

# Treatment options for the occlusal surface of first permanent molars

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*Restorative dentistry has been increasingly concerned with preservation of the dental structure. For that reason, ultraconservative cavity preparations have been performed with air abrasion systems. The aim of this study was to present treatment options for the occlusal surface of first permanent molars with employment of the conventional method and the air abrasion system for accomplishment of the cavity preparation and a composite occlusal matrix for an accurate reproduction of the tooth surface.*  
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## INTRODUCTION

The introduction of materials that promote micromechanical and/or chemical retention of the restoration to the remaining tooth structure gave rise to the preservative dentistry, characterized by ultraconservative restorations with adhesive materials presenting resistance and esthetics similar to the teeth.<sup>13</sup>

New methods have been recently introduced for the accomplishment of conservative preparations, such as the air abrasion system. The cutting action is the outcome of the kinetic energy produced by the emission of abrasive particles at high speed. When these particles, usually aluminum oxide, reach a tough substrate such as the dental enamel, the kinetic energy is transformed into cutting capacity, and the result is the fast removal of a small amount of this structure.<sup>3</sup>

Besides the doing conservative cavity preparations on the enamel, dentin and cement of deciduous and

permanent teeth,<sup>4,7,12,14</sup> the air abrasion system is also indicated for the removal of organic remnants from the pits and fissures before application of sealants; for the cleaning and preparation of internal surfaces of ceramic and composite crowns; as a mechanical etchant for enamel and dentin; for the repair of composite or ceramic restorations; for removal of composite restorations, ceramic inlays and onlays, and white spots on the enamel surface.<sup>5,7</sup>

The air abrasion system provides a reduction in noise, vibration and sensitivity, which are inherent to the conventional methods,<sup>6</sup> making the dental treatment more acceptable, especially for children. In addition to these advantages, this system may also be regarded as biocompatible, since it produces minimal alterations of the pulp tissue, similar or even milder than those generated by rotary instruments.<sup>9</sup>

The restorative technique is as important as the conservative preparation, since it must provide proper sealing of the cavity and reestablishment of the anatomical contour of the tooth surface affected. The latter depends on the skill of the professional to properly perform the dental sculpture. The technique of impression of the occlusal surface before doing the cavity preparation has been indicated in an attempt to reduce the effects related to the skill. This technique comprises the employment of a matrix that may be made from different materials, including the composite resin.<sup>10,13</sup>

This technique is indicated for Class I (occlusal) and Class II (proximo-occlusal) restorations in teeth affected by carious lesions extending towards the dentin, however, presenting intact enamel on the occlusal area and marginal ridge.<sup>2</sup>

The employment of a composite matrix allows the recovery of the occlusal features lost after caries removal, reduction in the working time due to elimination of the need of sculpture, besides reduction in the procedures of finishing and occlusal adjustments, which

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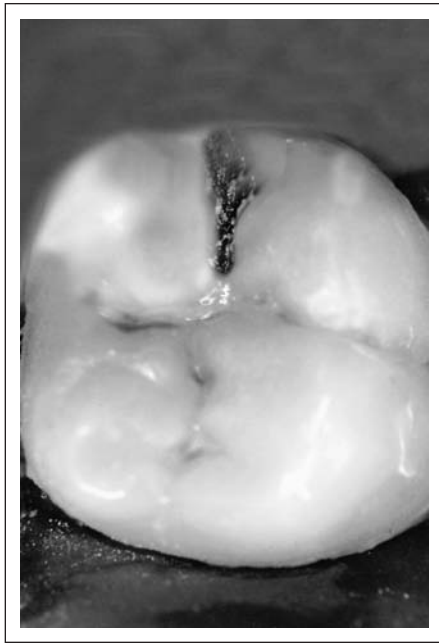


Figure 1. Caries on the occlusal surface of mandibular right first permanent molar.

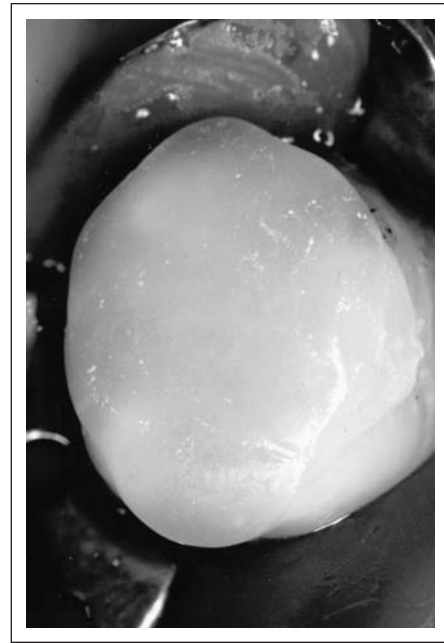


Figure 2. Insertion of a composite resin on the occlusal surface.

