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ENDODONTIC TREATMENT IN A SINGLE SESSION: SELECTION CRITERIA REGARDING POSTOPERATIVE PAIN

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ABSTRACT

Endodontics was modified due to technological advances, and the implementation of the technology allowed previous treatments in multiple sessions to be performed in a single clinical visit. But despite the possibility of shortening the time of dental intervention, many professionals are still reluctant about Endodontic therapy in a single visit, mainly due to the possible appearance of postoperative pain. Thus, this literature review has tried to elucidate the advantages of the therapy in a single session, as well as when the Endodontic intervention can be performed during a visit. For this, articles found in the databases through the following keywords: Endodontic or root canal obturation and Postoperative Pain; Phoenix Abscess and Endodontic; Post operative pain and Endodontic or root canal obturation; Preoperative pain and Endodontic were selected, reviewed and most appropriate, included in this narrative literature review. The results demonstrated that among the main advantages in the single view is the rapid return of tooth functions, reduction in the administration of anesthesia and antibiotic therapy, as well as the reduction in the chances of possible root recontamination. However, when it comes to postoperative pain, patients with pre-treatment pain will generally manifest painful sensation regardless of the technique used but as a way to prevent pain, treatment of non-vital teeth, with purulent or hemorrhagic exudation, with anatomical abnormalities or calcifications, presence of alveolar abscess, patients with previous flare-up and patients with symptomatic apical periodontitis, the procedure in a single visit should be avoided. In this way it is concluded that teeth with pulp alive or pulped teeth with absence of exudation, where the treatment time does not exceed 90 minutes, could be Endodontically treated in a single session.

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INTRODUCTION

Single-dose endodontic treatment is not considered a recent concept, Trallero in 1901, described the treatment in a single visit using bio-cloth washings, platinum sterilization, zinc oxide use, eugenol and xeroform paste (Oliet, 1983), but it was only in recent years that unique visits have gained adherents in dentistry. The multiple visits during the execution of the Endodontic treatment are conventionally used (Figini, 2008),

but the procedure that requires more than one visit to the Endodontist increases the probability of interruption of treatment, the risk of contamination, the appearance of flare-ups among others (Ahmed, 2016). Due to the evolution of techniques and equipment such as microscopes, foraminal locators, rotational systems of nickel-titanium, there was a reduction in the time necessary for the conclusion of the treatment, allowing it to be executed in a single visit. This change in methodology, in addition to increasing the success rate of Endodontic treatment, boosted the use of these technological innovations (Wong, 2014). The treatment regimen in a single session does not deviate from multi-session endodontic therapy, but due to the possibility of a single visit,

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it increases patient comfort and reduces the extra costs of multiple sessions, making it a choice in the option of treatment (Wong, 2014). In spite of the increasing preference of the professionals for the technique in a single session, one of the main fears in the adoption of the single session endodontic therapy is the occurrence of postoperative pain, in this way, the objective of this article of narrative review of literature was to discuss when the single session is an alternative that can be performed and describe the possible appearance of postoperative pain after the Endodontic technique.

MATERIAL AND METHODS

The articles of this narrative review were selected from the MEDLINE / PubMed (NLM), Science Direct, Lilacs Pubmed, Lilacs and Science Direct databases using the following keywords: (Endodontic or root canal obturation and Postoperative Pain); (Phoenix Abscess and Endodontic); (Postoperative pain and Endodontic or root canal obturation); (preoperative pain and Endodontic). After electronic searching, full articles were reviewed and the most appropriate ones were included in this article.

Advantage of the single session in endodontical treatment:

In the last two decades, Endodontics underwent a significant evolution through the implementation of mechanized instrumentation (Plotino, 2016). Technological advances through the inclusion of rotary and reciprocating motion of nickel-titanium alloys with surface heat treatment were fundamental to the progress of Endodontics (Gavini, 2018).

