Journal of Advanced Zoology

ISSN: 0253-7214

*Volume **44** Issue **S-1 Year 2023** Page **500:505***

Evaluation of the Effectiveness and Safety of Direct Treatment of Pulpal Protection as an Ultra-Conservative Option in Extensive Cervical Injuries

Luis Darío Pérez Villalba[1], Fernando Marcelo Armijos Briones[2]

[1,2,3,4]*Universidad Regional Autónoma de Los Andes Ambato. Ecuador.*

Email: ua.darioperez@uniandes.edu.ec[1], ua.fernandoarmijos@uniandes.edu.ec[2]

ORCID ID: 0000-0001-9810-8754[1], 0000-0002-5500-4768[2]

**Corresponding author's E-mail: ua.darioperez@uniandes.edu.ec*

Article History

Received: 06 June 2023
Revised: 05 Sept 2023
Accepted:11Sept 2023

Abstract

Treatment of deep caries can result in exposure of the dental pulp, even in teeth with sensitive but asymptomatic pulps. Direct pulp capping (DPU) is used to preserve pulp health, although it may sometimes require additional follow-up treatments, such as root canal treatment (RTC), which could have been performed immediately after exposure, possibly with better results. . The purpose of this case report is to highlight the advantages of RPD compared to TCR, which, while having a high success rate, is not a predominantly conservative approach. The follow-up evaluations were carried out in a time range that varied from 2 to 30 days. It is important to highlight that the present case contributes to the existing clinical evidence and provides a perspective on the effectiveness and clinical implications of RPD as an ultra-conservative alternative in the management of deep neck injuries.

Keywords: ***Cervical lesions, Dental pulp, Pulp cap, Root canals.***

1. Introduction

Clinicians are often faced with a dilemma during the treatment of deep caries approaching the pulp chamber: whether the dental pulp should be preserved to maintain vitality or completely removed to avoid necrosis, infection and induction of apical periodontitis. [(1)]. Concerns about the unreliability of vital pulp therapy (TPV) procedures, which include direct pulp coating (DPR), partial pulpotomy (PPR) and complete pulpotomy (CP), were mainly based on results derived from some follow-up studies. Pulpectomy procedures have success rates close to 90% [(2)]. Conversely, this success diminishes considerably for pulp coating and pulpotomy procedures. [(3)]. In a retrospective study, Barthel et al. [(4)] reported success rates of 37% and 13%, respectively, for 5- and 10-year follow-ups of direct pulp coating procedures. Also, Bjørndal and Others [(3)] showed a success rate of 31.8% for direct pulp coating and 34.5% for partial pulpotomy after 1 year. Although the shortcomings were evident in those follow-up studies, the unsatisfactory results led to the view that TPV should only be performed on teeth with open apices. [(5)], because the outcome of TPV performed on pulps exposed to caries of permanent teeth is unpredictable [(6)].

Another view that emerges from the literature is that VPT is only successful in teeth with mechanical or traumatic pulp exposure. [(7-8)]. The American Association of Endodontists (AAE) Glossary of Endodontic Terms [(9)] It recommends the use of direct pulp coating only when pulp exposure occurs mechanically (i.e., accidentally) or traumatically.

The diagnosis of irreversible pulpitis in permanent teeth is considered a contraindication for these procedures. These dental organs are conventionally treated with a complete pulpectomy. [(9-21)]. Contrary to this long-standing professional opinion, studies published before the 2000s [(10-11-22)] and

more recent ones have reported satisfactory results when a pulpotomy has been performed on exposed decayed pulps of vital teeth that presented signs and symptoms of irreversible pulpitis and even apical periodontitis [11-12-20]. Even a systematic review and meta-analysis published in 2019 indicated that TPV is a conservative treatment modality for irreversible pulpitis in permanent teeth. [13].

Similarly, it is known that cervical caries lesions that affect the pulp and require endodontic treatment must be complemented with a post / crown due to the additional coronal access required to directly enter the root canal system. What I can double, and even triple, the patient's expenses during the rehabilitation of that dental organ.

2. Materials And Methods

A prospective observational study will be conducted with the aim of evaluating the effectiveness of conservative treatment in deep carious lesions with pulp vitality. An adult patient presenting a deep carious lesion with pulp vitality in a lower molar tooth will be sampled. The inclusion criteria will be the symptoms of tooth sensitivity to cold and sweet stimuli, without pain on palpation or swelling in the apical area of the affected tooth. The participant must be willing to follow the treatment and follow up long-term.

Conservative treatment will be carried out on the deep carious lesion. This may include selective removal of caries, followed by the application of direct pulp protection materials, such as calcium hydroxide or glass ionomer cements, to protect pulp vitality and promote the formation of repairing dentin. Appropriate restorative treatment for the carious lesion will be provided.

