Chapter 1

Management of Chronic Dental Disease

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Case 1

Management of Root Caries

With Contribution from Martina Hayes, Cristiane da Mata, Finbarr Allen and Francis Burke

Figure 1.1.1 Circumferential root caries lesions affecting the remaining lower dentition.

A. Case Story

An 80-year-old female was admitted to a hospital ward following a stroke and a dental consultation was requested by her supervising medical team. She was wearing upper and lower acrylic partial dentures which had been constructed over 10 years ago. She had not attended her general dental practitioner since fabrication of the dentures as she had 'not had any pain from her teeth'. The woman was an inpatient in hospital and was medically frail. It was planned to admit her to a long-term residential care facility following discharge from the hospital as she would require a high level of nursing care, including feeding, toileting, bathing and dressing. A clinical examination revealed caries in her remaining natural teeth, particularly the partial denture abutment teeth (Figure 1.1.1). A clinical decision was made to manage the caries and to maintain the remaining natural dentition.

LEARNING GOALS AND OBJECTIVES

- Understand that root caries is a disease almost unique to older patients
- Understand the management of root caries and appreciate that restorations can have high failure rates
- Appreciate that glass ionomer cements, particularly high-viscosity glass ionomer cements, have been shown to have the highest success rates when restoring root caries lesions[1,2]
- Recognise that prevention or remineralisation of root caries must be implemented alongside any operative interventions

B. Medical History

- Previous stroke
- Patient very frail
- Rheumatoid arthritis
- Osteoporosis

C. Dental History

- Partially dentate and wearing upper and lower acrylic dentures constructed by her general dental practitioner approximately 10 years ago
- Patient has not attended a dentist for many years as her health has declined and she has found it difficult to travel

D. Medications

- Dabigatran (anticoagulant) 150 mg twice daily
- Clopidogrel (anticoagulant) 75 mg once daily
- Methotrexate (antimetabolite) 7.5 mg once weekly
- Ibuprofen (non-steroidal anti-inflammatory) 200 mg three times per day
- Alendronic acid (oral bisphosphonate) 10 mg once daily

E. Social History

- Widowed
- Patient was living independently until her stroke, due to enter long-term care facility after hospital discharge
- Non-smoker and does not consume alcohol

F. Extraoral Examination

- Medically frail
- Joints in fingers severely affected by rheumatoid arthritis

G. Soft Tissue Examination

- No significant findings

H. Clinical Findings/Problem List

- Partially dentate in upper and lower arch, patient wearing acrylic removable partial dentures; although worn, the dentures appear to be well tolerated and retained
- Oral hygiene poor, soft deposits present around all remaining natural teeth; no periodontal pocketing noted or mobility of remaining teeth
- Good oral lubrication, no evidence of xerostomia or salivary hypofunction
- Root caries evident in lower denture abutment teeth; no reported symptoms from carious teeth
- Evidence of toothwear on remaining upper dentition
- Tooth charting:

				4	3						4				
				4	3				2	3					

- Basic periodontal examination:

–	1	–
–	1	–

I. Diagnoses

- Chronic gingivitis
- Root caries
- Non-carious tooth surface loss
- Multiple edentulous spans

CLINICAL DECISION MAKING – DETERMINING FACTORS

- Patient has a very high caries risk and active root caries in her mouth. As a result of her recent stroke and rheumatoid arthritis, she has limited or no basic self-care ability. Following her stroke, this patient is now a high choking risk and her diet is soft or semi-liquid.
- In this case it is advisable to avoid extractions if possible, as the patient has been on bisphosphonate medication for a number of years and could be at risk of developing bisphosphonate-related osteonecrosis of the jaws (BRONJ).[3] In addition, the abutment teeth are helping to retain the patient's existing partial dentures.
- The patient will need oral care delivered at the bedside where possible as she is an inpatient in hospital. She is due to transfer to a residential facility where domiciliary visits will be required from a dental professional to help her maintain her dentition. Her carers will also require information on how to maintain her dentition.[4]
- It is very questionable if this patient has the ability to adapt to a new set of dentures. Although her existing dentures are worn, they are functional and reasonably well retained. A discussion was had with the patient's family and her medical team regarding the provision of new partial dentures. The medical team explained that they did not envisage the patient progressing beyond a semi-liquid diet. Given the patient's frailty and the difficulty in fabricating a satisfactory set of prostheses, the decision was made not to begin making new dentures.
- The focus of any treatment now is to avoid any future dental problems that could cause pain and/or infection.
- The treatment plan developed in this case included application of 22,600 ppm fluoride varnish every three months to reduce future caries risk and conservative management of carious teeth.
- The treatment was provided in a dental hospital with the patient transported via ambulance. The soft caries was excavated using a round bur in a slow-speed handpiece. Isolation was achieved using cotton-wool rolls and high-viscosity glass ionomer cement was placed (Fuji IX GP Extra™, GC Corporation, Japan). The restorations were covered with petroleum jelly to protect the glass ionomer cement during maturation (Figure 1.1.2).

Figure 1.1.2 Glass ionomer cement (Fuji IX GP Extra™, GC Corporation, Japan) restorations placed on lower teeth.

Figure 1.1.3 Patient at three-month review.

