Advanced tooth wear: restoration using a double-veneer technique

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SUMMARY. The present case describes the management of significant tooth wear in a 13-year-old boy who presented following excessive consumption of carbonated drinks, accompanied by a “frothing” habit. The case demonstrates an alternative approach to the management of tooth wear, using a double-veneer technique, and emphasises the importance of recognition and early intervention in cases of dental erosion.

KEY WORDS. Advanced tooth wear, Veneer technique.

Introduction

Tooth wear is common in adolescents: with recent dental surveys reporting tooth wear with dentine exposure in nearly 30% of 14-year-olds [O’Brien, 1994; Bartlett et al., 1998]. Furthermore, the problem of tooth wear in children and adolescents appears to be increasing, as highlighted by the National Child Dental Health Survey [O’Brien, 1994] and other surveys [Bartlett, 1998]. The major aetiological factor appears to be erosion from acidic drinks, either as pure fruit juices, squash or as carbonated drinks [Asher and Read, 1987; Shaw and Smith, 1994; Zero, 1996].

Tooth wear is characterised by tooth surfaces that are smooth, polished and rounded. It is imperative that signs of tooth wear are recognised early, allowing preventive measures to be instituted, with identification of aetiological factors [Nunn et al., 1996]. This emphasises the importance of regular attendance for check-ups and early recognition of tooth wear by the clinician. When treatment planning, aetiological factors need to be addressed first, prior to complex and expensive restorative techniques.

The present case details the restoration of advanced tooth wear using a double-veneer technique, which requires minimal tooth preparation and conserves the remaining tooth structure.

Case report

A 13-year-old Caucasian male was referred by his general dental practitioner concerning tooth wear affecting his maxillary central and lateral permanent incisor teeth. The patient’s main complaint was the appearance of these teeth and the thermal sensitivity he experienced when eating.

His dietary history revealed excessive consumption of carbonated drinks at regular intervals, throughout most days. Further, he had the habit of “frothing” the drink around his teeth prior to swallowing. History revealed neither evidence of gastro-oesophageal reflux nor of any eating disorder. The reason for the delay in presentation for dental treatment remains unknown, given the patient’s apparent regular attendance for dental inspections. It may be significant, however, that the patient had recently changed dentist and his new dental practitioner who recognised the problem was a recent dental graduate.

Medically, the patient had Nail-Patella syndrome, an autosomal dominant trait characterised by dysplastic nails, absent or hypoplastic patellae, iliac horns and in some cases, nephropathy. Osteoarthritis is a complication that develops in adult life. Otherwise his medical history was unremarkable.

Extra-oral examination revealed no abnormalities. Intra-oral examination revealed the following teeth to be present (FDI notation):
Oral hygiene was only fair and there was a marginal gingivitis, which was a persistent problem throughout treatment. Caries was present in 16, 26 and 46, and 36 presented as carious retained roots. Evidence of enamel decalcification was seen labially in 12 and 22 at the cervical margins. There was marked tooth wear affecting the palatal surfaces of 11 and 21, with near pulpal exposure of 21, and fracture of the incisal edges with a consequent loss of overbite and an edge-to-edge anterior occlusal relationship (Fig. 1, 2). There were no other areas of tooth wear. The patient had a Class I occlusion, although there was a crossbite affecting 12 and 42 and a unilateral posterior cross-bite without displacement on the right. All anterior teeth gave positive responses to electric and thermal pulp testing, although 21 subsequently became non-vital with abscess formation. Uncomplicated crown fractures affected 31, 32 and 41, with no signs or symptoms of loss of vitality in these teeth. Radiographic examination revealed that all permanent teeth were present.

The following treatment plan was formulated.
- Dietary analysis and advice.
- Temporary restoration of 11 and 21 palatal surfaces.
- Restoration of 31, 32 and 41.
- Upper removable appliance (URA) to correct crossbite 12 and decrease the overbite.
- Restoration of 11 and 21 using gold palatal veneers and labial ceramic veneers.
- Extraction of 36 retained roots, using inhalation sedation and local anaesthetic.

