



# Tooth wear in the child and the youth

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**Tooth surface loss is an increasing problem in younger individuals. Preventive strategies are essential while adhesive dentistry should be used whenever possible if restoration is necessary.**

The previous articles in this series have discussed tooth surface loss in the adult. Dentists will be aware of this problem in younger patients where it can sometimes cause very severe damage at an early stage in life. The management of the child and adolescent has a number of similarities to adults with a need for effective prevention. When restoration becomes necessary, consideration must be given to life-long management of the patient and adhesive techniques have a major role to play.

Tooth wear has become a major clinical challenge for dentists treating the young patient today. Although this wear is undoubtedly due to a combination of erosion, abrasion and attrition, the major factor in this age-group is erosion. The evidence that the prevalence of erosion is increasing remains largely anecdotal. However fewer dentists are questioning this as they see the problem growing in their own working environment. It has still to be demonstrated whether the prevalence is actually increasing or the heightened awareness of this problem is simply a matter of improved recognition and reporting. It is interesting to note that as early as 1908 G V Black stated that although erosion is rare compared with caries, once a practitioner is aware of erosion he will actually see it in many more patients:<sup>1</sup> a philosophy which is not out of place today. It remains a challenge for paediatric dentists familiar with the early diagnosis of erosion to teach their colleagues how to recognise the problem before it is too late. The first important study that attempted to determine the prevalence of dental erosion in children was the UK Child Dental Health Survey of 1993.<sup>2</sup> It was reported that 52% of 5-year-olds had erosion of their primary incisors with 25% showing dentinal or pulpal involvement. Of 11–14-year-olds, 28% were found to have erosion of their upper incisors. The higher susceptibility of the primary dentition is thought to be due to a reduced thickness of the enamel and its greater solubility in acid.

## Aetiology

All acids, whether intrinsic or extrinsic in origin, are capable of causing erosion. While gastric acid cannot be discounted the overwhelming evidence would suggest that the primary aetiology in this age group is the consumption of fruit juices, squashes and carbonated beverages. Data supplied by the Soft Drinks manufacturers

showing a seven-fold increase in the consumption of soft drinks between 1950 and 1990 support this.<sup>3</sup> Soft drink intake is much higher in younger age-groups. They have been reported to provide as much as one-fifth of added sugars in the diet of 11–12 year old children and 42% of fruit drinks are consumed by children aged between 2 and 9 years.<sup>4</sup> Nutritionists and dieticians are increasingly concerned that children are not eating sufficient quantities of food to maintain the correct calorific intake and level of nutrients for growth and development because they fill up on large quantities of fruit-based drinks. Of equal concern is the evidence that eating patterns established in childhood persist into adulthood. Children with erosion of the primary dentition have already established patterns of eating and drinking which place them in a high risk group for damage to the permanent dentition. In 1995 it was projected that by the year 2000, 12–15-year-olds would be drinking 50% more soft drinks.<sup>5</sup> The earlier such behaviour can be modified the better for the teeth.

Erosion is not linked simply to a high intake of acidic beverages but also to the frequency, the method and the timing of consumption. The latter is particularly important with respect to mealtimes and prior to toothbrushing. Erosion may be exacerbated by high standards of oral hygiene. Where a bedtime drink precedes bedtime toothbrushing, the potential for an even greater loss of tooth substance can exist.<sup>6</sup>

The development of dental erosion in an individual is dependent on a number of additional factors. Some of these are inherent to that person and cannot be altered by dietary management. Examples are the buffering capacity of saliva, the solubility of the tooth structure in acid and the relationship between the hard and soft tissues. The overall consumption of acidic foodstuffs in addition to beverages is also important as is the general health of the child or adolescent. A recent study to investigate the relationship between dental erosion and gastro-oesophageal reflux (GOR) found that only 9 of 53 affected children examined between 2 and 16 years, showed any signs of dental erosion and of these only one had erosion involving dentine.<sup>7</sup> The authors concluded that dental erosion may not be as great a problem in children with GOR as some authorities believe it to be in adults.

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## Establishing the diagnosis

### History

The need to take an adequate dietary history to explore the extent, frequency and timing of acid consumption has been outlined. A medical history to establish the role, if any, of intrinsic acid is imperative. Children and adolescents with eating disorders are known to be selective with the facts. Dietary enquiries may need to be made on a number of occasions in order to match the history with the dental findings.

