

Treatment of juvenile occlusal tooth wear with direct composite resin

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All teeth will wear during use, so called 'physiological' wear, but there seems to be little consensus as to what constitutes 'age-appropriate' tooth wear. Conversely, there are widely accepted tooth wear indices which give some help to clinicians to define 'severe' tooth wear. Furthermore, most dentists claim to recognise when tooth wear is 'pathological' and in need of restorative treatment. However, without a classification system for very early tooth wear, individual clinicians are left to form their own judgement as to whether implement treatment or not.

Introduction

Modern adhesive dentistry provides a range of minimally invasive, and even reversible, restorative techniques allowing clinicians to place restorations in the early stages of tooth wear. Early intervention preserves enamel thereby reducing restorative complexity by facilitating predictable bonding.

Early tooth surface loss does not cause symptoms, and busy clinicians may be forgiven for avoiding treatment until the condition is advanced. Significant restorative problems, often beyond the skill levels of general dentists, and the financial means of many patients, may well be the result.

Prevalence

The 2009 Adult Dental Health Survey (ADHS), a ten-year continuation of the first that was undertaken in 1968, reveals continued improvement in the overall dental health of the UK

population. However, against this welcome reduction in decay and periodontal disease, there has again been an increase in the prevalence of toothwear from 11% in 1998 to 15% in 2009.¹

Admittedly very few 2009 cases were designated as extreme tooth wear, but bearing in mind the data were collected almost seven years ago, it would not be unreasonable to expect the trend to continue, and for treatment of tooth wear to become a major theme of future dental care.

Aetiology

Clinically, tooth wear has been classified by aetiology, with clinical appearance the main diagnostic criteria.² The main causes have been described as:

Erosion: tooth tissue lost from purely chemical causes not involving bacteria.³ Stomach acid is the main intrinsic source, appearing in the mouth either from involuntary gastric

reflux⁴ or intentional vomiting, particularly with the rise of eating disorders such as bulimia. Foodstuffs, notably fruit juices and carbonated beverages, remain the main extrinsic source. Dentine dissolves quicker than enamel producing the classical 'cupping' appearance, usually on occlusal and incisal surfaces.⁵ The location of the erosion can indicate the source of the acidity.

Abrasion: tooth tissue lost from the action of an intermediary material. Aggressive tooth-brushing using abrasive dentifrice has been a suggested cause of cervical lesions, and pen-chewing, pipe smoking etc. have been implicated as causes of localised occlusal surface wear.

Attrition: teeth rubbing against each other with no intermediary substance can wear down. Enamel and dentine wear at the same rate producing a clinically recognisable flattened occlusal surface. Unequal posterior occlusal contacts have been suggested as a cause of

attritional tooth grinding behaviour when searching for full tooth closure.⁶ Parafunctional habits both conscious and sub-conscious (bruxism) also play a part.

Abfraction: cusp flexure under eccentric occlusal loading results in the loss of tooth tissue⁷ producing non carious cervical lesions.⁸

Ablation: bizarre and repeated tongue movements can also remove tooth tissue over time.

However, it is now generally agreed that tooth wear is actually a multifactorial phenomenon⁹ with individual aetiological classifications being of academic value as most tooth surface loss is produced by a combination of causes.

Modern lifestyles

Against the backdrop of general improvements in dental health there is a worrying trend of increasing tooth wear in recent years.¹⁰

This trend suggests unless successful preventive protocols are implemented this coming generation will experience a completely different set of dental problems.

The increased acidity in the modern diet¹¹ coupled with more abrasive 'healthy' foodstuffs has been implicated in increasing tooth surface loss (TSL), particularly in young adults.¹² The pressure to conform to idealised standards of physical beauty has led to an increase in bulimia.¹³

Today's younger generation have different lifestyle issues to their parents before them. The university system in the UK leads young adults to leave home to further their education with all the temptations such a lifestyle offers.

