

The methodology used in this research is based on reproductible parameters. The study is based on a sample of 134 patients undergoing endodontic treatments. The survey was available from November 2022 to March 2023. The data storage was done using a base of data transcript from manuscript questionnaire, to an excel document expressing every data in tables, categorizing the following information: age of the patients, gender, teeth that needed treatment, date of the treatment, pulpal diagnostic, presence of osseous destruction, number of visits, anatomical complexity of canals, symptoms pre-endodontics, evaluation of the pain on a scale from 0 to 10 based on the scale of VAS (42), and the need of medication post treatment. The sample of the research was patients of more than 16 years old undergoing endodontic treatment. Every survey emitted to the sample's patients were preceded by an inform consent regarding the utilization of those data. Each data was anonymized, and non-identifiable and the patient firmed this informed consent before filling the questionnaire.

We organized our data following our inclusion and exclusion criteria. All results were translated in percentages, statistical mean, and medians, as well as risk ratios (RR) and Odd Ratios (OR) elaborating a correlation between the appearance of pain and the characteristics of each case. A Chi2 (X2) Test was reproduced based on a risk alpha α of ± 0,05. The rejection of the null hypothesis was based on the deducted P value. We based our research on previous studies of the literature related to post operative pain, that were all from less than 12 years. Every scientific article used were extracted from data based as PUBMED, Science Direct, and JOE (Journal of Endodontics), with filters permitting to restrict our research in terms of doubloons, dates, languages, and targets.

In our investigation we are going to include patients with permanent teeth, presenting no symptoms and symptoms of irreversible pulpitis before the endodontic treatment, necrotic pulp, or retreatment from previous endodontia. We did consider in our study only patients that signed the official inform consent aggregated by the Management of Department of Dentistry. Only will be taken into consideration for results patients treated by Endodontist Specialists. In this research will not be accepted patients of less than 16 years old. Will be excluded patients in need of surgical endodontia and patients that undergo endodontic treatment under different techniques than the previously calibers consienscious.

The technique used in every patient participating to the survey was done with the same techniques, using rotatories instrumentation Protaper Gold (DENTSPLY) and Blue Shaper (ZARCS) and the obturation with Gutta-Percha was done by vertical condensation with thermoplastic technique. The final irrigation was always done with Ethylenediaminetetraacetic acid (EDTA) followed by Sodium Hypochlorite, and a final irrigation of EDTA. The irrigation was enhanced by a positive activation.

IV. Results.

1. Establishment of the sample

134 patients from the clinic participated in the survey as established in ANNEX 2. We established a scale of 0 to 10 corresponding to the pain that the patient was suffering after the endodontic treatment. The patients had to quantify this pain from completely absent, to very painful as shown in ANNEX 1, in a base of quantitative, qualitative, and visual scales. The follow-up of the pain was taken several hours after the treatment, 24 hours, and seven days after the appointment.

From all our sample, only 3% of patients were referencing pain in the following hours after the end of the treatment. 3 of 4 patients qualified their pain as a 2 on the scale of pain corresponding to a mild pain experience, while one referenced a pain until 8 (severe pain). Each of those patients were presenting different initial diagnosis,

however it is important to note that the patient with a pain until 8 was retreated from a previous endodontic treatment. The treatment was done in multiple visits. One day after the treatment patients were reached and 26% of them were responding positively to the presence of pain. Most of those were referring a pain at 4 (54% of those patients), 6 of them presented a pain at 2 (17%), 7 a pain of 6 (20%), and 2 of them presented a pain at 8 (6%). Only one presented a pain at 5.

2. Results of the sample

2.1 Age and gender.

55% of the participants were men, 44% were female and 2 participants did not mention the gender. On the 132 participants who did mention their gender 31,6% of woman mentioned suffering from pain post-operatively, against 23,6% of men. The Odd Ratio (OR) regarding the gender (being a woman) correlated with the incidence of pain is OR = 1,53 results in a positive exposition as illustrate in ANNEX 3.