Clinical and radiographic evaluations will be performed at different follow-up points, which can range from 6 months to 2 years. During these follow-up visits, tooth sensitivity, presence of pain or discomfort, integrity of the restoration, and pulp vitality will be evaluated. In addition, radiographic findings will be recorded to assess lesion progression and reparative dentin formation.

Variables to be evaluated will include clinical success of treatment, presence of pain or discomfort, pulp vitality, formation of restorative dentin, and integrity of the restoration. Complications and adverse events related to treatment will also be recorded. A descriptive statistical analysis will be performed to summarize the results obtained. Treatment success rates will be calculated and compared between different follow-up points using appropriate statistical tests.

The study will be conducted in accordance with established ethical principles and informed consent will be obtained from the participant. The confidentiality of the data will be guaranteed and the protocols for handling personal information will be followed.

The results of this study will provide relevant information on the effectiveness of conservative treatment in deep carious lesions with pulp vitality. These findings may help clinicians make informed decisions about the management of these injuries, avoiding invasive treatments such as endodontics in cases where pulp vitality is maintained. In addition, it will contribute to the development of evidence-based treatment guidelines to improve dental care and promote the preservation of natural dental tissues.

In conclusion, this prospective observational study will provide scientific evidence on the effectiveness of conservative treatment in deep carious lesions with pulp vitality. The results of this study may have significant clinical implications by providing up-to-date information for the management of these types of injuries and promoting a conservative approach for the benefit of patients.

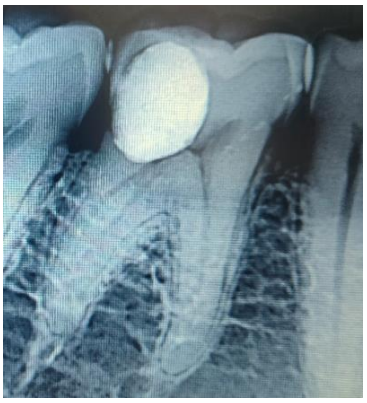
3. Results and Discussion

Case Report

A 40-year-old patient came to the dental clinic with a history of pain that was exacerbated by cold drinks and sweets in the lower right region for several weeks. Clinical examination showed a deep carious lesion at the cervical level in the first right lower molar. Thermal tests (Endo-Frost, Roeko, Coltene, Germany) reflected pulp vitality. There was no pain on palpation or swelling in the apical area of the dental organ in question. The clinical findings were confirmed with an intraoral periapical

X-ray (Figure 1) showing a deep lesion that was directed towards apical invading the protective periodontium.

Fig.1 Periapical X-ray showing the dental organ 4.6 with a deep carious lesion invading the cervical gum



Source: Authors.

The periapical radiography also revealed the absence of alteration in the periapex and because the patient is part of the health personnel and values prevention, it was decided to proceed with the removal of caries and later to direct pulp protection with Biodentine.

Procedure

After clinical and radiographic examination, the tooth was anesthetized with 2% lidocacine with adrenaline 1/200,000 (Scandonest Saint-Maur-des-Fosses Cedex, France), and subsequently isolated with a custom retractor clip for the Brinker B5 case (Hygienic, Coltène Whaledent, Langenau, Germany) and dental dam. Next, the tooth surface was disinfected with gauze soaked in 5% sodium hypochlorite (NaOCl) prior to caries removal. The cavity was prepared with a high-speed sterile bur with water coolant, caries was removed with a large low-speed round bur, and the cavity was rinsed with 2.5% NaOCl.

The exposed pulp tissue was additionally disinfected with 2.5% NaOCl for 2 minutes, and controlled that there was no hemorrhage (Figure 2).

Fig.2 Periapical X-ray showing the dental organ 4.6 during disinfection with 2.5% NaOCl for 2 minutes

Source: Authors.

Subsequently, Biodentine was mixed according to the manufacturer's instructions and placed in a 3mm layer above the pulp tissue using an amalgam carrier and gently packaged using a condenser.

After 12 minutes of waiting for the initial setting, a layer of resin-modified glass ionomer coating (Vitrebond; 3M ESPE, St Paul, MN) was applied and finally filled with a temporary sealing material (obture) for the final restoration after 3 months [(1)] (Figure 3).

Fig.3 post-treatment photograph showing the correct retraction of the gum that will later facilitate the definitive restoration

Source: Authors.

Tracking

Two days after the coating, the patient was contacted by phone to record the intensity of the pain. After one month the tooth was clinically examined for any signs or symptoms of pathology, including experience of pain, discomfort, soft tissue, inflammation, sinus tract, depth of probing bag, integrity of coronal restoration, coronal discoloration through visual perception of the colour of the treated tooth compared to adjacent teeth and mobility.

When was the treatment considered successful?

