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Pediatric Patient with Chronic Hyperplastic Pulpitis: Case Report and Pathology Overview

Oliver Renê Viana de Jesus[1*], Emanuele Souza Monteiro[1], Grazielly Andrade Melo dos Santos[1], Sabrina Adrielly Santos Lopes[1], Nadyne Andrade Cavalcante[1], Giovanna Alves Santos Massena[1], Cecília Bezerra de Meneses Corbal Guerra[2], Rangel Teles Freire[2]

[1]Mauricio de Nassau University Center, Aracaju, Sergipe, Brazil
[2]Master's Degree in Dentistry, Federal University of Sergipe, Aracaju, Sergipe, Brazil

Abstract: Pulp polyp (PP) is a type of irreversible pulpitis that occurs more frequently in young teeth, also referred to as chronic hyperplastic pulpitis or proliferative pulpitis, refers to a tissue condition characterized by excessive tissue growth in the pulp chamber. This process is often activated by an open cavity (traditionally induced by caries) and a chronic stimulus. This clinical case aimed to present a surgical traditional approach to extract a tooth diagnosed with a pulp pathology which is classified as a pulp polyp (PP) in a primary first molar. This article has been elaborated following the guidelines for case reports. A 7-year-old pediatric male patient with no systemic complications and no history of dental follow-up was referred to undergo care at the supervised internship clinic at the Maurício de Nassau University Center to assess his oral health condition in the year 2024 and to evaluate multiple caries lesions and sensitivity in some teeth. The patient didn't show any painful symptoms or signs of secondary infection and did not respond positively to pulp tests. The extraction of unit 74 was performed with minor local anesthesia and atraumatic technique. The removal was successful and the child did not have any complications, the recovery went well, respectively. Pulp polyps can be treated by removing the pulp polyp followed by pulpectomy or root canal therapy, which removes the diseased pulp and seals the canals, or, in extreme situations, by teeth extraction.

Keywords: Dental Pulp Diseases, Endodontics, Pulpitis, Oral Surgery.

Case Report

***Corresponding Author:**
Oliver Renê Viana de Jesus
Mauricio de Nassau University Center, Aracaju, Sergipe, Brazil

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1. INTRODUCTION

The primary cause of pathological pulp, root canal, and periapical diseases is the presence of bacteria in the tooth. Abbott (2022) demonstrates that bacteria can enter the dentine-pulp complex through various pathways such as through caries, injuries, fractures, and broken-down restoration margins. Multiple attempts have been made over the years to establish pulpal and periapical change classifications. However, many studies have demonstrated that there is no strong correlation between clinical signs, symptoms and the histopathology of a given clinical condition, however, the hyperplasia aspect is one aspect easily seen during the clinical exam performed by dentists [1].

Pulp polyp (PP) is a type of irreversible pulpitis that occurs more frequently in young teeth, also referred to as chronic hyperplastic pulpitis or proliferative pulpitis, refers to a tissue condition characterized by excessive tissue growth in the pulp chamber of the tooth and exophytic proliferation of granulation tissue with a pinkish-red color and fibrous consistency [14, 15]. The color can be easily noticeable while the diagnosis is carried out by the professional. Obtaining knowledge about the clinical characteristics of different sorts of pulp pathology is important to introduce a correct treatment recommendation [14].

When it comes to symptoms, according to Jardón *et al.*, (2022) the disease usually presents asymptomatically, although pain and bleeding on mastication are also described and reported by patients. This process is often activated by the existence of an open cavity (traditionally induced by caries) and a chronic stimulus interrupted. PP can be variable in size, ranging from an almost invisible lesion to extending beyond the tooth boundary [10]. Jesus *et al.*, (2024) discuss that even in purely endodontic cases, epithelial proliferation could result in a long junctional epithelial attachment. Jabbar *et al*., (2013) suggest that new polyps

are often more purplish and bleed more easily, while older polyps tend to be paler and less hemorrhagic [9, 10].

