

## **Failure of amalgam and composite restorations**     *Dr Firas Albaaj*

Several factors may be responsible for the failure of the common restorative materials (Amalgam and composite). Some of these failures are of short term and occur either immediately following the placement of the restoration or following a short period of function in the oral cavity. Other failures are of long term, which means the restoration shows a defect following a long period of function inside the oral cavity. Basically, short term failures occur due to improper cavity preparation or improper placement of the restoration, while the reasons for long term failures could be related to the material properties and the patient clinical situation. Careful clinical examination is a compulsory procedure to detect the restoration failure and to explore the underlying cause. This lecture discusses the common types and causes of failures in amalgam and composite restorations.

### **Clinical examination of the amalgam restoration.**

Evaluation of all restorations must be done systemically in a clean, dry, well lighted field. Clinical evaluation of a restoration requires visual observation, application of tactile sense with the explorer, use of dental floss, and radiographs. A careful clinical examination will detect any fracture line across the occlusal portion of an amalgam restoration. A line that occurs in the isthmus region generally indicates a fractured amalgam and thus a defective restoration that needs replacing.

Amalgam restoration should duplicate the normal anatomic contours of the teeth. Restorations that have inadequate embrasure form or proximal contact, should be classified as defective, indicating re-contouring or replacement.

The marginal ridge portion of the amalgam restoration should be compatible with adjacent marginal ridge. Both marginal ridges should be approximately the same level and display correct occlusal embrasure form for passage of food to the facial and lingual surfaces and for proper proximal contact area. If marginal ridge is not compatible, the restoration is defective and should be re-contoured and replaced.

The proximal contact area of an amalgam restoration should touch the adjacent tooth at the proper contact level and with correct embrasure form. If the proximal contact of any restoration is suspected to be inadequate, it should be evaluated with dental floss and/or visually by trial angulation of mouth

mirror) held lingually when viewing the facial aspect) to reflect light and see if there is a space at the contact (“open” contact). If the contact is “open” and is associated with poor interproximal tissue health and/or food impaction, the restoration should be replaced. Recurrent caries at the marginal area of the restoration is detected visually, tactilely, or radiographically and is indication for repair or replacement.

Inadequate occlusal contacts on an amalgam restoration may cause improper occlusal functioning and/or undesirable tooth movement. Such condition warrants correction or replacement.

### **Types of failure of amalgam restorations.**

Several conditions may be encountered when amalgam restorations are Failed:

- (1) Amalgam “blues”
- (2) Proximal overhangs
- (3) Marginal ditching
- (4) Voids
- (5) Fracture lines
- (6) Lines indicating the interface between abutted restorations.
- (7) Improper anatomic contours
- (8) Marginal ridge incompatibility
- (9) Improper proximal contacts
- (10) Recurrent caries
- (11) Improper occlusal contacts

**Amalgam blues** is a discolored area are often seen through the enamel in the teeth that have amalgam restorations. This bluish hue results either from leaching of corrosion products of amalgam into the dentinal tubules or from the color of underlying amalgam as seen through translucent enamel. The latter occurs when the enamel has no dentin support, such as undermined cusps, marginal ridges, and regions adjacent to proximal margins. When other aspects of the restoration are sound no further treatment required.



**Proximal overhangs** are diagnosed visually, tactilely, and radiographically. The amalgam-tooth junction is evaluated by moving the explorer back and forth across it. If the explorers stop at the junction and then moves outwardly onto the amalgam, an overhang is present. Overhangs can be confirmed by the catching or tearing of dental floss. Such an overhang can be a plaque trap and result in inflammation of the adjacent soft tissue. If causing problems, an overhang should be corrected, and this often indicates replacement of the defective restoration.



**Marginal gap or ditching** is the deterioration of the amalgam-tooth interface because of wear, fracture, or improper tooth preparation. It can be diagnosed visually or by the explorer dropping into an opening as it crosses the margin. Shallow ditching less than 0.5 mm deep usually is not a reason for restoration placement. If the ditch is too deep to be cleaned or jeopardizes the integrity of the remaining restoration or tooth structure, the restoration should be replaced. In addition, secondary caries is frequently found around marginal gaps near the gingival wall.