When there was no history of spontaneous pain or discomfort, except for the first few days after treatment, and the tooth was functional, no pain or discomfort when chewing or eating without sensitivity to percussion or palpation, normal grade I mobility and normal soft tissues around the tooth, without inflammation or sinus tract. It was successful radiographically when there was no intraradicular pathology, internal resorption or external root resorption.

Exposure of dental pulp due to various causes, such as caries, trauma or iatrogenic procedures, is a common phenomenon in dental practice. However, uncertainties remain about the durability and efficacy of pulp therapy in these cases. In addition, concerns arise as to whether definitive endodontic intervention may be necessary in the future, emphasizing the importance of carefully considering the circumstances in which these treatments are applied.

In addition, pulp exposure can pose clinical challenges, as a crucial decision must be made as to whether to maintain pulp vitality or perform a more invasive treatment that ensures complete pulp removal. This decision is based on the evaluation of various factors, such as the magnitude of pulp exposure, the presence of symptoms or signs of inflammation, the overall health of the tooth, and the patient's preferences.

In the field of conservative dentistry, vital pulp therapy has been put into practice, which includes techniques such as direct pulp coating and partial pulpotomy. These procedures seek to preserve pulp vitality and promote the formation of repairing dentin to protect the exposed pulp. However, there are concerns about the longevity and long-term effectiveness of these conservative approaches.

The need for definitive endodontic intervention in the future is also a matter of debate. Some clinicians consider that vital pulp therapy may be insufficient in certain cases and that performing a complete endodontic treatment could be the most appropriate option to ensure the long-term health and function of the tooth. This decision depends on the individual evaluation of each case, taking into account factors such as the extent of the pulp lesion, the presence of infection or periapical lesions, and the expectations and needs of the patient.

On the other hand, pulp inflammation, infection and the development of periapical lesions subsequent to RPD may not always be detected, possibly affecting the results of root canal treatment if necessary later. Instead, endodontic treatment is considered the most reliable and successful alternative. [14-22].

A relevant aspect that needs to be taken into account is the sequence of subsequent events. A study published in 2014 suggested that, despite requiring several controls, teeth with RPD were preserved for an equally long period of time compared to teeth that had received definitive endodontic treatment immediately. [15]. It mentions that, although there was great uncertainty about which treatment was more effective, RPD was less expensive, which could have a considerable economic impact given the prevalence of deep caries lesions [16-23]. and the frequency of pulp exposures that can be treated conservatively [17-24].

This case has several limitations. The age of the patient as well as the amount of dental tissue lost before the RPD can greatly influence long-term outcomes. In addition, other complications (e.g. risk of caries or lack of patient cooperation) were not analysed [18]. However, it is possible that this bias does not affect this outcome but simply increases the level of uncertainty, which in any case requires continuous follow-up for at least two years following treatment [19-25].

4. Conclusion

Based on the results obtained after one month of treatment, it can be affirmed that Direct Pulp Coating (CPR) procedures are an adequate option for the management of pulp exposures that occur during the removal of caries in teeth with initially sensitive and symptomatic pulps. CPR proves to be especially beneficial in young patients, in back teeth, and in caries lesions affecting the occlusal surface. However, it is important to note that its efficacy and cost may vary depending on the age of the patient, the location of the tooth and the type of pulp exposure.

In older patients, anterior teeth and in cases of proximal pulp exposures, endodontic treatment could be considered a more effective and cost-effective alternative. The selection of the therapeutic approach should be based on a thorough evaluation of each case, taking into account factors such as pulp viability, extent of injury, functional and aesthetic needs of the patient, and economic considerations.

Importantly, the long-term cost-effectiveness of initial therapies is influenced by the likelihood and type of follow-up treatments required. Regular monitoring and ongoing care are critical to assess treatment success and determine the need for additional interventions. In addition, it is essential to consider the patient's quality of life, potential side effects, and potential complications associated with each therapeutic option.

In conclusion, CPR procedures are an appropriate option for the treatment of pulp exposures during caries removal in teeth with initially sensitive and symptomatic pulps. However, the selection of the therapeutic approach should be individualized and consider aspects such as the age of the patient, the location of the tooth and the type of pulp exposure. Careful monitoring and ongoing evaluation are essential to ensure the long-term efficacy and cost-effectiveness of initial therapies.