Restoration of root caries lesions is challenging as they exhibit mixed cavity margins positioned in enamel as well as dentine. The cavities also tend to be broad, shallow and saucer shaped, with no natural retention. Failure rates of root caries restorations can be as high as 68% at 1 year.[5] However, one study on high-viscosity glass ionomer cements achieved survival rates of 87% at 1 year.[6] Glass ionomer cements have also been associated with protection against secondary caries, even after loss of the restoration itself.

- High-fluoride varnish (Duraphat® 22,600 PPM Varnish, Colgate, USA) was applied to all the remaining natural teeth. This has been shown to reduce the incidence of new root caries lesions and is a non-invasive, low-risk, inexpensive treatment to provide in a professional or domiciliary setting.[7] However, the varnish should avoided in patients with stomatitis or those with asthma.
- The patient was seen again after three months for another application of fluoride varnish. At this appointment it was noted that the restoration in the 32 had been lost. The cavity was leathery to a ball-ended probe and it seemed likely that this lesion was inactive.[8] It was decided to keep this lesion under observation at the three-monthly fluoride varnish applications (Figure 1.1.3).

Self-Study Questions

1. Which population group is root caries most frequently detected in?

- **a. Young adults**
- **b. Middle-aged adults**
- **c. Adults with heavily restored dentitions**
- **d. Older adults**

2. Which material is most effective for restoration of root caries?

- **a. Amalgam**
- **b. Composite resin**
- **c. High-viscosity glass ionomer cements**
- **d. Compomer**

3. Which of the following are important aetiological factors in the development of root caries?

- **a. Xerostomia**
- **b. Recurrent ulceration**
- **c. Denture stomatitis**
- **d. Angular cheilitis**

4. What are the reasons that high-fluoride varnish application is recommended in the prevention of root caries?

- **a. Expensive to deliver**
- **b. High risk**
- **c. Can be provided in a professional or domiciliary setting**
- **d. Little evidence to suggest effectiveness**

5. Which of these matches the typical appearance of a root caries lesion?

- **a. Broad, shallow and saucer shaped with no natural retention**
- **b. Well defined, arising at the contact point between adjacent teeth**
- **c. Deep, narrow lesions extending into the tooth**
- **d. There is no typical appearance**

Answers are located at the end of the case

Self-Study Answers

1. d. Older adults[7]

2. c. High-viscosity glass ionomer cements[2]

3. a. Xerostomia[7]

4. c. Can be provided in a professional or domiciliary setting[1]

5. a. Broad, shallow and sauced shaped with no natural retention[7]

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Case 2

Caries Management in a Long-Term Care Facility Using Atraumatic Restorative Treatment (ART)

With Contribution from Cristiane da Mata, Martina Hayes, Francis Burke and Finbarr Allen

Figure 1.2.1 Carious lesion in an upper molar tooth.

A. Case Story

A clinical examination of a 76-year-old female patient in a long-term care facility revealed caries in a number of teeth (Figures 1.2.1 and 1.2.2). The patient reported no painful symptoms from her teeth. She did report that she felt her teeth were 'crumbling down' and found it difficult to brush and keep them clean. The patient wears an upper removable partial denture and has not received any dental treatment for a number of years. The long-term care facility does not have an active preventative oral care programme in place, but does contact local dental practitioners if residents report discomfort from their mouth or teeth. In this case management of caries was undertaken using atraumatic restorative treatment (ART) in a domiciliary setting.

LEARNING GOALS AND OBJECTIVES

- Be aware that a large proportion of residential care home residents still have some or all of their natural teeth
- Appreciate that provision of operative care in a domiciliary setting can be challenging and that pragmatic treatment planning decisions must be made
- Comprehend that the ART approach for caries management has been shown to be an acceptable and cost-effective strategy to treat carious lesions in the elderly, overcoming treatment barriers such as access, cost and patient acceptability.

B. Medical History

- Type II diabetes mellitus, well controlled with medication
- High blood pressure
- Atrial fibrillation
- Rheumatoid arthritis
- Osteoporosis
- Limited mobility

C. Dental History

- Patient has not attended a dentist for a number of years and has not received an oral examination since entering the residential care home

Figure 1.2.2 Carious lesion in an upper lateral incisor.

- Patient previously had multiple extractions in the upper arch due to caries and now wears an upper removable denture; she finds her upper denture comfortable
- Patient finds it difficult to brush and clean her teeth without assistance

D. Medications

- Clopidogrel (anticoagulant) 75 mg once daily
- Captopril (ACE inhibitor) 150 mg once daily
- Methotrexate (antimetabolite) 7.5 mg once weekly
- Alendronic acid (oral bisphosphonate) 10 mg once daily
- Diazepam (benzodiazepine) 10 mg once daily

E. Social History

- Widowed
- Retired nurse
- Patient living in a long-term care facility
- Non-smoker and does not consume alcohol

F. Extraoral Examination

- Patient is frail with limited mobility, able to sit in chair
- No other significant findings

G. Soft Tissue Examination

- No significant findings

H. Clinical Findings/Problem List

- Poor plaque control
- Areas of gingival recession and root restorations
- Active cavitated carious lesions in molar and anterior teeth
- Partially dentate in upper and lower arch, patient wearing upper acrylic removable partial dentures; patient has retained lower anterior teeth (shorted dental arch) and has never worn a lower prosthesis; patient has no functional or aesthetic deficit
- Mouth dry, evidence of xerostomia or salivary hypofunction
- Tooth charting:

		6					1	1	2	3	4			7	
				4	3	2	1	1	2	3			6		

- Basic periodontal examination:

–	1	1
–	2	–

I. Diagnoses

- Chronic gingivitis
- Coronal caries
- Root caries
- Missing teeth

CLINICAL DECISION MAKING – DETERMINING FACTORS

- Manual dexterity problems, loss of independence, lack of a prevention culture, xerostomia and the use of sugary medications often put patients in residential care homes at a high risk for dental caries.[1] As a result of a lifelong deposition of secondary dentine, they frequently do not present with pain until carious lesions become extensive and restorative treatment challenging.
- Treatment for patients in residential care homes often necessitates domiciliary care, as travel to dental surgeries can be extremely challenging and logistically difficult.[2]
- In order to prevent caries from occurring in these patients, or to diagnose lesions at their initial stages, making treatment less costly and simpler, the use of the minimal intervention dentistry (MID) approach is a useful tool, ultimately avoiding tooth loss and maintaining a functional dentition.
- MID is a concept born from the evolution in the understanding of the caries process and the mechanisms involved in its beginning, progression and control, together with improved dental materials. It consists of diagnosing and treating the disease caries as early and as minimally invasively as possible. It means prioritising prevention, patient information and guidance to empower them to be responsible for their own oral health and to intervene as conservatively as possible when a surgical approach is judged necessary, thus minimising tooth tissue loss. The aim of MID is to keep teeth healthy and functional for life and the strategies to achieve this by keeping teeth free from carious lesions include early caries detection and risk assessment; remineralisation of demineralised enamel and dentine; optimal caries preventative measures;

Figure 1.2.3 Basic atraumatic restorative technique instrument kit used for domiciliary care in this case.

minimally invasive operative interventions such as ART; and repair rather than replacement of restorations.[1]

- This patient has impaired manual dexterity and plaque control is poor. She also presents with active cavitated root lesions which are asymptomatic. They have a light brown colour, are covered with plaque, and carious dentine is easily scraped off with the use of a probe. The cavities are not self-cleansable and patient's oral health is poor, which could contribute to the progression of the disease process and size of the lesions. Therefore, restoration of the carious lesions at this stage using a minimally invasive approach such ART is indicated.[3,4]
- The treatment plan developed for this patient included extensive oral hygiene instruction provided for her carers including using of a high-fluoride toothpaste (Duraphat® 5000 ppm Fluoride Toothpaste, Colgate-Palmolive, UK) and denture cleaning instructions; restoration of carious lesions; and application of high-fluoride varnish (Duraphat® 22,600 PPM Varnish, Colgate, USA) at three-monthly intervals to all remaining natural teeth.
- Utilising the ART approach, caries was removed and restorations placed using hand instruments only (Figures 1.2.3 and 1.2.4). Enamel hatchets were used to create access to the caries lesions and excavators removed the very soft, demineralised dentine (infected dentine). Removal of tissue was stopped when some resistance on excavation was felt. The cavity was then washed with water spray and dried with cotton pellets.

Figure 1.2.4 Cavity in upper molar after caries removal using hand instrument.

Moisture isolation was achieved with the use of a saliva ejector and cotton-wool rolls. A polyacrylic acid dentine conditioner (Dentin Conditioner, GC Corporation, Japan) was then used for 20 seconds. The acid was removed with a water spray and cotton pellets used again to dry the cavity but not desiccate it. A high-strength glass ionomer cement (Fuji IX GP Extra™, GC Corporation, Japan) was used to restore the cavity (Figures 1.2.5 and 1.2.6).

- Use of ART for restoration of carious lesions in older patients within a residential care setting produces survival rates which are similar to conventional rotary techniques.[5,6] The ART approach should be considered for providing dental care for older adults, particularly those in the non-clinical environment.

Figure 1.2.5 Cavity in upper canine after caries removal using hand instrument.

Figure 1.2.6 Glass ionomer cement (Fuji IX GP Extra™, GC Corporation, Japan) restoration placed on upper canine using ART approach.

Self-Study Questions

1. Atraumatic restorative treatment (ART) was first described as a clinical technique in which setting?

- **a. Dental surgery**
- **b. Community dental clinic**
- **c. A non-clinical environment**
- **d. Dental hospital**

2. Which of the following is an example of the concept of minimally invasive dentistry (MID)?

- **a. Repair of existing restorations**
- **b. Provision of extensive crown and bridgework**
- **c. Non-surgical periodontal treatment**
- **d. Root canal treatment**

3. Which instruments are used for removal of the carious lesion when applying the ART approach?

- **a. High-speed rotary handpiece**
- **b. Slow-speed rotary handpiece**
- **c. Periodontal probe**
- **d. ART hand instruments**

4. Which material is indicated for restoration of cavities prepared using the ART approach?

- **a. Composite resin**
- **b. Amalgam**
- **c. Intermediate restorative material (IRM)**
- **d. High-viscosity glass ionomer cement**

5. Which of the following chemical substances can be used to aid in the caries removal process during ART?

- **a. Ozone**
- **b. Hydrochloric acid**
- **c. Carisolv**
- **d. Dentine bonding agent**

Answers are located at the end of the case

Self-Study Answers

1. c. A non-clinical environment[3]

2. a. Repair of existing restorations[7]

3. d. ART hand instruments[3]

4. d. High-viscosity glass ionomer cement[5,6]

5. c. Carisolv[7]

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Case 3

Non-surgical Periodontal Treatment (NSPT) for Periodontally Involved Lower Incisors

With Contribution from Lewis Winning and Christopher Irwin

Figure 1.3.1 Clinical presentation of patient before treatment.

