CASE REPORT

Selective removal of hidden caries in permanent molars: a clinical and radiographic analysis - Case Report

Remoção seletiva de cárie oculta em molares permanentes: uma análise clínica e radiográfica - Relato de Caso

Pedro Henrique Acioly Guedes Peixoto Vieira[1], Wanessa Fernandes Matias Regis[2], Davi Costa Melo Praciano[1], Isabelle Montenegro Alves Marinho[1], Raquel Moreira Veiga de Castro[1], Lidiany Karla Azevedo Rodrigues[2]

1. Department of Dentistry, Unichristus, Fortaleza, Ceará, Brazil. 2. Department of Operative Dentistry, Postgraduate Program in Dentistry, Faculty of Pharmacy, Dentistry and Nursing, Federal University of Ceará, Fortaleza, Ceará, Brazil.

Abstract

Background: Hidden caries is characterized by lesions that cannot be detected exclusively through clinical examination, requiring the use of radiographic examinations for their identification. **Case Report**: This case study presents the management of two lower molars with microcavitations and enamel shading. Additionally, the presence of a pigmented occlusodistal fissure in one of the elements is noted. The radiographic examination revealed an extensive carious lesion in the dentin, which was not in proximity to the pulp and did not exhibit any periapical lesions. This finding led to the diagnosis of hidden caries. The technique of selective removal of the carious tissue was chosen due to its depth and the potential risk of pulp exposure. Then, the dentin/pulp complex was protected, and the definitive restoration was performed. **Conclusion**: The progression of hidden carious lesions can lead to tooth destruction without visible clinical signs. Treatment should adhere to minimally invasive dentistry principles to preserve tooth structure and reduce the risk of pulp exposure.

Keywords: hidden caries; dentin caries; minimally invasive dentistry.

Resumo

Introdução: A cárie oculta caracteriza-se por lesões que não são detectáveis exclusivamente por meio do exame clínico, exigindo a utilização de exames radiográficos para sua identificação. **Relato de Caso**: Apresentamos o manejo de dois molares inferiores com microcavitações e sombreamento do esmalte, além da presença de fissura oclusodistal pigmentada em um dos elementos apresentados. O exame radiográfico revelou uma lesão cariosa extensa na dentina, sem proximidade com a polpa e sem lesão periapical, estabelecendo o diagnóstico de cárie oculta. A técnica de remoção seletiva do tecido cariado foi escolhida devido à sua profundidade e ao risco potencial de exposição pulpar. Em seguida, o complexo dentina/polpa foi protegido, e a restauração definitiva foi realizada. **Conclusão:** A progressão de lesões cariosas ocultas pode destruir dentes sem sinais clínicos visíveis. O tratamento deve adotar princípios de odontologia minimamente invasiva para preservar a estrutura dental e reduzir o risco de exposição pulpar.

Palavras-Chave: cárie oculta; cárie dentinária; odontologia minimamente invasiva.

INTRODUCTION

Dental caries affects approximately half of the global population and represents one of the most prevalent non-communicable diseases worldwide[1]. The disease arises from the interaction between the tooth, the cariogenic biofilm, and a sugar-rich diet[2]. The initial clinical manifestation of dental caries is an increase in enamel microporosity, which can lead to lesions of varying extent and depth, influenced by the continuous processes of demineralization and remineralization that occur simultaneously[3].

The terms “hidden caries”, “occult caries”, “developmental caries”, or “pre-eruptive caries” are used to describe lesions that are not identifiable through clinical examination alone; these lesions can only be detected via radiographic imaging[4]. In these lesions, the occlusal and/or proximal surfaces appear free of caries, exhibiting healthy enamel or minimal demineralization, yet large demineralized areas are present in the underlying dentin[5]. These lesions are frequently undetected during routine clinical examinations, highlighting the necessity of combining clinical and radiographic methods for their detection[6].