The pulp's defense response against irritants also influences the pathogenesis of pulp disease. The detection of immune cells, various classes of immunoglobulins, and inflammatory mediators in the inflamed pulp highlights the immune system's role in pathological changes in the dental pulp [12]. When a tooth is affected by a pulp polyp, it is not uncommon to observe signs of internal root resorption and a periapical lesion, also known as apical periodontitis [14].

If hyperplastic tissue grows beyond the cavity of the tooth, it appears as if the gum is growing into the cavity and the periapical radiograph shows a large open cavity with direct access to the pulp chamber [15]. This clinical case aimed to present a surgical traditional approach to extract a tooth diagnosed with a pulp pathology which is classified as a pulp polyp (PP) in a primary first molar. This article has been elaborated on following the guidelines for case reports.

2. CASE REPORT

A 7-year-old pediatric male patient with no systemic complications and no history of dental follow-up was referred to undergo care at the supervised internship clinic at the Maurício de Nassau University Center to assess his oral health condition in the year 2024 and to evaluate multiple caries lesions and sensitivity in some teeth. The information was provided by the individual of the family responsible who authorized and monitored the entire evaluation process and approaches to the patient who demonstrated collaborative behavior throughout the evaluation.

After collecting data for anamnesis and capturing detailed information from the family, the process of intra and extra-oral examinations started. During visualization of the intraoral aspect (Figure 1), numerous extensive carious lesions were immediately observed in the deciduous units and in the permanent teeth, which had a few already erupted. In the first consultation, the ideal treatment plan for the case in question was carried out, and it was determined that in the second session, the patient would undergo restorative protocol to preserve the dentition and the extraction of the deciduous unit with severe pulp involvement, which is element 74.

Figure 1: Clinical intraoral aspect, showing numerous extensive caries lesions
Source: Authors, 2024.

In one of the dental elements, the presence of chronic hyperplastic pulpitis was notable and also was the first suggestive pathology discussed, the periapical radiograph confirmed the diagnosis (Figure 2). The patient didn't show any painful symptoms or signs of secondary infection. The patient did not respond positively to pulp tests.

Figure 2: Clinical aspect of the pulp polyp
Source: authors, 2024

The extraction of unit 74 was performed with minor local anesthesia and atraumatic technique. The removal was successful and the child did not have any complications, the recovery went well, respectively. The restorative approach to the other dental elements was also executed and the patient is still being accompanied. Responsibles were instructed to take care of the oral health situation.

3. DISCUSSION

Leaci (2023) describes pulp hyperplasia as a response resulting from bacterial invasion into the pulp of a deciduous or permanent tooth, caused by prolonged

mechanical irritation, leading to a significant destruction of the crown. This response is possible due to the rich blood supply and favorable immune response of young dental pulp, making it more resistant to bacterial infection. Amato (2023) demonstrates that one of the consequences of periapical infection is the formation of a pulp polyp due to long-standing infection [3, 12].

Teeth with normal pulp do not exhibit any spontaneous symptoms. The pulp will respond to electrical tests, and the symptoms produced by such tests will be mild, causing no discomfort to the patient and resulting in a transient sensation that disappears within seconds. Radiographically, there may be varying degrees of pulp mineralization but no evidence of resorption, caries, or mechanical pulp exposure. No endodontic treatment is indicated for these teeth [5].

When it comes to radiograph aspects, it is important to highlight that periapical radiography is essential in the process of understanding the lesion progress and Kahler *et al*., (2023) express that the radiographic examination is another essential part of pulp diagnosis [8, 11]. As irreversible pulpitis progresses (Figure 3), an increase in periodontal ligament space may be evident on radiography [13]. Deep restorations, caries, pulp exposure or any other direct or indirect aggression to the pulp, whether recent or not, may be present. Characteristically, when symptomatic irreversible pulpitis remains untreated, the pulp will eventually become necrotic [5, 13].

