CASO CLÍNICO

Remoción selectiva de caries y restauración con protección cuspídea: reporte de caso con seguimiento de 5 años

Selective caries removal and restoration with cuspal-coverage: 5 -year follow-up case report

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Abstract: The present case reports the management and five-year follow-up of a 19-year-old patient with a deep caries lesion in 3.7. The tooth was treated with selective caries excavation in order to avoid pulp exposure and to arrest caries lesion progression. The cavity preparation, after excavation, was extensive and included the distolingual cusp of the molar. The tooth was restored with a cavity base of Biodentine and direct resin composite. It was clinically and radiographically reviewed one, two, and five years after the treatment. In the follow-up sessions, the tooth responded positively to sensitivity tests and no periapical alterations were detected. In these sessions, the restoration was evaluated and, if necessary, it was refurbished or repaired in order to improve its clinical condition and delay the need to replace it.

Key words: Caries, caries treatment, resin composite, selective caries excavation, cuspal coverage

Resumen: El presente reporte de caso describe el manejo y seguimiento por cinco años, de un paciente de 19 años de edad con una lesión de caries dentinaria profunda en el diente 37. El diente fue tratado con remoción selectiva de caries para evitar exposición pulpar y detener la progresión de la lesión de caries. Al realizar la remoción selectiva, la preparación cavitaria resultante fue extensa, incluyendo la cúspide distolingual del molar. El diente fue restaurado con una base cavitaria de Biodentine y resina compuesta directa. Fue controlado clínica y radiográficamente después de uno, dos y cinco años del tratamiento. En las sesiones de seguimiento, el diente respondió positivamente a las pruebas de sensibilidad y no se detectaron alteraciones periapicales. En esas sesiones, se evaluó la restauración y, si fue necesario, se hizo reacondicionamiento o reparaciones menores a la restauración, de manera de mejorar su condición clínica y retrasar la necesidad de reemplazar la restauración.

Palabras clave: caries, tratamiento de caries, resina compuesta, remoción selective de caries, protección cuspídea.

Highlights:

Selective caries excavation reduces the risk of pulp exposure and, when a well-sealing restoration is provided, arrests the progression of the caries lesion, thus maintaining pulp vitality.

Introduction

Traditionally, the management of deep caries was performed with complete excavation, and if pulp exposure occurred root canal treatment was recommended[1]. The removal of all signs of the caries lesion and "extension for prevention" was the standard therapy several years ago[2]. However, the success of treatments maintaining a layer of softened dentin over the pulp, such as incomplete caries removal[3,4], indirect pulp capping[5], step-wise excavation[6,7] and partial excavation[8], has provided evidence that less invasive excavation treatments successfully avoid pulp exposure and impede caries lesion progression[9].

The relationship between the clinical appearance of the caries lesions with their histopathology, is not straightforward, with histologic terms being less useful when communicating among dentists[2]. Therefore, consensus recommendation on carious lesions terminology has been published, in an attempt to communicate successfully and concisely[2, 10, 11]. The terminology was based around the clinical consequences of disease, including the use of soft, leathery, firm, and hard dentine to describe caries removal[2]. The approaches to carious tissue removal currently accepted are: **1)** selective removal of carious tissue—including selective removal to soft dentine and selective removal to firm dentine; **2)** stepwise removal—including stage 1, selective removal to soft dentine, and stage 2, selective removal to firm dentine[2].

For deep caries lesions, consensus documents recommend selective removal of carious tissue—to soft dentine[12, 13]. The selectiveness of this treatment means that the peripheral enamel and dentine are excavated up to a hard consistency, whereas soft caries tissue is maintained over the pulpal aspect of the cavity[2]. This mode of excavation reduces the risk of pulp exposure and stress to the pulpal tissues, but also allows the placement of a durable and good-sealing restoration[12].

Conventionally, in molars and premolars, when a cusp was lost, the treatment of choice was an indirect restoration. However, as resin composite and adhesive systems have improved, clinicians have stretched the clinical indications for direct resin composites to restoring cusps and providing cuspal coverage[14, 15]. The present case shows the follow-up of a molar with a deep caries lesion that was treated successfully with selective caries excavation and restored with a direct resin composite.

Case report

A 19-year-old male patient presented for dental treatment to the clinic of the Faculty of Dentistry, University of Chile. The patient was healthy, but suffered from caries disease with several active caries lesions. Upon examination, tooth 37 presented a deep caries lesion, which was cavitated, active, and adjacent to an occlusal resin composite restoration **(Figure 1a)**. The tooth responded positively to the cold sensitivity test and no spontaneous pain was reported by the patient. Radiographic examination revealed a deep caries lesion and no periapical alteration was visible **(Figure 2a)**.