Numerous theories have been proposed regarding the etiology of hidden caries. The most widely accepted hypothesis suggests that it is an acquired defect, developmental in nature, arising from intracoronal resorption[7]. Resorptive cells such as osteoclasts, multinucleated giant cells, and chronic inflammatory cells

Correspondence: Lidiany Karla Azevedo Rodrigues, DDS, MSc, PhD, Full Professor Postgraduate Program in Dentistry, Faculty of Pharmacy, Dentistry and Nursing Federal University of Ceará, Fortaleza, Ceará, Brazil. Rua Monsenhor Furtado - S/N - Rodolfo Teófilo – Zip code: 60430-355 Email: lidianykarla@ufc.br

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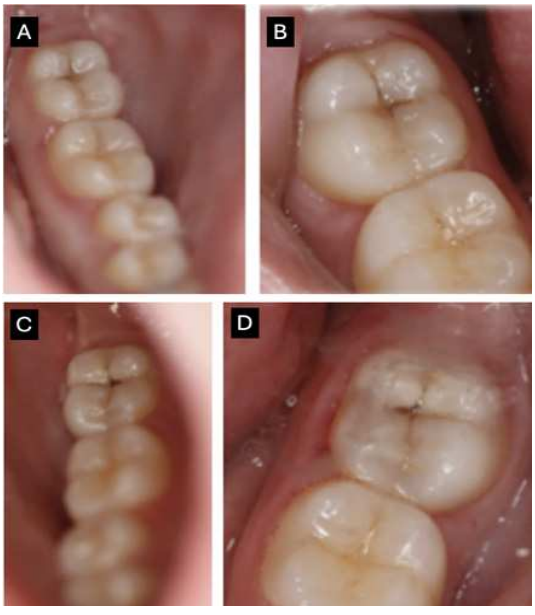
infiltrate the dentin through microperforations in the forming crown[8].

Advances in science and the concept of conservative treatments, which involve the selective removal of carious tissue, have gained increasing acceptance and demonstrated greater success in maintaining pulp health[9]. These procedures are based on the concept of minimal intervention, aiming to preserve as much healthy tooth structure as possible, thus maintaining tooth functionality. This approach supports an updated form of treatment for dental caries lesions[9]. Given the difficulty in diagnosing hidden caries lesions and the ongoing search for procedures that can provide patients with less traumatic and more conservative treatments, this study aims to present and discuss the treatment of hidden caries lesions by reporting a case report.

CASE REPORT

A 20-year-old girl was referred to the Dental School Clinic of the Christus University Center (UNICHRISTUS) in Fortaleza, Ceará, Brazil, with cold sensitivity in her posterior teeth. During anamnesis, no systemic alterations were found. The intraoral clinical examination revealed the presence of a pigmented occlusal-distal with underlying dentin shadows on the lower right second molar (47) (Figure 1). The occlusodistal surface of the lower right second molar (37) (Figures 1A and 1B) appeared clinically similar to tooth 47 (Figures 1C and 1D). Both were classified as ICDAS 4 (International Caries Detection and Assessment System)[10].

Figure 1. (A) The initial appearance of tooth 47 in occlusal view; and (B) the initial appearance of tooth 47 in occlusal view and at higher magnification. (C) The initial appearance of tooth 37 in occlusal view, and (D) the initial appearance of tooth 37 in occlusal view and with greater magnification



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A cold sensitivity test was performed on teeth 37 and 47, applying refrigerant spray (Endo-Frost®) as a cotton pellet saturated with the substance on the occlusal surface of the respective tooth. The response to the sensitivity test on both teeth was positive, passing quickly after the stimulus was removed, indicating a pulp within normal standards. Vertical percussion and palpation tests were then carried out on both teeth, and the results were negative, indicating values within the normal range.

As a supplementary examination, periapical and interproximal radiographs were obtained, which corroborated the presence of a deep caries lesion in dentin on tooth 47 (Figures 2A and 2B) and tooth 37 (Figures 2C and 2D). It confirmed the diagnosis of hidden caries. The recommended treatment plan was to selectively remove the decayed tissue.

First of all, the patient was anesthetized, and rubber dam isolation was performed. The initial approach to the carious lesions on teeth 37 and 47 involved using a high-speed diamond bur no. 1013 with water irrigation to access the crowns. Carious tissue was removed from the surrounding walls, followed by selective caries removal from the pulpal wall of the cavities using a low-speed carbide bur no. 3. Dentin excavators, appropriate for the cavity size, were used to aid in removing the decayed tissue without penetrating the pulp chamber during the procedure.