All participants were in the age range of 16 to 90 years old. All patients were categorized in different ranges of age. We classified them in ranges from 16 to 35 years old, from 35 to 54 years old, from 55 to 76 years old, and from 77 to 90 years old. 32 people of the sample were ranged between 16 and 35 years old, when 42 of them were between 36 and 54 years old, there were 53 patients between 55 and 76 years old and 4 of them were more than 77 years old. 2 patients did not mention their age, and one did not mention neither the gender nor the age. The median age of the sample being of 52 years old. Regarding the association between age and post-operative pain after endodontic treatment, we determined the OR of each range of age compared to the global sample related to the presence or absence of pain. OR (16-35) = 0,48 (P value = 0,59) which would be a protective factor of POP. OR (35-54) = 1,02 (P value = 0,97) is not significantly related to POP. OR (55-76) = 0,75 (P value = 0,48) corresponding to a protective factor and OR (76-90) = 0 due to the low amount of people in this category.

2.2 Type of teeth and arch.

75% of the treatments realized were done on posterior teeth, while 25% on the anterior sector. The OR (Anterior teeth) = 0,48 that should be considered as a protective factor, while OR (Posterior teeth) = 2,1 which is significantly a risk factor.

In our sample 63% of the teeth treated were maxillary teeth and 37% were mandibular teeth. The OR (Maxillary) = 1,08, not significantly correlated to the pain while the OR(Mandibular) = 0,32, indeed significantly protective factor of the incidence of pain after treatment.

The anatomical structure of each tooth has been classified as "Simple" or "Complex" following the number and anatomy of the roots and canals, complex orientation of roots, and difficulty of access. In teeth with a simple anatomy 20% of patients have referred to pain between the first hours after treatment and the following week while teeth considered with anatomical complexity have shown 46% of post-operative pain. The OR (complex) = 3,33 compared to OR (simple) = 0,30. (P value = 0,36) The results indicate that a complex anatomy seems associated with post-treatment pain.

2.3 Pulpar diagnosis.

The initial diagnosis of each tooth was categorized as followed: Vital pulp without symptoms, corresponding to an asymptomatic irreversible pulpitis (42% of the sample), Symptomatic irreversible pulpitis (23%), pulpal necrosis (21%) and retreatment of the tooth (14%). In those 134 patients, 34% of them were presenting important bone defect, most of all in the tooth needing retreatment where 79% of the retreated teeth presented bone loss, and necrotic tooth were 55% had also already lost bone structure. (Compared to 4% and 13% in patients with respectively asymptomatic and symptomatic irreversible pulpitis.) We related the presence or not of pain after the endodontic treatment, with the initial pulp diagnosis in each patient as expressed in ANNEX 4. In the 55 patients that were initially presenting vital pulp without external

symptoms, corresponding to an asymptomatic irreversible pulpitis, none of them were mentioning pain hours after the treatment. 6 of them presented pain 24h after the appointment (11%): one of them presented a pain up to 2, two of them presented pain up to 4, as well as 2 were presenting a pain up to 5 and one up to 6. One week after the endodontia, only 2 of them had persistent pain up to 4. All 6 patients were medicated after the treatment. 3 of them did take Ibuprofen from 3-4 days. 2 of 3 registered persistent pain after a week. 2 of them were prescribed external medications due to systemic conditions, during 1 to 2 days and one was medicated with paracetamol for 2 days.

On the 134 patients of the sample, 31 were diagnosed with symptomatic irreversible pulpitis. From those, 18 referred the apparition of pain post-treatment (58%). Only one of them did feel pain several hours after the treatment. 10 of them experienced a pain up to 4 the day after the treatment, 2 of them up to 2 as well as up to 6, and one of them expressed a pain up to 1.

All the 15 patients that experienced pain after 1 day were medicated during 1 to 3 days. Only one patient referred a persistent pain after one week up to 2.

From the 19 patients that had an appointment for retreatment, 9 patients were suffering from post-endodontic pain (47%). From those 9 patients, only one was suffering from pain up to 8 in hours after the treatment and was as well as persistent pain one week after up to 6 even after the intake of Ibuprofen. 24h after the treatment, they all have been experiencing pain from 2 to 8. All patients were prescribed Ibuprofen from 1 to 8 days.