Figure 1.3.2 Calculus deposits on lower anterior teeth.

A. Case Story

A 72-year-old female presented complaining of receding gums, slight mobility of the lower incisors, and general concern for the prognosis of her remaining dentition. Clinical and radiographic examination revealed a diagnosis of generalised moderate chronic periodontitis with localised severe disease affecting the lower incisor teeth. The patient admitted that she struggled with maintenance of oral hygiene, particularly in the lower incisor region. Oral hygiene was poor throughout the mouth, with supragingival deposits clearly visible on the lower incisors (Figures 1.3.1 and 1.3.2). There was Grade I mobility of the lower right and lower left central incisors, with approximately 80% bone loss around these teeth (Figure 1.3.3).

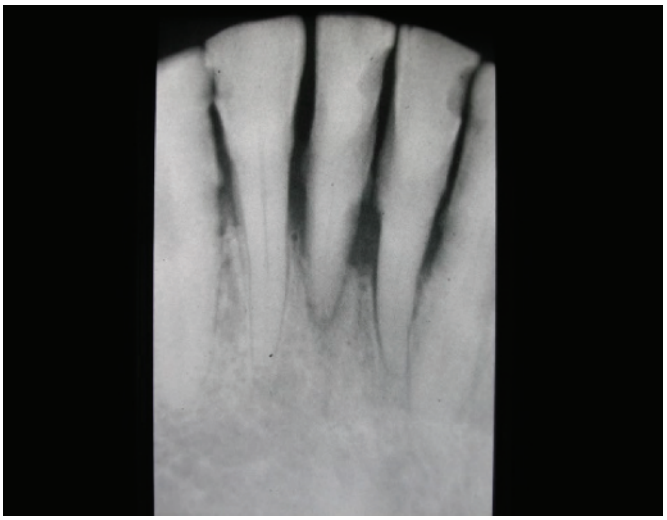

Figure 1.3.3 Radiographic findings at initial presentation.

LEARNING GOALS AND OBJECTIVES

- Understand that the prevalence and severity of periodontitis increase with age.[1] Previous interpretation of these data suggested that age itself could be a risk factor for periodontal disease.
- Recognise that ageing has been associated with a decline in immune responses, including mucosal immunoglobulin (Ig) M levels, cytokines and markers for B- and T-cells.[2,3]
- Understand that oral microbiological changes have also been proposed as a theory to explain the higher prevalence and/or severity of periodontitis in older adults.[4]
- Appreciate that due to the lack of direct evidence, the current view is that the greater level of periodontal destruction seen in older populations reflects more an accumulation of disease over a lifetime and not an age-specific condition.[5]

B. Medical History

- Mild osteoporosis
- Arthritis affecting the patient's hands
- Atrial fibrillation

C. Dental History

- Partially dentate but no experience of removable dentures
- Regular dental attender, but previously had not attended for a number of years
- Patient has previously lost posterior teeth due to periodontal disease
- Patient is aware that she suffers from periodontal disease

D. Medications

- Warfarin (anticoagulant) 2 mg daily
- Aspirin (non-steroidal anti-inflammatory) 150 mg daily
- Calcium carbonate (dietary supplement) 500 mg twice daily
- Propranolol hydrochloride (beta blocker) 80 mg twice per day
- Simvastatin (CoA reductase inhibitor) 40 mg once daily

E. Social History

- Retired, previously a part-time office worker
- Previous smoker, quit approximately 15 years ago
- Alcohol: less than 10 units per week

F. Extraoral Examination

- No significant findings

G. Soft Tissue Examination

- Gingivae around lower incisors inflamed
- No other significant findings

H. Clinical Findings/Problem List

- Partially dentate in upper and lower arches
- Oral hygiene poor, soft and hard deposits present
- Lower incisors grade I mobile
- Radiographic examination revealed approximately 70% horizontal bone loss associated with lower incisor teeth
- No denture-wearing experience
- Tooth charting:

	7				3	2	1	1	2	3			6	7	
8			5	4	3	2	1	1	2	3	4			7	

- Basic periodontal examination:

–	2	–
2	2	–

I. Diagnosis

- Chronic generalised periodontal disease
- Grade I mobile lower incisors

CLINICAL DECISION MAKING – DETERMINING FACTORS

- The decision whether to maintain or extract compromised dentition depends on a range of factors and is specific to the individual patient. With such advanced bone loss and the obvious difficulty in maintaining hygiene in this area, a good argument could be constructed for removal of both the lower right and lower left central incisors.
- However, this must be balanced by the fact this patient already has a reduced but functional dentition. Further tooth loss would likely necessitate a partial denture, which as discussed in other cases can have low acceptance rates and expedite further periodontal deterioration in the remaining dentition.[6]
- In this case, after discussion with the patient, a decision was made to maintain her current dentition. A treatment plan was drawn up including oral hygiene instruction, non-surgical periodontal therapy, review and regular maintenance therapy (Figures 1.3.4, 1.3.5 and 1.3.6).
- It was stressed to the patient that routine dental maintenance would be a key determining factor in tooth longevity. It has been shown previously that even teeth with advanced bone loss can be maintained as part of a functional dentition over long periods of time.[7] A further option would have been to splint the lower incisors; however, as the mobility was grade I and there was no functional interference, this was not indicated.
- Treatment was performed uneventfully and the patient adhered to a strict three-monthly maintenance regime with her dental hygienist, with annual periodontal review.
- Periodontal therapy in older patients must be adjusted to medical conditions, access to care, affordability and the ability to perform adequate oral hygiene.[8]
- Plaque control is central to the treatment of inflammatory periodontal disease. While self-performed plaque control is not in itself directly related to age, in the older patient it is much more common to encounter physical, psychological and medical conditions which impede the patient's ability to perform adequate home care and impact on the periodontal condition. Many older patients use several medications and they may be diagnosed with more than one chronic disease that can result in

Figure 1.3.4 Patient after completion of non-surgical periodontal treatment.

Figure 1.3.5 Lower incisors after removal of supragingival calculus deposits.

Figure 1.3.6 Radiographic review after 1 year illustrating no progression of horizontal bone loss association with lower incisors.

modifications to routine periodontal care. Moreover, chronic inflammatory diseases are common in older people, and the use of anti-inflammatory medications may have modulating effects on periodontal status, including evidence of plaque-induced gingival inflammation and periodontal pockets.

- The goal for treatment should be to preserve a functional, comfortable and aesthetically acceptable dentition. The basic treatment plan, encompassing non-surgical periodontal therapy supported by self-performed oral hygiene, is no different to that for a younger patient. Studies have shown that age is not a significant factor in determining outcome following treatment.[9]
- Similarly, age is not a contraindication to periodontal surgery, healing in older patients being no different compared to younger individuals. The factors influencing the decision to undertake surgical intervention, including levels of plaque control and smoking, are the same in all age groups. Maintenance therapy is a key component of the comprehensive periodontal treatment plan, and its effectiveness has previously been demonstrated in patients treated for advanced periodontal disease.[9]
- Evidence for maintenance therapy specific to older individuals is limited, but one study found that in individuals between the ages of 60 and 96, those with regular dental visits retained more teeth; however, the frequency of dental visits had no impact on plaque deposits, gingival inflammation or alveolar bone levels.[8]

Self-Study Questions

1. Which probe is used to carry out a basic periodontal examination (BPE)?

- **a. Williams probe**
- **b. World Health Organisation (WHO) BPE probe**
- **c. Sharp probe**
- **d. Furcation probe**

2. Which of the following describes the clinical appearance of a BPE code 2?

- **a. Furcation involvement**
- **b. Pocket depths <3.5 mm, supra- or subgingival calculus present**
- **c. Probing depth >5.5 mm**
- **d. Probing depth 3.5–5.5 mm**

3. How is progression of attachment loss in older adults mainly seen clinically?

- **a. Deepening periodontal pockets**
- **b. Gingival swelling**
- **c. Bleeding**
- **d. Gingival recession**

4. Which of the following systemic conditions can have a negative impact on mechanical plaque control in older patients?

- **a. Parkinson's disease**
- **b. Hypertension**
- **c. High cholesterol**
- **d. Angina**

Answers are located at the end of the case

Self-Study Answers

1. b. World Health Organisation (WHO) BPE probe[10]

2. b. Pocket depths <3.5 mm, supra- or subgingival calculus present[10]

3. d. Gingival recession[5]

4. a. Parkinson's disease[5]

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Case 4

Splinting and Maintenance of Periodontally Involved Lower Incisors

With Contribution from Lewis Winning and Christopher Irwin

Figure 1.4.1 Lower incisor teeth at initial presentation.

A. Case Story

A 63-year-old male presented with loose lower incisors (Figure 1.4.1). He had been aware of increased mobility over the last three years, and was now conscious of looseness when eating. The patient's relevant medical history was clear and he was a non-smoker. He had previously had some non-surgical periodontal treatment of the lower incisor region and regularly attended his dental hygienist. A number of treatment options were discussed with the patient, including extraction of the mobile lower anterior teeth and prosthodontic replacement. The patient was very keen to retain his lower teeth for as long as possible even though they had a guarded long-term prognosis. Non-surgical periodontal treatment was carried out followed by splinting of the teeth.

LEARNING GOALS AND OBJECTIVES

- Understand that the aim of periodontal splinting is to improve masticatory function and comfort of teeth
- Identify when mobility in periodontally involved teeth has reached a level where functional interference is apparent and then splinting of the teeth is indicated
- Recognise that splinting must be accompanied by adequate oral hygiene and maintenance, as mechanical cleaning of the teeth is compromised by the presence of the periodontal splint

B. Medical History

- Osteoarthritis
- Atrial fibrillation
- High blood pressure controlled by medication
- Irregular heart beat
- High cholesterol controlled by medication and diet
- Former smoker, quit 20 years ago

C. Dental History

- Regular dental attender
- No previous experience of removable prosthesis
- Previous treatment for periodontal disease with dental hygienist

