Restorative Management of the Worn Dentition: 3. Localized Posterior Toothwear

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Abstract: In the management of localized posterior occlusal toothwear, care must be taken not only in determining whether the worn teeth are restorable, but also the desirable occlusal scheme. Assessments of the periodontal, endodontic, and coronal tooth tissues, and the occlusal relationship are necessary for a comprehensive treatment plan for worn posterior teeth.

Clinical Relevance: Anatomical differences between anterior and posterior teeth make the management of worn dentition distinct from each other. Recognizing these differences will facilitate treatment planning.

Restorative Dentistry

Erosion-related toothwear mainly affects the palatal surfaces of upper anterior teeth although, less frequently, the posterior teeth may also be affected in a localized manner. The area from which tooth substance is lost depends on a combination of causative factors and protective mechanisms.

- The lower anterior teeth are relatively less affected by erosion than their upper counterparts. It has been postulated that this is because extrinsic or intrinsic acids are held by the tongue against the upper teeth1 while the lower teeth are buffered in secretions from the submandibular and sublingual glands.
- Likewise, the upper posterior teeth might be directly protected by secretions from the parotid glands.
- On the other hand, the upper molars have anatomically prominent palatal supporting cusps and thick enamel, and these teeth may tend to over-erupt once the less wear-resistant dentine of the supporting buccal cusps of the lower molars has been exposed.
- Severe enamel hypoplasia affecting the occlusal surfaces may also predispose to toothwear of both upper and lower teeth.

From a functional aspect, bruxing, habitual unilateral chewing and a lack of posterior disclusion by anterior teeth may also contribute to localized posterior toothwear in modern societies.

DIAGNOSIS AND TREATMENT PLANNING

Anatomical differences mean that worn anterior and posterior teeth must be managed differently. Recognizing these differences will facilitate treatment planning. Assessments of the Periodontal, Endodontic and Coronal tooth tissues and the Occlusal relationship (PECO) are necessary for a comprehensive treatment plan for worn posterior teeth.

Periodontal Assessment

When existing molar crown height is insufficient to retain extracoronal restoration, clinical crown lengthening surgery may be carried out; however, the risk of furcation exposure must not be overlooked. Furcation exposure is associated with greater risk of tooth loss in patients who are susceptible to periodontal disease,2 unless appropriate periodontal maintenance is carried out.3 Radiographs taken with the paralleling technique will be useful for determining the length of root trunk before surgery.

A concavity may be found on the mesial root surfaces of upper first premolars: periodontal surgery may expose the plaque-retentive concavity, and interproximal cleansing with an interdental brush will be necessary. The insertion of the buccal frena in the premolar regions should also be examined because muscular activity may pull the gingival margin apically.

Endodontic Assessment

Protection of pulp vitality and...
management of dentine sensitivity are the most important concerns: false-positive pulp vitality results are often found with multi-rooted teeth.4 Clinical examination can be assisted by use of a fibre optic light to identify minute pulpal exposure. Periapical radiographs of worn teeth must also be taken to discover if there are any periapical changes from normal, because 80% of pulpal pathologies are asymptomatic.5

The quality of previous endodontic treatment must also be evaluated; retreatment may be necessary. Because the success rate of using endodontically treated teeth as abutments for fixed prostheses is lower than using sound teeth,6 implant-retained prostheses may be considered when there are missing teeth to be replaced.

**Coronal Assessment**

Posterior toothwear may be localized to the supporting cusps or affect the whole occlusal surface. Both conditions make the retention of intracoronal core materials or restorations difficult because of the lack of embracing walls. It is tempting to create retentive features by elective endodontic treatment and radicular space creation, but endodontically treated posterior teeth may be more prone to fracture in the absence of cuspal protection.7

Additional retentive features in the form of trough or post-hole preparations in dentine instead of pin placement are favoured, because they minimize the risks of stress cracks in dentine and of lateral perforations.8

**Occlusal Assessment**

If posterior teeth are in contact and restorations are planned, interocclusal space must be created. This can be achieved in one of the following ways:

- occlusal reduction;
- increase in occlusal vertical dimension (OVD);
- use of a Dahl appliance.

