It’s all about the matrix

Prof. Dilek Tagtekin

During the past decades, restorative treatments in dentistry have changed remarkably. Growing interest in aesthetic restorations in the posterior region and the alleged adverse health effects and environmental concerns regarding the release of mercury gave rise to controversial discussions about the use of amalgam in several countries.

Along with the introduction of new and improved resin materials that offered adhesive properties and the principle of minimal invasive interventions, this has led to a change from the use of amalgam towards the use of composite resins in posterior teeth.

Restoring a Class II preparation with composite resin can be challenging. Open contacts, poor anatomical contour, and an inadequate marginal seal are just some of the problems that clinicians have to deal with. Initially, these issues can be linked in part to the use of amalgam matrix systems.

The ideal matrix system creates a tight interproximal, anatomically correct contact with minimal flash and a seamless marginal seal. It has been shown that composite resin provides little internal force to counteract the force from the matrix. Therefore, unlike amalgam, which has a very high resistance to deformation, composites are easily forced back into their original position by a tight circumferential matrix band, thus resulting in open contacts.

This problem is the result of several factors, including that composite cannot be condensed like amalgam, which leads to an insufficient adaptation of the matrix towards the adjacent tooth, the polymerisation shrinkage of the composite material, and the effects on tooth position owing to the elastic behaviour of the rubber dam.

Proximal contact plays an important role in the stomatognathic system. Inadequate contact may result in impaired food and lead to periodontal disease and tooth movement. Researchers have sought to overcome these problems by improving material characteristics and application techniques. The choice of matrix systems and separation techniques is an important factor. In order to improve the proximal contacts, instruments were designed to allow the tightening of contact during curing. Other techniques advocated the use of cured composite or ceramic inserts that would provide predictable contacts and proper physiological contour. Heavy-bodied composites were introduced in an attempt to mimic the handling characteristics of amalgam and create more favourable contacts.

However, researchers have demonstrated that it is the matrix system and not the handling characteristics of the composite that determines a favourable contact. Composite resin is a technique-sensitive material that requires its own unique matrix system.

In response to these frustrating clinical problems, the sectional matrix and contact ring matrix retainer were developed, providing significant improvements to previous devices. In modern dentistry, traditional circumferential matrix systems are very popular, but they have shortcomings with regard to their improper proximal matrix form and establishing tight proximal contacts. The circumferential matrix systems showed significantly lesser proximal contacts in studies on Class II cavities, which might be explained by the thickness of the matrix when placing a two-surface restoration.

In recent in vitro and in vivo studies, sectional matrix systems in combination with separation rings were proved to generate proximal contacts with a reliable tightness in two-surface Class II cavities. The use of a sectional matrix system for two-surface Class II cavities resulted in significantly tighter proximal contacts than the use of the circumferential matrix systems did.

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