The patient consented to a treatment plan that included the management of caries disease with oral hygiene instruction, diet counselling, and the prescription of a high fluoride toothpaste, together with the operative treatment of the non-cleansable cavitated, active lesions. Under local anesthesia and rubber dam isolation, selective caries excavation was performed on tooth 37. Excavation was performed first in enamel, with a round, high-speed, diamond bur, and later with a round, low-speed, carbide bur in order to achieve healthy peripheral walls and to leave soft tissue over the pulpal wall. The resultant cavity preparation was extended over the occlusal surface, including the distolingual cusp of the molar. After cavity preparation, this was restored following manufacturer's instructions for each material used. A cavity base of Biodentine (Septodont, France) was applied covering the entire pulpal wall, with 2 mm thickness, without prior application of a disinfectant. The cavity was then etched with phosphoric acid gel (ScotchbondTM Etchant, 3M ESPE, USA) and two layers of resin adhesive (AdperTM Single Bond 2, 3M ESPE, USA) applied and light cured for 20 seconds (3M Elipar 2500, 3M ESPE, USA). Then the resin composite (N´Durance, Septodont, France) was applied using incremental technique, with each layer light cured for 30 seconds (3M Elipar 2500, 3M ESPE, USA) **(Figure 1b-d).** The restoration was finished and polished.

The patient was invited for recall visits every year, but only attended such visits one, two, and five years from the restorative treatment **(Figure 1 e-h, Figure 2 c-f)**. During the recall sessions, the tooth was assessed clinically and radiographically, the tooth 37 was asymptomatic, responded positive to sensitivity test and no periapical alterations were detected. The restoration was refurbished and repaired, when considered necessary, in order to improve its clinical condition and avoid the replacement of the restoration.

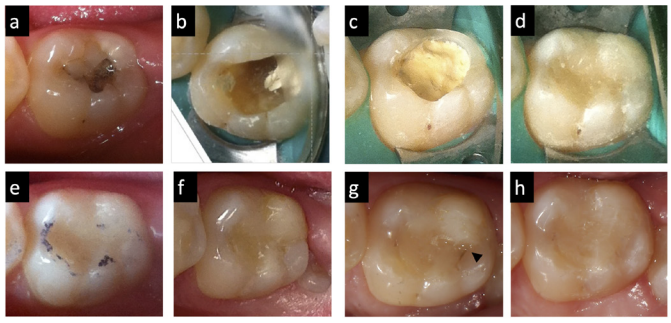

Figure 1. Clinical image of deep caries lesion in 37 **(a)**, selective caries removal **(b)**, cavity base **(c)**, and resin composite restoration **(d)**. Images after one **(e)**, two **(f)**, and five years of treatment; arrow in **(g)** shows marginal staining, which was repaired **(h)**.

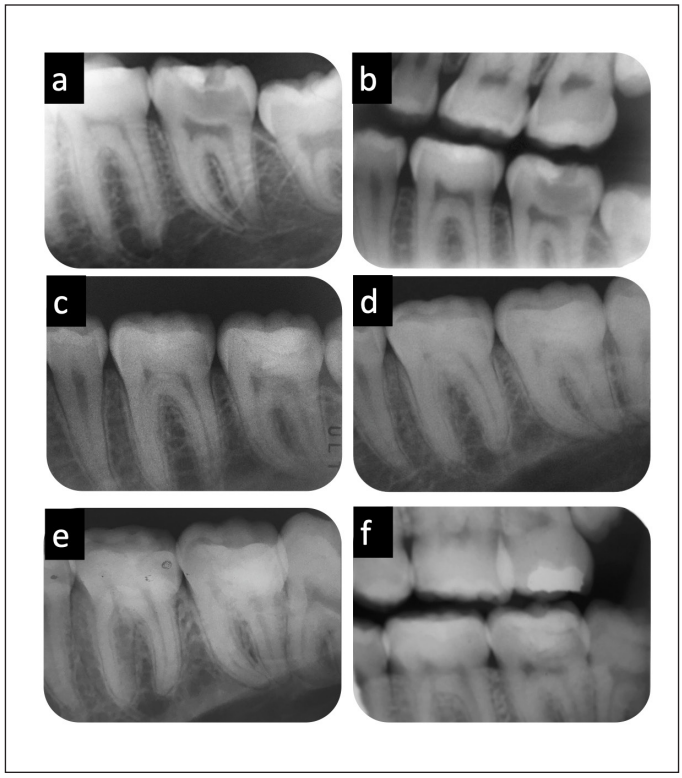

Figure 2. Periapical **(a)** and bitewing **(b)** radiographic images of deep caries lesion in 37. Radiographic images after one **(c)**, two **(d)**, and five years after treatment **(e, f)**.