In the 21 patients presenting initially a necrotic pulp, 6 of them were mentioning pain (29%). One of them presented pain in the following hours after the treatment judge as a 2, 3 of them presented a pain up to 4 the day after the appointment and one of them presented a pain up to 6 the day after the appointment, as well as a persistent pain of 6 one week after. The last one referred a pain up to 8 one day after the treatment, that was not persistent after the administration of antalgics.

All of them were medicated for the pain with Ibuprofen from 1 to 8 days. One patient was prescribed Amoxicillin for 8 days. 5 of the 6 patients resolved the pain after a day. In conclusion, from the patient diagnosed initially of asymptomatic pulpitis, 11 % of them have been experiencing pain, and 4% of them suffered from persistent pain after one week and medication.

From patient diagnosed of vital symptomatic pulpitis, 58% of them have been suffering pain post treatment and one patient corresponding to 3% ended up with an unresolved pain after a week. In the group of 21 patients having initially a necrotic tooth, 29% suffered pain after, with only one patient with persistence after one week and finally, from 19 patients coming for a retreatment of a previously endodontic tooth, 47% experienced pain. From all those 19 patients, one will suffer from unresolved prolongated post-endodontic pain after one week. Regarding each diagnosis, the OR (AIP) = 0,19; OR (SIP) = 5,03; OR (Necrosis) = 0,47 and OR (Retreatment) = 2,80. On another part, the RR (AIP) = 0,28; RR (SIP) = 2,82; RR (Necrosis) = 0,57; and RR (Retreatment) = 1,95. (P value = 0,95)

In general, 29% of patients have experienced a low or high pain after endodontic treatment from hours after the treatment to one week after the treatment and 3,7% did not resolve the pain with time nor medication. Most of patients referred the pain during eating, chewing, or biting.

2.4 Number of visits.

In our sample 95% of the treatment were done in one appointment and only 5% of them required multiple appointments. Most of them due to retreatment of the canals. The Odd Ratio (Simple visits) = 0,05 and the Relative Risk (Simple visits) = 0,28. However, the value is not significantly relatable due to the small group formed by patients undergoing endodontic treatment in multiple visits in our sample (7 patients).

2.5 Pre-operative pain and medication.

Before the treatment, 87 patients (65%) were not presenting clinical symptoms while 47 (35%) of them were symptomatic. One asymptomatic patient was treated with hypertensive drugs and 4 were taking anti-inflammatory drugs for extern reasons.

From the patients presenting symptoms before endodontia, 20 were not medicated, 14 were already taking anti-inflammatory drugs and antalgics, and 13 were under antibiotics and antalgic medications.

V. Discussion.

1. Association of post-operative pain in endodontics with age and gender

In our research the odd ratio at 0,48 which suggest that being young would be a protective factor against post-operative pain. The OR of patients from 35 to 54 was 1,02, it is not significantly related to POP, in fact the OR is significantly close to 1, meaning that being of middle adult age would be independent from the apparition of pain. Finally, the OR of patients of 55 to 76 years old was 0,75 corresponding to a protective factor and from 76 to 90 was 0, this last one was limited by the small number of patients in this category. Resulting from the sample that we have our OR are not much significant on this correlation, caused by the small number of participants having a small relatability. It seems that being young and older than 55 would influence the apparition of pain in positive way (increasing the prevalence of pain), however the P value (=0,69) from that hypothesis insinuate that the sample is not significantly large to deduct from those results, a concrete conclusion.

Regarding other studies, the results are very different following last year's researches. In different studies, the age and gender of the patients are found to be not significantly relevant either, regarding the prevalence of POP. Nevertheless, some studies have admitted a relationship between an increasing age with a higher risk of pain, while others considered the reducing width of canals with calcification and wear, a factor to prevent the possible postoperative pain (26). Regarding gender, a study from D.Sadaf

and M.Zubair Ahmad have shown a higher incidence of pain in female (65%) than in male (35%) (24). In the same way, a study about gender aspects in postoperative pain conducted in 2015 have shown that women seems to be more predisposed to develop pain after treatment than man (43). In a study made on a Tertiary care center of 2021, they assessed that groups that were needing more endodontic treatment would be female and young patients (44). Compared to our study in a sample of 134 patients, the prevalence of endodontic treatment need was more important in men than in women, and the prevalence of pain after treatment was more important in women than in men. The most important age range needing root canal treatment were around 52 years old, which do not correlate with most studies. However further studies would need to be undergone to come to a conjuncture.