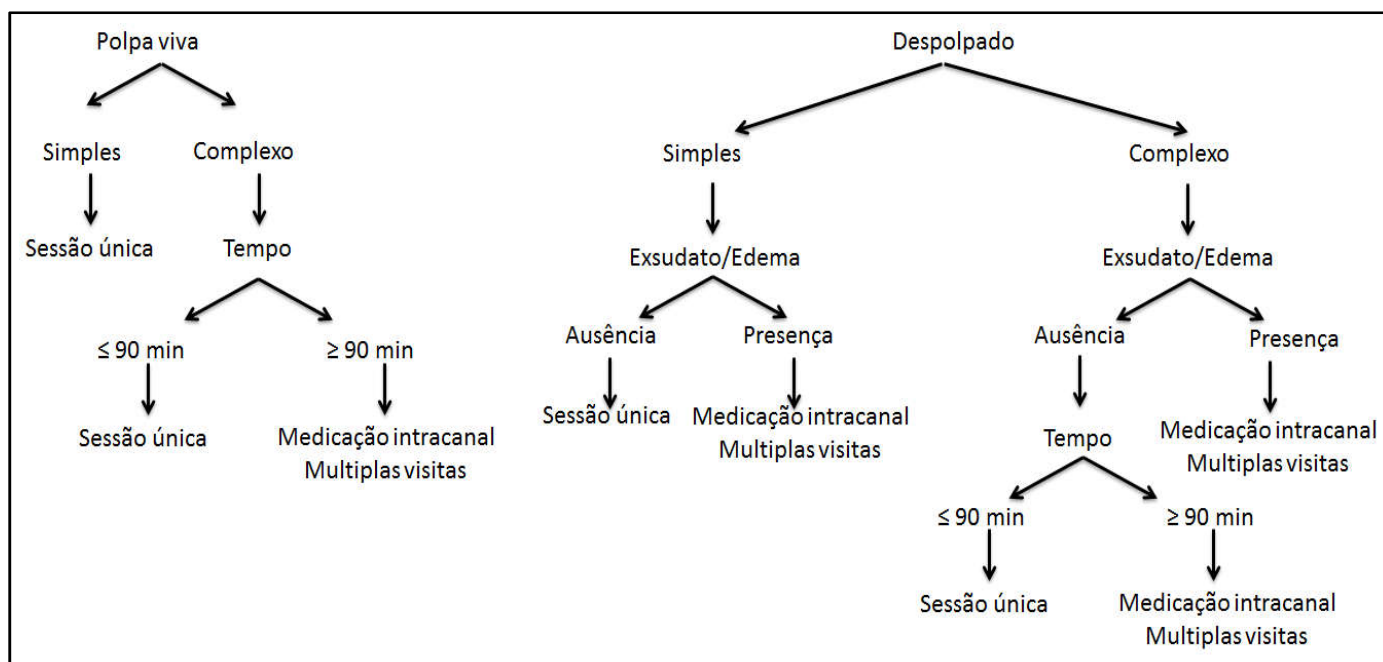
It is noteworthy that without endodontic technology, instrumentation of the root canals was performed manually through stainless steel files. Files used limbs were poorly flexible and increased the chances of perforation of the root canal. But the search for more malleable and resilient materials, and the breakthroughs in innovation, Endodontia has entered the Age of Technology (Iandolo, 2016). It is noteworthy that technological improvements have also been made to the electronic foraminifera locators, the incorporation of ultrasound into specific inserts, the use of magnification with operative microscopes, advances in imaging with the scanning of images such as convex beam tomographies, new systems and the improvement of biomaterials (Al-Rahabi, 2012). This inclusion of the technology in Endodontics was fundamental for the transition of the multiple sessions in a single visit to the Endodontist, bringing several advantages for the patient and for the dentist.