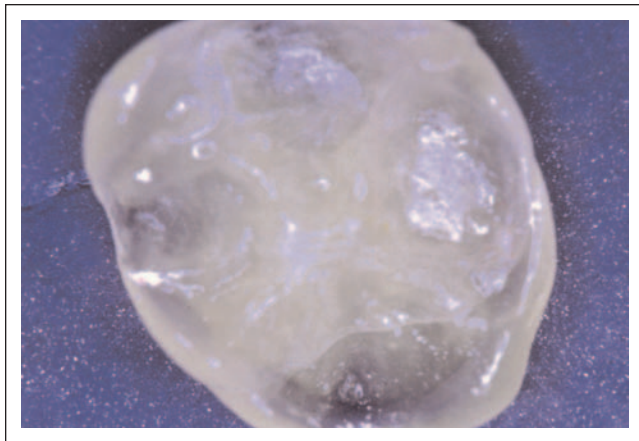


Figure 3. Occlusal matrix light-cured.

might lead to unnecessary wear of the remaining tooth structure.<sup>2,13</sup>

The aim of this study was to present treatment options for the occlusal surface of permanent first molars, by means of the conventional method and the air abrasion system for the cavity preparation and a composite occlusal matrix for an accurate reproduction of the decayed tooth surface.

### CASE REPORT

A male patient aged 10 years old attended the clinics for dental treatment, and the intraoral clinical examination revealed the presence of carious lesions on the occlusal surfaces of the mandibular right first permanent molar (Figure 1) and the maxillary right first permanent molar (Figure 6). The radiographic examina-

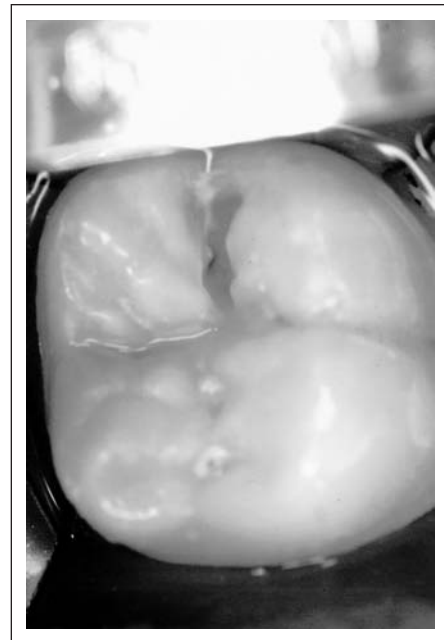


Figure 4. Conservative cavity preparation using air abrasion system.

tion further revealed the presence of dentinal carious lesion just on the maxillary right first permanent molar, which did not affect the proximal aspects. The treatment indicated was restoration of the occlusal surface with rotary instruments and the air abrasion system for the cavity preparation and a composite occlusal matrix for reestablishment of the occlusal morphology. Even though each tooth was individually restored, both will be simultaneously described, since the only difference between them is the procedure for cavity preparation.



Figure 5. Composite restoration of mandibular right first permanent molar after occlusal matrix application.



Figure 6. Caries on the occlusal surface of maxillary right first permanent molar.

Both teeth were initially cleaned with pumice and water in order to allow a proper selection of the shade of composite resin. Thereafter, local anesthesia was performed and a rubber dam was placed. The occlusal matrix was achieved by means of impression of the occlusal surface of the tooth through insertion of a small portion of temporary light-cured composite resin (Fermit, Vivadent, Brazil) followed by light curing for 40 seconds (Figure 2). Afterwards, one aspect of the composite matrix was labeled to serve as a reference for posterior insertion on the tooth. Then, the matrix was carefully removed from the occlusal surface of the teeth using a blunt instrument (Figure 3).

The mandibular right first permanent molar was prepared with the PrepStar (Danville - USA) air abrasion system (Figure 4), comprising an active point with an 80° angle and a diameter of 0.38mm, which was kept at a distance of about 2mm from the tooth surface, under a propulsion pressure of 80 psi. The aluminum oxide powder released by this system consisted of 27µm particles. Cavity preparation of the maxillary right first permanent molar was performed with round steel burs at low-speed just for caries removal, which provided a conservative cavity preparation of the occlusal surface of this tooth (Figure 7).

After completion of the cavity preparations, both dentin and enamel were etched with 37% phosphoric acid for 15 and 30 seconds, respectively. Afterwards, the cavity was washed and dried. The adhesive system (Single Bond, 3M ESPE) was applied and light cured for 20 seconds.

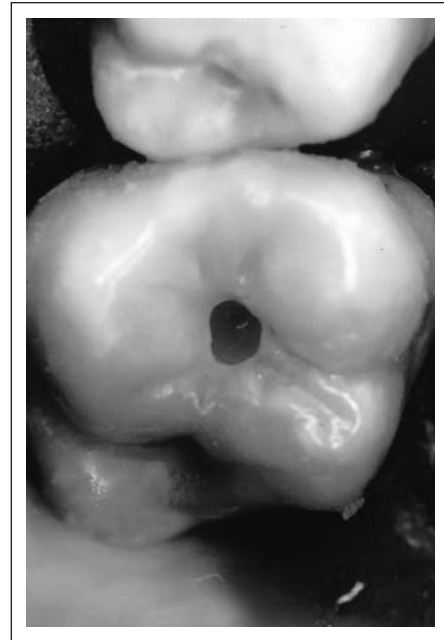


Figure 7. Caries removal using round steel burs at low-speed.

