A 42 year old female with thermal sensitivity in the lower left first molar tooth

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Presentation of Case

Dr. Hasan Ali (MS Resident): A 42 year old female presented with the complaints of thermal sensitivity and impaction of food during mastication on her lower left posterior region. On clinical examination, carious lesions involving proximal surface was detected at the lower left first molar tooth which extended up to the dentin (Figure 1A). The vitality test showed that the affected tooth was vital and the teeth was also non-tender to percussion.

Radiological Findings

Dr. Ali. Radiographic examination revealed that the tooth had a radiolucent area in the proximal surface that extended to the dentin. However, there was no involvement of the pulp and periodontal tissues (Figure 1B).

Treatment Procedure

Dr. Ali: After considering the structural integrity of the tooth, it was decided to restore the tooth by direct nanohybrid resin composite (Ceram X™) restorative material with an one-step self-etching adhesive system (7th generation). At first, the carious tissue was removed by carbide bur under constant water cooling. A cavity with a diameter of 3 mm × 4 mm was prepared with-out bevel and neither lining nor a base material was used. Then, the operative field was carefully isolated with the cotton rolls and a suction device. After removal of caries, a thin metallic matrix band was fixed in the interproximal area and the cavity was cleaned by a thorough full rinsing with water. Application of the adhesive resin was given according to the manufacturer’s instructions; after drying the operative field, the bonding agent was applied and light cured for 10 sec.

Restoration with nanohybrid composite resin

An E-2 shade of nanohybrid composite resin (Ceram X™) was applied in layers of maximally 2-3 mm width. Every increment was light-cured with a well-controlled LED light-unit for at least 20 sec. The occlusion was adjusted and contour was prepared with finishing diamond burs. The final polishing was performed with the shofu polishing system. The final restoration had excellent marginal integrity and the color was matched with the adjacent tooth (Figure 1C). The patient was instructed to continue the normal oral hygiene.

Provisional Diagnosis

Caries lesion

Differential Diagnosis

Dentin hypersensitivity

Dr. Md. Joynal Abdin: Dentin hypersensitivity is characterized by short sharp pain arising from the exposed dentine in response to stimuli such as thermal, evaporative, tactile, osmotic or chemical and which cannot be ascribed to any other form of dental defect or pathology. It is due to the fluid movement within the dentinal tubules that acts as a provocative stimulus. However, in most of the cases, the tubules can be sealed off without damaging the tooth or the dental pulp and the problem can also be at least partially resolved by suppressing nerve fiber within the pulp. In the present case, the patient complains of thermal sensitivity and impaction of food due to the development of a cavity of the affected tooth. The persistent thermal sensitivity of the affected tooth indicates that dentin cannot be sealed off at this stage.

Tooth hyperemia

Dr. Abdin: Previous studies have indicated that there is a correlation between the clinical symptoms of thermal sensitivity and histological signs of pulpal hyperemia and inflammation. Usually, the number of teeth sensitive to both cold and heat gradually increased significantly in the presence of hyperemia. Furthermore, as pulpal inflammation increased in severity, the number of teeth sensitive to heat
could also be increased. However, in the present study, only a single tooth was sensitive to cold stimulation, there might be a minimum chance to find out any correlation between the degree of inflammation and sensitivity to cold. This is also supported by a previous study.

Irreversible pulpitis

Dr. Abdin: Irreversible pulpitis usually occurs as a result of more severe insults from caries, erosion, attrition, abrasion, operative procedures, scaling or trauma. In this situation, the pulp cannot recover from the insult and damage. Dental caries that has reached the pulp of the tooth induces bacteria into the pulp. Although the pulp is vital, the introduction of bacteria will not allow healing of the pulp. The symptoms include pain that develops spontaneously or from stimuli which lasts from minutes to hours. In the later stages, heat may be more significant than the cold and periodontal ligament may be wide radiographically. Furthermore, when the periodontal ligament becomes involved, the pain will be localized by the patient.

Pulp necrosis

Dr. Abdin: Pulp necrosis occurs as the end result of irreversible pulpitis. At this stage, bacteria in the pulp will not allow the pulp to heal and ultimately result in the necrosis or death of the pulp. In this situation, tooth does not respond to thermal stimulation and bite pain may occur in aggressive situation.