Evaluating the patient, among the facilities of a single visit are the reductions of expenses with locomotion and absences at work, the reduction of stress and the rapid return of the functions of the tooth. It is also worth noting that patients who require prophylactic antibiotic therapy due to the presence of cardiac lesions, vascular implants or immunosuppression, as well as patients requiring sedation or hospital admission, are the only ones that are extremely advantageous and may be a methodology of choice during treatment Endodontic (Chaudhry, 2016). But the advantages of the single visit are also observed during treatment. The single intervention decreases the amount of injected anesthesia, the need for reinstallation of absolute isolation, access to the tooth several times, the use of excessive intra-canal medication and the use of temporary restorations (Chu, 2014). But the dentist also benefits from the execution in a single visit, because the reduction in the chances of contamination and infiltration by

the reduction of the endodontic interventions (Schwendicke, 2017). In addition, this technique reduces the possible iatrogenies resulting from prolonged exposures of instrumentation (perforation, deviation, tear, and extrusion of debris / irrigators), improvement of the tactile sensation of preparation, anatomy and length of the canal, which during multiple visits are hampered by the inability to memorize (Sergio Endo, 2015). It is emphasized that problems of coronary infiltration and disruption of temporary sealing can be avoided in single session treatments. But perhaps the most important advantage is the prevention of root canal recontamination (Singh, 2012). During the multiple visit procedure, the use of intra-canal medication is not always efficient preventing the bacterial infiltration of saliva into the pulp cavity (Siqueira, 1998), thus, the treatment in a single visit avoids the recontamination of the cavity.

Pain in Endodontic Therapy: But one of the greatest hesitations in the use of Endodontic treatments in a single visit is the possible emergence of postoperative pain (Bhagwat, 2013). During the execution of the Endodontic treatment, it is necessary the cleaning and modeling of the channels, in an attempt to remove any possibility of localized contamination in the system of root canals, and finally the filling, providing an airtight seal (Chugal, 2017). But in some cases, there is the onset or persistence of pain after completion of Endodontic therapy. Among the factors involved in the appearance of pain after the Endodontic treatment are those that precede the intervention, the factors related to the procedure execution and the postoperative factors (Sipavičiūtė, 2014). Of the preoperative factors involved in the onset of pain after the endodontic intervention is the presence of pain prior to treatment. Patients with prior pain the intervention Endodontics tend to continue with painful manifestation after treatment associated with the presence of non-vital teeth, periradicular lesions, abscesses and fractures (Shibu, 2015). For in general, the primary etiologies are the causes of odontogenic pain. Inflammatory and infectious responses leading to canal treatment are responsible for pain after the intervention (Pamboo, 2014). In addition, the literature indicates that women tend to feel more postoperative pain than men, exalting physiological differences in this finding (Ince, 2009).

During the execution of the Endodontic procedure, the impossibility of performing the treatment without absolute isolation, irrigation extravasation, apical material extrusion and over-instrumentation may be responsible for the onset of pain⁽²¹⁾. However, it is important to stress that during preparation of the root canal, it may also occur to the extrusion of bacteria to the periradicular region leading to the onset of pain after treatment (Sadaf, 2014). Even during the procedure, in situations where the mechanical-mechanical preparation of the canal occurs through insufficient instrumentation, the imbalance of the microbial community may occur, eliminating some inhibitory species and favoring the permanence of other microorganisms, which may lead to exacerbation of the lesion, favoring with previously asymptomatic cases may become symptomatic (Jayakodi, 2012). But in postoperative conditions, temporary or permanent extravasation of obturator material and the use of medications during the technique may be related to pain after the intervention (Jawriwala, 2001). But knowing that when the source of the pain is pulping, the degenerating tissue must be removed, cleaned and properly