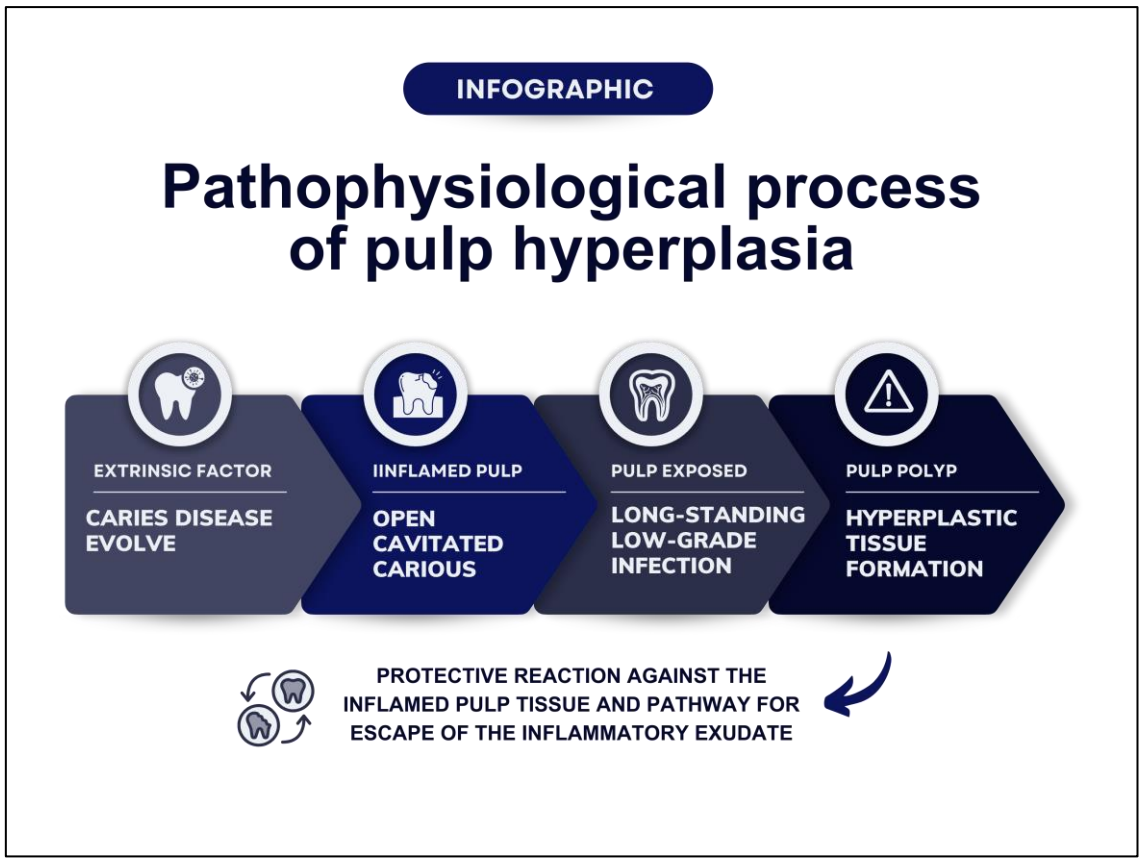

Figure 3: Infographics describing irreversible pulpitis aspects (defined by Lopes & Siqueira, 2015)
Source: authors, 2024

Regarding pulp pathology, extremely deep carious lesions were often associated with severe pulp inflammation and infection, and a radiographic threshold between deep and extremely deep lesions is suggested as an indicator of the bacterial penetration level and the severity of the pulpal response before intervention. Besides radiographic exams, there are other forms to perform a diagnosis and understanding of the intensity of the lesion, which normally occurs due a trauma process [6].

Pulp polyp is known as chronic hyperplastic pulpitis clinically it appears as a proliferative red mass associated mostly with the occlusal surface of vital molars in individuals with higher immunity and resulting from a long-standing low-grade infection. It is considered a protective reaction against the inflamed pulp tissue resulting in hyperplastic tissue formation (Figure 4) [2]. It occurs in an open cavitated carious or fractured tooth which acts as a pathway for escape of the inflammatory exudate [2].