Dr. Hasan Ali’s Diagnosis

Carious lesion

Discussion

Diagnosis

Dr. Mozammal Hossain: The diagnosis was performed by the patient symptoms, clinical and radiological findings. The tooth is sensitive to cold and the painful response to stimuli is not prolonged. A previous study also indicates that reversible pulpitis is generally characterized by sharp sensitivity to cold, which is not low-grade ache, and the painful response to stimuli is not prolonged. In irreversible pulpitis, swelling is generally not present and the pain is difficult to localize. Furthermore, inside the pulp, the inflammation is not as pronounced as with irreversible pulpitis, and less damage to the pulp tissues (if any) has occurred. Based on the patient symptoms and radiological findings, the present case is diagnosed as reversible pulpitis.

Cavity preparation

Dr. Hossain: The goal of restorative dentistry is to preserve healthy tooth tissue as well as remove and restore the diseased tissue and maintain the function of the tooth. Limited access to the proximal surfaces in class II carious lesion increases the requirements for retention of some restorative materials and adequate bulk for resistance to fracture. It is, therefore, said that a significant volume of unaffected dentin and enamel may need to be removed to ensure the retention of a restoration. Composite resin has significant advantages over the metallic restorative material because it can be bonded to sound enamel and dentin, allowing for more conservative cavity design.

In the present study, class II preparation for nanohybrid composite resin did not follow rigid rules. Firstly, removal of carious, unsupported and friable tooth structure was performed and no mechanical retention was given. Therefore, the cavity was prepared without removing bulky enamel area; neither enamel bevel nor any conventional retention form was applied. The previous study also indicated that bevel preparation failed to improve margin quality in large class II composite restoration. It also removes the sound tooth structure and makes the tooth more compromised. Therefore, it is no longer recommended in modern dentistry. However, undermined enamel should be removed to prevent enamel fractures. Therefore, in the present study, the carious enamel and dentin were removed during the cavity preparation and ensured removal of unsupported enamel.

Restoration with nanohybrid composite

Dr. Hossain: Recently, nanoceramic technology with nanofillers and nanoparticles (Ceram X) has been introduced in the dentistry and its use for all the posterior direct restorations has been expected by many previous studies. It contains small particles in the range of 0.1–100 nanometers, which is considered favorable to achieve high fracture toughness, better lasting polish, retention as well as increased the aesthetic value and wear resistance. Nanohybrid composite resin restoration showed less

Figure 1: The clinical and radiological photographs of the case. Preoperative clinical photograph of the carious lesion (A), Preoperative radiograph (B), Final restoration (C)
wear than that of the fine hybrid composite in 6 years observation period. Furthermore, 12 months clinical study observed minimum loss of retention and with respect to color match, marginal adaptation, secondary caries and surface texture, none of the restorations had marginal discoloration and anatomic form loss on the 12 months follow-up. In the present case, nanohybrid resin composite (Ceram x) restorative material was used for restoring class II cavity of lower left first permanent molar tooth and clinically it shows favorable performance.

Follow-up

Dr. Ali: The restoration was then assessed clinically and checked the occlusion by bite paper after every 6 months. Furthermore, the shade guide was used to check the color matching of the restoration and the patient was pleased esthetically. The patient was advised to use a soft toothbrush, avoid highly abrasive toothpaste and another hard object that can cause fracture of the restoration.

Dr. Md. Asaduzzaman: Why don’t you use the amalgam?
Dr. Farzana Hoque Tanmi: What are the advantages of nanohybrid technology?

Dr. Ali: Nanotechnology has been introduced in dentistry which is defined as the production and manipulation of materials and structures in the range of 0.1–100 nanometers. Small particles are favorable to obtain good wear resistance, highly polished and increased esthetics. Furthermore, the use of nanofillers can increase the overall filler level due to their small particle sizes. Furthermore, it obtains high fracture toughness, better lasting polish, retention and aesthetics and higher wear resistance.

Recently, ormocer-based nanohybrid resin composite Ceram X (Dentsply-De Trey, Germany) has been developed which is defined as nanoceramic resin composite, there methacrylate-modified silicon-dioxide-containing nanofiller (10 nm) substitutes for the microfiller that is typically used in today’s hybrid resin composite materials. Most of the conventional resin matrix is replaced by a matrix full of highly dispersed methacrylate modified polysiloxane particles. The ceramic particles are described as inorganic–organic hybrid particles where the inorganic siloxane part provides the strength and organic methacrylic part makes the particles polymerizable with the resin matrix. One recently published clinical evaluation showed clinically acceptable survival rates after one, two and four years for the nanohybrid Ceram X combined with etch-and-rinse adhesives.

**Final Diagnosis**

Reversible pulpitis

**References**