The presenting complaint of the child or teenager is of equal importance. This is usually one of the following :

- Sensitivity from the teeth
- Pain from the teeth
- Chipping of the incisal edges
- Fracture of the teeth
- Incisal greying
- Darkening of the teeth.

### Examination

Clinical examination of the anterior teeth may reveal any one or all of the following:

- A loss of surface anatomy (fig. 1)
- Increased incisal translucency (fig. 2)
- Chipping of the incisal edges (fig. 3)
- Areas where the enamel is absent (fig. 4)
- Exposure of the pulp (fig. 5).

At the back of the mouth erosion causes a similar loss of surface anatomy, classically with cuspal cupping (fig. 6), and a darkening of the colour of the teeth. However, due to the shape of the teeth, chipping is less frequent. Exposure of the pulp in the posterior teeth of the permanent dentition as a consequence of erosion is almost unheard of whereas pulpal exposure of deciduous molars in cases of severe erosion is seen more frequently (fig. 7).

### Management

Once a diagnosis of erosion has been made, management of the condition primarily aims to prevent acid reaching the teeth. If the acid is dietary in origin, advice must centre on altering the diet to remove the cause. Additional recommendations, such as confining the intake of acidic foodstuffs and beverages to mealtimes and never drinking a fruit drink prior to bedtime, need to be given with caution. Monitoring may determine whether the dietary advice has been heeded. However, estimating the progress of wear remains one of the most difficult challenges faced by practitioners today. Despite photographs, study casts and indices, ongoing erosion remains difficult to detect and impossible to quantify. For the permanent dentition the approach of not providing treatment until one is certain erosion has ceased is not realistic. More specifically in today's culture where fruit drinks and carbonated beverages are so readily available many children and adolescents do not



**Fig. 1** A loss of surface anatomy



**Fig. 2** Increased incisal translucency



**Fig. 3** Chipping of the incisal edges



**Fig. 4** Areas where the enamel is absent



**Fig. 5** Exposure of the dental pulp of the maxillary left central incisor

**Fig. 6** Wear of a mandibular first molar with loss of surface anatomy



**Fig. 7** Pulpal exposure of the maxillary deciduous molars



**Fig. 8** Significant areas of exposed dentine on the palatal surfaces of the maxillary central incisors



**Fig. 9** Fracture of the incisal edges



**Fig. 10** Widespread loss of enamel leading to hypersensitivity



and cannot comply with the dietary advice given.

Active restorative intervention is necessary:

- Where there are significant areas of exposed dentine (fig. 8)
- Where there is a risk of tooth fracture (fig. 9)
- If there is hypersensitivity which cannot be controlled by any other means (fig. 10).

The aims of such treatment will be:

- To protect the remaining tooth structure
- Control symptoms and
- To stabilise the occlusion.

A number of materials is available to assist in achieving these aims which differ according to whether deciduous or permanent teeth are being restored.

### The deciduous dentition

Treatment of erosion in the deciduous dentition is limited by patient compliance, inadequate enamel and insufficient coronal tissue to provide successful adhesive restorations. In theory it is possible to build up worn deciduous incisors with composite resin, in practice this is rarely done. Provided the worn teeth remain symptom free, they are left unrestored until they are exfoliated (fig. 11). If symptoms arise these teeth are usually removed.

Worn deciduous molars which are sensitive are often not amenable to successful treatment with intra-coronal restorations due to the widespread shallow nature of the erosive lesions (fig. 12). Adhesive materials undoubtedly have more to offer than amalgam in such clinical circumstances and may be successfully used for minimal lesions. However placement of stainless-steel crowns on deciduous molars is frequently the only satisfactory way of providing relief of symptoms, cessation of continued wear and assurance that a tooth may remain *in-situ* until exfoliation.

### The permanent dentition

Other articles in this series assess materials currently available to treat wear in the permanent dentition. This remains an area of contention as each clinician tends to favour a particular method. To ensure placement of a satisfactory restoration in the young patient a number of factors need to be borne in mind:

- Enamel loss is characteristically over a wide area of limited thickness (fig. 13)
- Anterior restorations in the mouth of an adolescent are vulnerable to loss, for example contact sports and orthodontic appliances may affect their longevity.

### Anterior restorations

Where enamel loss is limited to the incisal aspect of a crown or conversely enamel loss is extensive (figs 14, 15), composite resin is the material of choice. This material performs best when placed in bulk and provides an excellent aesthetic

result. In individuals where the pattern of enamel loss is more classical in its distribution involving the palatal surfaces of upper anterior teeth, composite resin is difficult to apply, demanding to finish and liable to fracture. The claim that easy repair makes composite an ideal material for use in this situation is countered by the almost certain need for frequent repairs and regular maintenance.