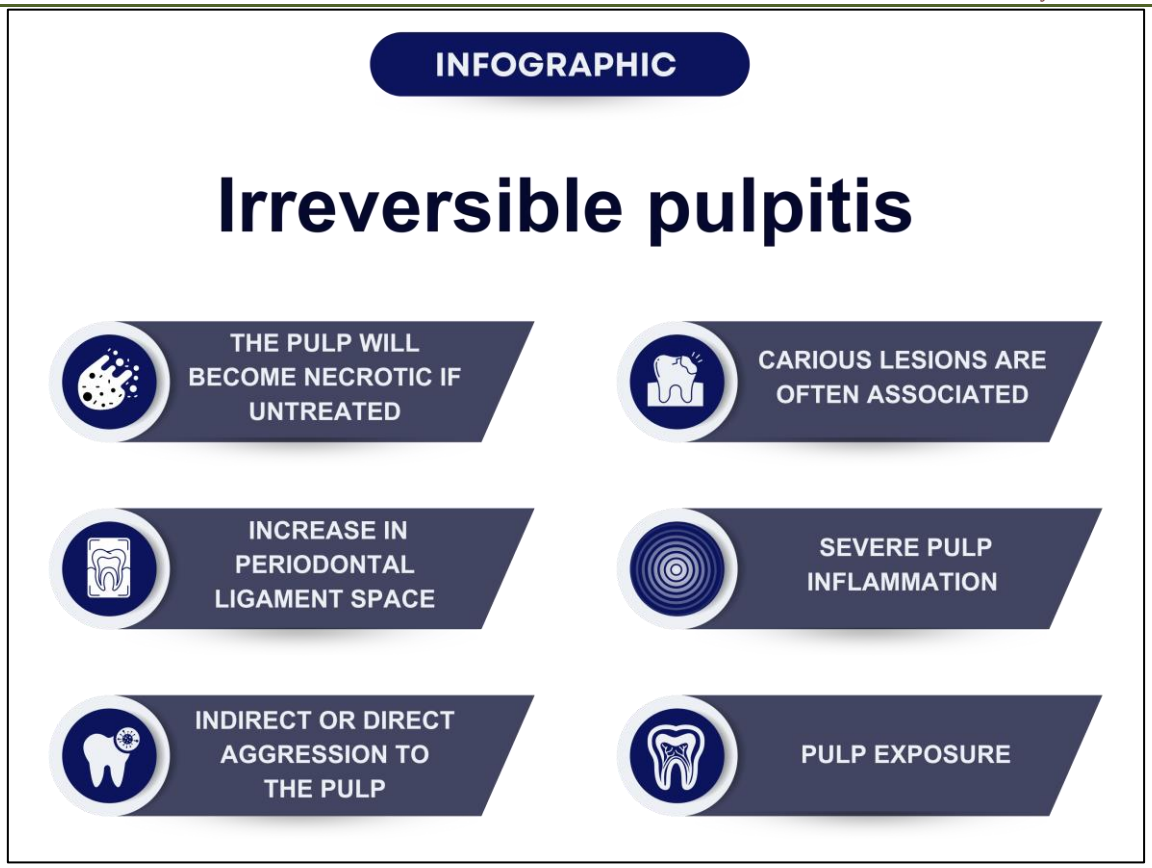

Figure 4: Infographic illustrating how the pulp begins a hyperplasic process after the development of a pulp pathological reaction (described by Alrifai *et al.*, 2022)
Source: Authors, 2024.

As the carious lesion approaches the pulp, there is a critical exacerbation of the initial chronic inflammation, which is characterized by an influx of neutrophils. The accumulation of inflammatory cells becomes marked when the front of the infection reaches the tertiary dentin. Pulp exposure in primary teeth and immature permanent teeth can lead to a proliferative response or hyperplastic pulpitis exuberant inflammatory tissue proliferates through exposure forming a "pulp polyp" [13]. It is likely that an intense blood supply, associated with extensive lymphatic and oral drainage, allows this proliferative response to occur. Conventional endodontic therapy or progressive vital pulp therapy is indicated.

The proliferative response to caries in a young tooth is called proliferative pulpitis, hyperplastic pulpitis, or pulp polyp. On the other hand, if there is a pulp polyp and the bleeding stops normally after the removal of the coronary pulp, a pulpotomy may be performed instead of a more radical procedure [13]. The case reported was incompatible with a conservative approach, not only because of the patient's economic situation but also because the permanent tooth was at the eruption stage.