References:

1. Ricucci D, Siqueira JF, Li Y, Tay FR. (2019). Vital pulp therapy: histopathology and histobacteriology-based guidelines to treat teeth with deep caries and pulp exposure. *J Dent*, 86, 41-52.
2. Ng YL, Mann V, Rahbaran S, Lewsey J, Gulabivala K. (2007). Outcome of primary root canal treatment: systematic review of the literature – Part 1. Effects of study characteristics on probability of success. *Int Endod J*, 40(12), 921-939.
3. Salgado MFS, Torres YLV, Jimenez LT. (2020). Conceptual mapping as a tool to understand the causes of traffic accidents. *University and Society*, 12(S1), 388–397. https://doi.org/10.24054/2020v12s1.1803
4. Medina CAR, Ortiz BET, Cordova MEV. (2020). Analysis of due process in the closure of customer service premises using Pestel analysis combined with Saaty's AHP. *University and Society*, 12(S1), 398–404. https://doi.org/10.24054/2020v12s1.1811
5. Bjørndal L, Reit C, Bruun G, Markvart M, Kjaeldgaard M, Näsman P, et al. (2010). Treatment of deep caries lesions in adults: randomized clinical trials comparing stepwise vs. direct complete excavation, and direct pulp capping vs. partial pulpotomy: Treatment of deep caries in adults. *Eur J Oral Sci*, 118(3), 290-297.
6. Barthel C, Rosenkranz B, Leuenberg A, Roulet J. (2000). Pulp Capping of Carious Exposures: Treatment Outcome after 5 and 10 Years: A Retrospective Study. *J Endod*, 26(9), 525-528.
7. Guideline on Pulp Therapy for Primary and Immature Permanent Teeth. (2016). *Pediatric Dent*, 38(6), 280-288.
8. Cvek M. (1978). A clinical report on partial pulpotomy and capping with calcium hydroxide in permanent incisors with complicated crown fracture. *J Endod*, 4(8), 232-237.

9. Trope M. (2008). Regenerative potential of dental pulp. *Pediatric Dent*, 30(3), 206-210.
10. Swift EJ, Trope M, Ritter AV. (2003). Vital pulp therapy for the mature tooth - can it work? *Endod Top*, 5(1), 49-56.
11. Ave NS. (Year not provided). *Glossary of Endodontic Terms*.
12. Garrido AS, Nava CAM. (2021). Moxibustion to strengthen the immune system. *University and Society*, 13(S3), 28–34. https://doi.org/10.24054/2021v13s3.2467
13. Ortiz VAS, Jimenez KVB. (2021). Methods for the decontamination and reuse of the N95 respirator during the Sars-Cov-2 pandemic. *University and Society*, 13(S3), 35–41. https://doi.org/10.24054/2021v13s3.2446
14. Mejare I, Cvek M. (1993). Partial pulpotomy in young permanent teeth with deep carious lesions. *Dent Traumatol*, 9(6), 238-242.
15. Zilberman U, Mass E, Sarnat H. (1989). Partial pulpotomy in carious permanent molars. *Am J Dent*, 2(4), 147-150.
16. Asgary S, Eghbal MJ, Ghoddusi J, Yazdani S. (2013). One-year results of vital pulp therapy in permanent molars with irreversible pulpitis: an ongoing multicenter, randomized, non-inferiority clinical trial. *Clin Oral Investig*, 17(2), 431-439.
17. Li Y, Sui B, Dahl C, Bergeron B, Shipman P, Niu L, et al. (2019). Pulpotomy for carious pulp exposures in permanent teeth: A systematic review and meta-analysis. *J Dent*, 84, 1-8.
18. Schwendicke F, Meyer-Lueckel H, Dörfer C, Paris S. (2013). Attitudes and Behaviour regarding Deep Dentin Caries Removal: A Survey among German Dentists. *Caries Res*, 47(6), 566-573.
19. Schwendicke F, Stolpe M. (2014). Direct Pulp Capping after a Carious Exposure Versus Root Canal Treatment: A Cost-effectiveness Analysis. *J Endod*, 40(11), 1764-1770.
20. Ridell K, Olsson H, Mejàre I. (2008). Unrestored Dentin Caries and Deep Dentin Restorations in Swedish Adolescents. *Caries Res*, 42(3), 164-170.
21. Schwendicke F, Meyer-Lueckel H, Dörfer C, Paris S. (2013). Failure of incompletely excavated teeth—A systematic review. *J Dent*, 41(7), 569-580.
22. Lucarotti PSK, Holder RL, Burke FJT. (2005). Outcome of direct restorations placed within the general dental services in England and Wales (Part 1): Variation by type of restoration and re-intervention. *J Dent*, 33(10), 805-815.
23. Deeks J, Dinnes J, D'Amico R, Sowden A, Sakarovitch C, Song F, et al. (2003). Evaluating non-randomised intervention studies. *Health Technol Assess*, 7(27). https://doi.org/10.3310/hta7270
24. Cando JLM, Ayala JMB, Hidalgo GFA. (2020). Draft reform to the general organic code of processes by determining a term to cite using the AHP method. *University and Society*, 12(S1), 269–275. https://doi.org/10.24054/2020v12s1.1785