Intervention

There is much discussion concerning the normal rate of tooth wear. Lambrechts suggests 0.01 mm per year,¹⁴ yet there remains no recognised classification quantifying 'normal' tooth wear.⁷ Despite this, many practitioners seem confident when recognising 'age-appropriate' tooth wear. Such 'normal' rates of tooth wear are described as 'physiological' and cause little concern, yet more dramatic and progressive tooth wear, has been termed 'pathological' with intervention recommended.

Monitoring the situation is a necessary process to determine if the condition is on-going or stabilised, and a full clinical examination and record taking is mandatory to establish a 'baseline' position. The debate rages around how to treat tooth wear and, more controversially, when to treat. Early intervention before symptoms occur offers the opportunity for minimally invasive options while deferral may lead to significant restorative treatment.

Treatment options

Ideally, prevention is the best approach and a full history and

dietary survey is a sensible first step to identify aetiology. Lifestyle counselling and dietary advice is easily offered where an erosive component is suspected while reversible treatment with occlusal splint therapy, where occlusal factors and parafunction are deemed significant, is easily initiated.

Equally, whether the wear is localised or generalised will have an impact on treatment decisions. Localised anterior wear can be treated using orthodontic intrusion with Dahl principles¹⁵ being a popular choice.¹⁶ However, generalised TSL may require full mouth restorations. Either approach involves alterations in occlusion, the so-called 're-organised' approach.

Passive treatment

Tooth wear is not a diagnosis but a clinical finding and the aetiology is important when considering intervention. To intervene restoratively when first observing tooth wear may be considered 'overtreatment', and access to historical records is necessary to confirm if deterioration is taking place. Equally, on-going and robust monitoring is necessary if the condition appears stable, along with regular preventative advice.

Active treatment

Once dentine is exposed; Lussi⁹ has classified this as 'severe' wear, it would seem sensible to consider its early coverage irrespective of aetiology. Traditionally active treatment would involve varying degrees of tooth preparation to provide mechanical retention for indirect restorations. In the face of

Figure 1



such aggressive intervention many practitioners were perhaps rightly uncomfortable intervening at all, preferring to await developments rather than sacrifice healthy tooth tissue.

However, recent increases in tooth surface loss¹ suggest such 'watch and wait' tactics are not serving patients well. Modern adhesive dental techniques allow for early intervention at minimal biological cost, but rely heavily upon enamel as the best bonding substrate.¹⁷ Consequently, it could perhaps be described as negligent to allow dentine to become exposed at all.

Without intervention, tooth wear may develop into a significant restorative challenge requiring new clinical skills to be mastered by clinicians.¹⁸

Ironically, those clinicians who have invested heavily in acquiring new skills may discover the patient does not have the financial wherewithal to proceed with such complex treatment.

Put simply, patients may not be able to afford the solutions to their problems, and in the face of such possibilities, early and robust intervention is advised.



Figure 6

Figure 2



Case study

This case report describes the treatment of juvenile occlusal tooth wear with direct composite resin at a raised occlusal vertical dimension. It outlines a process for rapidly placing adhesive direct composite resin restorations without any tooth preparation, and at minimal financial cost, before significant tooth tissue is lost.

A 19-year-old man had attended the practice regularly since an early age, but having moved away to university had latterly failed his regular recalls. His previous appointment three years earlier, had revealed new carious lesions and early signs of widespread tooth wear (*Figures 1 and 2*).

Upper anteriors were restored definitively with adhesive composite resin, but the extensive molar decay was excavated by hand to avoid pulpal exposure, and sealed with glass ionomer cement transitional restorations to allow progressive secondary dentine formation.¹⁹

Preventive lifestyle advice, including reduction of carbonated beverage consumption was advised (erosion was suspected). Study models and photographs were also recorded to



Figure 7

Figure 3



Figure 4



Figure 5



establish a baseline position to monitor the wear. Unfortunately he failed to attend for follow-up appointments.

Emergency treatment

Three years later the sudden loss of the restoration in 11 (*Figure 3*) prompted an emergency appointment which allowed monitoring to continue. Comparison with earlier study models and photographs revealed tooth wear had indeed progressed with noticeable dentine exposure. More worrying was the dramatic incisal wear; palatally uppers (*Figure 4*) and incisally lowers (*Figure 5*).

