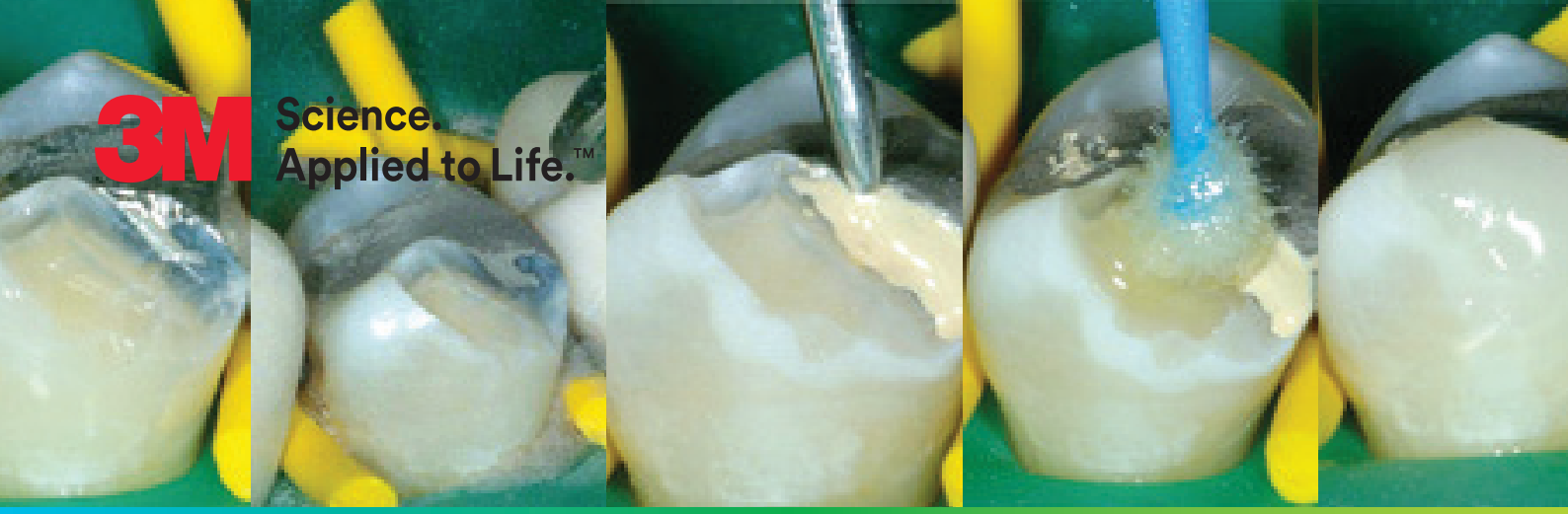

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When to repair and when to replace
Objective intervention criteria are needed (3/3)

Mutlu Özcan,
University of Zurich, Switzerland

In case of failures of dental restorations, the decision of when to repair and when to replace is often taken based on subjective criteria. Dentists in general opt for replacement of defective restorations, even though this procedure is usually accompanied by the associated loss of tooth structure and intact restorative materials. Repair procedures employing adhesive technologies, on the other hand, are more cost and time efficient and lead to a reduced iatrogenic damage[1-4]. Therefore, such actions should be undertaken wherever appropriate.

The use of repair and maintenance methods in the dental practice, however, seems to depend on different factors: Firstly, repair is carried out more often in some countries than in others, which might be connected to the way the subject is taught at the respective universities (in many dental schools, repair is not a part of the undergraduate curriculum). Secondly, factors such as the size of the restoration and its position in the patient's mouth have an impact on the decision. Also, the original dentist is more likely to choose for repair than a practitioner that did not place the restoration.

For many dental practitioners, the lack of objective guidelines for quality evaluation and the fact that the repair procedure is different depending on the substrate, is rather confusing. Since dentists are usually paid by the number of restorations they deliver, every replacement delivers financial income. Attempts in prolonging the lifetime of partially failed restorations with repair actions, however, does not bring much financial benefit to the dentists depending on the healthcare system. As a consequence, replacement constitutes the majority of chairside time of a general dentist.