On the surrounding walls, non-selective removal was carried out until hard dentin was reached, and on the pulpal wall, selective removal was performed up to leathery dentin[11], leaving a layer of dentin at the bottom that could be remineralized according to current literature[12].

The dentin-pulp complex was protected by applying calcium hydroxide cement (Hydcal® - Maquira, Paraná, Brazil) evenly and extensively to the floor of the cavity, followed by a provisional restoration with Resin-Modified Glass Ionomer Cement in a capsule (Riva Light Cure® - SDI Limited, Victoria, Australia) on teeth 47 (Figure 3A) and 37 (Figure 3E), which was then light-cured. Finally, the restorations were finished and polished.

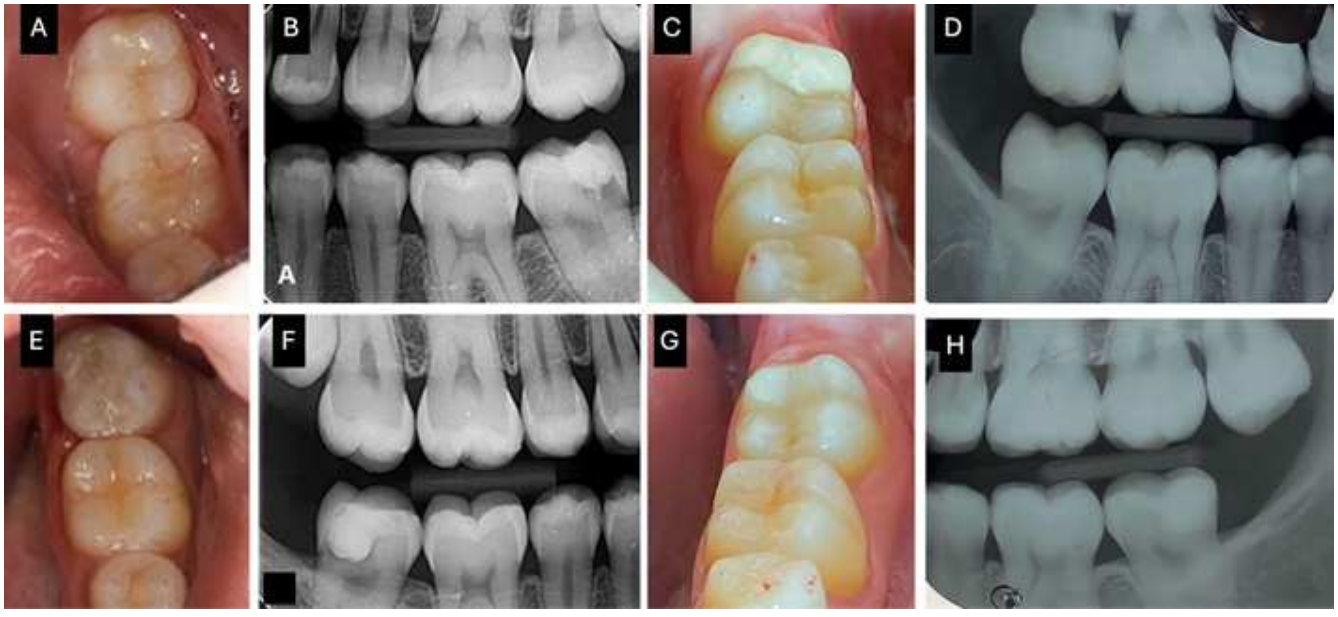
After sealing the cavity, a new radiograph (interproximal radiograph) was taken of elements 37 (Figure 3B) and 47 (Figure 3F) to check the adaptation of the material in the cavity, and the patient was instructed to return 90 days after the appointment. After 90 days, new endodontic tests were carried out: the cold sensitivity test and vertical percussion and palpation test had similar results to the initial examination, indicating pulp and periradicular normality.