D. Medications

- Warfarin (anticoagulant) 2 mg daily
- Aspirin (non-steroidal anti-inflammatory) 50 mg daily
- Propranolol hydrochloride (beta blocker) 80 mg twice per day
- Simvastatin (CoA reductase inhibitor) 40 mg once daily

E. Social History

- Retired, previous mechanic
- Previous smoker, quit approximately 20 years ago
- Alcohol: approximately 20 units per week

F. Extraoral Examination

- No significant findings

G. Soft Tissue Examination

- No significant findings

H. Clinical Findings/Problem List

- Partially dentate with some missing posterior units in the upper arch
- Oral hygiene good
- Lower central incisors Grade II mobile
- Generalised gingival recession
- Abrasion cavities on exposed root surfaces in lower arch
- Radiographs show approximately 80% horizontal bone loss around lower central incisors

- Tooth charting:

	7			4	3	2	1	1	2	3		5	6	7	
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8

- Basic periodontal examination:

1	1	1
1	2	1

I. Diagnosis

- Localised severe chronic periodontitis affecting the lower incisors
- Generalised recession

CLINICAL DECISION MAKING – DETERMINING FACTORS

- In this case, after discussion with the patient, a decision was made to maintain the lower incisor teeth. However, as mobility of the LR1 and LL1 had reached a level where functional interference was now an issue, splinting of these teeth was indicated. The aim of periodontal splinting is to improve masticatory function and comfort of teeth. Many types of periodontal splint have been described in the literature. The splinting technique described in the current case is the indirect permanent wire splint, which is based upon the orthodontic styled 'bonded lingual retainer'. This has the advantage that although fixed, the slightly elastic properties of the orthodontic wire still allow some physiological mobility of the teeth during function. The main disadvantage of splinting is that it compromises plaque control by making oral hygiene access difficult, thus instructing the patient about enhanced measures for oral hygiene after splinting is essential for the improved longevity of the connected teeth.[1]
- Clinical procedure (indirect permanent wire splint technique): interdental spaces were first blocked out using soft wax. An alginate impression was then recorded of the lower arch. After casting of the model in dental stone, a Twistflex® wire (Wildcat® Wire, GAC International Inc., USA) was adapted to the lingual surfaces of the lower incisor teeth. The wire must rest against the lingual surfaces passively without tension or interference with the occlusion. The length of the wire is dependent upon the health of the neighbouring incisor teeth. In this case, because bone levels were favourable on the lower right and left lateral incisors and there was no pathological mobility of these teeth, the wire was adapted to the four incisor teeth only (i.e. one 'healthy' unit on either side). If the lateral incisors had also been compromised, the splint could have been extended to include the lower right and left canine teeth. A putty (Lab-Putty™, Coltene, UK) seating jig was also fabricated to aid accurate transfer and seating intraorally (Figure 1.4.2).

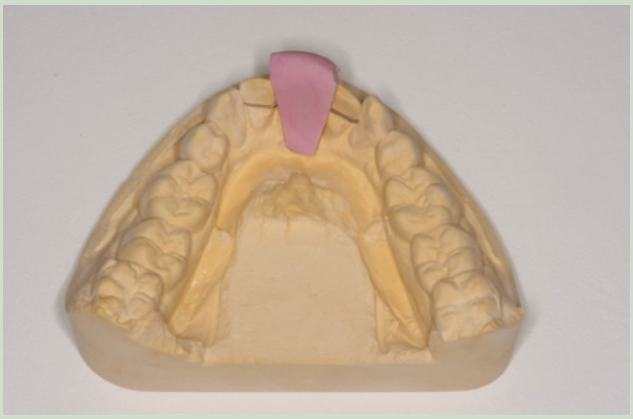


Figure 1.4.2 Putty matrix fabricated for placement of the periodontal splint.

- The intraoral procedure was carried out under rubber dam to ensure isolation of the teeth. All surfaces of the teeth were thoroughly polished with a slurry of pumice and water using a rotating brush, then rinsed and dried with air (Figure 1.4.3).
- Acid etchant (37.5% phosphoric acid) was applied to the central area of lingual surfaces of

the lower incisors where the wire would rest. After 30 seconds for the etchant to take effect, it was thoroughly rinsed, and the teeth were air dried to give the typical post-etch chalky white appearance. A prime and bond in one system (Prime & Bond NT, Dentsply, USA) was applied to the previously etched areas of the four lingual surfaces where the wire would rest. After 5 seconds of air drying, surfaces were light cured as per manufacturer instructions. The wire was then seated with the jig in situ. A small amount of flowable composite (Filtek™ Supreme XTE Flowable Restorative, 3M ESPE, USA) was sequentially placed and adapted to the wire and tooth of the two exposed lateral incisors either side of the seating jig. Following this the putty jig was removed, allowing the flowable composite to be placed on the two central incisors (Figure 1.4.4).

- The final stage involved careful checking of occlusal interferences in both static and dynamic positions using articulating paper. This is an essential step, as excess force directed onto the compromised teeth will cause the splint to debond. In this case, it was necessary to adjust the lower right central incisor to relieve an occlusal interference during protrusive movements (Figure 1.4.5).
- As with the post-periodontal patient, a strict maintenance programme with regular recall for prophylactic periodontal maintenance scaling and reinforcement of oral hygiene instruction is mandatory in these patients. Future debond of the wire from a supporting tooth is usually repairable chairside; again, it is essential that occlusal interferences are investigated and adjusted if necessary.