Frequently it is necessary to restore the incisal aspect of an upper anterior tooth with composite resin and employ a more durable, stronger material to restore the palatal surfaces. The two materials most suitable for this purpose are yellow gold and nickel-chromium alloys. Nickel-chrome veneers are highly successful (fig. 16): in a series of over three hundred placed by the author in the Paediatric Dental Department at the Eastman Dental Hospital over the past decade, only two veneers have debonded. This reflects the reliability and high bond strengths obtained when using surface-active composite luting agents in conjunction with sand-blasted nickel-chromium alloy. When using opaque versions of these cements, theoretical objections to nickel-chromium alloys on grounds of poor aesthetics are minimal. The preference is for a material which in a number of clinical circumstances, such as resin-retained bridges, has demonstrated its superiority. The clinical procedure is conservative of tooth structure as no preparation is required and cementation is carried out under rubber dam to ensure moisture control. For those operators familiar with the clinical procedure for the cementation of resin-retained bridges, the transference of their skills to cement what, in effect, are multiple individual retainers is straightforward.

A similar method is employed to restore the occlusal surfaces of worn molar teeth (fig. 17). Here a nickel chrome onlay is cemented to the worn occlusal surface of a tooth. Again no tooth preparation is carried out. In the young patient the use of this method is ideal as it conserves the maximum amount of tooth structure with minimal restorative intervention. If at a later date the individual wishes placement of a more aesthetic restoration, a return to how the dentition looked pre-treatment is relatively straightforward. The provision of the nickel-chrome adhesive onlay causing deliberate axial tooth



**Fig. 11 Worn deciduous incisors**



**Fig. 12 Worn deciduous molars**



**Fig. 13 Enamel lost over a widespread area but of limited thickness**

movement has re-created the space lost occlusally through wear.<sup>8</sup>

Tooth surface loss in the younger patient is due primarily to acid erosion. The most significant aetiological factor appears to be the consumption of acidic beverages. Current data indicate that tooth surface loss is widespread in younger patients. The characteristics of the patterns of wear have been described. Young patients often find difficulty in complying with the dietary control necessary to minimise further tooth surface loss.

The restorative principles are conservative relying on adhesive techniques. The durability and predictability of adhesive nickel-chromium



**Figs. 14 and 15 The labial and palatal views of two extensively worn maxillary central incisors**



**Fig. 16** Nickel-chromium veneers on the palatal surfaces of the maxillary incisors



**Fig. 17** Nickel-chromium onlays placed on the mandibular first molars

veneers makes them the method of choice where teeth require protection against further damage. When the incisal edges of the maxillary incisors have been lost, composite resin is effective only when used in sufficient bulk. The restorative management parallels that for adults with adhesive techniques being used whenever possible.

The final parts of this series will discuss the

principles of treatment planning for the restorative care of those affected by tooth surface loss. The next article describes how treatment can be ordered to deliver it effectively and the strategies that may be used to create inter-occlusal space when clinical crown height is lacking.

- 1 Black G V. *A work on operative dentistry in two volumes*. Chicago. Medico-dental publishing company, 1908.
- 2 O'Brien M. *Children's Dental Health in the United Kingdom, 1993*. London: OPCS HMSO.
- 3 British Soft Drinks Association. *Report of Seminar in Heidelberg, 1991; Factsheet number 9-7.91*.
- 4 Rugg-Gunn A J, Lennon M A, Brown J. Sugar consumption in the United Kingdom. *Br Dent J* 1986; 161: 359-364.
- 5 Shaw L. Personal communication, 1998.
- 6 Millward A, Shaw I, Smith A J, Rippin J W, Harrington E. The distribution and severity of tooth wear and the relationship between erosion and dietary constituents in a group of children. *Int J Paed Dent* 1994; 4: 151-157.
- 7 O'Sullivan E A, Curzon M E J, Roberts G J, Milla P J, Stringer M D. Gastroesophageal reflux in children and its relationship to erosion of primary and permanent teeth. *Eur J Oral Sci* 1998; 106: 765-769.
- 8 Harley K E, Ibbetson R J. Dental anomalies — are adhesive castings the solution? *Br Dent J* 1993; 174: 15-22.

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