2. Association of post-operative pain with the anatomical complexity of the teeth.

Our study did not succeed to significant correlation between the complexity of the tooth treated with endodontia and the POP, however our results were suggesting that a higher complexity of the structure of roots and teeth, was inducing a more important incidence of pain post treatment. A study of associated factors of post-operative pain conducted in 2018 have shown that the incidence of pain after endodontic treatment was significantly correlated to the anatomical complexity of the tooth and the number of canals, as well as the type of teeth treated. This study has demonstrated that the appearance of pain after treatment was higher in posterior teeth and multiple canals anatomy than in anterior teeth, which reflect the results of our proper study (45). In accordance with our research, the dental literature have shown that, the majority of the teeth needing endodontic treatment were posterior teeth, which correlate our results, showing an important predominance of posterior teeth treated (44). In a controversial way, a study on the instrumentation techniques incidence on POP conducted in 2013 supported that the implication of the anatomical characteristics were less when the correct instrumentation techniques was used properly (46). Finally,

some studies have also associated the potential pain after RCT and the arch concerned; Mandibular molars would be more at risk to produce pain after treatment compared to maxillary teeth that contradict our own results (5). In those studies, teeth that were not molars shows a lower rate of pain postoperatively (47).

3. Association of post-operative pain in endodontics with pulpar diagnosis.

Concerning our results, the odd ratios found illustrate that the odds that a patients suffer from postoperative pain after endodontic treatment if this one was suffering from asymptomatic irreversible pulpitis would be lowered from 81%, and from 53% if one was initially diagnosis with necrosis. In the other side, OR found are superior to 1, meaning that the odds of experiencing pain would be higher if the patient is diagnosed with symptomatic irreversible pulpitis, and retreatment. The Relative Risks are expressing similarly, that the probability of experiencing pain suffering from asymptomatic irreversible pulpitis or necrosis is lower than other diagnostic while symptomatic irreversible pulpitis and retreatment would increase this probability. However, as shown before by the resulting P value from the Chi Square Test performed, the results are not significantly relatable at a Risk α of $\pm$ 0,05. Some studies have shown the incidence of pain is more expected after treatment in necrotic pulp than in vital pulp. This pain would be related to the periodontal inflammation caused by the infection. Studies on flare-ups appearance shown than the incidence would be more recurrent in necrotic pulp than in acute or chronic pulpitis, even more in presence of periodical pathologies (48). Controversially, other studies of literature resulted in more pain prevalence in acute and chronic pulpitis than necrosis. Symptomatic irreversible pulpitis, linked to apical lesions have been found in literature, with a greater incidence of post-operative pain than other diagnosis (47).

In this same study regarding the Tertiary care research conducted on associated factors of pain post endodontic, the most found pulpar diagnosis was symptomatic irreversible pulpitis, while in our sample, 42% of patients were diagnosed

asymptomatic against 23% symptomatic irreversible pulpitis (44). In the clinical study conducted by S. Bhagwat and D. Mehta, was induced that the incidence of pain in vital or non-vital teeth was not significant, however it was shown that in most of the case, the pain had a tendency to dropped between 24h and the following weeks, this last statement correlate with our research, which show that after 1 week, less than 4% of patients recorded a persistent pain, while 29% were counted between the first hours to the first day post-operative (49). Related to the need of medications post-operatively, a study directed by A. Pereira in 2018 related to the profile of patients in dental emergencies, the most predominant diagnosis was the irreversible pulpitis, which resonate with our proper study that results by 65% of the cases. This same study has shown that the endodontic treatment was the most frequent dental treatment done in an emergency case, which is related to the pain pre-treatment that occurs very frequently. The need of systemic post-operative medication was significantly low, which results to less than 5% of prescriptions; compared to our study we can see that 24% of our patients were prescribed systemic medications as analgesics and/or antibiotics, after the treatment because of the pain (50).