filled (Plotino, 2016). In the case of necrotic tissues, pain usually originates from portions of the canal that have not been properly filled and filled, harboring infectious pathogens that may trigger painful processes(3). In this case, the appearance of pain is closely related to the failure of the endodontic intervention (Estrela, 2014). But one of the causes of postoperative pain is through the appearance of symptomatic apical periodontitis, also known as flare-up or phobic abscess (Siqueira, 2013). Defined as an acute exacerbation of a pulpal or periradicular pathogenesis, with subsequent development of severe pain and edema after endodontic treatment (Carrotte, 2004). Although the reasons for the appearance of flare-up are not always evident, it is believed that there are factors associated with the patient and the therapeutic procedure in this response (Sipavičiūtė, 2014 and Walton, 2002). In this case, pain may be a consequence of mechanical factors (from preparation and instrumentation, presence of pulp residues in periapical tissue), chemical factors (irrigating solutions, intracanal medications and obturator materials) as well as the presence of contaminants microbiological (Bhagwat, 2013; Sipavičiūtė, 2014; Shibu, 2015; Quelice, 2017; Siqueira, 2003). Even when the endodontic instruments do not extend beyond the apical foramen, all preparation techniques can extrude dentine scrapings, pulp tissue residues, microorganisms and irritants through the apical foramen to the periapical region, and the relationship between extruded materials, periradicular inflammation, development of postoperative pain and flare-ups (Kashefnejad, 2016 and Siritapetawee, 2009).

Single visit or multiple visits?

In the case of a single visit or multiple visits in the onset of pain, Patil et al. (2016) observed that pain was significantly higher in patients who underwent two visits compared to patients exposed to treatment in a single session. It should be emphasized that the authors did not detect significant difference reported by the patients 48 hours after the endodontic treatment in both groups. The data described above clearly demonstrates that the single session procedure should not be ruled out based on a possible painful increase, demonstrating that the channel treatment can be safely

concluded in a single session. But the authors emphasize that the cases should be evaluated, not meaning that all endodontic treatment should be performed in a single session (Patil, 2016). Alvarez et al. Carried out a study with 171 patients and evaluated the efficacy of endodontic treatment in a single session on teeth with pulp and / or periapical pathologies. The researchers found that 81.87% of the treated patients did not present any postoperative symptoms, being this event restricted to those with apical periodontitis (Alvarez Rodríguez, 2014). In the case of the use of rotational systems, root canal preparation with the MTwo nickel-titanium (NiTi) system may cause lower incidence of postoperative pain when compared to manual K-type files.(31)Studies comparing manual and mechanized techniques have revealed that back-and-forth movements extrude more debris to the apex than techniques using rotating instruments (Kashefnejad, 2016). Therefore, it is advised that for the reduction of postoperative pain both for situations where the single session occurs and multiple visits, preference should be given to the mechanization of endodontic therapy.

DISCUSSION

This literature review has demonstrated that the single session has visible advantages over the multiple session. The different points of view about multiple sessions or single sessions in endodontic treatment are quite controversial, but in general they are associated with the possible emergence of post-surgical pain. Authors claim that endodontic treatment in multiple sessions does not reduce the incidence of pain. Many still report an increase in the incidence of postoperative pain after multiple visits and that there is no evidence that channel treatment in a single session undergoes any type of impairment of quality (Singh, 2012). Therefore, as a way of avoiding pain after endodontic therapy in a single session, the procedure should not be performed on non-vital teeth, with purulent or hemorrhagic exudation, with anatomical abnormalities or calcifications, presence of alveolar abscess, patients with anterior flare-up and patients with symptomatic apical periodontitis, being in these specific cases the choice for treatments in multiple visits (Ahmed, 2016; Wong, 2014 and

Estrela, 2014). Among the possible pain responses related to endodontic treatment, there are changes in periapical tissue pressure, apical periodontitis, presence of bacteria and / or virulence of the endodontic microbiota from the pre-installed process in the region or from the apical extrusion of infected debris⁽¹⁸⁾. In addition, the general health of the patient, the condition of the pulp and periapical tissues would be considered the factors associated with the patient. And the association of these two factors could exacerbate the inflammatory process leading to the undesirable effects of this painful response, but it is emphasized that in the previously reported cases, pain could be observed in both single and multiple session treatments (Shibu, 2015 and Pasqualini, 2012).

