Post-cementation problems and failure of fixed bridges

During the last decade, the specific demand for fixed Prosthodontics has increased. This is primarily due to increased patient’s awareness, attempting to preserve teeth and esthetics and introduction of new technologies and techniques. With introduction of implants and resin cements, treatment options have increased and prognosis and longevity of treatment are enhanced. Advantages of using fixed prosthesis should be evaluated against disadvantages.

**Advantages:**

1. Esthetics.
2. To achieve occlusal stability. This is considered an advantage in recently lost teeth and in multiple missing posterior teeth. ( with single teeth that have been extracted for a long time, the patient will eventually achieve occlusal stability, by overeruption of the opposing teeth, in these cases you can’t say your choice of fixed prosthodontics is to achieve occlusal stability)
3. Speech
4. Function (in some patients there is no need to replace all missing teeth, some pt have posterior teeth up to the 6’s and are functioning well and some will complain of function after extraction of one tooth, so we always take into consideration the chief complaint of the patient)

Note: in some cases pts have teeth from second premolar to second premolar, this is called “shortened dental arch” and has certain indications

1. Periodontal splinting; fixed bridges can be used as splints (fixed splints) in cases of periodontally compromised teeth. Peroidontally compromised teeth isn’t the same as periodontally involved teeth. We never do a fixed bridge on teeth with active periodontal disease. Periodontally compromised teeth have a healthy periodontium but have reduced support (bone resorption and gingival recession) so they have some sort of mobility grade 1 or 2. Usually, bridges should be as short and separated as possible, but in a case shown by the dr, a full arch replacement was done in a pt that had periodontally compromised teeth. It is very difficult to do and very difficult to achieve parallelism between all the teeth, but in this case the occlusal load is distributed to all teeth.
2. Insufficient spaces can be manipulated by means of orthodontics to open up the space. Fixed prosthesis would also serve to maintain initial orthodontic outcomes ( orthodontic retention)
3. Restore lost vertical dimension (VD)
4. psychological reasons

**Disadvantages:**

1- Loss of tooth structure due to preparation. It is more comprehensible and justifiable when it is largely restored and endodontically treated.

2- Pulpal irritation

3- Emergence of secondary caries, this is because the margins are never hermetically sealed and with time leakage occurs

4- Periodontal problems due to subgingival margins, open margins, open or tight embrasures, over contoured crown. Generally try to place the margins juxta- or supra-gingival except when in the facial anterior area.

5- Cost and time

-------------------------------------------------------------------------

**Failures of bridges are of:**

An isolated incidence (trauma), or in relation to progressive diseases (caries and periodontal disease), or due to bad planning or execution (dentists' or technicians fault).

 A bridge can be judged as: clinically satisfactory, containing repairable problem, or a failure.

Surveys show 1.5 to 10 % failures per year. These are neither retrospective nor are based on random clinical trials; they are biased. Naturally, a grey area exists where there is a wide controversy among dentists over the concept of failure, "relative failure". For example, chipping of a crown may be considered a failure for some dentists and not for others.

***Failure*** is present as a non repairable problem inside the patient's mouth.

***Survival time*** is defined as the period of time starting from the successful fitting of the restoration and ending with the restoration presented with an irreparable damage.

* **Causes of failure:**

Could be related to **loss of retention**, **mechanical**, **biological errors**, **design**, **or faulty lab techniques**.

1. **Loss of retention:**

A patient would come complaining of a loose bridge. If the bridge falls, then retention would be faulty on both teeth. This is easier to manage than loss of retention on one tooth, particularly since the latter is harder to detect early; thus progressive damage results such as leakage and caries.

Management: Identify the cause, evaluate the abutments, recement and adjust

Examine the bridge, abutments (taper and preparation), and cementation. Any of these might be faulty. For instance, the cement might be contaminated during mixing. High eccentric contacts might lead to loss of retention. If the preparation from the beginning was not retentive, modify it by adding retentive means; like grooves. The type of bridge that is least retentive and most likely to dislodge is resin bonded bridge

1. **Mechanical failures:**

These indicate changes in prosthesis such as:

**Porcelain fractures**. If small chipping occurs, it can be repaired in the patients mouth this can be done using a porcelain repair kit. It is comprised of composite, silane coupling agent, HF acid. First the porcelain surface needs to be prepared. Smoothen and polish (with abrasive disks, rubber and finishing burs; all of which are used for composites).If the chipping is large and is in the posterior area where esthetics are not a concern; we can polish the surface and accept it. The problem with porcelain repair is if it is a large repair it doesn’t last long and also the difference in the shade between porcelain and composite and the added composite might not be able to mask the grayish appearance of metal.