Where a tooth is over-erupted and occludes with one that is worn, occlusal reduction might be the easiest means of space creation. However, tooth reduction may lead to dentine sensitivity or even pulp exposure, which may impose elective endodontic treatment. While elective endodontics is occasionally useful, the decision must not be taken lightly because of the destructive nature of such treatment.

An increase in OVD may provide sufficient interocclusal space for restoring all the teeth in one or both jaws. However, such an approach cannot correct individual overerupted teeth. Increasing OVD in order to treat localized posterior toothwear is unacceptable because at least all the teeth in one arch would have to be restored, and sound anterior teeth with small vertical overlap would have to be lengthened excessively.

Use of a supra-occluding appliance (posterior Dahl appliance) may be considered as a viable alternative. This technique allows local intrusion of worn teeth and their opposing counterpart, with eruption of the remaining dentition. However, the patient may experience masticatory difficulties as only one or a few pairs of posterior teeth are in contact before the occlusal relationship settles again. In addition, excessive intrusion of the worn teeth, instead of the targeted over-erupted teeth, may occur; this should be monitored carefully and, if it occurs, the number of abutment teeth should be increased, for example by splinting with sectional orthodontics.

Changes in the interproximal contacts may occur as a result of proximal toothwear. Use of plastic orthodontic separators before the preparation of adhesive onlays or crowns may be useful for access to the broad interproximal areas.

**Selection of Restorative Material**

Provided that the worn tooth is vital, adhesive techniques using resin composite or amalgam may be considered as conservative options to replace lost tooth substance. Enamel and dentine etching, with the use of dentine bonding agents, is popular for bonded restorations in posterior teeth, but variations in dentine structure, lack of enamel and the polymerization shrinkage of resin may lead to inadequate retention.9

Selection of the final restoration depends not only on pulp vitality and the amount of tooth substance lost, but also on the nature of the opposing dentition and restorative materials, and the occlusal relationship required:

- It is advisable to have a cast restoration to protect the remaining tooth substance and core material when the supporting cusp is missing.10 Although an amalgam onlay with cuspal coverage is functionally adequate, cast restorations are preferable when multiple posterior restorations are required for occlusal stability.
- Metal occlusal surfaces are appropriate when the restored worn dentition is opposing natural teeth.11–12 Conventional feldspathic porcelain is more abrasive, especially when the surface glaze is lost.13

The following cases illustrate how severe posterior localized toothwear can be managed using several restorative methods.

**CASE 1**

A 21-year-old man presented with a carious lower left molar that was painful, especially when drinking hot and cold liquids. On examination, the [7] was associated with marginal gingivitis. No probing depth greater than 3 mm was
noted. The coronal pulp was exposed, and the whole occlusal surface was worn with minimal remaining clinical crown length (Figure 1). Occlusal analysis showed no interocclusal space between the overerupted |7 and the worn |7 in the intercuspal position (Figure 2).

The patient declined fixed orthodontic treatment to correct the anterior tooth crowding present, and requested restoration of |7 only.

**Treatment**

Treatment aims included the restoration of |7 to its original occlusal plane and intrusion of |7.

Crown lengthening surgery was performed on |7 after initial endodontic instrumentation and dressing. Four weeks later, the tooth was root-filled under rubber dam isolation. At the existing OVD a radicular resin composite core was placed using a packable composite (SureFil, Dentsply, Milford, DE 19963–0359, USA). Orthodontic separators were then placed mesial and distal to |6.

Four months after the periodontal surgery, an onlay preparation was carried out on |7 (Figure 3), and a working impression was taken with an orthodontic band on |6. A supra-occluding cast onlay with a soldered buccal tube was cemented on |7 with Panavia F (Kuraray, Osaka 530, Japan). Orthodontic separators were then placed mesial and distal to |6.

To prevent intrusion of |7, a rectangular wire was used to splint |6 and |7 together (Figures 4 and 5).

Follow-up

The patient was reviewed 1 week later and had no discomfort, except for some difficulty in chewing. All teeth were in contact again after 2 months. The orthodontic band and buccal tube were removed at the end of treatment (Figure 6).