4. Association of post-operative pain with treatment in one or multiple visits.

Concerning our own results, the P value was very low, inhibiting the possibility to conclude any concrete relationship without bias. However, the results were correlating with most of the studies previously published on the association between postoperative pain and multiple visits. Indeed, the RR and OR of simple visits suffering from pain were both very low, inducing that executing endodontic treatment in a single visit when it is possible could be a very important protective factor of future pain and discomfort. A randomized controlled trial done in 2016 conducted on the incidence of post-operative pain in RCT after one or two visits concluded that the frequency of appearance of pain after several hours were significantly higher during endodontic treatment done in two visits compared to a single visit, however the long-

term pain was not significantly related. In our sample only 7 cases were treated in multiple visits, which could not be significantly retable, however, 6 of those 7 patients experienced post-operative pain in hours and days after the root canal treatment (51). The study of Singh and Garg regarding the same thematic confirm that a treatment done in a single visit would lead to a less probable appearance of post-operative pain. (52). Confirming this hypothesis, in a research on the healing rate of 2017, it has been shown that even if the healing rate was not significantly different, the reported prevalence of pain was lower after one-visits treatments (53). Finally, it is very important to note that the necessity of a certain number of visits depends predominantly on each patient's situation.

VI. Conclusion

The post-operative pain is a very well-known potential secondary effect of endodontic treatment. It is indeed very important to establish prior to the treatment, a very detail medical history, complementary tests, and final diagnosis of the patient as well as a proper establishment of the treatment plan. In order to provide the best circumstances possible to patients and avoid a maximum risks of post treatment pain and discomfort, various associated factors need to be taken into account.

Our study, related to the past years studies on the same topic, have shown that the appearance of pain after a root canal treatment is expected in the several hours to days after the treatment in approximately 25 to 50% of the cases (In our sample, 29%). In contrary, this pain is expected to reduce in the several weeks after treatment to the order of 3 to 4% of patients (3,7% in our sample). It appears that the prevalence of POP would be more prevalent in female patients, of middle adult age, and in complexes anatomical teeth. The pulpar diagnosis that seems to be the more at risk would be the symptomatic irreversible pulpitis. This research has not shown any significant differences between teeth of mandibular and maxillary arch. Finally, despite the lack of patients in our sample to provide statistically significant, results suggest that multiple visits can be considered as a risk factor of potential post-operative pain. The limits of our studies have been situated in two different axes. Firstly, the limited number of examinators, creating an important bias in the extractions of results and secondly, the limited patients participating to the survey, restricting the possibility to achieve a reliable significance. The need of further studies related to those risk factors could lead to a more concluding relationship that could help dentists to diagnose and treat in the best condition possible to prevent postoperative endodontic pain.

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VIII. ANNEXES

ANNEX 1 : Survey related to patient undergoing endodontic treatment.

GRADUATION PROJECT
Degree Dentistry

Universidad Europea

PORCENTAGES OF CASES OF PATIENTS THAT PRESENT POST-OPERATORY PAIN AFTER ENDODONTIC TREATMENT PROCEDURE IN ONE VISIT OR MORE THAN ONE VISIT

Madrid, academic year 2022/2023

Consentimiento informado:
El presente cuestionario forma parte del Trabajo de Fin de Grado en Odontología de la Universidad Europea de Madrid titulado Título Trabajo Fin de Grado y dirigido por el Profesor/a Shirley Dallo El propósito del presente trabajo es indicar objetivos del trabajo y la información será recogida a través de una breve encuesta.

Su participación en este estudio es de carácter libre y voluntario, pudiendo solicitar ser excluido del mismo, sin justificación previa ni perjuicio para usted. La información recogida será confidencial y no se usará para ningún otro propósito fuera de esta investigación y derivados de la divulgación investigativa. Los datos recogidos serán completamente anónimos. No se solicitarán datos personales identificativos. Los datos que se recojan en la encuesta se tratarán de acuerdo con lo establecido en la Ley Orgánica 3/2018, de 5 de diciembre, de Protección de Datos Personales y garantía de los derechos digitales.