Discussion

In this case, the choice to selectively excavate the caries lesion was based on a careful clinical/radiographic examination, including pulp diagnosis and evaluation of pain history. The lesion was clinically and radiographically assessed as a deep dentinal, cavitated, and active caries lesion, which was non-cleansable. Therefore, a restorative intervention was indicated[12]. Selective removal to soft dentine was performed, which has been suggested for deep cavitated lesions (which extend into the pulpal third or quarter of the dentine). This strategy aims to leave soft carious tissue over the pulp to prevent stress and a possible exposure of the pulp, while the peripheral walls, are prepared up to a hard tissue resistance, to allow the placement of a long-lasting restoration[12]. High survival rates have been demonstrated for this type of excavation in deep caries lesions[3, 4, 16, 17]. In addition, it has been shown that selective caries removal in one or two steps (step-wise) reduces the risk of pulpal exposure, compared to complete caries excavation[18, 9].

A calcium silicate cement (Biodentine) was applied as a cavity base. This cement has been used in deep caries lesions in conjunction with overlying resin composite restorations with favorable results[19]. No prior cavity disinfection was performed, although a wide variety of products for cavity disinfection is available. However, the scientific evidence regarding its benefits, before the use of dental restorative materials, is not entirely clear[20]. Although chlorhexidine has shown to be a safe option, able to inhibit collagen-degrading enzymes while not intervening in the subsequent adhesion, further clinical studies with longer follow-up periods are necessary to support its use[20]. In addition, the use of a disinfectant prior to the application of calcium silicate based materials has not been widely researched. Therefore, the therapeutic choice in this case was to follow the manufacturer's instructions which suggests applying the material directly to the cavity preparation[21]. Also, there is no clarity regarding the need or benefit of a cavity liner[22], which has been proven to be unnecessary to control the caries lesion as long as a well-sealed restoration is placed[12]. However, the liner might have a potential benefit in blocking monomer penetration and avoiding fracture of the remaining dentine when the lesion is restored with a resin composite[12].

Due to the large extension of the caries lesion, the distolingual cusp of the molar was removed during excavation in order to achieve healthy peripheral tissues on the cavity preparation, following selective excavation principles[12]. Then, a direct resin composite was used to restore the missing tissues, which provided satisfactory anatomy. Traditionally, the lack of one or more cusps in molars and premolars was the indication for an indirect restoration; clinicians have utilized direct resin composites in these cases as a more conservative

approach[14, 15]. An adhesive chairside direct restoration allows clinicians to preserve more tooth structure than with an indirect restoration[15]. Although indirect restorations present the advantages of a higher degree of polymerization and the possibility of shaping and polishing the restoration extraorally, they require diverging preparations and therefore risk a greater loss of tooth structure[23]. Present-day resin composites exhibit superior mechanical and physical properties than the composites available decades ago.

A two-step etch and rinse bonding strategy was used, whose main bonding mechanism is described as diffusion-based micromechanical interlocking[24]. Etch-and-rinse strategies completely dissolve smear layer, and they are considered the best approach for enamel adhesion, however the exposure of collagen fibers in dentin has been considered responsible for later bond-degradation. Other generations of adhesive systems have been developed later, with their own advantages and disadvantages[24]. The resin composite was applied using incremental technique in order to reduce the polymerization shrinkage stress at the cavity wall interface, allow a more efficient light curing of the material and a lower gap formation at the interface[25]. Nevertheless, defects in the restoration were found years later at the follow-up appointments. It was decided to repair the restoration, since this is a less invasive option than the replacement, increasing the longevity of the restoration[26].

In this case, the caries lesion was treated in conjunction with the management of the patient´s caries risk and reviewed at every recall visit. Review and monitoring visits are cornerstones for the treatment of caries disease[27].

Conclusion

In deep caries lesions, selective caries excavation reduces the risk of pulp exposure and, when a well-sealed restoration is provided, stops the progression of the caries lesion, thus maintaining pulp vitality. Direct resin composite restorations allow clinicians to preserve tooth structure and are able to reconstruct severely damaged teeth. Recall visits are necessary to detect and treat small defects in order to avoid the need to replace the entire restoration.

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