Application of the composite resin (Z250, 3M ESPE) on the cavity was performed in small thickness increments, which were light cured up to the penultimate layer. The occlusal matrix was isolated with a thin layer of solid petroleum jelly and positioned on the occlusal surface after application of the last layer of composite resin and before light curing, under light pressure in order to promote adjustment of the composite resin. Then, light curing was performed for 20 seconds. The

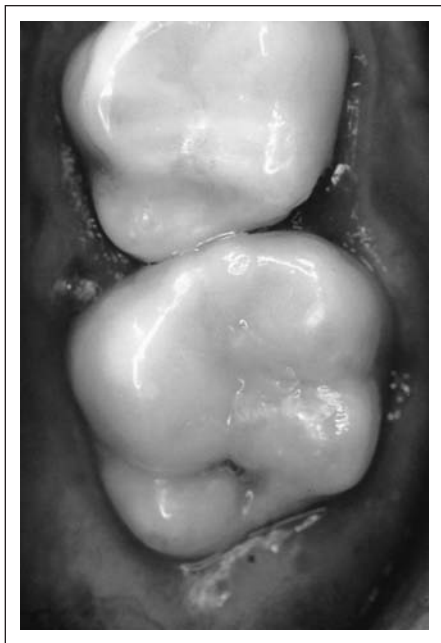


Figure 8. Maxillary right first permanent molar restored with composite resin, after occlusal matrix application.

matrix was carefully removed and light curing was complemented for further 40 seconds.

The occlusion was checked after removal of the rubber dam. Small occlusal adjustments were required. The final finishing and polishing of the restorations were properly performed in another session (Figures 5 and 8).

## DISCUSSION

This study comprised the employment of two different methods for accomplishment of cavity preparations, namely the conventional method and the air abrasion system. These techniques perform conservative preparations with maximum maintenance of the healthy tooth structure and proper removal of the carious tissue, being indicated according to the severity of the dental involvement.

The conventional method and the air abrasion system were compared as to the removal of carious tissue from the enamel and dentin. Both methods were similar as to the speed of caries removal from the enamel pits and fissures; however, air abrasion was demonstrated to remove less healthy tooth structure. The air abrasion system was regarded as faster for shallow dental carious lesions. However, the burs were better indicated for deep dental lesions, since the air abrasion is not well indicated for removal of softened tissue.<sup>15</sup>

The *in vitro* efficiency (working time) and effectiveness (amount of dentin removed) of some methods for removal of dental caries were evaluated, including the air abrasion system and the conventional method compared to hand excavation. The bur demonstrated to be faster and more effective than all

other methods; however, it yielded rather extensive cavity preparations.<sup>1</sup>

The air abrasion acts on the human enamel and dentin with formation of a U-shaped cavity preparation with rounded internal and cavosurface angles. A halo of abraded enamel is also observed around the cavity preparation, as well as microscopic roughness of the enamel and dentin. These findings suggested that cavity preparation would be enough to assure adhesion of the composite resin, without the need for acid etching.<sup>8</sup> However, it was demonstrated that surface preparation with air abrasion leads to a low bond strength and therefore, should not be indicated for routine use without previous acid etching.<sup>11</sup>

Another important aspect that should be highlighted as to the application of air abrasion is that it should be counterindicated for patients with asthma, severe allergy to dust and other breathing problems, because of the aluminum oxide spray released.<sup>15</sup> The adoption of proper individual protective equipment (eye protector, mask and cap) for the entire staff, air filters and high power suction may avoid the irritation caused by the spray.<sup>4</sup> Eye protectors and rubber dam are recommended for the patient.<sup>7</sup>

The tooth restorations in the present study included the technique of impression of the occlusal surface with a composite matrix. This material has been successfully employed in other studies<sup>10,13</sup> due to the translucent and rubber-like aspect and the easy application. Besides these advantages, the composite resin may be easily removed from the preparation with no damages to the prepared margins.

The technique of impression of the occlusal surface allowed reestablishment of the anatomical characteristics of the decayed tooth surface, decrease in the clinical working time and restoration of a natural and harmonious occlusion, therefore being an alternative technique for the restoration of teeth presenting mild involvement of the occlusal surface.

## CONCLUSIONS

Besides the speed of ultraconservative preparations, the air abrasion system provides a reduction in the noise, vibration and sensitivity that might occur with employment of the conventional method. Despite of these advantages, this system presents some shortcomings such as the high cost and the low efficiency for removal of decayed dentin and some resilient materials.

The employment of the composite occlusal matrix reduces the working time and the unnecessary tooth wear inherent to the procedures of finishing and occlusal adjustment of the restoration, besides reestablishing the anatomy of the occlusal surface.

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