**CASE 2**

A 57-year-old man was referred to a dental hospital by his dentist, who anticipated difficulty in restoring the patient’s severely worn posterior teeth, even though the wear was localized. The patient was concerned about the rate of toothwear and his inability to chew well.

On clinical and radiographic examination, there was mild generalized horizontal bone loss and slight angular bone loss on the mesial root of |7. The heavily restored |6 was found to be non-vital. Marked tooth wear and exposure of secondary dentine of |5 and |7 were visible (Figure 7). The |4 to |7 had all over-erupted and minimal interocclusal space was seen in the intercuspal position (Figure 8).

Elsewhere there was generalized mild toothwear, particularly in the anterior region, with a Class III malocclusion incisal relationship (Figure 9). The mandible could not be positioned to a more retruded position from the original intercuspal position even after the patient wore a splint for 1 month.

The edge-to-edge incisal relationship may further increase the incisal and...
posterior toothwear as there was inadequate posterior disclusion by the existing anterior guidance. Functionally, the missing posterior teeth \([6] and [5] \) may encourage the patient to seek more effective occlusal contacts by posturing the mandible anteriorly, again increasing the anterior toothwear.

Examination of the mounted study casts and diagnostic wax-up showed that, if the posterior teeth could be intruded and the anterior teeth proclined, restorations could be provided to restore the anterior teeth to allow posterior disclusion, and to improve posterior masticatory function. A multidisciplinary approach was considered: to correct the posterior interocclusal space problems by using bilateral posterior bite-planes and to correct the edge-to-edge incisal relationship by using a maxillary fixed orthodontic appliance.

**Treatment**

After endodontic treatment of the non-vital \([6] \) and the replacement of defective restorations, bilateral posterior bite-planes were bonded with glass-ionomer cement at an increased OVD (Figures 10 and 11). The incisal edges of the anterior teeth were then restored and lengthened with composite resin.

Fixed orthodontic treatment was initiated after 4 months, when the posterior bite planes had intruded the posterior teeth, with some overeruption of the anterior teeth. Four brackets \([2] \) to \([2] \) and two molar bands \([6] and [6] \) were cemented, and push coil springs were used on both sides to procline and extrude the anterior teeth (Figure 12).

After 10 months, an appropriate anterior guidance was established and refined with resin composite placed on the upper and lower anterior teeth. Adequate posterior interocclusal space was available after debonding of the bilateral posterior bite planes (Figure 13).

Unfortunately, tooth \([7] \) was found to have further periodontal bone loss involving the mesial root. Despite repeated root planing under local anaesthesia, the vital tooth still had persistent pocket infection. The tooth was endodontically treated and its mesial root resected.

Adhesive nickel-chromium onlays were placed on \([4] \) to \([7] \), and \([5] \) and \([7] \) were prepared for a conventional ceramometal bridge replacing \([6] \). Teeth \([6] \) and \([7] \) were heavily restored, hence three-quarter crowns were used to protect them. Tooth \([3] \) was restored with an amalgam onlay. The root-resected \([7] \) was restored with radicular amalgam only because its long-term prognosis is questionable (Figures 14–16). An implant-retained prosthesis may be used to replace \([6] \) and \([7] \) in the future.

**SUMMARY**

In the management of localized posterior occlusal toothwear, care must be taken not only to determine whether the worn teeth are restorable, but also to devise the desirable final occlusal scheme. Although supra-occluding appliances/restorations could intrude the posterior worn teeth and/or their opposing teeth for space creation, the use of fixed orthodontic appliances for correction of other malocclusions and for achieving an anterior guidance must not be overlooked.

It had been expressed that ‘over-contoured restorations’ or ‘high spots’ should be avoided because they are not
Hence the stomatognathic system can create interocclusal space in different parts of the mouth. The loss of both anterior and posterior teeth may result in the stomatognathic system adapting to any new occlusal relationship. Consideration of the restorative treatment decisions and options is shown in the flowchart (Figure 17).

Regular recalls are required for successful maintenance.

**REFERENCES**