**Voids** other than ditching also occurs at the margins of amalgam restoration. If the void is at least 0.3 mm deep and is in the gingival third of the tooth crown, then the restoration is judged as defective and should be repaired or replaced. Accessible small voids in other marginal areas where the enamel is thicker may be corrected by re-contouring or repairing with a small restoration.



## **Clinical examination of composite and other tooth-colored restoration.**

### **Factors to be considered:**

- Composite restorations are more susceptible to secondary caries than amalgam restorations, therefore special care should be taken for patient with high risk of dental caries.
- Large restorations have less survival rate than small restorations.

- The anterior restorations have lower survival rate than posterior restorations.

Tooth colored restorations should be evaluated clinically in the same manner as amalgam and cast restorations. If there is an improper contour or proximal contact, overhanging, recurrent caries, or other condition that impairs cleaning, the restoration is considered defective. Corrective procedures include re-contouring, polishing, repairing, or replacing.

One of the main concerns with anterior teeth is esthetics. If a tooth –colored restoration has dark marginal staining or is discolored to the extent that it is esthetically displeasing and the patient is unhappy with the appearance, the restoration should be judged defective. Marginal staining that is that is judged non carious may be corrected by a small repair of the restoration.



### **Type of failure of the composite restoration.**

1. Surface staining.
2. Marginal staining.
3. Translucency and color stability.
4. Fracture.
5. Adhesive failure: Retention, marginal adaptation.
6. post-operative sensitivity: pain after placement of composite restoration.
7. Tooth vitality.

## **Surface staining (brown discoloration):**

### **Causes and treatment:**

1. Operator related: the dentist did not perform proper finishing and polishing to the composite restoration. Such a case is treated with re-polishing of the composite using proper procedures and instruments.
2. Material related: the composite restoration has large size filler particles which are difficult to be finished to a smooth surface. Replacement of the filling with a microfine type composite is the treatment of choice.
3. Patient related: patients who smoke and drink coffee very frequently without maintaining good oral hygiene. The treatment of choice is polishing of the restoration surface and reassurance of the patient to maintain good oral hygiene.



### **Marginal staining:**

It is a brown discoloration at the tooth/filling margin. It could be partial staining or complete including the whole margin. It can be diagnosed visually and differentiated from secondary caries using a sharp dental explorer. Secondary caries always reveals cavitation at the margin that catches the tip of the explorer.

Causes: Adhesive failure at the margin or overhanging filling.

Treatment: Partial staining can be corrected locally, however, complete marginal staining requires the complete replacement of the composite restoration.



**Changing in translucency and color stability of a composite restoration:**

It is a reddish-brown discoloration including the whole bulk of a composite restoration.

Causes: Accumulative exposure to ultraviolet light, especially in the aged composite restoration.



**Fracture or chipping of composite restoration:**

The causes and treatment are almost similar to the same failure category of the amalgam restoration.



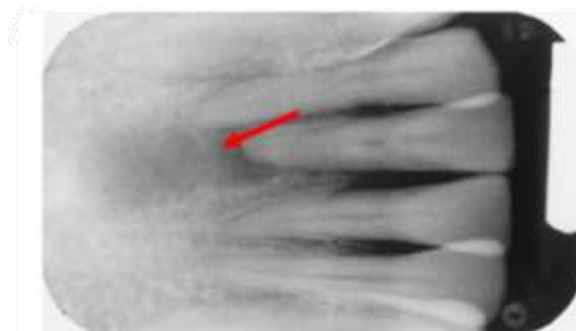
### **Secondary caries:**

The lesion should be carefully distinguished from marginal staining. Such a lesion catches the tip of the explorer as the caries extended beyond the tooth/filling interface.



### **Tooth vitality**

In certain situation, treatment with tooth colored restorative materials ends with the loss of tooth vitality. This can be frequently seen in the treatment of deep seated caries or when there is adhesive failure at the tooth/filling interface.



## **Radiographic examination of teeth and restoration.**

Radiograph is essential in modern dental office for evaluation of teeth caries restoration and other abnormalities.

e.g., panoramic film, posterior bitewing, and periapical film for identifying the following:

1. proximal caries
2. improper contour
3. overhang
4. recurrent caries
5. pulpal abnormalities such as pulp stone, internal resorption
6. periapical abscesses
7. impacted 3<sup>rd</sup> molar.
8. bone level.