Figure 1.4.3 Lower incisor teeth isolated using rubber dam.

Figure 1.4.4 Periodontal splint in situ.

Figure 1.4.5 (a) and (b) Checking of periodontal splint for occlusal interference.

Self-Study Questions

1. Which of the following is a method for constructing a periodontal splint?

- **a. Indirect permanent wire splint**
- **b. Functional splint**
- **c. Titanium trauma splint**
- **d. Fixed-fixed adhesive bridge**

2. When should a periodontal splint be considered?

- **a. When oral hygiene is poor**
- **b. When the patient has no symptoms from the mobile teeth**
- **c. Where the mobile periodontally involved teeth are interfering with function**
- **d. When there is furcation involvement**

3. Evidence suggests that poorly controlled periodontal disease is linked to which of the following systemic diseases?

- **a. Diabetes mellitus**
- **b. Asthma**
- **c. Rheumatoid arthritis**
- **d. Angina**

Answers are located at the end of the case

Self-Study Answers

1. a. Indirect permanent wire splint[1]

2. c. Where the mobile periodontally involved teeth are interfering with function[2]

3. a. Diabetes mellitus

Reference

1 Quirynen M, Mongardini C, Lambrechts P, et al. (1999) A long-term evaluation of composite-bonded natural/resin teeth as replacement of lower incisors with terminal periodontitis. *Journal of Periodontology* 70: 205–212.

Case 5

Management of Toothwear Using Direct Composite Restorations

With Contribution from Francis Burke

Figure 1.5.1 Appearance of patient's teeth at initial presentation. Photograph courtesy of Dr Chien Yen Tan.

A. Case Story

A 65-year-old man presented to his dentist complaining of sensitivity associated with his upper and lower teeth. The patient had noted that his front teeth had 'reduced in size' and he felt that this had become more apparent over the last five years (Figures 1.5.1 and 1.5.2). The patient's past medical history revealed longstanding treatment for gastric reflux, which was now well controlled with medication. The patient had researched the use of full-coverage crowns and was keen to discuss treatment options to improve his aesthetics. A more conservative approach was taken to manage the patient's toothwear using composite resin to cover exposed dentine and replace missing tooth structure.

Figure 1.5.2 Intraoral appearance of patient at initial presentation. Photograph courtesy of Dr Chien Yen Tan.

LEARNING GOALS AND OBJECTIVES

- Recognise that toothwear can be classified as physiological wear or pathological wear in older patients. The majority of elderly dentate have evidence of physiological toothwear. If the wear does not pose an aesthetic or functional issue for the patient, it may not require operative care.[1]
- Understand that treatment for toothwear may be warranted if the patient has a functional deficit as a result of their pathological toothwear.
- Appreciate that for moderate toothwear in dentate patients, composite resin can be used to provide a conservative and simple approach to treatment by utilising the Dahl concept.[2]

B. Medical History

- The patient reported a longstanding history of gastric reflux, which was now controlled by prescribed medication
- High blood pressure
- High cholesterol

C. Dental History

- Irregular dental attender, previously had treatment to build up lower teeth but failed very quickly and the patient did not return
- Patient has a nocturnal grinding habit (noted by patient's wife)
- Patient has not received any treatment for bruxism
- Some missing units in lower arch, but these are not a functional or aesthetic concern

D. Medications

- Propranolol hydrochloride (beta blocker) 80 mg twice daily
- Simvastatin (CoA reductase inhibitor) 40 mg once daily
- Aspirin (non-steroidal anti-inflammatory) 75 mg once daily
- Omeprazole (proton pump inhibitor) 20 mg once daily

E. Social History

- Married with adult children and four grandchildren
- Semi-retired electrician
- Previous smoker but quit 15 years ago
- Alcohol: approximately 18 units per week (beer and cider)

F. Extraoral Examination

- Temporomandibular joint (TMJ): asymptomatic click, left side opening
- Muscles of mastication: some evidence of masseteric hypertrophy and tenderness on palpation
- Lymph nodes: nothing abnormal detected

G. Soft Tissue Examination

- Linea alba on right and left buccal mucosa

H. Clinical Findings/Problem List

- Localised anterior toothwear on upper and lower arches: approximately 30–40% tooth substance lost from teeth
- Upper and lower anterior teeth sensitive to cold air
- Oral hygiene good, no evidence of active caries
- Minimally restored dentition, missing 46
- Tooth charting:

	7	6	5	4	3	2	1	1	2	3	4	5	6	7	
	7		5	4	3	2	1	1	2	3	4	5	6	7	

- Basic periodontal examination:

2	1	2
2	2	1

I. Diagnoses

- Generalised moderate toothwear with erosive and attritional aetiology
- Generalised sensitivity
- Missing lower left first molar