Studies have shown that, for the most part, pulpectomies have a lower incidence of postoperative pain development. However, the cases of pulpy teeth and acute periapical abscesses have the highest frequency of pain development. Suggesting that the inflammatory state of the periradicular tissue as well as the presence of periapical bacterial colonization due to the procedure or previous colonization predisposes the development of pain and flare-up (Walton, 2002). Due to the presence of microorganisms in the apical portion of the canal and the presence of periradicular lesions, it is necessary to decontaminate and debride the apical foramen during instrumentation. But it is emphasized that the accomplishment of the foraminal enlargement can impact on the possibility of development of postoperative pain, since the over-instrumentation on exacerbation can irritate the periapical tissues and cause pain (Silva, 2013). Several factors affect the extrusion of debris, such as irrigation protocol, apical diameter, time spent on root canal instrumentation, technique employed and instrument design. The existence of preoperative pain should be evaluated, and the presence of it may be a strong indication of possible postoperative pain. In this way, the prescription of analgesics for immediate use after treatment can be performed. These pains mostly occur during the first 24h-48h after obturation, usually regress within a few hours (10h-12h), but there are reports of persistence for a few days (Estrela, 2014). Researchers justify that the absence of pain in single session treatments may be due to the low complexity of the cases chosen for this methodology, considering that they are generally vital and non-problematic teeth. Another factor raised may be immediate filling, which reduces the chances of bacterial infiltration in temporary restorations. However, it should be noted that for the correct choice of treatment modality (single session or multiple session), the endodontist's ability and clinical experience, previously reported conditions of the tooth such as vitality, lack of bleeding during procedure, absence of apical periodontitis, and adequate time of treatment (noting that treatments that exceed 90 minutes should be considered in multiple visits), patient time limitations, medical history, and anatomical and biological considerations (Siqueira, 2013).

Conclusion

Single session treatment compared to multiple visits has been the subject of much debate in the Endodontic community. In the literature there are many articles that advise against the treatments Endodontics performed in a single session. But many of these works are based on a period of Endodontics where there was a constraint on the development of the alloys used in the manufacture of instruments, equipment

improvement, incorporation of digital images. The success of endodontic therapy is directly related to the competence of the chemical-mechanical preparation (eg active chlorine concentration, agent action time, complete removal of pulp residues), the technical capacity and clinical experience of the Endodontist, which directly reflect no postoperative pain. Based on the existing literature and the experience of the authors of the study, a diagram based on pulp viability, case complexity and the presence of exudate and edema were developed to follow the possible methodology chosen.

Thus, we conclude that single sessions can be performed with reduced chances of post-surgical pain in the following cases:

- Teeth with living pulp of low complexity;
- Teeth with live pulp, complex, but where the treatment time does not exceed 90 minutes;
- Pulled teeth with absence of exudate or edema;
- Pulled, complex teeth, with absence of exudate or edema, but that the treatment time does not exceed 90 minutes.

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REFERENCES

- Ahmed, F., Thosar, N., Baliga, Rathi. 2016. Single Visit Endodontic Therapy: A Review. *Austin J Dent Austin J Dent.*, 3(3) pp.1035–2.
- Al-Rahabi M, Abdulkhayum A. 2012. Single visit root canal treatment: Review. *Saudi Endod J.*,2(2) pp. 80. Available from: <http://www.saudiendodj.com/text.asp?2012/2/2/80/108156>
- Alvarez Rodríguez J, Teresita De Jesús D, Vázquez C, Odalys D, Alonso B, Boris E, *et al.* 2014. Tratamiento endodóntico radical en pulpa no vital en una sola visita The Endodontic Treatment in a non-vital dental pulp. Clinic following in a single consult. *Rev Habanera Ciencias Médicas.* 13(2):219–26.
- Bhagwat S, Mehta D. 2013. Incidence of post-operative pain following single visit endodontics in vital and non-vital teeth: An in vivo study. *Contemp Clin Dent.* Jul;4(3):295–302. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24124293>
- Bourreau MLS, Soares A de J, Souza-Filho FJ de. 2015. Evaluation of postoperative pain after endodontic treatment with foraminal enlargement and obturation using two auxiliary chemical protocols. *Rev Odontol da UNESP;*44(3):157–62.
- Carrotte P. 2004. Endodontics: Part 3 Treatment of endodontic emergencies. *Br Dent J [Internet].* Sep 25 [cited 2017 Sep 24];197(6):299–305. Available from: <http://www.nature.com/doi/10.1038/sj.bdj.4811641>
- Chaudhry S, Jaiswal R, Sachdeva S. 2016. Dental considerations in cardiovascular patients: A practical perspective. *Indian Heart J .*,68(4): 572–5. Available from: <http://linkinghub.elsevier.com/retrieve/pii/S0019483215009001>
- Chu C-H, Wong A, Zhang C. 2014. A systematic review of nonsurgical single-visit versus multiple-visit endodontic treatment. *Clin Cosmet Investig Dent.*, 6: 45-56. Available from: <http://www.dovepress.com/a-systematic-review-of->