Then, the color of the composite resin for the teeth was selected using the VITA Shade Guides (VITA Zahnfabrik, EUA). After prophylaxis with pumice/water were performed using 37% phosphoric acid for 30 seconds on the enamel, followed by rinsing with a water jet for 60 seconds and cavity drying. Subsequently, 2% chlorhexidine was applied to the cavities for 30 seconds and dried with absorbent paper.A two-step self-etch

adhesive system (Clearfil™ SE Bond, Kuraray®) was applied, where active application of the acidic primer was performed for 20 seconds on the entire cavity (enamel and dentin) using a disposable microbrush applicator (KG Sorensen®, Cotia, SP). The solvents were then volatilized with gentle air jets.

Figure 2. Periapical radiograph of tooth 47 (A); Bitewing radiograph of tooth 47 (B). Periapical radiograph of tooth 37 (C); Bitewing radiograph of tooth 37 (D).

Figure 3. Provisional restoration with Resin-Modified Glass Ionomer Cement (3A) Tooth 47; and (3E) Tooth 37. Interproximal radiography of the elements after provisional restoration (3B) Tooth 37; and (3F) Tooth 47. Final restoration in Composite Resin, shade A1 (3C) Tooth 47; and (3G) Tooth 37. Interproximal radiograph of the elements six months after definitive restoration (3D) Tooth 47; and (3H) Tooth 37



Finally, a thin layer of adhesive was applied and light-cured for 20 seconds. The composite resin (Filtek Z250 XT® A1, 3M ESPE, St. Paul, MN, USA) was incrementally applied, starting with the A1 dentin resin at the cavity base, followed by the A1 enamel resin to ensure proper tooth anatomy. Each layer was light-cured for 20 seconds, as per the manufacturer's guidelines.

Subsequently, occlusal adjustment was performed using Accu Film (Parkell®, NY, USA) occlusal marking strips with the patient guided to occlude in centric relation and maximum habitual intercuspation until no interferences were observed. The composite resin restorations were polished using silicone polishing points (Optimize®) and felt discs impregnated (TDV®), completing the restorative procedure in 47 (Figure 3C) and on 37 (Figure 3G).

The patient was readmitted for a follow-up examination six months later. During this re-evaluation, interproximal radiographs and endodontic tests were conducted. The results were comparable to those of the initial examination, indicating normal pulpal health. This outcome validated the efficacy of the selective removal approach in managing hidden carious lesions as a conservative treatment strategy.

DISCUSSION

The selective caries removal treatment, along with the use of antibacterial materials and adequate cavity sealing, promotes the remineralization of affected dentin, thereby preserving pulp vitality[11,12].

Regarding the diagnosis of hidden caries, radiographic examination is essential as an auxiliary method in diagnosing these lesions[13]. Therefore, for a more accurate diagnosis of dentinal carious lesions, it is necessary to combine visual inspection sugar-rich diet examination.

The ideal treatment for carious lesions consists of a minimally invasive approach in which the maximum amount of tooth structure is preserved[12]. The procedure of choice for restorative treatment, especially in medium to deep cavities, as seen in this case, is the selective removal of decayed tissue, followed by cavity sealing[11].

The chosen treatment discussed in this case was selective caries removal treatment, which aims to provide a biological response of the pulp through the production of tertiary dentin, with provisional coronal sealing being performed using resin-modified glass ionomer cement (Riva Light Cure® - SDI Limited, Victoria, Australia). Studies show that the effectiveness of glass ionomer cement as a provisional restorative material is enhanced due to its antibacterial properties and chemical adhesion to the tooth structure[14].

There are high success rates using calcium hydroxide cement due to its antimicrobial properties and its ability to stimulate the formation of mineralized tissue9. Therefore, when there is good marginal sealing of the cavity, this reduces the progression of the carious lesion through reactions of the dentin-pulp complex, which induces the formation of tertiary dentin, increasing its thickness and providing greater protection to the pulp tissue[12].

It is recommended that conservative treatment be given priority since the non-selective removal of carious tissue in deep cavities may result in pulp exposure, necessitating more complex and invasive procedures. It is important to note that the satisfactory outcome of selective caries removal treatment is correlated with a good diagnosis supported by clinical and radiographic findings.

CONCLUSION

The progression of hidden carious lesions can result in tooth destruction in the absence of discernible clinical signs. Whenever feasible, the treatment approach should adhere to the principles of minimally invasive dentistry, prioritizing the preservation of tooth structure and minimizing the risk of pulp exposure.

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