CLINICAL DECISION MAKING – DETERMINING FACTORS

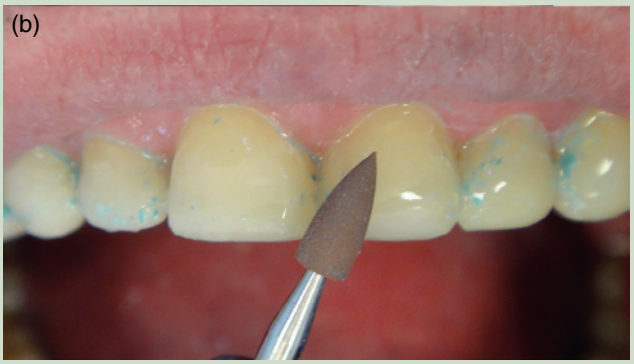
- In patients with moderate to severe toothwear which has previously been untreated, their motivation to present requesting operative care should be considered. While for some it is because their functional deficit has become so pronounced that they cannot function adequately, for others it is in response to external social drivers such as encouragement from a spouse or offspring.
- Pathological toothwear does not occur spontaneously. The underlying aetiology should be identified and managed prior to initiating specific operative procedures.
- Some treatments for toothwear are costly in terms of time and finance. An early conversation with the patient before initiating a prolonged and expensive course of treatment can reduce future conflict.
- There is an expectation that the dentist will carry out the procedure and 'cure' the toothwear. It is incumbent upon the patient to participate in control of the aetiology and in the long-term maintenance of whatever modality of treatment is provided. Active patient engagement will considerably enhance the prospects for long-term success for treatment.
- For a dentate patient, as in this case, who has lost a considerable amount of tooth structure, it may be possible to replace the lost tissue with composite restorations. It is essential that there is sufficient enamel remaining for adequate bonding to occur. Should bonding be attempted to dentine only, especially sclerotic dentine, then the prognosis is generally poor. Composite resins tend to be weak in thin section, so a minimum thickness of 2 mm of composite is recommended.[3] It is noteworthy that patients seem to have little trouble in accommodating to the increase in vertical dimension. This is probably due to the presence of proprioceptive nerves in the periodontal ligament attached to the remaining teeth.
- In this case, as there was a planned alteration in vertical dimension and occlusal scheme, a diagnostic wax-up was used (Figures 1.5.3 and 1.5.4). This helped to plan the occlusal scheme; determine the vertical dimension; demonstrate to the patient what was planned; and aided in the provision of a putty matrix to help with placement of the composite restorations (Figure 1.5.5).

- When carrying out the wax-up it is important to ensure that there is even and simultaneous contact on all teeth in centric occlusion and in lateral excursions.
- Composite resin restorations (Ceram.X Universal, Denstply, USA) were placed and polished (Soflex Disc, 3M ESPE, USA) (Figures 1.5.6a and b, 1.5.7, 1.5.8 and 1.5.9).

Figure 1.5.3 Upper and lower models mounted on semi-adjustable articulator. Anterior view of wax-up; note thickness of wax in excess of 2 mm on upper and lower teeth. Photograph courtesy of Dr Chien Yen Tan.

Figure 1.5.4 Right lateral view of wax-up. Note the disclusion of the molars. Photograph courtesy of Dr Chien Yen Tan.

Figure 1.5.5 Anterior view of putty matrix which was made from wax-up. The matrix delineated the palatal contour and incisal height of the composite restorations. Polytetrafluoroethylene (PTFE) tape was placed over the canines to minimise adhesion of the composites to the adjacent teeth. Photograph courtesy of Dr Chien Yen Tan.



Figures 1.5.6 (a) and (b) Polishing of restorations. Photographs courtesy of Dr Chien Yen Tan.

Figure 1.5.7 Palatal view of maxillary teeth showing occlusal contact marked with articulating paper. Photograph courtesy of Dr Chien Yen Tan.

Figure 1.5.8 Lingual view of mandibular teeth showing occlusal contact marked with articulating paper. Photograph courtesy of Dr Chien Yen Tan.

Figure 1.5.9 Anterior view after treatment. Photograph courtesy of Dr Chien Yen Tan.

Self-Study Questions

1. Which of the following statements about toothwear is correct?

a. **Abrasion is caused by tooth-to-tooth contact**
b. **Attrition is wear caused by non-bacterial chemical dissolution**
c. **'Cupped-out' concavities are seen in patients with erosion**
d. **Erosion is caused by bacterial chemical dissolution**
e. **Erosion by gastric acid is usually seen on the labial aspects of the upper anterior teeth**

2. What is the Dahl technique for the management of tooth wear based upon?

a. **Anterior tooth extrusion and posterior tooth intrusion**
b. **Anterior tooth intrusion and posterior tooth extrusion**
c. **Proclination of the lower incisors**
d. **Proclination of the upper incisors**
e. **Retroclination of the upper and lower anterior teeth**

Answers are located at the end of the case

Self-Study Answers

1. c. 'Cupped-out' concavities are seen in patients with erosion[1]

2. b. Anterior tooth intrusion and posterior tooth extrusion[2]

References

1 Burke FM, McKenna G (2011). Toothwear and the older patient. *Dental Update* 38: 165–168.

2 Gulamali AB, Hemmings KW, Tredwin CJ, Petrie A (2011). Survival analysis of composite Dahl restorations provided to manage localised anterior tooth wear (ten year follow up). *British Dental Journal* 211: E9. doi: 10.1038/sj.bdj.2011.683

3 Poyser NJ, Briggs PF, Chana HS, et al. (2007). The evaluation of direct composite restorations for the worn mandibular anterior dentition – clinical performance and patient satisfaction. *Journal of Oral Rehabilitation* 34**:** 361–376.