A los efectos de lo dispuesto en el reglamento de la Ley Orgánica 3/2018, de 5 de diciembre, de Protección de Datos Personales y garantía de los derechos digitales, queda informado y es expresamente consiente de la utilización de los datos proporcionados en la encuesta, con los fines anteriormente indicados. El presente consentimiento se otorga sin perjuicio de todos los derechos que le asisten en relación con normativa anteriormente citada, existiendo la posibilidad de acceder a la información proporcionada, rectificación, cancelación y oposición en cualquier momento que lo desee. Para ello debe dirigirse por escrito al tutor Prof. Shirley Dallo del tutor/a (SHIRLEY.DALLO@universidadeuropea.es).

¿Da su consentimiento de participación en la encuesta como voluntario/a para que los resultados en la encuesta se utilicen en el Trabajo Fin de Grado PORCENTAGES OF CASES OF PATIENTS THAT PRESENT POST-OPERATORY PAIN AFTER ENDODONTIC TREATMENT PROCEDURE IN ONE VISIT OR MORE THAN ONE VISIT ?

Si No

Firma del paciente:

_____

Edad : Sex :

Esta sección debe ser llenada por el endodoncista

Diente endodonciada : _____ **Fecha :** _____
Diagnostic pulpar :
• Pulpa vital — Pulpa necrotica — Pulp vital con sintomas — Retratamiento

Presencia de destrucción ossea ?
• Si
• No

Tratamiento ha sido hecho en :
• Una cita — Multiple cita

Tecnica de instrumentacion :
_____
Tecnica de obturacion:
_____

Anatomia de los canales considerada :
• Simple — Complicated

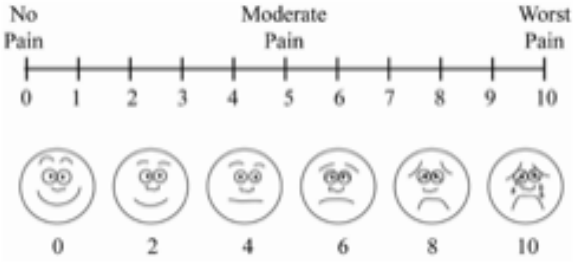
Sintio algún **sintomas** antes del tratamiento de este diente ?
- Si
- No

Toma algún tipo de medicación ? Si si, cual es ?
- Si
- No

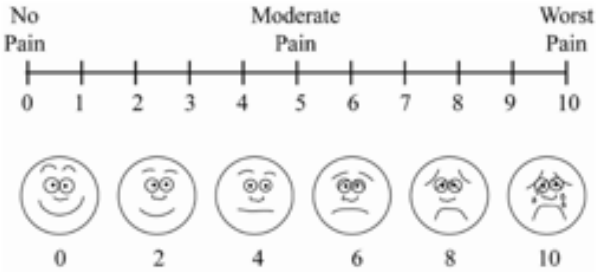
¿Presentaba alguna **inflamacion** antes del tratamiento?
- Si
- No

¿Sufrió algún **dolor** después del tratamiento de estos dientes?
- Si
- No

Si si,
En la siguiente escala podría calificar el dolor de 1 al 10, **1 dia después del tratamiento** :



En la siguiente escala podría calificar el dolor de 1 al 10, **1 semana después del tratamiento** :



¿Tenia que tomar medicación después del tratamiento? Si si, cual?

Si sí, cuántos días ha tomado este medicación?

¿Tuvo que comunicar con el dentista después del tratamiento debido al dolor?

Gracias por responder al cuestionario.

16 – 35 years old (32 Patients)										
Female (9 Patients)					Male (22)					
Anterior (4 Patients)		Posterior (5 Patients)			Anterior (6 patients)			Posterior (16 patients)		
Retreatment (2 patients)	Vital symptomatic (2 patients)	Vital Asymptomatic (3 patients)	Vital symptomatic (1 patient)	Retreatment (1 patient)	Vital Asymptomatic (1 patient)	Necrosis (2 patients)	Retreatment (3 Patients)	Vital Asymptomatic (8 patients)	Vital Asymptomatic (7 patients)	Retreatment (1 Patient)

36 - 54 years old (42 patients)											
Female (20 patients)					Male (22 patients)						
Anterior (2 patients)	Posterior (18 patients)				Anterior (10 patients)			Posterior (12 patients)			
Vital asymptomatic (2 patients)	Vital asymptomatic (7 patients)	Vital symptomatic (7 patients)	Necrosis (1 patient)	Retreatment (3 patient)	Vital Asymptomatic (8 patients)	Vital symptomatic (1 patient)	Necrosis (1 patient)	Vital Asymptomatic (4 patients)	Vital symptomatic (4 patients)	Necrosis (4 patients)	Retreatment (1 patient)

ANNEX 2.a : Table 1. Recapitulative of the sample.