Aetiology and diagnosis

He accepted his hectic student lifestyle had contributed to the situation, and contritely admitted previous preventive advice had been ignored. Furthermore, upon comparing newly cast study models and photographs (*Figures 6 and 7*) with previous records it was apparent the condition was on-going

and deteriorating rapidly. The tooth wear was consequently diagnosed as 'pathological' and the comparative records convinced the patient his dentition had deteriorated over the last three years and he requested treatment to arrest further tooth surface loss.

Preventive therapy starts with a thorough examination to ascertain aetiology. Clinical findings can indicate the cause of tooth wear, and the occlusal 'cupping' of molars and premolars suggested an erosive component.⁵ Medical history excluded gastric reflux, consequently extrinsic acid sources were suspected. A dietary survey again revealed significant carbonated beverage consumption.

However, tooth surface loss has multifactorial aetiology²⁰ and other causes should also be considered. Cervical wear and gingival recession were negligible, hence neither abfraction nor abrasive tooth-brushing were considered contributing factors. The characteristic anterior wear suggested an occlusally initiated attritional habit, and occlusal examination revealed initial contact in CR was right second molar (*Figure 8*) with horizontal forward slide. Further questioning revealed clenching habits suggesting Parafunctional

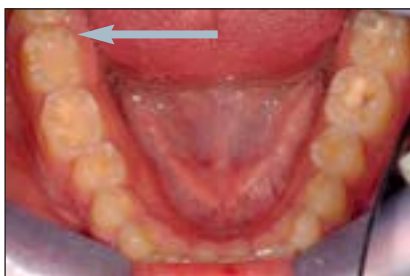


Figure 8

activity, reinforced by the recent sudden loss of the anterior restoration.

The tooth wear was therefore diagnosed as severe⁹ and caused by occlusally mitigated attrition with a significant dietary acid erosive component.

Treatment: passive

The first stage was to stabilise the condition with lifestyle changes advised. Cognitive behavioural therapy helped control the destructive clenching habit. Erosive damage from carbonated drinks was addressed by modifying the "swishing" drinking habit²² and using a drinking straw to bypass the anterior teeth²³ coupled with reducing overall consumption.

As a keen rugby player he regularly consumed carbonated "energy drinks" during training.²⁴ Despite this, dehydration is not uncommon in athletes. The importance of saliva buffering after acid exposure is significant,²⁵ and a salivary flow test (GC Europe) revealed low salivary flow rate suggesting chronic dehydration. This was addressed by increasing water consumption and reducing alcohol and caffeine consumption. Xylitol chewing gum²⁶ was advised to help improve saliva flow rate.

Treatment: active

The initial posterior occlusal interference and slide into full closure suggests a protective masticatory muscle engram has developed. This learned avoidance pattern involved habitual mandibular forward posturing

producing destructive anterior occlusal contact. Davies suggests "an occlusion can only be judged by the reaction of the tissues to it",⁷ and the anterior wear suggests an occlusal component is involved.

Occlusal adjustment to remove premature occlusal contacts would allow uninterrupted closure into maximum Intercusation with the condyles remaining in Centric Relation (CR).²⁷ However, occlusal equilibration is traditionally a reductive process often resulting in a reduced occlusal vertical dimension (OVD).²⁷ When occlusal tooth tissue is already lost, equilibration by addition is a less destructive option. The aim of equilibration by addition is to create a new conventionally designed occlusion, but at opened OVD.

Such an approach is termed 'reorganised' and requires a consistently reproducible condyle position (CR) to facilitate opening (or closing) of OVD along the terminal hinge axis. CR mounted study models allow investigation and also 'trial equilibration'. However, when opening OVD a functional wax-up to create a new occlusion at raised OVD is prescribed. It is now accepted that OVD can be opened restoratively with little adverse effects as long as strict protocol is observed.²⁸

Treatment process

The first step is to record CR, and various methods of locating and recording CR are available. As the Joint was healthy, a Kois occlusal deprogrammer (*Figure 9*) was utilised for its flexibility.²⁹ The

Figure 9



appliance is a modified Hawley orthodontic retainer but with the addition of an anterior platform reminiscent of a Lucia jig,³⁰ designed to separate the posterior teeth by just 1.0 mm. However, unlike a Lucia jig, it is worn full-time (apart from mealtimes) for four weeks to fully de-programme the articulatory system thereby allowing condyles to correctly seat themselves passively without the need for manipulation by the dentist.