- nonsurgical-single-visit-versus-multiple-visit--peer-reviewed-article-CCIDE
- Chugal, N, Mallya SM, Kahler B, Lin LM. Endodontic Treatment Outcomes. *Dent Clin North Am.* 2017; 61(1):59–80.
- Estrela C, Holland R, Estrela CR de A, Alencar AHG, Sousa-Neto MD, Pécora JD, et al (2014). Characterization of Successful Root Canal Treatment. *Braz Dent J.*, 25(1):3–11. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0103-64402014000100003&lng=en&tln=en
- Figini L, Lodi G, Gorni F, Gagliani M. 2008. Single Versus Multiple Visits for Endodontic Treatment of Permanent Teeth: A Cochrane Systematic Review. *J Endod.*, 34(9):1041–7.
- Gavini G, Santos M dos, Caldeira CL, Machado ME de L, Freire LG, Iglecias EF, et al. 2018. Nickel–titanium instruments in endodontics: a concise review of the state of the art. *Braz Oral Res.* 32(suppl 1):44–65.
- Iandolo A, Iandolo G, Malvano M, Pantaleo G, Simeone M. Modern technologies in Endodontics. (2016) *G Ital Endod.*, 30(1): 2–9. Available from: <http://dx.doi.org/10.1016/j.gien.2015.12.001>
- Ince B, Ercan E, Dalli M, Dulgergil CT, Zorba YO, Colak H 2009. Incidence of postoperative pain after single- and multi-visit endodontic treatment in teeth with vital and non-vital pulp. *Eur J Dent.*, 3(4):273–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19826598>
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC2761157>
- Jawriwala SP and Goel Br 2001. Pain in Endodontics : Causes, Prevention and Management. Vol. 13, *Endodontology.* p. 63–6.
- Jayakodi H, Kailasam S, Kumaravadivel K, Thangavelu B, Mathew S 2012. Clinical and pharmacological management of endodontic flare-up. Vol. 4, *Journal of Pharmacy and Bioallied Sciences.* S294–8.
- Kashefinejad M, Harandi A, Eram S, Bijani A (2016). Comparison of Single Visit Post Endodontic Pain Using Mtwo Rotary and Hand K-File Instruments: A Randomized Clinical Trial. *J Dent (Tehran).* 13(1):10–7.
- Ng YL, Mann V, Rahbaran S, Lewsey J, Gulabivala K. 2008. Outcome of primary root canal treatment: Systematic review of the literature - Part 2. Influence of clinical factors. Vol. 41, *International Endodontic Journal.* p. 6–31.
- Oliet S. 1983. Single-visit Endodontics: A Clinical Study. *Journal of Endodontics*, 9(4):147-152 Available from: <http://suffolkrootcanal.co.uk/wp-content/uploads/2015/04/Single-visit-endodontics-a-clinical-study-Oliet-1983.pdf>
- Pamboo J, Hans MK, Kumaraswamy BN, Chander S, Bhaskaran S. 2014. Incidence and factors associated with flare-ups in a post graduate programme in the Indian population. *J Clin Exp Dent.* 6(5):e514–9.
- Pasqualini D, Mollo L, Scotti N, Cantatore G, Castellucci A, Migliaretti G, et al. 2012. Postoperative Pain after Manual and Mechanical Glide Path: A Randomized Clinical Trial. *J Endod.* Jan;38(1):32–6.
- Patil AA, Joshi SB, Bhagwat S V, Patil SA. 2016. Incidence of Postoperative Pain after Single Visit and Two Visit Root Canal Therapy: A Randomized Controlled Trial. *J Clin Diagn Res.* May;10(5):ZC09-12.