Fractures occur due to high occlusal forces or when porcelain is thicker than an optimal thickness of (1.5-2 mm).This means that porcelain is not supported enough by metal. Porcelain is a brittle material, it needs to be supported well by an infra structure. Another reason for fracture of pontics: The wrong choice of alloy (that is not rigid enough, leading to flexion of metals and fracture of porcelain). Base metal alloys are indicated for long span bridges because they are more rigid than noble alloys. Titanium in the substructure can also be used when more rigidity is desired.

NOTE: thickness of metal for base alloys are 3mm and for noble alloys 5mm

All this section strictly refers to PFMs. On the other hand, if fracture to an all ceramic crown is encountered, the entire bridge must be remade because the whole structural durability is influenced. In cases of extensive fractures in pfm, also we must replace.

Notes:

* A Heavy bruxism pt must be supplied with an occlusal splint to protect the teeth surfaces. All ceramic bridges are not contraindicated in such cases. However; if the prosthesis keeps chipping - say three times or so-, you would need to change your initial design.
* For a bruxism pt, an all metal prosthesis on the palatal surface is preferable; since metals act as better stoppers and this approach is more conservative. In other words, metal on enamel is preferable to Porcelain on enamel.

-Mechanical failures related to **solder joints:**

Reasons: 1 - too thin or too narrow of a connector. 2- Improper solder or unclean metal. The Metal substructure is either all casted as one piece or is soldered at consecutive stages. Errors in the latter indicate failure of solder to bind. 3- Wrong choice of alloy. In bridges of greater than two units, soldering is preferable to the first technique .4-poor casting technique (bubbles, surface roughness). Management: Redo the bridge.

**Distortion**: causes: metal substructure is too thin, alloy not rigid enough, long span. In all these cases, bridges need to be remade.

-**Perforations:**

Perforation mainly occurs because of low-hardness alloy. This usually happens in gold alloys. If no caries are present and the perforation is merely on the occlusal surface, just observe. A direct restoration might be added. However if there are caries, we need to remove the entire bridge.

If an RCT is essential to a prepared tooth onto which prosthesis is placed, do an access cavity through the occlusal surface of the crown.

General Treatment: monitor or replace

**Loss of facings**

This used to be common with acrylic fused mechanically to metal prosthesis. Repair is very difficult and bridge needs to be replaced.

**C) Biological failures:**

These are attributed to changes in abutment teeth or the surrounding tissues.

**Periodontal disease**: you have to remove the prosthesis and maintain a proper periodontium, stabilize the periodontal disease and then redo the prosthesis. You may need to redesign your treatment plan such as going for removable instead of fixed.

 **Caries** on margins are either due to faulty preparations, positive or negative ledge, or to patients inadequate Oral hygiene methods. Caries on adjacent teeth to abutments may be of iatrogenic origins; i.e. by inadvertently exposing dentine or thinning enamel; thereby increasing susceptibility to caries.

Treatment options: Identify the cause, treat the lesion and redo.

**Damage to the pulp** might happen even when best precautions are sought. There are no guarantees. This might result from lack of provisional prosthesis or insufficient hydration during preparation, accounting for extra heat. If the bridge is done properly and in good condition access can be performed through the crown or the lesion can be removed surgically. Studies have shown that if a good RCT was preformed, the prognosis of the prosthesis is not influenced.

**Root fractures**: they might occur when long span bridges and posts are used. Posts weaken the tooth and should only be placed as a last resort.

**Tooth movement**: caused by occlusal trauma or periodontal disease.

**d) Failures attributed to design:**

This is reflected by all aspects of your bridge. A Faulty bridge design includes (long spans, lack of support, faulty abutments…)

E.g. Retainers as inlays in a patient with heavy occlusion and missing 6. Too many abutments, for example if the abutments are compromised, the dentist may do a 5 unit bridge instead of 3 units. This is wrong because compromised teeth shouldn’t receive a fixed prosthesis from the beginning.

-Improper clinical or laboratory techniques (like negative ledges or open margins). Open margins always require redoing of the entire bridge. Usually seen when the crown is ill fitting or during cementation the crown is not fully seated. In this case the open margin is seen all around the tooth and not only on one side. On the other hand, Positive and negative ledges can be adjustable. For instance if a positive ledge exists simultaneously with sufficient porcelain and a supragingival margin; chairside adjustments are the solution.

**E) Esthetic problems:**

Fixed prosthesis is a poor shape and color.

In PFMS, dark margins are due to metal show and thin porcelain, thin gingiva, or supra gingival margin. Modification is done by cutting back the metal and adding porcelain to the margin.

**Core shine** (Tooth shining on the core) primarily because of presence of a thick opaque layer which is white covered by a very thin layer of dentine or enamel porcelain resulting in a poor shine. This can be traced back to inadequate preparation for layering.

**Shadowed areas** are because of over glazing or excessive transparent enamel porcelain giving a grayish appearance. This usually happens in the pontic areas that have increased amount of ceramic.