Review

The patient’s general dental practitioner was asked to provide preventive care and restorative treatment for the caries affecting 16, 26 and 46 as well as removal of the carious roots of 36.

Following dietary analysis, advice was given regarding limitation of carbonated drink intake to meal-times and its substitution with either milk or water. The patient was also advised to drink any carbonated drinks through a straw, positioning the straw posteriorly in the mouth and to avoid tooth-brushing for 20 minutes after juice ingestion. In addition, a daily neutral sodium fluoride mouthwash was prescribed. A conventional glass ionomer cement [Chemfil Superior®] was used as a temporary restoration of the palatal surfaces of 11, 21. Subsequently, 31, 32 and 41 were restored with composite resin [Spectrum®], under rubber dam, and an upper removable appliance was fitted to decrease the overbite and to correct the crossbite affecting 12, with appropriate care instructions being given.

During the orthodontic treatment period, the patient presented with pain in the upper left dental quadrant. Clinical examination revealed a fluctuant swelling associated with 21 and radiographic examination revealed a periradicular radiolucency associated with 21. The pulp of 21 was extirpated under local analgesia and a calcium hydroxide intracanal dressing [Hypocal®] was placed. At the end of orthodontic treatment (after 3 months) the 21 was permanently obturated with multiple gutta percha points and root canal sealant [Tubliseal®] (Fig. 3).

Minimal tooth preparation of 11 and 21 was undertaken and an impression taken using an
addition silicone impression material [Express®] in a non-perforated, close-fitting special tray. The working cast was mounted on a semi-adjustable articulator opposite the study cast of the mandibular arch. Cast metal palatal restorations were fabricated using a gold alloy [Mattident 60®] whose fitting surfaces were sandblasted, and the veneers cemented with a dual-affinity resin [Panavia-21®] (Fig. 4). In those areas that extended past the natural tooth tissue, core porcelain [Vita Omega Core Opaquer®] was bonded to the casting (Fig. 5). Labial ceramic veneers [Vita Omega 900®] were fabricated, silane coated and cemented using a dual-cure cement [Duo Cure®].

At the final visit, the retained carious roots of 36 were elevated using local anaesthetic under inhalation sedation, as the patient was apprehensive about dental extractions.

At 24-month review, all restorations remained functional and aesthetically acceptable (Fig. 6), although there was the continuing problem of poor oral hygiene which persisted at 48-month review. Despite this, the restorations at 48 months were still satisfactory (Fig. 7).

**Discussion**

Tooth wear is common in adolescents, with the major aetiological factor being erosion from acidic drinks, either as pure fruit juices, fruit squash or as carbonated drinks [Asher and Read, 1987; Shaw and Smith, 1987; Zero, 1996]. Indeed, data supplied by the Soft Drinks Manufacturers demonstrates a doubling of sales of soft drinks in the United Kingdom since 1970 and a seven-fold increase since 1950 [British Soft Drinks Association, 1991; Shaw and Smith, 1994]. Sales to adolescents and children account for 65% of this total [Rugg-Gunn et al., 1984; Shaw and Smith, 1994]. Soft drinks have been reported to provide as much as one fifth of added sugars in the diet of 11-12 year old children [Rugg-Gunn et al., 1986]. In recent years there has also been an increasing popularity in so called designer drinks, with increased consumption of sports drinks and alcoholic soft drinks, both of which have been associated with higher levels of dental erosion [Hughes et al., 1997; Milosevic et al., 1997; O’Sullivan and Curzon, 1998]. It is highly likely...
that the increase in availability and consumption of soft drinks accounts for the high incidence of tooth wear observed in the UK [O'Brien, 1994; Nunn, 1997]. This was undoubtedly the situation with the present case, as opposed to other causes of erosion, such as eating disorders [Burke et al., 1996]; rumination [Gilmour and Beckett, 1994]; gastro-oesophageal reflux [Barlett et al., 1996a; Bartlett et al., 1996b]; and the recent surge in the use of designer drugs [Duxbury, 1993].