## **Adjunctive aids for examining teeth and restoration.**

- 1- **The percussion test:** it is performed by gently tapping the occlusal or incisal surfaces of the suspected tooth and adjacent teeth with the end of the handle of a mouth mirror.
- 2- **Palpation** is performed by rubbing the index finger along the facial and lingual mucosa overlying the apical region of the tooth.
- 3- **Thermal tests:** which test the vitality of the tooth, a cotton applicator tip sprayed with a freezing agent or hot gutta-percha is applied directly to the tooth. Hot and cold testing should elicit from the healthy pulp a response that will subside within a few seconds, following removal of the stimulus. Pain lasting 10 to 15 seconds or less after stimulation by heat and cold suggests a hyperemia. An inflammation that may be reversed by timely removal of the irritant. Pain of longer duration from hot and cold usually suggests irreversible pulpitis, which can only be treated by endodontic therapy or extraction. Pain that results from heat but is quickly relieved by cold also suggests irreversible pulpitis. Lack of response to thermal tests may indicate that the pulp is necrotic.
- 4- **Electric pulp test:** also has a value in determining the vitality of the dental pulp. The electric pulp tester is placed on the tooth and not on the restoration. A small electric current delivered to the tooth causes a



tingling sensation. Results of an electric pulp test should not be the sole basis for a pulpal diagnosis because false positive or false negative responses with other evaluation methods.

- 5- **Test preparation:** a test preparation can be performed to help in the evaluation of pulpal vitality when a large restoration in the tooth may be resulting in a false-negative response with other evaluation methods.

Positive results on only one test should not be considered conclusive.

### **Clinical examination of periodontium.**

- 1- Depth of the sulcus
- 2- Pocketing or presence of hemorrhage.
- 3- Gingival color or texture.
- 4- Gingival recession and tooth mobility

### **Examination of patient in pain:**

The problem can be identified and treated by subjecting information from clinical examination with appropriate test then the patient to describe the problem:

- 1- Onset and duration of pain.
- 2- Stimuli causing the pain.
- 3- Spontaneity of pain.
- 4- Intensity of the pain.
- 5- Factors that is relieve the pain

### **Treatment plan**

Treatment plan sequencing is the process of scheduling the need procedure into a time frame, certain treatment must naturally follow others in a logical order.

### **Control phase:**

- (1) Eliminate the pain.
- (2) Eliminate active disease such as caries and inflammation.
- (3) Remove conditions preventing maintenance.
- (4) Remove errors such as overhang.
- (5) Eliminate potential causes of the disease.
- (6) Begin preventive dentistry activities.

The goals of this phase are to remove etiological factors and stabilize the patient's dental health. Examples of control phase treatment include extractions, endodontics, periodontal debridement and scaling, occlusal adjustment as needed, caries removal replacement or repair of defective restoration. Such as those with gingival overhangs and use of caries control measures.

**Re-evaluation phase:** the holding phase is a time between the control and the definitive phases that allows for restoration of inflammation and time for healing. Home care habits are reinforced, motivation for further treatment is assessed and initial treatment and pulpal responses are re-evaluated before definitive care is begun.

**Definitive phase:** after the dentist reassesses initial treatment and determines the need for further care, the patient enters the corrective or definitive phase of treatment. This may include endodontic, periodontic, orthodontic, oral surgical and operative procedures before fixed or removable prosthodontic treatment. Inter disciplinary considerations in operative treatment planning.

**Maintenance phase:** this phase includes regular recall examinations that include:

- (1) Adjustments to prevent future breakdowns.
- (2) Provide an opportunity to reinforce home care. The frequency of re-evaluation examinations during maintenance phase depends in large part on the patient's risk for dental disease. A patient who has stable periodontal health and a recent history of no caries should have longer intervals (e.g., 9 to 12 months or longer) between recall visits. In contrast, those at high risk for dental caries and/or periodontal breakdown should be examined much more frequently (e.g. 3 to 4 months)

**End**