

IN BRIEF

- Ageing dentate patients are increasing in number.
- Caries risk assessment facilitates dental management.
- Restoration monitoring, repair or refurbishment should always be considered before a restoration is placed.
- Stabilisation splints are helpful in preventing further non-cariou tooth tissue loss.
- Fluoride release from restorative materials may not have a therapeutic benefit.
- Dry mouth is not specifically age related.

Prevention. Part 6: Prevention in the older dentate patient

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Managing the ageing dentition is a frequent problem for practitioners. Prevention of further tooth loss, let alone preserving tooth tissue, whilst minimising the effects of operative intervention form the basis for successful management of older dentate patients. The purpose of this article is to consider the prevention of caries, further tooth tissue loss due to operative intervention and non-cariou tooth tissue loss in the ageing dentate patient.

PREVENTION

1. Smoking cessation advice
2. Dietary advice
3. Prevention of tooth wear
4. Toothbrushing advice
5. Patients requiring osseointegrated oral implant treatment
6. Older dentate patient
7. Professionally applied topical fluorides for caries prevention
8. Pit and fissure sealants in preventing caries in the permanent dentition of children

*Last scene of all,
That ends this strange eventful history,
Is second childishness and mere oblivion,
Sans teeth, sans eyes, sans taste, sans everything
As You Like It, Shakespeare (c.1599)*

Twenty years ago Shakespeare's vision of ageing in the UK was alarmingly accurate with people commonly surviving their natural dentition. Advances in our understanding of dental disease and dental care coupled with increasing dental awareness and motivation by patients has fortunately changed his somewhat dim view of dental ageing.

The part played by the dental profession in this public health success story is sadly somewhat underplayed. One of the consequences of our success however, which practitioners face on a day-to-day basis is managing the ageing dentition. This along with meeting the expectations of an ever increasing elderly population with quite rightly youthful expectations of both function and aesthetics is demanding. Prevention of further tooth tissue and tooth loss *per se* is paramount in the management of all patients but especially elderly dentate patients. One retained tooth, for example, can support and help retain a lower partial denture with which the patient can function whereas a complete lower denture would be unstable with poor retention, particularly if the ridge is especially atrophic.

Caries is often described as a disease of the two extremes of life assuming all risk factors remain equal. The availability of fluoride in toothpaste particularly has changed the pattern of disease seen by practitioners, with caries largely confined to pits and fissures and smooth surface caries relatively uncommon in younger patients. In contrast elderly patients are more likely to present with root caries and caries adjacent to existing restorations. Alongside this different pattern of caries experience elderly patients present with non-cariou tooth tissue loss, the cumulative effects of generalized periodontitis and failing often quite advanced restorative dentistry.

The purpose of this article is to consider the prevention of caries, further tooth tissue loss due to operative intervention and non-cariou tooth tissue loss in the elderly dentate patient. Prevention for the edentulous patient with or without implant-retained prostheses is covered elsewhere in the series. Many of the interventions we prescribe for our patients on a daily basis are not evidence-based and considerable research is required to provide an evidence base for our clinical practice. There are however a lack of clinical studies in this area, which makes this difficult. Given the increasing number of elderly dentate patients it is suggested that this is an area that deserves some priority when research funding is allocated. Interventions suggested for

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Caries risk assessment

Helps the practitioner decide whether to intervene and informs the frequency of subsequent recall and radiographs

prevention in the elderly dentate patient will however be supported by evidence where it is available. The strength of this evidence will be indicated using the following hierarchy of evidence:

- Type 1 Systematic review of at least one randomized controlled trial (RCT)
- Type 2 At least one RCT
- Type 3 Non-randomized intervention studies
- Type 4 Observational studies
- Type 5 Traditional reviews, expert opinion

CARIES

Caries is a totally preventable disease irrespective of a patient's age. Assuming all risk factors remain equal it is unusual to see new lesions in any patient but particularly in older patients where susceptible pits and fissures if prone to caries will already have experienced the disease. Physiological ageing of a dentition however results in gradual exposure of root surfaces, which can be prone to caries in later life ie a new susceptible site emerges and consequently the pattern of disease experience changes with age.

Currently there is considerable debate in the literature regarding the management of dental caries with the evidence suggesting that we move to a less interventive approach. This involves concentrating our efforts on arresting established lesions, especially root and cervical caries, reversing early occlusal lesions and only intervening when lesions are cavitated. Central to this philosophy is assessing the caries risk of our patients and recognizing that this assessment can change.