Following four weeks of deprogramming, CR was recorded with the Kois deprogrammer in place utilising an inter-occlusal record (Futar; Optident) (Figure 10). A Kois dento-facial analyser face bow record (Optident) (Figure 11) facilitated CR mounted study models upon a Panadent semi-adjustable articulator (Figure 12) (Optident). Finally, a functional wax-up conforming to conventional occlusal standards was fabricated at opened OVD (Figure 13).

The functional wax up was then transferred to the existing dentition using direct application of composite resin bonded to etched occlusal enamel. The Kois occlusal deprogrammer maintained CR at raised OVD while the inter-occlusal space was filled with composite resin. Putty stents were utilised to ensure a true copy of the wax-up was delivered.³¹ Such an approach

Figure 10



Figure 12



allowed creation of the newly planned occlusion at a raised OVD in CR without any tooth preparation.

The final occlusal pattern was refined and finalised, again using the Kois occlusal deprogrammer, to ensure a correctly planned occlusion was delivered. In this way a stable occlusal pattern was created with lower buccal cusps contacting cleanly within opposing upper fossae (Figures 14 and 15).

Conclusion

Composite resin used in this way can survive at least 30 months,³² while allowing the future option to duplicate the composite resin restorations with indirect alternatives for greater durability as necessary. When placing future indirect restorations a 'conformative' approach would be followed; in effect maintaining the successful occlusal pattern established previously with composite resin.³³

Figure 11



Figure 13



Discussion

Currently the majority of restorative work carried out by UK dentists is the maintenance of deteriorating restorative work already present in an ageing population.

Treatment for this so-called "heavy metal generation" is essentially reactive and reparative in nature.¹⁸ Consequently it is perhaps easy for overwhelmed practitioners to adopt a symptom-led treatment philosophy which may perhaps blind them to the less immediate needs of the younger population; namely tooth surface loss.

Tooth wear is a growing problem, particularly in young adults¹⁰ with hectic modern lifestyles who lose significant enamel at a relatively early age.

Traditionally restorative treatment involved placing indirect restorations with significant tooth preparation required.³⁴

Figure 14



Many practitioners were rightly reluctant to further remove tooth tissue from already compromised teeth and consequently were more inclined to await significant TSL before intervening. However, with modern adhesive techniques, active treatment can now be minimally invasive making a restorative approach a realistic option for early treatment.³⁵

Enamel is at a premium with adhesive dental techniques and must be preserved for predictable bonding protocols.³⁶ The observant practitioner should be on the lookout for early signs of TSL to ensure precious enamel is not lost unnoticed.

Early restorative treatment as described has minimal biological and financial cost and can preserve tooth tissue, often during a difficult stage of a young patient's life (Figures 16 and 17).

However, in the face of accusations of 'profiteering' from the public and fellow dentists alike, the pressure is



Figure 16

Figure 15



to continue to 'monitor' a deteriorating situation until the need for restorative intervention is beyond doubt; a questionable approach at best.

Hard splints need to be accurately fabricated and adjusted, yet dentists are often poor providers³⁷ resulting in many splints remaining unused leaving the patient open to further tooth wear.

The addition of composite resin as described in effect creates the benefits of a hard splint, but without the instability of fit or the facility for removal leaving vulnerable teeth unprotected (Figures 18-21).

Reflection

Clinicians are constantly being reminded that enamel is too precious to drill away haphazardly.³⁸ but surely adopting an approach which allows enamel to slowly dwindle away is equally questionable.



Figure 17

A twist upon Kelleher's celebrated "daughter test"³⁹ would be to consider the ethics of failing to provide such treatment as this. Not just for our own children, but for all youngsters under our care.

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Figure 18



Figure 19



Figure 20



Figure 21



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