(2 of the patients were not classified by missing information)

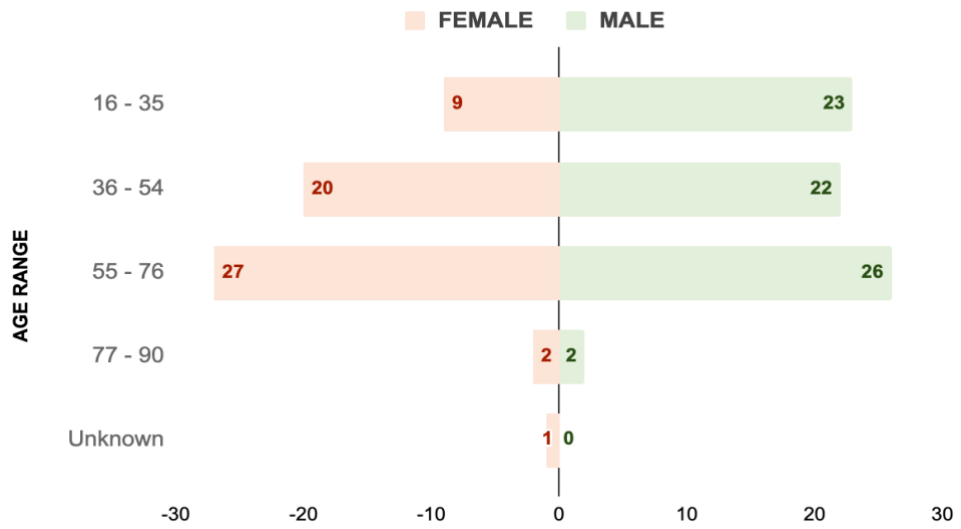
55 – 76 years old (53 patients)											
Female (27 patients)						Male (26 patients)					
Anterior (6 patients)		Posterior (21 patients)				Anterior (5 patients)		Posterior (21 patients)			
Retreatment (3 patient)	Vital asymptomatic (3 patients)	Vital asymptomatic (4 patients)	Vital symptomatic (5 patients)	Necrosis (11 patients)	Retreatment (1 patient)	Vital Asymptomatic (3 patients)	Necrosis (2 patient)	Vital Asymptomatic (9 patients)	Vital symptomatic (4 patients)	Necrosis (4 patients)	Retreatment (4 patients)

76 – 90 years old (4 patients)			
Female (2 patients)		Male (2 patients)	
Posterior (2 patients)		Anterior (1 patients)	Posterior (1 patients)
Vital asymptomatic (1 patients)	Necrosis (1 patients)	Vital Asymptomatic (1 patient)	Necrosis (1 patient)

ANNEX 2.b : Table 1.Recapitulative of the sample.

(2 of the patients were not classified by missing information)

ANNEX 3 : Table 2. Repartition and representation of gender and age related to pain post-operative. *(Relatives to patients of the sample mentionning their age and gender)*



	Pain	No Pain	Total
Women	19	41	60
Men	17	55	72
Total	36	95	132

	Pain	No pain	TOTAL
Age 16 to 35	11	21	32
35 to 54	11	31	42
55 to 76	12	41	53
More than 76	0	4	4
TOTAL	34	97	131

ANNEX 4: Table 4. Relationship between initial diagnosis and post-endodontic pain.

	AIP	**SIP**	**NECROSIS**	**RETREATMENT**	**TOTAL**
PAIN	6	17	5	9	37 patients
NO PAIN	49	14	24	10	97 patients
TOTAL	55 patients	31 patients	29 patients	19 patients	134 PATIENTS