

Failure of crown & bridge cases (reasons and solution)

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5. Recurrent caries⁽⁴⁾

It may be due to:

- i) Over-extension, the margins will cause plaque formation and periodontal problem due to resorption of the cement, which closes the space between the cast and teeth.
- ii) Short casting will leave rough cementum or dentin, which causes collection of debris.
- iii) Open margin will allow the saliva and cariogenic organisms to enter between the tooth and the restoration.
- iv) Weariness of the cast will cause resorption of the cement and exposure of the tooth surface, which cause caries later on.
- v) Looseness of one of the retainers.
- vi) Pontic form, which fills all embrasures.
- vii) Poor oral hygiene.
- viii) Using a wrong type of retainer.

Dental caries is one of the most common causes of failure of a cast restoration. Its detection can be very difficult particularly with complete crown.

The caries is often detected only after irreversible pulp involvement has resulted.

The disease may rapidly progress to the point where tooth loss or the fabrication of a new prosthesis becomes inevitable.

The cause of the problem should be identified and dealt with before repair or replacement is started.

5. Inadequate clinical or laboratory technique.

It is helpful to allocate problems in the construction of crowns and bridges to one of three groups:

- I. Minor problems to be noted and monitored but where no action is needed.
- II. The type of inadequacies that can be corrected in site.
- III. Those that cannot be corrected.

• Marginal deficiencies⁽¹⁾

a. Positive ledge (overhang)

A positive ledge is an excess of crown material protruding beyond the margin of the preparation. These are more common with porcelain than any other margins. This is easy to recognize and correct before the crown or bridge is fitted. However, it is often possible to correct them without disturbing the restoration.

b. Negative ledge

This is a deficiency of crown material that leaves the margin of the preparation exposed but with no major gaps between the crown and the tooth. It is a fairly common fault particularly with metal margins, but that is difficult or impossible to correct at the try-in stage.

Causes:

1. The impression did not give a clear enough indication of the margin of the preparation.

2. The die was over-trimmed resulting in under-extension of the retainer.

3. The die is not separated.

Supragingival margin or just at the margin, it is possible to adjust tooth surface of the crown. Subgingival margin can be adjusted with a pointed stone although this will cause gingival damage. The best solution is remaking the restoration.

• **Defects in the casting**

1) Nodules: bubbles of gas trapped between the wax pattern and the investment produce nodules on the casting surface. When they are large or situated in a margin → remake the restoration.

2) Fins: are caused by cracks in the investment that have been filled with molten metal.⁽²⁾ These cracks can result from:

- Weak mix of investment (high water/powder ratio).
- Excessive casting force.
- Steam generated from too rapid heating.
- Reheating invested pattern.
- Improperly situated pattern (too close to the periphery of the casting ring).
- Premature rough handling of the ring after investment.

3) Incompleteness

- i. If an area of wax is too thin (less than 0.3 mm) incomplete casting may result (veneering surface of a metal-ceramic restoration).
- ii. Inadequate heating of the metal.
- iii. Incomplete wax elimination.
- iv. Excessive cooling (freezing) of the mold.
- v. Insufficient casting force.
- vi. Not enough metal or metal spillage.

4) Voids or porosity

Voids caused by debris trapped in the mold. A well-small spru will help to prevent them.

Porosity results from:

- i. Solidification shrinkage occurs if the metal in the spru solidifies before that in the mold. This may happen when the spru is too narrow, too long, or incorrectly located or a large casting is made in the absence of a chill vent.
- ii. Gases may dissolve in the molten alloy during melting and leave porosity defects.
- iii. Backpressure porosity may be caused by air pressure.

• Waxing

Any problem in the waxing → problem in the final restoration.

1. When the wax pattern is left off the die, leads to distortion because stresses occur in the wax as a result of the heating and manipulation of the wax during fabrication.

2. Wax pattern should be oversized slightly mesiodistally → finishing and polishing without creating an open contact in the finished restoration.
3. Most common error relating to axial contour is the creation of bulge or excessive convexity → accumulation of food debris and plaque → gingival inflammation.
4. During the margin finishing, don't approach the finishing line on the die with sharp instrument that can remove die material → final restoration will not fit on the prepared tooth. The margin is a critical area of any wax pattern.
5. Any roughness in the wax near the margin → plaque and irritation → inflammation of adjacent gingival tissues. Don't count on being able to remove these irregularities. Once the casting has been made → undesirable change in contour.

• **Poor investing and casting procedure**

- i. Vacuum mixing of investment materials highly recommended for obtaining consistent results in casting with no surface defects, especially when phosphate-bonded investment is being used.
- ii. Cooling and reheating of the investment can cause casting inaccuracy, since the refractory and binder will not return to their original forms. Inadequate expansion and cracking of the investment are typical results. (5)

- iii. Excessive burnout temperature led to increased surface roughness on this casting.
- iv. Alloys from different manufacturers when they are mixed even if they are similar → defect in the casting.

Defects:

A defect is a gap between the crown and preparation margins. There are four possible causes:

- 1) The crown or retainer did not fit and the gap was present at try-in (faults during waxing or impression taking).
- 2) The crown or retainer fitted at try-in but at the time of cementation the hydrostatic pressure of the cement particularly if the cement was beginning to set produced incomplete seating.
- 3) With a mobile bridge or splint abutment, the cement depressed the mobile tooth in its socket more than the other abutment teeth, thus leaving the gap.
- 4) No gap was present at the time of cementation but one developed following the loss of cement at the margin and crevice has been created by a combination of erosion/abrasion and possibly caries.

For these cases, the choice is to remove the bridge, restore the gap with a suitable restoration or leave it alone and observe it periodically.

Poor shape or color (esthetic problems):

- 1) A common mistake in preparing upper incisors for crowns is to remove insufficient material from the buccal/incisal third of the preparation. This results in either a crown that is too thin, so that the opaque core material shows through or in a bulbous crown.
- 2) Insufficient thickness of porcelain.
- 3) Too much adjustment is done, the incisal shade of porcelain will be ground away and the esthetic effect spoiled.
- 4) The stone should be held perpendicular to the junction otherwise the metal particles may contaminate the porcelain causing discoloration and black spotty appearance after glazing.
- 5) Absence of embrasures will recognize the teeth as artificial.
- 6) Excessive glazed anterior teeth will look unnatural.
- 7) Inaccurate shade selection.

Causes of failure, in general, are classified as:-

1) The dentist:

- i. Poor diagnosis of the case.
- ii. Improper or wrong treatment planning, such as taking a premolar as abutment to restore a canine.
- iii. Failure in preparation or impression taking or selecting the improper color.
- iv. Taking a wrong bite registration.
- v. Failure during cementation.

2) Technician: when the technician does not follow the right scientific principles or ignores some of them.

3) The patient:

- i. The patient does not care of his oral hygiene.
- ii. The patient does not follow the dentist's advices and does not visit the dentist periodically.
- iii. Psychological causes.

Other causes, such as:

- i. Hypersensitivity to Ni → inflammation of the soft tissues.
- ii. Accidents.
- iii. The age of restoration (an old restoration).

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