Patients can move from low to high risk by changing their diet, for example, older patients post radiotherapy or past smokers sucking sweets more frequently than normal to combat the effects of a dry mouth or in lieu of a cigarette.

Restricting operative intervention to high and moderate risk patients whilst opting for a preventive monitoring type approach in low risk patients is arguably a more scientific approach to the management of the dental caries rather than the purely surgical approach traditionally adopted in the UK.

ASSESSING CARIES RISK

Caries risk assessment is defined as the risk that a patient will develop new lesions of caries or existing lesions will continue to progress assuming that all aetiological factors (diet, time, susceptible surface and plaque levels) remain equal (Table 1). Individuals are assessed as being at high, medium and low risk of developing further lesions. A high-risk category would be allocated to a patient where the majority of the factors in Table 1 point to a high risk and vice versa. Moderate risk would be attributed where the factors in the table balance out.

It is an important assessment as it informs the recall period for patients in regular dental care, helps the practitioner to decide whether to intervene or instigate preventive regimes; let alone the frequency that further radiographs should be taken for monitoring purposes (Table 2). It is accepted however that the recommendations in Table 2 have no robust evidence base. A systematic review looking at the evidence base for 6-monthly check-ups is currently ongoing. Until such time as the results of this review have been reported it is suggested that the recommendations in Table 2 are a good starting point. Computer programs are available to help clinicians assess caries risk and also to plan preventive treatments but these systems are in their infancy and have yet to be fully evaluated.

CARIES PREVENTION

Having decided what the patient's caries risk assessment status is it is suggested that the following preventive regimes, which combine the application of fluoride and chlorhexidine (Type 2)¹ are appropriate:²

High Risk

High-risk patients require intensive prevention regimes to include:

- Baseline radiographs
- Prophylaxis with application of chlorhexidine for 1 minute followed by rinsing
- Apply sealant to pits and fissures, which must be checked for integrity at recall
- Fluoride varnish application. Patient should be advised not brush or eat hard foods for 10 hours. Three applications of fluoride varnish are recommended over a 3-month period
- Brushing twice a day with a fluoridated toothpaste

Table 1 Determination of caries risk

High	Factor	Low
Diet high in fermentable carbohydrate	Diet Check with diet history	Diet low in fermentable carbohydrates
Frequent consumption not confined to mealtimes	Frequency Check frequency of consumption with diet history	Infrequent consumption or confined to mealtimes
High plaque score	Plaque Amount and nature	Low plaque score
Low flow rates High lactobacilli and streptococcus counts	Saliva Amount and nature	High flow rates Low lactobacilli and streptococcus counts
Not dentally motivated Deprived background Low dental aspirations High caries family	Socio-economic Status	Dentally motivated patients Privileged background High dental aspirations Low caries family
High number of Filled and Missing Surfaces (FMS)	Past Disease Experience	Low number of Filled and Missing Surfaces (FMS)
High number of Decayed surfaces (DS)	Current Disease Experience	Low number of Decayed surfaces (DS)
Irregular and/or pain only attenders	Attendance Pattern	Regular attenders
Infrequent use of rinses and toothpaste Non-fluoridated water supply	Fluoride and Chlorhexidine	Frequent use of rinses and toothpastes Fluoridated water supply
Xerostomia, Learning difficulties Cariogenic medication	Medical History	Fit and well
Partial dentures used to replace missing units	Other	Bridgework used to replace missing units

- Rinsing daily for 1 minute with a fluoride mouthwash (0.05% NaF) at bedtime (Type 2)³
- Rinse weekly rather than daily (Type 2)⁴ with a chlorhexidine solution for 6 weeks
- After 6 months repeat baseline radiographs to monitor proximal lesions and restore any lesions, which have reached the middle third of dentine. If progression has been detected increase the application of chlorhexidine and apply fluoride varnish two to three times on a six monthly basis
- Oral hygiene instruction and dietary counselling are required to ensure success
- Monitor patient at six monthly intervals until patient's caries risk falls to moderate or low

Moderate risk

Prevention for patients in this group should include:

- Prophylaxis followed by fluoride varnish application. Patient should be advised not to brush or eat hard foods for 10 hours. Three applications of fluoride varnish are recommended over a 3-month period for every year the patient remains at moderate risk
- Brushing twice a day with a fluoridated toothpaste
- Rinsing daily for 1 minute with a fluoride mouthwash (0.05% NaF) at bedtime (Type 2)³
- Monitor lesion size and depth and whether new lesions arise at 6–12 monthly intervals until the caries risk moves to low. If lesions progress or new lesions arise increase applications of the fluoride varnish and give further dietary advice

Low risk

Prevention is limited to brushing twice a day with fluoridated toothpaste with reviews at 12–18 month intervals to check for white spot formation and proximal radiolucencies.

PRESERVING TOOTH TISSUE

Elderly patients if prone to caries in their youth are likely to have relatively large restorations, as a consequence of the restorative cycle or staircase, and these will be prone to eventual failure.⁵ The term staircase is to be preferred as the word cycle implies a return to the start where clearly each step on the staircase is a step further to the loss of a tooth. Newer elderly cohorts will have progressively more sound teeth, as operative intervention will have been restricted to where indicated, with minimal preparations and where modern adhesive materials will have been used. These patients will require different management strategies and this will pose a challenge for practitioners in the future.

Currently on average 60% of restorations placed by practitioners are replacement restorations that are deemed to have failed in clinical service.⁶ The commonest reason cited for replacing restorations is secondary caries. There is considerable debate in the literature as to what constitutes secondary caries, ie is it

Table 2 Caries risk assessment

Caries Risk	Recall Interval	Intervention	Radiograph Frequency
High	Six Monthly	Yes	Six Monthly
Moderate	Six Monthly- Annually	Yes	Annually
Low	1-2 years	Monitor and attempt to arrest and reverse the lesions	1-2 years

recurrent caries or residual caries or is it a new lesion. It has been suggested that secondary caries is in fact a new carious lesion adjacent to an existing restoration. As such it should be treated as a primary lesion and more often than not the adjacent restoration does not warrant complete replacement therapy (Type 4).⁷ Marginal defects are often misdiagnosed as secondary caries and restorations replaced needlessly. Similarly restorations are frequently replaced that could have been repaired, refurbished or simply monitored.

Replacement of restorations where a more preservative approach could have been adopted pushes the tooth further down the restorative staircase which if followed to its ultimate conclusion will result in tooth loss. Practitioners are encouraged therefore to minimize the nature and effect of operative intervention wherever possible.

NON-CARIOUS TOOTH TISSUE LOSS

Elderly patients frequently exhibit the effects of non-carious tooth tissue loss (NCTTL). NCTTL is often multi-factorial and is a combination of erosion (intrinsic and or extrinsic), abrasion and attrition. Extrinsic erosion due to acid present in the diet will on the whole affect the labial surface of the anterior teeth and to a lesser extent the occlusal surfaces of the lower permanent molars. Intrinsic erosion due to acid regurgitation (gastric acid) will usually affect the palatal surfaces of the upper teeth and on occasion the occlusal surfaces of the lower permanent molars. The effects of NCTTL are cumulative and irreversible but in a similar manner to periodontal disease the process has periods of disease activity and quiescence. Consequently in a patient who presents with NCTTL it cannot be assumed that the disease process is still active and some form of assessment is required. This usually involves taking study casts and comparing them with casts taken 6 months later to determine if the process is still ongoing. Dietary analysis is important to identify factors that might be responsible for the NCTTL the patient has experienced. Liaison with a medical practitioner should intrinsic erosion be diagnosed will also be necessary. Once a diagnosis is made the prime objective is to stabilize the disease process and prevent further tooth tissue loss before addressing the patient's functional, aesthetic or occlusal needs. A significant number of patients are successfully managed on preventive regimes with relatively few patients needing extensive advanced restorative therapy.

Restoration replacement

Consider restoration repair, refurbishment or monitoring in regular patients

Missing teeth

Replacement of missing units with bridgework is associated with less caries and periodontal disease than the use of removable partial dentures to replace missing units

PREVENTION OF NON-CARIOUS TOOTH TISSUE LOSS

It is very important that a correct diagnosis is made if appropriate preventive measures are to be effective, recognising that NCTTL can be multi-factorial. It would be sensible to liaise with the patient's medical practitioner, particularly if you suspect intrinsic erosion is responsible for the NCTTL the patient has experienced. It is helpful to explain to your medical colleague, in the referral letter, the association between eating disorders, reflux etc and NCTTL. It is also important to emphasise that reflux can often be asymptomatic and NCTTL can be the first sign of an underlying problem. A dietary history will be required if you suspect an extrinsic erosive cause and counselling the patient with regard to their dietary habits may be necessary.