- Plotino G, Cortese T, Grande NM, Leonardi DP, Di Giorgio G, Testarelli L, et al. 2016. New technologies to improve root canal disinfection. *Brazilian Dental Journal.* 27: 3–8. Available from: <http://dx.doi.org/10.1590/0103-6440201600726>
- Quelice H, Gonçalves T, Cardoso MM, Silva D. 2017. FACULDADE INTEGRADA DE PERNAMBUCO - FAPIPE ODONTOLOGIA Endodontia em sessão única; uma revisão de literatura.
- Sadaf D, Ahmad MZ 2014. Factors associated with postoperative pain in endodontic therapy. *Int J Biomed Sci.*, 10(4): 243–7. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25598754>
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC4289697>
- Schwendicke F, Göstemeyer G. 2017. Single-visit or multiple-visit root canal treatment: Systematic review, meta-Analysis and trial sequential analysis. *BMJ Open.* 7(2): 1–11.
- Sergio Endo M, Clara Lobianco dos Santos A, Jose Pavan A, Franco Queiroz A, Narumi Orita Pavan N. 2015. Endodontia em sessão única ou múltipla: revisão da literatura Endodontics in single or multiple visits: literature review., 20(3):408–13. Available from: <http://dx.doi.org/10.5335/rfo.v20i3.5014>
- Shibu TM. Post operative pain in endodontics: A systemic review. *J Dent Oral Hyg [Internet].* 2015;7(8):130–7. Available from: <http://www.academicjournals.org/journal/JDOH/article-abstract/566E2C554525>
- Silva EJNL, Menaged K, Ajuz N, Monteiro MRFP, Coutinho-Filho T de S. 2013. Postoperative Pain after Foraminal Enlargement in Anterior Teeth with Necrosis and Apical Periodontitis: A Prospective and Randomized Clinical Trial. *J Endod.* Feb;39(2):173–6.
- Singh S, Garg A. 2012. Incidence of post-operative pain after single visit and multiple visit root canal treatment: A randomized controlled trial. *J Conserv Dent.* Oct; 15(4) : 323–7.
- Sipavičiūtė E, Manelienė R. Pain and flare-up after endodontic treatment procedures. *Stomatologija [Internet].* 2014;16(1):25–30. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24824057>
- Siqueira JF, Lopes HP, De Uzeda M. 1998. Recontamination of coronally unsealed root canals medicated with camphorated paramonochlorophenol or calcium hydroxide pastes after saliva challenge. *J Endod.* 24(1):11–4.
- Siqueira JF, Rôças IN. 2013. Microbiology and treatment of acute apical abscesses. *Clin Microbiol Rev.* 26(2):255–73.
- Siqueira JF. 2003. Microbial causes of endodontic flare-ups. Vol. 36, *International Endodontic Journal.* p. 453–63.
- Siritapetawee M, Chailertvanitkul P, Jorns TP, Ngamjarus C 2009. Interventions for the management of post-endodontic pain. *Cochrane Database of Systematic Reviews.*
- Walton RE. 2002. Interappointment flare-ups: incidence, related factors, prevention, and management. *Endod Top.*;3:67–76.
- Wong AW, Zhang C, Chu C-H. 2014. A systematic review of nonsurgical single-visit versus multiple-visit endodontic treatment. *Clin Cosmet Investig Dent.*6: 45–56. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24855389>