Direct Restorations

For the evaluation of direct restorations, the following Ryge/CDA criteria have been suggested[5] The criteria may be used for an assessment that serves as a basis for decision making. In general, repair of amalgam restorations is often possible with simple methods. An upgrade from “delta” to “bravo” score can be achieved in some cases simply by refurbishing and repolishing procedures. Repair of composite restorations is usually also unproblematic after surface conditioning and relayering. In any case, the repair process should be carried out using high-performance adhesive technologies in combination with a suitable physio-chemical surface conditioning technique. The repair material of choice remains to be a resin-based composite for chairside applications.

Category	Rating	Characteristic
Marginal Integrity	Alpha	No visible evidence of a crevice along the margin into which an explorer will catch
	Bravo	The explorer catches a crevice along the margin, but there is no exposure of dentin or base
	Charlie	Visible evidence of a crevice with exposure of dentin or base
	Delta	The restoration is fractured or missing in part or in toto
Anatomic Form	Alpha	The restoration is not undercontoured
	Bravo	The restoration is undercontoured, but there is no dentin or base exposed
	Charlie	Sufficient restorative material is missing so that dentin or base is exposed
Secondary Caries	Alpha	No evidence of secondary caries along the margin of the restoration
	Bravo	Presence of softness, opacity at the margins as evidence of undermining or demineralization, or etching or white spots as evidence of demineralization in areas where an explorer catches or resists removal after insertion
Marginal Discolouration	Alpha	No existing marginal discoloration at all
	Bravo	Presence of discolouration at the margins between the restoration and the tooth structure; discolouration does not penetrate along the margins of the restoration toward the pulp
	Charlie	The discolouration penetrated along the margins of the restoration in a pulpal direction
Colour Match	Oscar	The restoration cannot be detected with a mirror
	Alpha	The restoration is visible, but there is no mismatch in colour, shade and/or translucency between the restoration and the adjacent tooth structure
	Bravo	There is a mismatch in colour, shade or translucency, but not outside the normal range of tooth colour, shade and/or translucency
	Charlie	The mismatch is outside the normal range of tooth colour, shade and/or translucency
Surface	Romeo	Surface is smooth, and the adjacent tissues showed no irritation
	Sierra	Surface of the restoration is slightly rough or pitted but can be refinished
	Tango	Surface is deeply pitted or shows irregular grooves, which were not related to the natural anatomy and could not be refinished
	Victor	Surface is fractured or flaking

Ryge/CDA criteria used for clinical evaluation

Repair of a cusp fracture

Indirect Restorations

Chipping of glass ceramic restoration.

Restoration 3.5 years after repair with composite.

Metal and glass ceramic restorations can be repaired with composite as well. When the substrate is glass ceramics, I use the following repair protocol: Firstly, premature contacts are controlled and removed where needed. Then, surface contamination is eliminated and hydrofluoric acid is applied for conditioning of the surface. Subsequently, a silane coupling agent and an adhesive resin are applied.

In bilayered all-ceramic restorations with a core and a veneering material, the most frequent reason for failure is chipping. The reason for chipping is multifactoral but usually the cause is insufficient thickness of the porcelain layer or inadequate framework support. Repair is possible depending on the extent of the defect. A classification including decision criteria is provided by Crisp et al.[6]:

A. A minor chip < 1 mm in diameter within the veneering porcelain – may be left alone or polished.

B. A larger chip > 1 mm but still within the veneering porcelain.

C. A repairable after diameter chip involving the framework interface.

D. A catastrophic loss of veneering porcelain requiring restoration replacement.

In the case of oxide ceramics, air-abrasion and subsequent silanization of the framework ceramic is recommended instead of etching with hydrofluoric acid.

Conclusion

In order to implement repair and maintenance procedures for failed restorations, that are a clinical reality in virtually every dental practice for intervention, more objective guidelines for decision-making have to be developed. Furthermore, maintenance and repair options have to be integrated in the undergraduate curriculum. What is also needed is a simplification of surface conditioning methods for repair procedures. Chemicals can be developed that work equally effective on every substrate in order to substitute physical surface conditioning methods and to avoid cross-contamination of surfaces with different chemicals. With the introduction of new multipurpose adhesives (e.g. 3M™ ESPE™ Scotchbond™ Universal Adhesive), manufacturers aim at simplifying the adhesive procedures without compromizing the performance.

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Contact: Prof. Dr. Mutlu Özcan mutluozcan@hotmail.com

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Building A, 1 Rivett Road
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94 Apollo Drive
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