The pulp polyp could also influence on dentist's clinical decision-making, as it is a rare event, and many professionals may be unaware of treatment alternatives [9]. Facing the complexity of diagnosis, many clinicians could frequently opt for dental extraction in cases of PP, as represented in the proscript case report, as well. Otherwise, studies made by Jabbar *et al*., (2013) corroborate that endodontic treatment is often the first option instead of early primary tooth extraction. Therefore, the authors corroborate that the presence of a pulp polyp does not lead to early primary tooth loss as observed in some stages of the necrosis process [9].

4. HISTOPATHOLOGICAL ASPECTS

Histologically, Singh *et al*., (2020) authenticate that the granulation tissue proliferates and becomes pink to reddish (depending on the degree of fibrosis), and sometimes appears covered by a stratified surface epithelium [15]. Although its incidence is low, numerous cases of this pathology have been reported in recent decades, especially in children, adults, and even infants [14].

PP can occur in deciduous and permanent dentitions. In some cases, two PPs have occurred bilaterally in the same patient, and three pulp polyps have even been described in different teeth at the same time [10]. The presumptive diagnosis is clinical and

radiographic, although it must be confirmed by histopathological study [10].

Some of the characteristics of chronic conditions, especially chronic hyperplastic pulpitis, are the simultaneous signs of active inflammation, tissue degradation, and commitment to healing [12]. This condition is marked by a non-exudative proliferative response, evidenced by the proliferation of granulation tissue in various pits or fissures. Angiogenesis is observed, leading to significant vascular compromise and fibrosis that affects the pulp's defense capacity [12]. Furthermore, chronic inflammatory cells such as polymorphonuclear neutrophils, lymphocytes, and plasma cells are identified.

A very enlightening and routine example of asymptomatic irreversible pulpitis is the clinical picture of the appearance of the pulp polyp, which has a direct clinical relationship with the histological picture of chronic hyperplastic pulpitis. Although these two pathological entities are strongly correlated, it is necessary to emphasize that it is more appropriate for the dental surgeon to use the term pulp polyp in his clinical diagnosis, since hyperplasia (increase in the number of cells) is a manifestation only observable in the microscopic examination of this disease [13].

It is confirmed that pulp defense cells play a key role in the pathogenesis of pulp polyps due to the difference in the number of immune cells and mediators in the carious lesion compared to teeth without caries [3]. The substantial amount of immunoglobulins (IgE), CD8+ T cells, CD4+ T cells, and B cells in an advanced caries cavity is capable of provoking a type 1 hypersensitivity reaction to deal with inflammation. However, in smaller cavities, only CD8+ T cells are present [12].

Studies confirm that there are a greater number of mast cells and a higher concentration of histamine, immunoglobulin E, and interleukin-4 in the pulp polyp zone compared to normal pulps, and a close correlation between IgE and histamine concentrations. It is well established that mast cells are the only human tissue cells that contain histamine and express very high-affinity receptors for immunoglobulin E (IgE) [12, 13]. IgE and mast cells play an essential role in allergic and type I hypersensitivity reactions. Tissue mast cells are normally coated with IgE, indicating that type I hypersensitivity or allergy is involved in the pathogenesis of pulp disease [12].

The pulp polyp as a diseased tissue contains appropriate amounts of stem cells with differentiation potentials comparable to those of the functional normal pulp. They are non-invasively acquired tissue resources usually discarded during endodontic therapies. This may provide a chance to access a new possible source of stem cells for affected patients [4].

5. FINAL CONSIDERATIONS

The pathology is an uncommon response to trauma that exposes the pulp to the oral environment. PP can be treated by the removal of the pulp polyp followed by pulpectomy or root canal therapy, which removes the diseased pulp and seals the canals, or, in extreme situations, by extraction of teeth, as presented by the case reported in this article. The pathological aspects of pulp pathology still need to be researched by other specialists to understand the newest information about physiology. The studies show the necessity of other publications and investigations regarding the treatment modalities of the disease discussed.

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