Patients often attend with NCTTL seeking an assurance that the condition will not deteriorate and are happy if further NCTTL can be prevented. Unfortunately many patients are treated with extensive treatments, for example, a full mouth rehabilitation in a slavish attempt to restore teeth to their pre disease shape and contour. Whilst this is appropriate for a small number of patients a more preservative preventive philosophy is indicated for the majority of patients. A hard acrylic splint, in the form of a stabilisation splint, is very helpful to prevent further tooth tissue loss due to attrition and this is frequently the only treatment required. Patient compliance with splint wear can however be problematical and as teeth scarcely meet in the day, night time wear is all that is required. It may also be used as a diagnostic aid, particularly if an increase in the occlusal vertical dimension is planned subsequently. If abnormal occlusal loading is identified as an aetiological factor this will also need to be corrected, by a specialist, but only after a period of splint wear.

A stabilization splint is designed to have the following features:

- Even contact of all teeth in centric relation (retruded contact position – RCP)
- Protrusive and excursive guidance
- No non-working interferences

To produce a stabilization splint for a patient on a semi-adjustable articulator the laboratory will need the following:

- Full arch impressions
- Facebow record
- Centric and protrusive occlusal records

The splint may need to be relined with cold cure acrylic resin to improve the retention of the appliance and occlusal adjustment will typically be required. Frequently this is the only treatment required to stabilize a patient's dentition and prevent further tooth tissue loss. The evidence base for using splints in this way however needs to be tested in a properly conducted randomised controlled clinical trial.

If you have a patient who has a history of recurrent vomiting, for example, as in hiatus hernia advise the patient not to brush their teeth after vomiting. This is because tooth brushing will further abrade the eroded tooth tissue. To prevent tooth tissue loss counsel your patient to rinse with either 0.05% NaF rinse or alkaline mineral water. These will neutralise the effects of the acid and prevent further erosion and decrease subsequent sensitivity.

FURTHER REMARKS

Removing all the caries: Is this always necessary?

A randomised controlled study (Type 2)⁸ has demonstrated that if dentine affected by caries but uninfected is sealed in it does not progress and lesions will arrest and burnout. With newer adhesive materials the prospect of reliably sealing affected but uninfected dentine within the centre of a preparation is achievable clinically. This will reduce the incidence of carious exposure of the pulp and could be termed preventive endodontic therapy.

Fluoride release from restorative materials: Is this useful?

Manufacturers often make claims about fluoride release from restorative materials. Whilst water fluoridation and the topical effects of fluoride in toothpaste are beyond question the therapeutic effects of fluoride release from restorative materials are questionable. A systematic review of the literature (Type 1)⁹ showed no evidence of a preventive effect when fluoride-releasing restorative materials are used. Practitioners should therefore not place undue reliance on manufacturers' claims regarding fluoride release.

Replacing missing teeth: denture or bridgework?

In an elderly population who are retaining more of their natural dentition the replacement of missing units is a common clinical situation faced by practitioners. A randomised controlled trial (Type 2)¹⁰ has clearly demonstrated that the replacement of missing units with bridgework is associated with less caries and periodontal disease than the prescription of partial dentures. The use of bridgework in suitably selected cases for the replacement of missing units is arguably therefore a more preservative approach to fixed prosthodontics in the elderly.

Dry mouth: An age-related phenomenon?

It is a myth that salivary flow reduces due to ageing.¹¹ Dry mouth is however common for elderly patients who are on medication, which reduces salivary flow due to autonomic effects. This can change a patient's caries risk and new lesions may develop consequently. Similarly patients who have had surgery to their salivary glands and or radiotherapy will have reduced salivary flow. These patients are best managed with a saliva substitute to ease the feeling of

dryness. There are several on the market but it is sensible to prescribe one that contains fluoride. At least one randomised controlled trial has shown that 10% chlorhexidine varnish is useful for controlling root caries in adults with a dry mouth (Type 2).¹²

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