In the present case, in addition to tooth wear being attributed to excessive ingestion of carbonated drinks, the problem was compounded by the patient “frothing” the drink between his teeth prior to swallowing. As such, the initial aim was to prevent acid reaching his teeth. Specific recommendations which were made included reducing the frequency of fizzy drink intake; drinking more water or milk; not to “froth” drink between the teeth; avoiding sipping drinks and to use a straw positioned palatal to the upper incisors [Edwards et al., 1998]; not drinking carbonated drinks prior to bedtime [Millward et al., 1994] and avoiding brushing for 20 minutes after drinking [Davies and Winter, 1980]. In addition, a neutral daily sodium fluoride mouthwash was prescribed [Kelly and Smith, 1988].

Prior to restoring 11 and 21, the overbite was reduced using an URA to reduce the overbite [Rickett and Smith, 1993; Hussyey et al., 1994]. Additionally, a “Z” spring was incorporated into the appliance to procline 12. The principle of creating space between the upper and lower incisors is based upon the Dahl appliance [Dahl and Krogstad, 1982; Dahl and Krogstad, 1983].

Having decreased the overbite and corrected the crossbite with an URA, 11 and 21 were restored using separate labial and palatal adhesive restorations [Bishop et al., 1996]. This technique requires minimal tooth preparation and conserves the remaining tooth structure. Furthermore, the metal coverage of the palatal surfaces provides a durable and non-abrasive occluding surface [Al-Hiyasat et al., 1998]. To overcome the aesthetically unacceptable grey-out [Saunders, 1989] that occurs with the extension of metal beyond the incisal edge even with opaque resin cements, core porcelain was added to the areas of metal extending beyond the natural tooth structure. Nickel-chrome veneers are an alternative and in one series, over 300 such veneers were placed in a Paediatric Department using Panavia-21 and over a 10-year period, it was reported that only two of these veneers debonded [Harley, 1999]. Separate labial ceramic veneers were chosen to ensure a good aesthetic result. Ceramics are routinely treated to allow their use as an ‘adhesive’ restoration [Walls, 1995] resulting in reports of very low levels of failure after up to five years in use [McLaughlin and Morrison, 1988].

An alternative to the double-veneer technique in the treatment of tooth wear is the dentine-bonded crown, which also makes use of adhesive techniques. Advantages include excellent aesthetics and minimal tooth preparation [Burke et al., 1995], as well as good fracture resistance [Burke and Watts, 1994], minimal pulpal effects [Milosovic and Jones, 1996] and reduced microleakage [Saunders et al., 1997]. They are not, however, suitable for crown preparations with subgingival margins. To date, assessment of the clinical performance of dentine-bonded crowns

![Fig. 6 - Labial view of 11 and 21 after coronal restoration at 24 months.](image6)

![Fig. 7 - Labial view of 11 and 21 after coronal restoration at 48 months.](image7)
appears promising [McLaughlin and Morrison, 1988; Qualtrough et al., 1997], although their long-term success is unknown as no clinical trials have been carried out.

The question of maintaining good oral hygiene is pertinent to this case. Oral hygiene was not as good as desirable but at the same time there was a severe problem with the loss of tooth tissue of the anterior teeth. While it is usual not to place veneers unless the oral hygiene is very good, sometimes the longer term care of a patient’s dentition requires immediate restorative treatment. In the present case while oral hygiene has improved it could still be better. Nevertheless, this young man is now a better dental patient and is beginning to take more care of his teeth. This might well not have been the case if his anterior maxillary teeth had been left untreated.

This case illustrates the importance of early recognition of tooth wear to prevent the need for complex and expensive restorative techniques which subject the patient to a lifetime of restorative care. It also demonstrates the management of tooth wear using an adhesive double-veneer technique and emphasises that prevention remains the cornerstone in the management of dental erosion.

**References**


O’Sullivan EA, Curzon MEJ. Dental erosion associated with the use of ‘alcopop’ – a case report. Brit Dent J 1998; 184:


