CASE PORTFOLIO

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DMD 4 [redacted]

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CASE 1

Multi-disciplinary

CASE 1

Multi-disciplinary

1.1 The patient

1.1.1 Details

- 64 year-old male

1.1.2 Presenting complaint/s

- Presented in January 2019 with the following complaints:
  i. "I have intermittent pain in a couple of my teeth (37, 47) and in my gums."
  ii. "There is a hole in the back of my tooth (22) and sometimes stuff gets in there and causes sensitivity."
  iii. "I think it would be beneficial to have dentures because of my missing teeth."

1.1.3 History of presenting complaint/s

- Dull, throbbing pain that lingers with minor temperature changes on lower left.
- Recent spontaneous, dull pain with minor temperature changes on lower right.
- Gingival pain and bleeding on brushing.

1.1.4 Medical history

Medical condition	Description	Dental implications (1)
Chronic obstructive pulmonary disease (COPD)	Respiratory condition that causes narrowing of the bronchial tubes in the lungs, making breathing difficult. Symptoms identical to asthma and include wheezing, shortness of breath, chest tightness, coughing.	Mouth breathing. Increased risk of xerostomia. Difficulty tolerating horizontal position. Difficulty tolerating rubber dam.
Abdominal hernia Reflux oesophagitis	Protrusion of organs through weakened section of abdominal wall. Associated with oesophageal reflux; regurgitation of stomach contents into oesophagus resulting in chemical insult to oesophagus from gastric acid, enzymes, bile.	Difficulty tolerating horizontal position. Acid erosion and accelerated tooth wear.
Osteoarthritis affecting shoulders, fingers, legs, back	Inflammation and/or damage of joints affecting bone, cartilage, ligaments, muscles and causing pain, swelling, difficulty moving.	Difficulty performing adequate oral hygiene.
Stents in L & R legs	Tube inserted into blocked arteries in legs.	Difficulty with long dental appointments.
Post-traumatic stress disorder (PTSD)	Mental health condition triggered by a terrifying event causing flashbacks, fear, nightmares and severe anxiety.	Difficulty coping with changes in plans and new procedures. Easily frustrated.
Previous hospitalisation	April 2018 – COPD and back pain February 2019 – numbness in legs and back pain	Nil.

(1) Therapeutic Guidelines: oral and dental (2019).

Medication	Dosage	Use & Mechanism of action (2, 3)	Dental implications (2, 3)
Breo Ellipta (Fluticasone Furoate & Vilanterol)	100 mg / 25 mg q.d.	Corticosteroid/β_2 agonist. Symptom relief of asthma. Anti-inflammatory action and bronchodilation.	Increased susceptibility to: (i) Dental caries – decreased salivary flow rate caused by β_2-adrenergic agonist, decrease in salivary and plaque pH due to use of inhalers, fermentable carbohydrate in anti-asthma medications. (ii) Dental erosion – reduction in buffering capacity and salivary flow rate due to beta-2 agonist. (iii) Periodontal disease – decrease in salivary protection due to reduction in salivary flow, dehydration of alveolar mucosa due to mouth breathing, alteration of immune response, decrease in mineral bone density associated with inhaled corticosteroids. (iv) Oral candidiasis – generalised immune-suppressive and anti-inflammatory effects of steroids, low salivary flow rate.
Bricanyl Turbuhaler (Terbutaline Sulfate)	500 mcg q.d.	β_2-agonist. Symptom relief of asthma. Relaxes bronchial smooth muscles.	
Ventolin (Salbutamol Sulfate)	100 mcg p.r.n.	β_2-adrenergic agonist. Symptom relief of asthma. Relaxes bronchial smooth muscles.	

			Management: Education, regular check-ups, good oral hygiene, caries prevention, mouth rinsing after use of inhalers, increase water intake, sugar-free gum. (4)
Esomeprazole	20 mg tab q.d.	Proton pump inhibitor that binds to hydrogen-potassium ATPase enzyme system inhibiting stimulated and basal gastric acid production and secretion. For reflux oesophagitis.	Nil.
Pregabalin – ceased	75 mg tab q.d.	Exact mechanism unknown. Used for relief of neuropathic pain and epilepsy.	Common adverse effects include dry mouth, increasing risk of dental caries.
Panadol (Paracetamol)	p.r.n.	Exact mechanism unknown, possibly inhibition of central prostaglandin synthesis and modulation. Used for analgesic and anti-pyretic action.	May alter perception of dental pain, affecting diagnostic procedures.

(2) Monthly Index of Medical Specialities Australia. (3) Australian Medicines Handbook.

Allergy	Description	Dental implications
Penicillin	Anaphylactic reaction.	Penicillin contraindicated. Prescribe alternative antibiotics e.g. Clindamycin.

Alcohol & Tobacco Use	Amount, Frequency & Duration	Dental implications
Never smoker	N/A.	Nil.
Current drinker	1-2 standard drinks per month.	Alcohol consumption raises risk of cancer including on lip and in oral cavity (5)

1.1.5 Dental history and dental attitude

- Dental history
  - Attended government dental clinic in 2016 for fillings and an extraction.
  - Attended free dental day in 2017 for clean and fillings and screened at OHCWA.
  - Previously attempted to access regular care but been placed on long waitlists.
  - History of extractions due to dental decay.
  - Never worn dentures.
  - Presented to student clinic for initial examination January 2019.

- Dental attitude
  - Functional motivation.
  - Understands and appreciates role of dental health in overall health and wellbeing.
  - Highly motivated and compliant.
  - Never missed an appointment.

1.1.6 Oral hygiene

- Poor oral hygiene:
  - Brushes teeth two to three times daily after meals.
  - Uses manual toothbrush and fluoride toothpaste.
  - Uses floss pick sometimes.
  - Daily salt-water rinses.

1.1.7 Social history

- Born in Melbourne and raised in Israel.
- Previously worked as an Ultra-Orthodox Jewish Rabbi and for United Nations Human Rights Commission, suffering physical and psychological injuries as a result.
- Currently retired in Perth and living alone on disability pension.
- Spends time volunteering for various causes.

1.2 Examination and diagnostics

Date: January 2019

1.2.1 Extra-oral examination

Findings	
Facial symmetry	Absence of facial swelling
Facial skin	Continuous and firm
Lips	Continuous and firm texture with even colouring Vermilion border present Commissures continuous and intact
Temporomandibular joint	Bilateral clicking on closing Bilateral clicking on lateral excursion to right Absence of pain and tenderness on palpation
Lymph nodes	No sign of lymphadenopathy Absence of pain and tenderness on palpation
Muscles of mastication	Absence of pain and tenderness on palpation
Thyroid gland	No obvious abnormal enlargement

1.2.2 Extra-oral photographs and findings

Dentofacial analysis	
Horizontal facial proportions	Proportional facial thirds
Vertical facial proportions	Proportional facial fifths
Horizontal symmetry	Parallelism between interpupillary, intercommissural and incisal lines
Vertical symmetry	Mild facial asymmetry with mandible left of midline Facial midline and dental midline coincide Maxillary dental midline and mandibular dental midline do not coincide; mandibular dental midline deviated to left by 4-5 mm
Facial symmetry	Relatively symmetrical
Smile analysis	High smile line Average smile width Wide buccal corridors Flat incisal/occlusal curve
Profile	Indications of class I skeletal relationship

1.2.3 Intraoral examination

Findings	
Labial mucosa	Nil abnormalities detected
Buccal mucosa	Nil abnormalities detected
Buccal and labial sulci	Adequate depth
Frenal attachments	Maxilla: labial, buccal bilaterally Mandible: labial, lingual
Hard palate	Prominent rugae
Soft palate	Nil abnormalities detected
Gingivae	Thick scalloped phenotype Generalised gingival Inflammation Generalised gingival recession and blunted papillae
Tongue	Fissuring and plaque accumulation on dorsum
Floor of mouth	Nil abnormalities detected

1.2.4 Intraoral photographs and findings

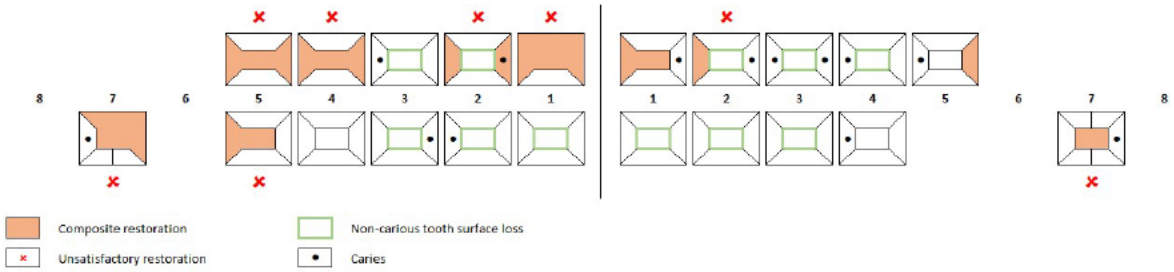
View	Findings	
Maxillary occlusal	Teeth	Partially dentate: Kennedy-Applegate Class I (6) Incisal wear into dentine 13-23 Large cavity 22D
	Restorations	Large composite restorations 11, 14, 15 Composite restorations 12, 21, 25
	Soft tissues	Prominent rugae
Mandibular occlusal	Teeth	Partially dentate: Kennedy-Applegate Class III Modification 1 (6) Incisal wear into dentine 33-43
	Restorations	Large composite restorations 37, 38
	Soft tissues	Narrow alveolar ridge 36-35 area
Right buccal	Teeth	Missing teeth 16, 17, 46 47 intrudes into prosthetic space of opposing arch Yellow-brown bands on cervical areas of teeth* Abundant plaque
	Restorations	Large composite restoration 47
	Soft tissues	Marginal gingival inflammation Generalised gingival recession
Left buccal	Teeth	Missing teeth 26, 27, 35, 36 37 intrudes into prosthetic space of opposing arch Yellow-brown bands on cervical areas of teeth* Abundant plaque
	Restorations	Large composite restoration 37
	Soft tissues	Marginal gingival inflammation Generalised gingival recession
Anterior	Teeth	Caries 23M Abundant plaque and calculus Deviation of mandibular dental midline to left
	Restorations	Composite restorations 11, 21
	Soft tissues	Marginal gingival inflammation Generalised gingival recession Blunted papilla

*Causes of discolouration may be intrinsic or extrinsic. Likely intrinsic staining caused by past use of tetracycline antibiotics.

1.2.5 Occlusion

Findings	
Overjet	3 mm
Overbite	2 mm
Canine class	LHS: Class I, RHS: Class III
Molar class	LHS: -, RHS: -
Crossbite	Absent
Crowding / Spacing	Nil
Tilting	34, 37, 47
Rotation	22
Supraeruption	37, 47
Occlusal scheme	Group function

1.2.6 Odontogram



1.2.7 Periodontal assessment

1.2.7.1 Community Index of Periodontal Treatment Needs (CPITN)

Findings		
CPITN 3 3 3 3 3 3	Sextant 1	Maximum probing depth 5 mm, generalised BOP
	Sextant 2	Maximum probing depth 5 mm, generalised BOP
	Sextant 3	Maximum probing depth 4 mm, generalised BOP
	Sextant 4	Maximum probing depth 5 mm, generalised BOP
	Sextant 5	Maximum probing depth 5 mm, generalised BOP Extremely tender to probing
	Sextant 6	Maximum probing depth 4 mm, generalised BOP

1.2.7.2 Periodontal examination

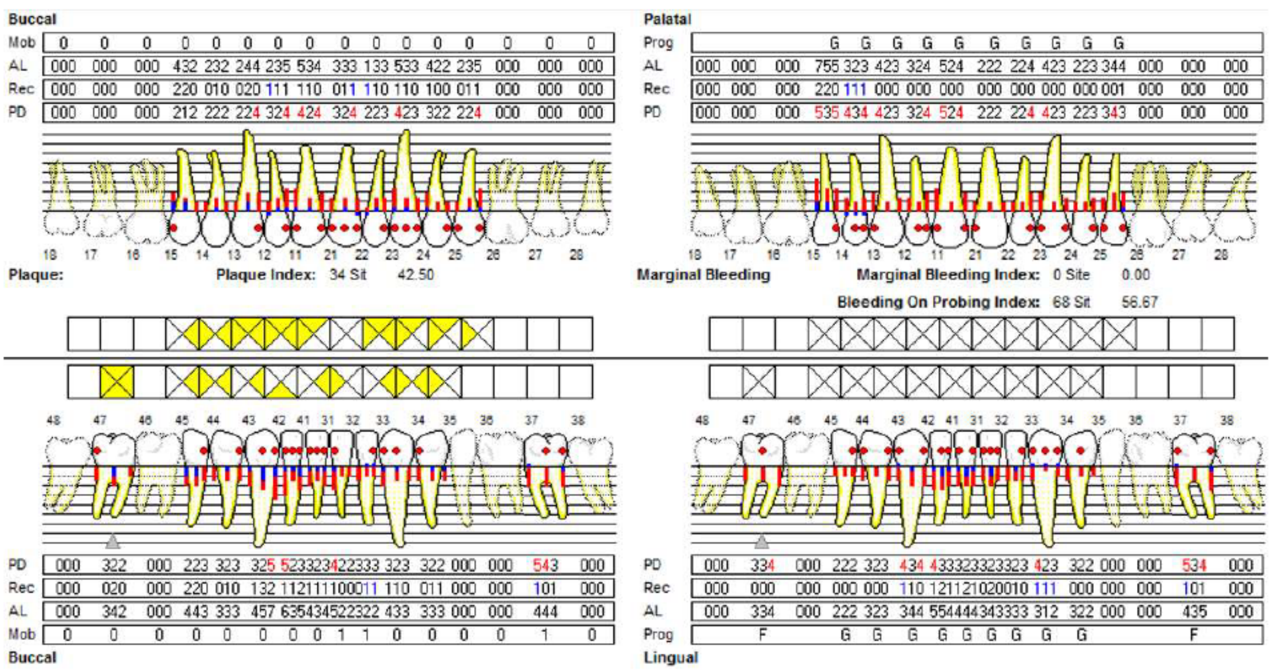
	Findings	
Clinical	Gingival tissues	Generalised bleeding on probing Oedematous texture Pink with red marginal gingival inflammation Generalised gingival recession with blunted papillae Thick biotype
	Plaque distribution	Generalised plaque distribution Abundant in interproximal areas
	Plaque score	43%
	Calculus distribution	Generalised supragingival and subgingival calculus Abundant in lingual lower anterior teeth
	Plaque-retentive factors	Restoration overhangs 11, rotated 22, distally tilted 34, mesially tilted 37
	Furcation involvement	No
	Halitosis	Yes
Radiographic	Bone levels	Generalised mild horizontal bone loss in maxilla and mandible

1.2.7.3 Periodontal tests

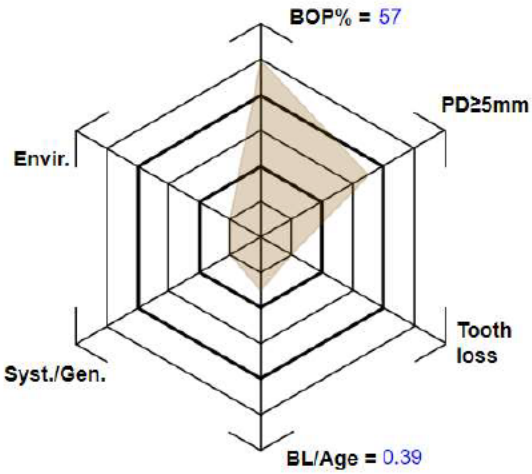
Mobility			-	-	-	-	-	-	-	-	-			
TTPalp			-	-	-	-	-	-	-	-	-			
TTP			-	-	-	-	-	-	-	-	-			
			15	14	13	12	11	21	22	23	24			
	47		45	44	43	42	41	31	32	33	34			37
TTP	++		-	-	-	-	-	-	-	-	-			+++
TTPalp	-		-	-	-	-	-	-	-	-	-			-
Mobility	-		-	-	-	-	-	GI	GI	-	-			GI

1.2.7.4 Periodontal chart

- CPITN indicated need for periodontal chart.
- Baseline data to evaluate success of periodontal treatment.
- Periodontal assessment in consideration of removable prostheses.



1.2.7.5 Periodontal Risk Assessment (PRA) (7, 8)



Age	64
Number of teeth and implants	21 (1 - 32)
Number of sites per tooth / implant	○ 2 ○ 4 ◉ 6
Number of BOP-pos. sites	72 of 126
Number of sites with PPD≥5mm	7
Number of missing teeth	0
% alveolar bone loss (estimated in % or 10% per 1mm)	25 %
Syst./Gen.	○ Yes ◉ No
Envir.	◉ Non-smoker (NS) ○ Former smoker (FS) ○ Occasional smoker (OS) ○ Smoker (S) ○ Heavy smoker (HS)

Polygon surface: 32.04293

Periodontal Risk: medium

Suggested Recall Interval: **6** Months

(7) Periodontal Risk Assessment for patients in Supportive Periodontal Therapy, Lang & Tonetti (2003). (8) PRA online tool.

1.2.8 Pulp sensibility tests

EPT				20	22	15	73	37	56	0	36	36	67		
CO_2				++	-	+	-	-	-	-	+	+	-		
			15	14	13	12	11	21	22	23	24	25			
	47		45	44	43	42	41	31	32	33	34			37	
CO_2	-		-	+	++	-	-	-	-	-	++			+++	
EPT	0		20	17	11	42	32	29	48	26	30			0	

1.2.9 Radiographs

Rationale: each radiograph taken has rationale where stated – ALARA

Note: Subscript a = amalgam, c = composite, m = metallic, p = metal-ceramic

1.2.9.1 Orthopantogram

Date: 3/11/2017

Findings (9)	
Periphery and corners	Ossified stylohyoid ligaments bilaterally
Cortices of mandible	Continuous and even Thin rami Condyles cannot be visualised
Cortices of maxilla	Nil abnormalities detected
Zygomatic bones	Nil abnormalities detected
Maxillary sinuses	Nil abnormalities detected
Nasal cavity and palate	Nil abnormalities detected
Bone pattern of maxilla	Normal density and trabeculation
Bone pattern of mandible	Normal density and trabeculation Rectangular-shaped radiolucency R body of mandible - artefact
Alveolar processes	Generalised mild horizontal bone loss in maxilla and mandible No furcation involvement any teeth
Teeth	Missing posterior teeth 17, 16, 26, 27, 36, 35, 46 Gross carious lesion 37 Heavily restored 15, 14, 47 Mesial tilt 37, 47

(9) Interpretation of panoramic radiographs, Perschbacher (2012).

1.2.9.2 Bitewings

Bitewing – Right	Findings	
 Date: 7/2/2019 Rationale: interproximal caries detection	Caries	13D, 47D
	Restorations	15MOD$_c$ (suspicious margins), 14MOD$_c$ (mesial overhang), 45D$_c$, 47MO$_c$ (D secondary caries)
	Pulp	Nil abnormalities detected
	Periodontium	14D PDL space widening Generalised crestal bone loss Mild horizontal bone loss
	Other	46 missing 47 mesial tilt

1.2.9.3 Periapicals

Periapical – 47	Findings	
 Date: 7/3/2019 Rationale: Check for pathology	Caries	47D (deep into dentine)
	Restorations	47MO$_c$
	Pulp	Nil abnormalities detected
	Periodontium	Intact PDL space Nil furcation involvement Possible PA radiolucency D root
	Other	46 missing 47 mesial tilt

Periapical – 21-25	Findings	
 Date: 27/3/2019 Rationale: Check for pathology	Caries	21D, 22M&D, 23M
	Restorations	47MO$_c$
	Pulp	Nil abnormalities detected
	Periodontium	21 slight PDL space widening Nil PA radiolucency detected
	Other	Incisal wear anterior teeth

1.2.10 Caries risk assessment

1.2.10.1 Dietary assessment

- Diet is high in sugars and fermentable carbohydrates
  - Coffee with 2 teaspoons of sugar four to six times daily
  - Fruit juice once daily
  - Bread and pasta
  - Cakes, sweet biscuits, muffins
  - 3-4 scoops of icecream, thickshakes, chocolate for dessert
- Frequent snacking two to three times daily

1.2.10.2 Saliva test

Unstimulated saliva			Stimulated saliva	
Flow rate	Consistency	pH	Quantity at 5 mins	Buffering capacity
>60 s – low	Sticky/frothy	5.0-5.8	<3.5 mL – very low	0-5 – very low
30-60 s – normal	Frothy/bubbly	6.0-6.6	3.5-5.0 mL – low	6-9 – low
<30 s – high	Watery/clear	6.8-7.8	>5.0 mL – normal	10-12 – normal

1.2.10.3 Caries Management By Risk Assessment (CAMBRA) (10)

Disease indicators	Visible caries and radiographic penetration into dentine Radiographic approximal enamel lesions White spots on smooth surfaces Restorations in last 3 years
Risk factors	Visible heavy plaque on teeth Frequent snacking
Protective factors	Lives in fluoridated community Fluoridated toothpaste at least 2x daily Adequate saliva flow

- Caries risk:
  - High
- Suggested management:
  - Prescription toothpaste with 5000 ppm fluoride twice daily
  - Chlorhexidine gluconate 0.12% mouthrinse once daily for 1 week
  - Xylitol candies or gum four times daily
  - Fluoride varnish
  - 3-month recall

(10) The evidence for Caries Management by Risk Assessment, Featherstone & Chaffee (2018).

1.3 Diagnoses and problem list

1.3.1 Diagnoses

Diagnosis		
	Caries	Multiple active carious lesions
Pathological	Restorations	Multiple unsatisfactory restorations
	Endodontic disease (11, 12)	37 chronic irreversible pulpitis with primary acute apical periodontitis due to caries and broken down restoration
		47 necrotic and possibly pulpless and infected with primary acute apical periodontitis due to caries and broken down restoration
		22 chronic reversible pulpitis and severely calcified canal with clinically normal periapical tissues due to caries and broken down restoration
	Periodontal disease (13)	Generalised Stage III Grade B unstable periodontitis*
	Non-carious tooth surface loss	Attrition of anterior teeth with possible contribution from erosion
Morphological	Malocclusion	Angle skeletal class I Class III malocclusion – habitual forward posture of mandible Bilateral posterior crossbite Rotated 24, 26
	Overbite/Overjet	2 mm / 3 mm
	Missing teeth	17-16, 26-27, 36-35, 46
	Posterior impairment	Loss of posterior support Multiple missing posterior teeth in maxilla and mandible Mesially tilted 37, 47
	Occlusal stability	Unstable
	Guidance system	Group function
Host-related factors	Psychosocial	Good personal presentation Functional concern Good dental attitude and motivated to attend appointments
	Habits	Poor oral hygiene High sugar and fermentable carbohydrate diet with frequent snacking
	Socioeconomic	Financial resources available for dental care
	Medical	Psychological issues Limited manual dexterity Predominantly mouth breather
	Functional	Strong gag reflex

(11) Classification, diagnosis and clinical manifestations of apical periodontitis, Abbott (2004). (12) A clinical classification of the status of the pulp and the root canal system, Abbott & Yu (2007). (13) Periodontitis: Consensus report if workgroup 2 of the 2017 world workshop on the classification of periodontal and peri-implant diseases and conditions, Papapanou et. al. (2018).

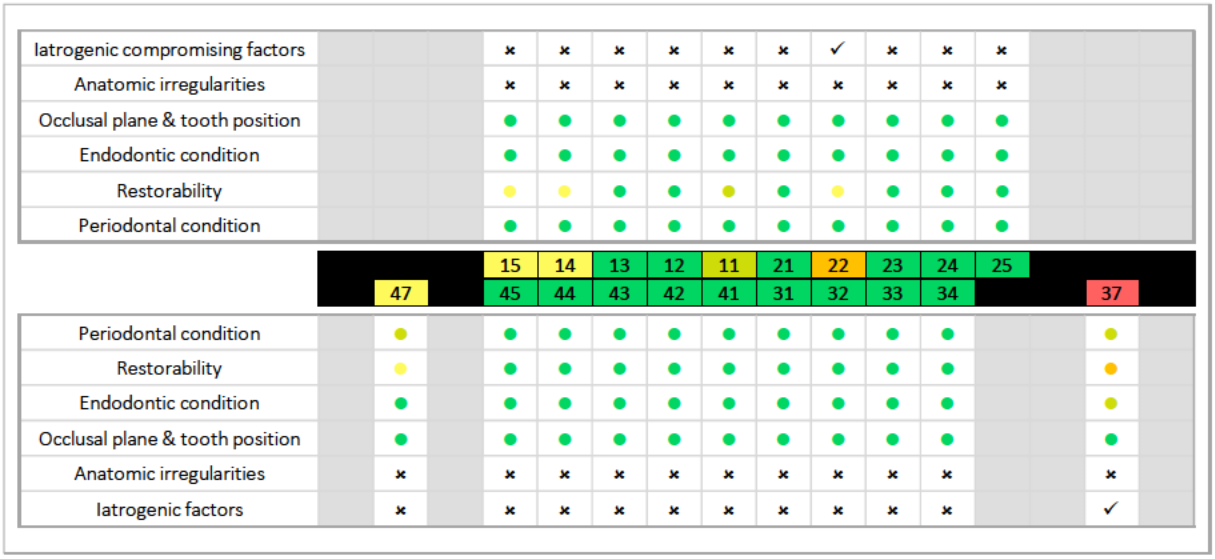
*Stage III – ≥ 5mm CAL, 25% RBL, maximum probing depth < 5mm, no furcation involvement, occlusal trauma, masticatory dysfunction, bite collapse or severe ridge defects. Grade B – BL/Age 0.39, heavy film deposits with low destruction, non-smoking, normoglycaemic. Generalised – affects >30% of teeth. Unstable – BOP > 10% and pockets 4-5mm or more.

1.3.2 Problem list

- Pulpal pathology (37, 47, 22)
- Caries (13D, 12M, 21D, 22M&D, 23M&D, 24M, 25M, 37DB, 34M, 42D, 43M, 47D)
- Unsatisfactory restorations (15MODBP, 14MODBP, 12M, 11MIDLa, 22M, 37O, 45DO, 47MOLi)
- Stage III Grade B unstable periodontitis
- Multiple missing posterior teeth – lack of posterior occlusal support and occlusal instability
- High caries risk – poor oral hygiene, limited manual dexterity, mouth breathing, psychological issues, poor dietary habits

1.4 Prognosis (14)

1.4.1 Individual teeth



Key: Good | Questionable | Hopeless | Fair | Poor

Evaluation of pathology and scale of severity

	Class A – Good	Class B – Fair	Class C – Questionable	Class D – Poor
Periodontal condition	80%-100% bone support. Easily maintained.	50%-80% bone support. Can be well maintained.	30%-50% remaining bone support. Difficult to be well maintained.	<30% one support. Cannot be cleaned or maintained well and has evidence of active periodontal disease.
Restorability	80%-100% remaining sound coronal tooth structure. Easily restored.	50%-80% remaining sound coronal tooth structure. Restoration results in no infringement of biologic width, has adequate ferrule, good crown-root ratio.	30%-50% remaining sound coronal tooth structure. Achieving adequate ferrule would compromise crown-root ratio to some extent or affect adjacent structures.	<30% sound tooth structure. Extent of lost tooth structure does not enable good ferrule to be achieved without totally compromising support of adjacent tooth structures or crown-root ratio.
Endodontic condition	Can receive straightforward primary endodontic treatment, or already has good endodontic therapy.	Failing endodontic treatment can receive predictable re-treatment, or requires a difficult primary endodontic treatment.	Failing endodontic treatment that is difficult to predictably re-treat.	Failing endodontic treatment that cannot be predictably re-treated.
Occlusal plane & tooth position	Tooth in correct occlusal plane, position, slightly deviated from ideal.	Tooth out of correct occlusal plane, can be adjusted to function within correct occlusal plane.	Tooth out of occlusal plane and requires multiple procedures to function within occlusal plane.	Tooth severely out of occlusal plane, severely tilted that after extensive treatment will exhibit reduced crown-root ratio, prevent from serving as long-term unit in arch. Position impacts health of adjacent structures.

Factors that result in drop of determined class

Iatrogenic compromising factors	Perforations, extensive post preparations, minimal tooth structure thickness left after preparation, dental materials that cannot be removed, etc. 22, 37 – minimal tooth structure thickness left after preparation

1.4.2 Patient-level risk factors

Biologic risk factors		
Medical conditions that impair immune function and healing	●	Nil
Impaired salivary flow/function	●	Adequate salivary flow
Medical condition or disability limiting oral hygiene	●	Poor manual dexterity
Other missing teeth	●	History of missing teeth due to caries
Behavioural risk factors		
Compromised or poor oral hygiene	●	Poor oral hygiene
Cariogenic diet	●	High cariogenic diet
Low exposure to fluoride	●	Adequate exposure to fluoride
Parafunctional habits	●	No
Ability and willingness to adhere to long-term maintenance protocol	●	Yes
Smoking	●	Non-smoker
Financial and personal risk factors		
Motivation for treatment	●	Highly motivated
Available resources for dental care	●	Yes
Willingness to commit finances, time, and effort	●	Yes
Attitude toward losing teeth	●	Strong willingness to preserve existing teeth
Understanding of one's condition and needed treatment	●	Yes
Aesthetic expectations	●	Reasonable
Low dental IQ	●	Adequate dental IQ with education

Key: Favourable
Questionable
Unfavourable

(14) Evaluation of prognosis of individual teeth and patient-level risk factors adapted from Samet and Jotkowitz (2009).

1.4.3 Overall dentition

- All teeth have sound periodontal health with exception of 37, 47 which have < 80% remaining bone support.
- 22, 47 can be predictably root treated, 37 cannot be predictably root treated due to gross carious destruction of tooth structure.
- History of extensive restoration of posterior teeth has detrimental effect on restorability of several teeth especially after restoration removal and tooth preparation.
- Prognoses: 14, 15, 47 guarded, 22 poor, 37 hopeless.
- Patient's high sugar and high cariogenic diet in combination with poor oral hygiene is unfavourable to prognosis of dentition.
- However, patient has a good attitude, is highly motivated and compliant, open to education and appears willing to commit finances, effort and time to dental treatment.
- If the patient receives no treatment for his current condition:
  - Progression of active caries, pulpal disease, periodontal disease
  - Further loss of teeth and edentulism
- The long-term impact of tooth loss includes:
  - Loss of efficient function → speech, mastication
  - Poor aesthetics → decreased self-esteem, confidence
  - Poor physical and psychological health and reduction in overall quality of life

1.5 Treatment options

Problem	Treatment Option		Benefits	Risks	Decision & Rationale
Pulpal pathology: 37	1	• No treatment	• No commitment required	• Does not address presenting complaint • Acute pain • Infection	Option 2: • Risk of acute pain and infection • Tooth has hopeless prognosis
	2	• Extraction	• Addresses presenting complaint • Tooth has hopeless prognosis • Minimal time and financial commitment	• Extraction complications – grossly carious and risk of crown fracture • Post-extraction complications	
Pulpal pathology: 47	1	• No treatment	• No commitment required	• Does not address presenting complaint	Option 2: • Patient understands risks of choosing option but willing to attempt treatment to save tooth
	2	• Endodontic treatment	• Addresses presenting complaint • High strategic value • Root canal treatment to acceptable standard possible • Requires more time and financial commitment • Patient wishes to save tooth	• Difficult to use rubber dam due to patient's mouth breathing and anxiety • Difficult access due to location and tilt • Difficult restoration due to subgingival margins • Questionable longevity	
	3	• Extraction	• Addresses presenting complaint • Minimal time and financial commitment	• Extraction complications • Post-extraction complications • Loss of tooth with high strategic value	
Pulpal pathology: 22	1	• No treatment	• No commitment required	• Does not address presenting complaint	Option 2: • Patient understands risks of choosing option but willing to attempt treatment to save tooth
	2	• Endodontic treatment	• Addresses presenting complaint • Root canal treatment to acceptable standard possible • Patient wishes to save tooth • Requires more time and financial commitment	• Tooth has poor prognosis • Post and core required to support coronal restoration • Little remaining tooth structure after preparation • Possible inadequate ferrule and unrestorable • Questionable longevity	
	3	• Extraction	• Addresses presenting complaint • Tooth has poor prognosis • Minimal time and financial commitment	• Extraction complications • Post-extraction complications • Loss of anterior tooth in aesthetic region	
Caries: 13D, 12M, 21D, 23M&D, 24M, 25M, 34M, 42D, 43M	1	• No treatment	• No commitment required	• Plaque trapping, gingival inflammation • Caries, pulpal involvement, infection • Breakdown of tooth structure • Extraction	Option 2: • Patient wishes to keep as many teeth as possible Prevent further breakdown of tooth structure due to caries

	2	• Remove caries and restorations • Restore tooth	• Minimal commitment required • Tooth preservation	• Pulpal irritation, post-operative sensitivity	
Unsatisfactory restoration: 15MODBP (marginal deficiencies) 14MODBP (marginal deficiencies)	1	• No treatment	• No commitment required	• Tooth with old and large restoration being used as potential abutment tooth for denture • Risk marginal leakage • Plaque trapping, gingival inflammation • Caries, pulpal involvement, infection • Breakdown of tooth structure • Loss of denture abutment features if future restoration required and reduced denture stability and retention	Option 2: • Maximise longevity and integrity of restored tooth for denture
	2	• Remove restoration • Assess restorability • Restore tooth	• Potential abutment tooth for denture – maximise longevity for denture retention	• Asymptomatic • Quality and quantity of underlying tooth structure unknown, inadequate remaining coronal tooth structure may involve extensive restorative work	
Stage III Grade B periodontitis	1	• No treatment	• No commitment required	• Does not address presenting complaint • Plaque and calculus accumulation • Deterioration of periodontal condition • Caries • Tooth loss • Systemic health effects	Option 2: • Favour periodontal and systemic health • Reduce periodontal disease progression • Reduce risk of caries, potential for breakdown of tooth structure • Reduce risk of tooth loss • Create favourable environment for commencement and maintenance of indirect prostheses
	2	• Non-surgical periodontal therapy • Oral hygiene instruction	• Addresses presenting complaint • Remove plaque and calculus to promote periodontal and systemic health • Reduce progression of periodontal disease • Reduce risk of caries • Reduce risk of further tooth loss	• Post-operative pain, bleeding, swelling, bruising, infection • Increased tooth sensitivity • Gingival recession • Root surface exposure dentures, likelihood of similar outcome	
Missing posterior teeth: 17-16, 26-27	1	• No treatment – shortened dental arch	• No commitment required	• Does not address presenting complaint • Ongoing lack of posterior occlusal support and stability	Option 2: • Patient wishes to undergo occlusal rehabilitation
	2	• Partial denture	• Addresses presenting complaint • Moderate time and financial commitment	• Patient has never worn a denture – potential discomfort, have difficulty inability to adapt to denture	

			• Provide posterior occlusal support and stability • Improve function	• Long-term success relies on patient maintaining good oral hygiene	
Missing posterior teeth: 37-36, 46	1	• No treatment – shortened dental arch	• No commitment required	• Does not address presenting complaint • Ongoing lack of posterior occlusal support and stability	Option 2: • Patient wishes to undergo occlusal rehabilitation
	2	• Partial denture	• Addresses presenting complaint • Moderate time and financial commitment	• Patient has never worn a denture – potential discomfort, have difficulty inability to adapt to denture	

1.6 Management plan

Systemic phase	Dietary counselling
Emergency phase	Not applicable
Control phase *Eliminate pain, infection, inflammation*	Patient education and consent to treatment
	Hygienic phase of periodontal therapy: Supragingival scale and subgingival debridement Fluoride application Oral hygiene instruction
	Caries control and replacement of unsatisfactory restorations: 13D, 12M, 21D, 23M&D, 24M, 25M, 34M, 42D, 43M Recontouring of existing restorations: 11MIDLa, 45DO
	Extraction of teeth with hopeless prognosis: 37
	Endodontic treatment: 22 tooth investigation 47 tooth investigation
Holding phase *Preserve residual dentition*	Periodontal review 6 weeks after periodontal treatment
	Assess response to periodontal therapy and oral hygiene compliance
	Endodontic review: 22 review and root filling if asymptomatic 47 review and root filling if asymptomatic
Reconstructive phase *Replace lost tissue and stabilise occlusion*	22 cast post-core and crown
	47 survey crown
	14 onlay
	15 onlay
	Co-Cr maxillary partial denture
	Co-Cr mandibular partial denture
Maintenance phase *Prevention of further breakdown*	Partial denture post-insert review
	Recall exam
	3 monthly periodontal review Reinforce oral and denture hygiene

1.7 Treatment delivery

1.7.1 Treatment delivery

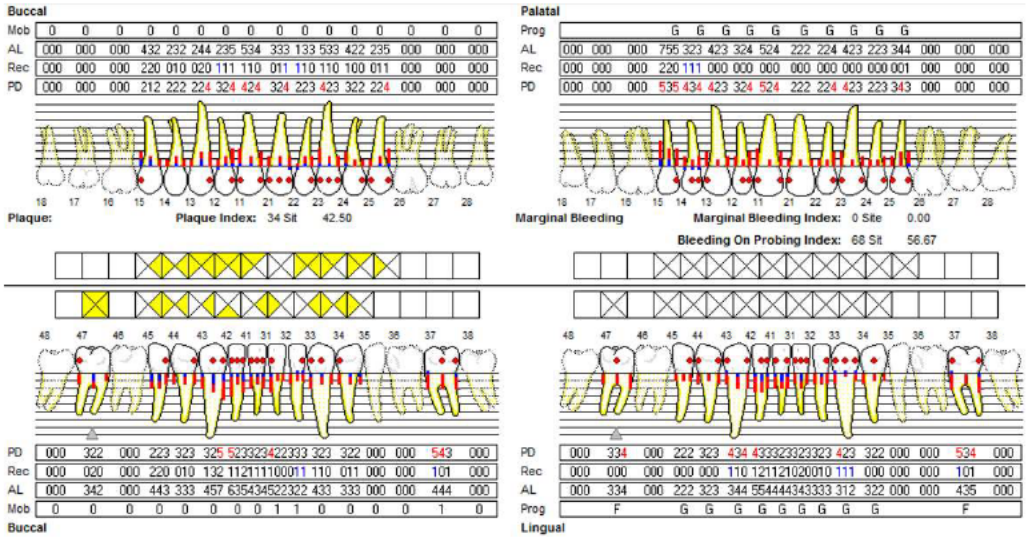
Date: January 2019 – October 2020

	Date	Treatment
2019	January	Comprehensive exam
		Patient education and consent to treatment
		Dietary counselling
	February	Initial periodontal charting
	March	Hygienic phase of periodontal therapy Fluoride application Oral hygiene instruction
	April	47 tooth investigation
	May	Caries control and replacement of unsatisfactory restorations commenced
		47 working length and canal preparation
		Review periodontal charting
	June	-
	July	Caries control and replacement of unsatisfactory restorations continued
		37 extraction
	August	Caries control and replacement of unsatisfactory restorations completed
		47 obturation
	September	22 tooth investigation, working length, canal preparation
	October	47 direct post and core build-up
		15 onlay preparation

	Date	Treatment
2020	January	Recall exam
		Supragingival scale and clean Reinforce oral hygiene instruction
		22 obturation
	February	22 post space preparation and post space impression 22 cast post-core cementation 22 crown preparation
	March	14 onlay preparation
		47 survey crown preparation
	April	-
	May	-
	June	-
	July	Recall exam
		Supragingival scale and clean Reinforce oral hygiene instruction
	August	14, 15, 22, 47 onlay and crown final impressions
		14, 15 onlay cementation
		22 crown cementation
		47 survey crown cementation
		Mouth preparation for maxillary and mandibular partial dentures CoCr maxillary and mandibular partial denture final impressions MMR
	September	CoCr maxillary and mandibular framework try-in MMR
	October	CoCr maxillary and mandibular partial denture post-insert review Reinforce oral hygiene instruction

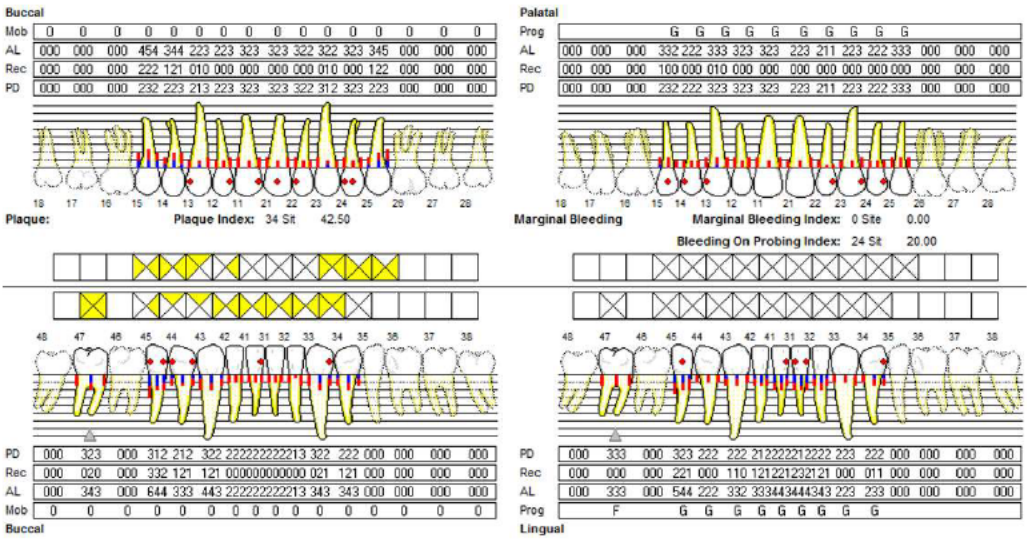
- Diagnostics:

- Patient education and consent to treatment:
  - Major problem is caries and poor oral hygiene.
  - Educated patient on aetiology of caries i.e. tooth, bacteria, diet, time.
  - Dietary counselling and encouraged patient to keep a food diary.
  - Discussed patient's goals, treatment options and proposed treatment plan.
  - Discussed expectations in terms of financial and time commitment required, stages of treatment and milestones, patient's and clinician's responsibilities.
  - Patient accepted treatment plan.
- Initial periodontal chart (February 2019):



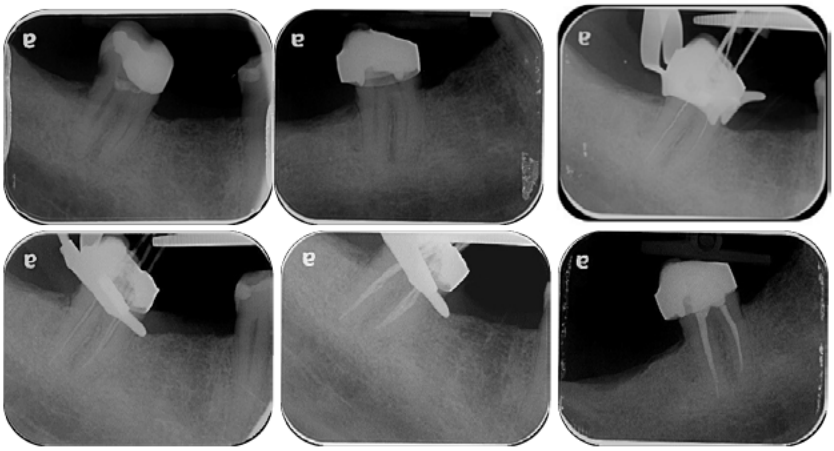
  - Plaque score 100%.
  - Bleeding on probing 68/126 sites (57%).
  - Periodontal probing depth ≥4 mm 30/126 sites (24%).
  - Grade I mobility 31, 32, 37.
  - Extreme gingival pain.
  - Oral hygiene extremely poor; instruction to use interproximal brushes and electric toothbrush.
  - First round periodontal debridement completed; gingival sensitivity and bleeding during treatment.

- Review periodontal chart (May 2019):



  - Plaque score 43% (reduced to 21% by September 2019) ↓
  - Bleeding on probing 24/126 sites (20%) ↓
  - Periodontal probing depth ≥4 mm 0/36 sites (0%) ↓
  - No mobility 31, 32, 37 ↓
  - Periodontal diagnosis revised from Generalised Stage III Grade B unstable periodontitis to Generalised Stage III Grade B periodontitis currently in remission.
  - Oral hygiene improved; patient reported nil gingival pain or bleeding on brushing and nil halitosis
- Caries control and replacement of unsatisfactory restorations:
  - Carious teeth and unsatisfactory restorations treated over multiple appointments.
  - Patient started using electric toothbrush after every meal, Modified Bass technique, Neutrafluor 5000 toothpaste, Neutrafluor 220 mouthwash and interdental brushes.
  - Food diary recorded; halved coffee consumption and substituted sugar with Stevia, eliminated fruit juices, reduced fermentable carbohydrate intake, increased fruit, vegetable, eggs, cheese and dairy intake, reduced snacking from four times to once daily. However, was consuming high sugar diet shakes.
- 37 extraction:
  - Symptomatic, unrestorable due to extensive subgingival caries.
  - Uncomplicated extraction in emergency clinic.

- 47 endodontic treatment (April 2019 – September 2019):
  - Periapical radiographs from left to right: pre-operative (7/3/2019), tooth investigation (13/5/2019), working length (16/5/2019), master GP (30/8/2019), apical third (30/8/2019), post-operative (5/9/2019).



- 47 definitive restoration:
  - Stainless steel direct post and amalgam Nayyar core build-up.
    Direct post placed into distal canal as posts should be placed in the largest and straightest canal to avoid weakening the root too much during post space preparation and root perforation in curved canals. (15) Amalgam Nayyar core technique is a viable method for restoring endodontically treated posterior teeth. (16) For technique to be successful (i) size of remaining pulp chamber should be of sufficient width and depth to provide adequate bulk of amalgam and for retention (ii) adequate dentin thickness in area of pulp chamber is required for rigidity and strength. May be completed at the end of obturation appointment. (16) Amalgam as core material used successfully for many years, high strength, low solubility, coefficient of thermal expansion similar to tooth substance, however, requires prolonged setting time and difficult to prepare immediately after placement, not aesthetic, concerns of toxicity. (15)

- Survey crown preparation.
  Tooth prepared for zirconia survey crown. Zirconia was chosen for 47 due to its superior mechanical properties. As a posterior abutment, aesthetics is not an important factor as strength. There is clinical evidence that zirconia is a good choice for posterior single unit restorations. (17) Provisionally restored with Luxatemp crown cemented with TempoCem.

- Final impressions taken using PVS and poured in die-stone.

- 22 endodontic treatment (May 2019 – January 2020):
  - Periapical radiographs from left to right: pre-operative (27/3/2019), tooth investigation and working length (5/9/2019), master GP (30/1/2020), apical third (30/1/2020), post-operative (30/1/2020).

  - Canal was calcified and difficult to access, assistance from Endodontist required.
  - Tooth was temporised with GIC dome restoration as patient was not concerned about gap, note the minimal tooth structure remaining.

- 22 definitive restoration:
  - Cast gold direct post-core.
    Post should only be used when there is insufficient tooth substance remaining to support final restoration as preparation of post space and placement of post can weaken the root and lead to root fracture and treatment failure. (15) If an anterior tooth must be prepared to receive a crown after endodontic treatment because a good amount of tooth structure was lost, a post may be necessary to retain the core to the tooth can resist functional forces. (15) Cast post and cores have been used for decades, have reported success rate of 90.6%, cast gold alloy (type III/IV) is inert with modulus of elasticity and coefficient of thermal expansion similar to those of enamel with good compressive strength to withstand normal occlusal forces. (15) Disadvantages are multiple appointments required and aesthetics as metal shade shows through newer ceramics, however this can be overcome with porcelain-fused to metal crowns. Post design: parallel (more retentive, no wedging effect), passive (transfer less stress to root) post. Post length: extend to half the length of root supported by bone with preservation of 3-6 mm apical gutta percha. Post width: not exceed one third of root width.
  - Post space preparation completed to adequate length, note transportation of canal evident from radiograph.

    
  - Post space impression taken using PVS and poured in die stone.

    
    
  - Cast gold post-core fabricated.

- Cemented with Panavia, marginal deficiency of 0.5 mm filled with cement.
  Zinc phosphate has longest history of success, extended working time, compatible with zinc oxide eugenol contained in most root canal sealers, easier to remove, lower risk of root fracture compared with post bonded with resin-based cement. Resin-based cement has potential to bond to dentine, improved post retention, decreased microleakage, higher fracture resistance, similar modulus of elasticity to that of dentine, however, difficult to remove in case of endodontic failure. (15)



- Crown preparation and provisional restoration with polycarbonate shell-lined with PEMA and cemented with IRM.
  Tooth prepared for zirconia crown. Generally, glass-based ceramics such as lithium disilicate is chosen for anterior crowns. With new materials on the market, for a single anterior tooth, all ceramics have sufficient longevity based on clinical trial data, so the choice can be made on aesthetic capability alone. (18) In this case, 22 had a cast post-core to support the coronal restoration. The colour of the metal would show through a glass-based ceramic; hence zirconia was chosen as a safer option. Zirconia aesthetics have improved over the years and is available in different translucencies. Use of an opaque cement may also be beneficial to mask the metallic shade under the crowns. Metal-ceramic crowns are another available option which allows more control over the aesthetic outcome. However, due to financial reasons zirconia was chosen.

- Final impressions taken using PVS and poured in die-stone.


- 15 & 14 definitive restorations:
  - Large MOD composite restorations removed and remaining tooth structure reassessed.
  - Cracks found in tooth 15, buccal and palatal walls reduced for cuspal coverage to prevent failure of tooth by cuspal flexure.

  - Both teeth prepared for onlays.

    Teeth prepared for Emax onlays to prevent cuspal flexure and failure. IPS Emax is a glass ceramic containing approximately 70% crystalline lithium disilicate in a glass matrix. Available as ingots to be used according to heat-pressing procedure or blue state blocks to be used for CAD-CAM manufacturing. Flexural strength of approximately 500 MPa. Indications for veneers, inlays, onlays, crowns. A study analysing survival and success rates of IPS Emax for all ceramic restorations found for full coverage crowns, 5-year survival was 94.90% with causes of failure including fracture of the restoration, apical osteitis, loss of retention, hypersensitivity, pre-prosthetic core fracture. (19) A clinical study examining 10-year survival of pressed lithium disilicate glass-ceramic full coverage restorations found that these restorations survived successfully over 10.4 year period with overall failure rate of below 0.2% per year. (20) Another clinical study examining 10.9-year survival of pressed lithium disilicate glass-ceramic partial coverage restorations found 98.3% survival at 9.8 years, with failure occurring in the molar region. (21) There is good evidence for lithium disilicate restoration longevity to justify its use.

  - Both teeth provisionally restored with stainless steel bands and IRM.

- Final impressions taken using PVS and poured in die-stone.

- Cementation of definitive 14, 15, 22, 47:
  - 14 & 15 cemented with Variolink.
  - 22 cemented with Panavia.
  - 47 cemented with Permacem.

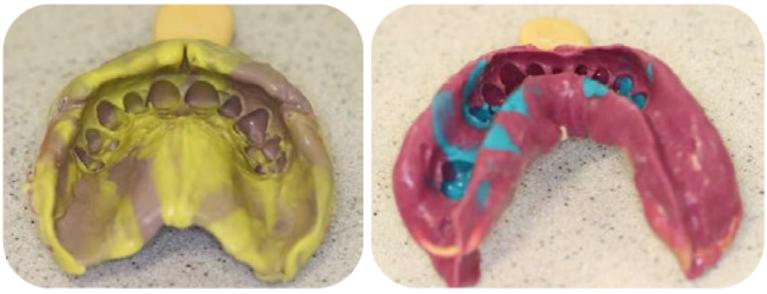
- CoCr maxillary and mandibular removable prostheses design:
  - Diagnostic models mounted and surveyed.
  - Preliminary CoCr maxillary and mandibular dentures designed.

A cobalt-chrome denture was selected over acrylic.

Advantages	*Disadvantages*
Accurate adaptation to tissues for comfort	*Expensive*
Easily cleaned and favourable to tissue health	*Difficult to adjust and reline*
Thermal conductivity	*Cannot add tooth on as easily as acrylic*
Low specific gravity i.e. low weight and bulk for comfort and adaptation	
Higher strength and resistance to fracture	

McCracken's Removable Partial Prosthodontics (6)

- Mouth preparation:
  - Rest seats 15M, 14M, 47M (incorporated into indirect restorations)
  - Rest seats 24M, 25M, 33P, 45D
  - Guide planes 15D, 47M (incorporated into indirect restorations)
  - Guide planes 25D, 34D
- Final impressions:
  - Maxillary and mandibular final impressions taken using PVS and poured in die stone.



- MMR:
  - Master models mounted.
  - Maxillary and mandibular CoCr frameworks fabricated.

- CoCr framework try-in:
  - Maxillary framework did not seat passively even with minimal adjustment.
  - Clinical decision to re-take maxillary final impression to fabricate new CoCr framework.
  - Second maxillary framework did not seat passively but was better than first, clinical decision to accept second framework.
  - Mandibular framework fitted and seated correctly.
  - Wax rims added to metal framework and MMR taken to mount models and set teeth.

- CoCr framework with denture teeth try-in:
  - Aesthetics satisfactory.
  - Phonetics satisfactory.
  - Occlusion satisfactory.
  - Sent to lab for final processing.
- Maxillary and mandibular partial denture insert:
  - Maxillary partial denture did not seat passively without additional finger pressure, however with clasp adjustment, seating and stability was satisfactory and found acceptable to patient.
  - Patient very happy with final outcome.

In determining whether provision of removable partial denture is justified – shortened dental arch (minimum of four occlusal units which provide functionlal satisfaction) (22) was considered, and current literature shows that to assure optimal function throughout life an individual should have natural dentition of not less than 20 teeth. (23) Wearing of CoCr removable partial dentures has been shown to be related to higher prevalence of plaque, gingivitis, gingival recession and root caries. (24) In a study, usage of CoCr removable partial dentures has been found to decline with time and half of the dentures had been discarded or replaced 5-6 years after insertion, with reasons being general dissatisfaction with dentures due to comfort, fit, chewing ability, food trapping and appearance. In the same study, status of CoCr removable partial dentures that had constantly been used for 5-6 years by patients was good and demonstrated fair to good cleanliness, stability and retention with no defect of any sort. (25)

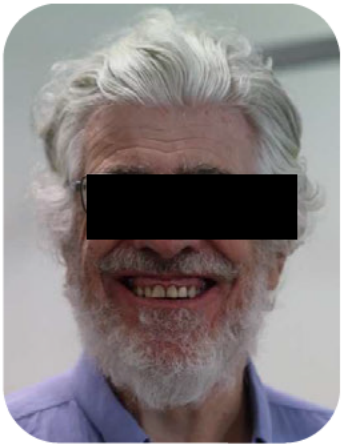
Despite the evidence and the patient having 21 teeth after control phase, patient chose to have removable partial dentures with knowledge that success depends highly on patient's ability to adapt to prostheses, oral and denture hygiene in addition to regular dental visits for periodontal maintenance and review of prostheses.

1.7.2 Before and after photographs

Date: January 2019 – October 2020

Diagnostic phase January 2019	 Pre-treatment
Control phase May 2019	 Initial phase periodontal therapy completed Caries control in progress Endodontic treatment 47 in progress
Control phase August 2019	 Extraction 37 completed Caries control in progress Endodontic treatment 22 & 47 in progress Periodontal status maintained
Control phase September 2019	 Caries control completed Endodontic treatment 47 completed Endodontic treatment 22 in progress Periodontal status maintained

Reconstructive phase October 2019	 Direct post and core 47 completed Endodontic treatment 22 in progress with new provisional restoration Tooth preparation 15 in progress Periodontal status maintained
Holding phase March 2020	 Endodontic treatment 22 completed Cast post-core 22 completed Crown preparation 14, 15, 22 & 47 in progress Periodontal status maintained
Reconstructive phase August 2020	 Indirect fixed restorations 14, 15, 22 47 completed Periodontal status maintained
Reconstructive phase October 2020	 Removable prostheses inserted Periodontal status maintained

1.7.3 Patient response to treatment

- Patient was very satisfied with overall outcome of treatment.
  - "I did not believe this day would come where I would get my dentures!"
  - "I feel more stable (bite)."
- Resolution of presenting complaints:
  i. "I have intermittent pain in a couple of my teeth (37, 47) and in my gums."
     ✓ 37 pain resolved after extraction.
     ✓ 47 pain resolved after endodontic treatment and definitive restoration.
     ✓ Gingival pain resolved after periodontal treatment.
  ii. "There is a hole in the back of my tooth (22) and sometimes stuff gets in there and causes sensitivity – it's been there for a long time me."
     ✓ 22 sensitivity resolved after endodontic treatment and definitive restoration.
  iii. "I think it would be beneficial to have dentures because of my missing teeth."
     ✓ Maxillary and mandibular Co-Cr partial dentures inserted.
- Patient changed lifestyle and followed overall management plan in order to achieve health goals e.g. diet, exercise, mental health, dental work.
- Changes to lifestyle complemented dental goals.
- Patient was highly compliant with dental advice and instructions – oral hygiene occasionally regressed to old habits but with gentle reminders patient was able to stay on track.
- Patient has never missed an appointment without notice and will continue to attend OHCWA for maintenance.

1.7.4 Reflection

Challenges		Management
Patient-related	Medication	• Patient did not take medication to control leg spasms because he thought it would interfere with dental treatment. - Emphasized to patient importance of taking medication as prescribed by general medical practitioner. - Informed patient is he has any concerns about medication and dental treatment to check with general medical practitioner. - Xylocaine spray
	Back pain	• Patient had back pain from sitting in dental chair for extended periods. - Frequent breaks during appointments to stretch. - Use of cushioning to support neck and back in dental chair.
	Rubber dam	• As a mouth breather, patient found it difficult to tolerate rubber dam. - Gentle encouragement, education on importance of use and frequent use allowed patient to adjust and tolerate it.
	Post-traumatic stress disorder	• Common symptom of PTSD is anxiety. - Managed by preventing stressing patient during dental appointments and constant reassurance.
Clinical	Rubber dam placement	• Rubber dam leakage during 47 working length appointment. - Patient panicked. - Rubber dam removed promptly, patient allowed to rinse, reassured patient, canals re-irrigated and re-medicated. - Thoroughly check rubber dam adaptation prior to commencing treatment and use oraseal If necessary to cover gaps.
	Subgingival restorations	• Cavity preparations some teeth were subgingival. - Place GIC temporarily and wait for gingival tissues to heal prior to placing composite. - Healthy gingiva easier to control moisture. - Use retraction cord.
	Shade matching	• Difficulty matching shade of tetracycline stained teeth. - Accept differences in shades and provide explanation to patient.
	Post space preparation	• Transportation of canal - Stop preparation
	Cast post-core	• Poor marginal fit - Accept gap and fill with cement - Re-take post space impression with Duralay or PVS
	CoCr framework	• Framework did not seat passively - Likely an issue with impression as patient has strong gag reflex

CASE 2

Fixed Aesthetic

CASE 2

Fixed Aesthetic

2.1.1 Details

- 61 year-old female

2.1.2 Presenting complaint/s

- Patient presented to student clinic in May 2019 with the following complaints:
  i. "I don't smile anymore because my front teeth are so bad. The front tooth (21) is brown, they're all mismatched. I want the teeth (13-21) to look the same colour because when I smile, I'm self-conscious."
  ii. "My crown (11) has fallen off and been stuck on again – I'm afraid it will fall off again."
  iii. "I had some sensitivity last week when eating sweet foods (47)."

2.1.3 History of presenting complaint/s

- Upper anterior crowns (11, 12) were inserted 20-30 years ago. 11 crown de-bonded and was re-cemented 7 years ago.
- Noticed occasional sensitivity on lower right-hand side after eating sweet foods. Happened about a week ago. No sensitivity to thermal stimuli. Did not cause patient to wake at night. Relieved by ibuprofen.

2.1.4 Medical history

Medical condition	Description	Dental implications (1)
History of asthma attack a few years ago	Wheezing, coughing, chest tightness or shortness of breath. Often waking at night with asthma symptoms. Becomes a medical emergency when symptoms worsen rapidly, speaking becomes difficult, lips look blue or there is little relief from reliever inhaler.	Asthma attack in dental chair. Sit person upright, reassure. Give 4 puffs blue/grey reliever every 4 minutes. If symptoms do not improve call 000 immediately.

(1) Therapeutic Guidelines: oral and dental (2019).

Medication	Dosage	Use & Mechanism of action	Dental implications
Not currently taking any medication/s			

Allergy	Description	Dental implications
No known allergies		

Alcohol & Tobacco Use	Amount, Frequency & Duration	Dental implications
Former smoker in twenties	5-6 cigarettes a day for 4 years (1 pack year). Quit and has not smoked since.	Among former smokers, time since quitting is statistically significantly protective against periodontal disease. (26)
Current drinker	1 glass of wine – 1.5 standard drinks a fortnight.	Alcohol consumption raises risk of cancer including on lip and in oral cavity. (5)

2.1.5 Dental history and dental attitude

- Dental history
  - Attended dentist in Ireland once every six months for routine examinations, cleans and restorations as required. Last attended 2018.
  - History of extractions and orthodontic treatment in teenage years.
  - History of endodontic treatment 11, 12 due to dental infection.
  - No history of trauma.
  - Attended OHCWA screening clinic February 2019. Presented to student clinic for initial examination May 2019.

- Dental attitude
  - Aesthetic motivation.
  - Apprehensive to radiation exposure.
  - Strong gag reflex.
  - Lack of trust in student clinicians.
  - Never missed an appointment.

2.1.6 Oral hygiene

- Fair oral hygiene
  - Brushes teeth twice daily, morning and night.
  - Uses electric toothbrush and pea-sized amount of fluoride toothpaste.
  - Uses floss once a week.
  - Does not use any other cleaning adjuncts.

2.1.7 Social history

- Born and raised in Ireland, moved to Australia in November 2018.
- Currently lives alone and works in aged care.
- Two children; son (researcher living in Sydney) and daughter (doctor living in Perth).
- Enjoys playing competitive golf every Tuesday.
- Thinking of moving to Sydney in future.

2.2 Examination and diagnostics

Date: May 2019

2.2.1 Extra-oral examination

Findings	
Facial symmetry	Absence of facial swelling
Facial skin	Dry, peeling skin and hyperpigmentation
Lips	Dry, cracked lips and indistinct vermillion border*
Temporomandibular joint	Minor crepitus on opening and closing bilaterally Absence of clicking and crepitus in excursion bilaterally Absence of pain and tenderness on palpation
Lymph nodes	No sign of lymphadenopathy Absence of pain and tenderness on palpation
Muscles of mastication	Absence of pain and tenderness on palpation
Thyroid gland	No obvious abnormal enlargement

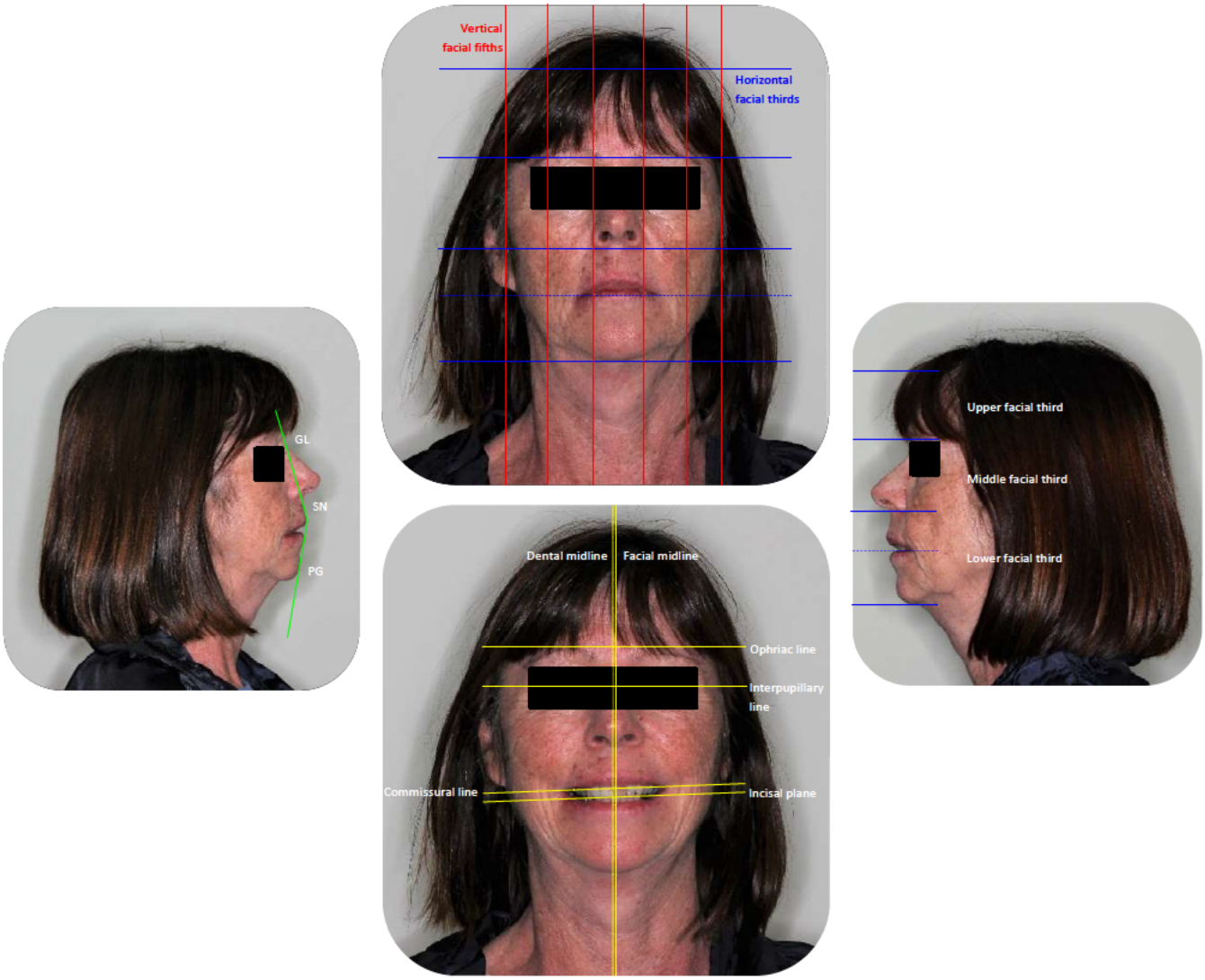
*Consultation with Oral Medicine – confirmed actinic cheilitis.

2.2.2 Extra-oral photographs and findings

Dentofacial analysis	
Horizontal facial proportions	Elongated lower facial third Elongated philtrum
Vertical facial proportions	Proportional facial fifths
Horizontal symmetry	Incisal plane lacks parallelism with ophriac and interpupillary lines Incisal plane cants slightly downward to right
Vertical symmetry	Facial midline and dental midline do not coincide*
Facial symmetry	Relatively symmetrical
Smile analysis	Low smile line** Extra wide smile width Normal buccal corridors Flat incisal/occlusal curve
Profile	Convex – indicative of class II skeletal profile

*Midline discrepancy not detectable at conversational distance. A study on midline deviations among different facial types concluded overall threshold for acceptability of midline deviation 2.92 ± 1.10 mm. (27)

**Patient is not smiling normally.



2.2.3 Intraoral examination

Findings	
Labial mucosa	No abnormalities detected
Buccal mucosa	Bilateral, symmetrical horizontal white lines level with occlusal plane (asymptomatic)*
Hard palate	No abnormalities detected
Soft palate	No abnormalities detected
Gingivae	Approximately 5 mm x 3 mm soft, round, slate grey macule on area buccal of 45 (asymptomatic)**
Tongue	No abnormalities detected
Floor of mouth	Bilateral lingual tori

*Consultation with Oral Medicine and monitoring – confirmed frictional hyperkeratosis. Ddx leukoedema, oral lichen planus.
*Consultation with Oral Medicine and radiographic finding – confirmed amalgam tattoo. Ddx melanotic macule, oral nevi.

2.2.4 Intraoral photographs and findings

View	Findings	
Maxillary occlusal	Teeth	Heavily restored dentition Missing premolars 14, 24* Non-carious tooth surface loss 33I Brown discolouration 13, 21** Calculus on buccal of upper posterior teeth
	Restorations	Metallic crown 17 Amalgam restorations 16, 15, 25, 26, 27 Metal-ceramic crown 12 (visible labial margin) Metal-ceramic crown 11 (MI fractured, repaired?) Composite restorations 21, 22
	Soft tissues	Lip mucosa appears dry and fragile
Mandibular occlusal	Teeth	Heavily restored dentition Missing premolars 34, 44* Non-carious tooth surface loss 32I Buccal malposition 33 outside occlusal arch Calculus on lingual of lower anterior teeth
	Restorations	Amalgam restorations 47 (broken ML), 36, 37 Metallic crown 46 Composite restoration 45 (leakage) GIC restoration 35
	Soft tissues	-
Right buccal	Teeth	White-brown opacities 16B, 47B Enamel infraction 13B Distally inclined long axis 12 Calculus on buccal of upper posterior teeth
	Restorations	Metallic crown 17 Metal-ceramic crown 12 (triangular shape, long mesial outline, straight distal outline with rounded corner, rounded incisal edge, poor colour-white hue, high value) Composite restoration 45 (leakage) Metallic crown 46
	Soft tissues	Gingival recession at 12 Gingival zenith 12 at equal height to that of 13, 11 Loss of interdental papilla 12M Mild marginal gingival inflammation
Left buccal	Teeth	Distally inclined long axis 22 Long and straight mesial outline 22 White-brown opacities 26B, 27B, 37B, 36B Brown-grey discolouration 27 Buccal malposition 33 outside occlusal arch
	Restorations	Composite restoration 22 (translucent, poor contour at gingival margin) Amalgam restoration 36
	Soft tissues	Gingival zenith 22 flat and coronal to that of 23 Loss of interdental papilla 22M, 33M Mild marginal gingival inflammation
Anterior	Teeth	Disharmonious, asymmetric, unaesthetic anterior teeth (11, 21 different colour, shape, size) Brown discolouration, white-brown opacities 13 Brown discolouration, high W:L (square) shape 21 Long and straight mesial outline 22 Incisal plane cants slightly downward to right Maxillary midline not coincident with mandibular midline (mandibular midline deviates 3.5 mm to the right of maxillary midline)***

	Restorations	Metal-ceramic crown 12 (visible margins, incisal edge in line with 11, poor colour-white hue, high value) Metal-ceramic crown 11 (square shape, poor colour-white hue, high value) Composite restoration 21 (poor contour at gingival margin) Composite restoration 22 (translucent, poor contour at mesial gingival margin) Composite restoration 45 (leakage) Incisal embrasures asymmetric (larger embrasures on left than right)
	Soft tissues	Slate grey macule on area buccal of 45 Gingival recession at 12 Gingival zenith 13-23 non-ideal**** Loss of interdental papilla 12-22 Gingival discolouration 12-11 Mild marginal gingival inflammation

*Patient has history of extractions and orthodontic treatment to correct malocclusion. Rounded/oval occlusal outline rather than angular/hexagonal of maxillary premolars suggest U5 present. Appearance of three distinct cusps characteristic of square-shaped three cusp-type in mandibular premolars suggests L5 present. (28)

**Causes of discolouration may be intrinsic or extrinsic. Possibly extrinsic staining caused by tea/coffee consumption.

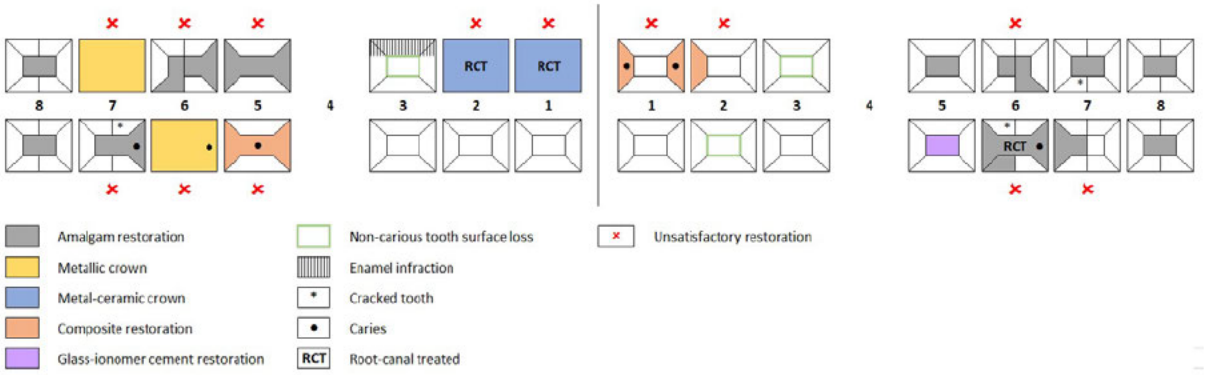
***Relatively common problem at finishing stage of orthodontic treatment is discrepancy in midlines of dental arches, resulting from pre-existing midline discrepancy or asymmetric closure of spaces within the arch. Minor discrepancies at finishing stage are no great problem, but quite difficult to correct large discrepancies after closure of spaces and occlusal relationships have been nearly established. (29)

****Aesthetic gingival shape elliptical for maxillary central incisors and canines with gingival zenith distal to long axis of these teeth, and semi-circular for lateral incisors. Gingival zenith of maxillary central incisors and canines should be apical to that of lateral incisors for aesthetics. (30)

2.2.5 Occlusion

Findings	
Overjet	3 mm
Overbite	2 mm
Canine class	LHS: Class II, RHS: Class I
Molar class	LHS: Class II, RHS: ½ Class II
Crossbite	Absent
Crowding / Spacing	Lower anterior crowding, 33 malposed buccally
Rotation	Absent
Supraeruption	Absent
Occlusal scheme	Canine guidance

2.2.6 Odontogram



2.2.7 Periodontal assessment

2.2.7.1 Community Index of Periodontal Treatment Needs (CPITN)

Findings		
CPITN 3 2 2 2 2 2	Sextant 1	17MB 5 mm pocket likely due to over-contoured crown Generalised BOP, plaque, calculus
	Sextant 2	Generalised BOP, plaque, calculus
	Sextant 3	Generalised BOP, plaque, calculus
	Sextant 4	Generalised BOP, plaque, calculus
	Sextant 5	Generalised BOP, plaque, calculus
	Sextant 6	Generalised BOP, plaque, calculus

2.2.7.2 Periodontal examination

	Findings	
Clinical	Gingival tissues	Light pink, oedematous, blunted papillae, medium biotype
	Plaque distribution	Generalised plaque distribution abundant in interproximal areas
	Plaque score	70%
	Calculus distribution	Generalised calculus, abundant on buccal upper posterior teeth and lingual lower anterior teeth
	Plaque-retentive factors	Restoration overhangs 16, 15, 21, 22, 37, 45, 46, 47, open contact 36, over-contoured crown 17, lower anterior crowding, buccal malposition 33
	Furcation involvement	No
	Halitosis	No
Radiographic	Bone levels	Generalised mild horizontal bone loss in maxilla and mandible

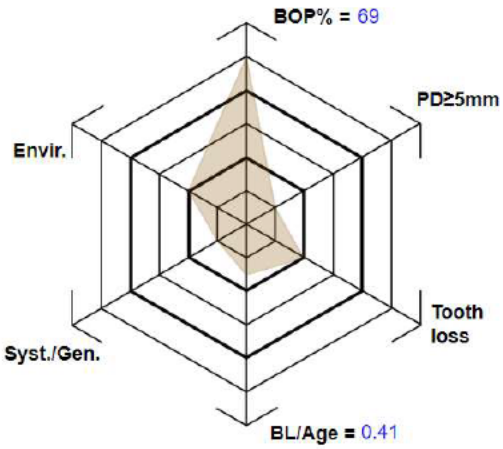
2.2.7.3 Periodontal tests

Mobility	-	-	-	-		-	-	-	-	-	-		-	-	-	-
TTPalp	-	-	-	-		-	-	-	-	-	-		-	-	-	-
TTP	-	-	-	-		-	-	-	-	-	-		-	-	-	-
	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
TTP	-	-	-	-		-	-	-	-	-	-		-	-	-	-
TTPalp	-	-	-	-		-	-	-	-	-	-		-	-	-	-
Mobility	-	-	-	-		-	-	-	-	-	-		-	-	-	-

2.2.7.4 Periodontal chart

- Local pocketing at one site and general risk assessment did not warrant full periodontal chart.

2.2.7.5 Periodontal Risk Assessment (PRA) (7, 8)



Polygon surface: 21.65063

Periodontal Risk: medium

Suggested Recall Interval: **6** Months

Age	61
Number of teeth and implants	24 (1 - 32)
Number of sites per tooth / implant	○ 2 ○ 4 ◉ 6
Number of BOP-pos. sites	99 of 144
Number of sites with PPD≥5mm	1
Number of missing teeth	4
% alveolar bone loss (estimated in % or 10% per 1mm)	25 %
Syst./Gen.	○ Yes ◉ No
Envir.	○ Non-smoker (NS) ◉ Former smoker (FS) ○ Occasional smoker (OS) ○ Smoker (S) ○ Heavy smoker (HS)

Periodontal Risk Assessment (PRA) for patients in Supportive Periodontal Therapy (SPT). (7) PRA tool. (8)

2.2.8 Pulp sensibility tests

EPT	38	47	56	42		20	0	0	32	26	27		22	28	34	33
CO_2	+	+	+	+		+	-	-	+	+	+		+	+	+	+
	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
CO_2	+	+	+	+		+	+	+	+	++	+		+	-	+	+
EPT	34	30	44	29		27	19	4	14	7	27		34	0	26	48

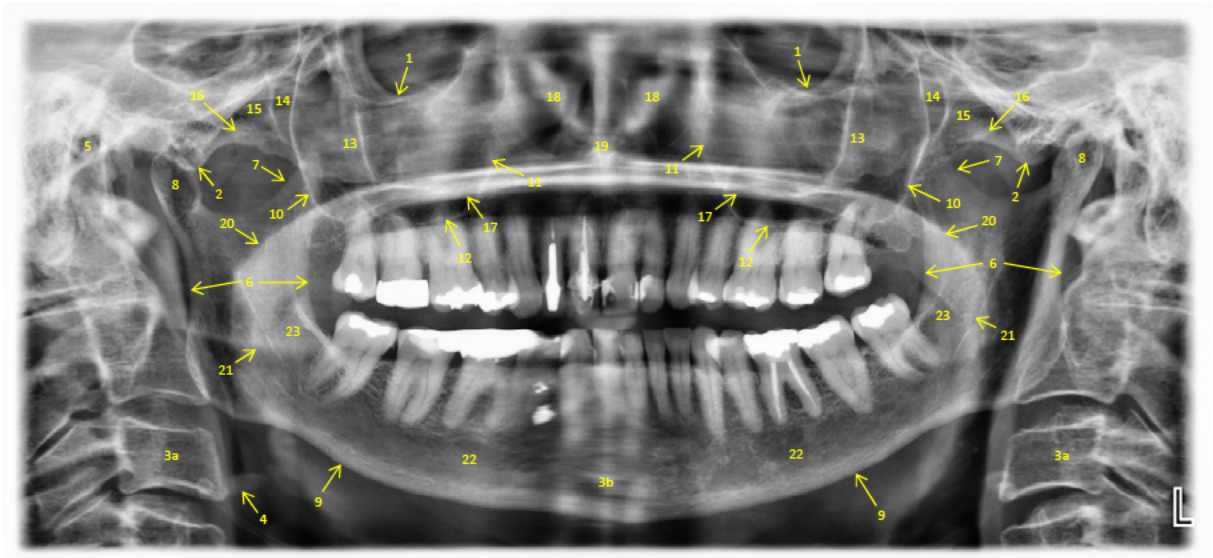
2.2.9 Radiographs

Rationale: each radiograph taken has rationale where stated – ALARA

Note: Subscript a = amalgam, c = composite, m = metallic, p = metal-ceramic

2.2.9.1 Orthopantogram

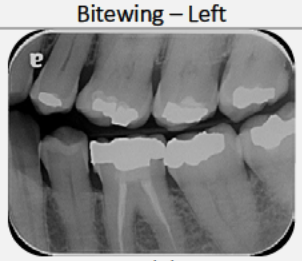
Date: 25/2/2019



Findings (9)	
Periphery and corners	Nil abnormalities detected *Inferior rim of orbits (1) Articular processes of temporal bones (2) Cervical spine (3a) Superimposition of cervical spine (3b) Styloid processes (not identified) Pharynx (not identified) Hyoid bone (4) External acoustic meatuses (5)*
Cortices of mandible	Continuous and even *Anterior and posterior rami (6) Coronoid processes (7) Condyles (8) Inferior borders of mandible (9)*
Cortices of maxilla	Nil abnormalities detected *Posterior walls of maxillary sinuses (10) Medial walls of maxillary sinuses (11) Floor of maxillary sinuses (12) Zygomatic processes of maxillae (13) Pterygomaxillary fissures (14) Lateral pterygoid plate (15)*
Zygomatic bones	Nil abnormalities detected *Zygomatic bone (16)*
Maxillary sinuses	Internal density of sinuses: Radiopaque shadow within sinuses – superimposition of inferior nasal conchae and zygomatic buttresses
Nasal cavity and palate	Nil abnormalities detected *Floor of nose/hard palate (17) Nasal conchae (18) Anterior nasal spine (19) Soft palate (20)*
Bone pattern of maxilla	Normal density and trabeculation
Bone pattern of mandible	Normal density and trabeculation Two radiopaque spots on right body of mandible superimposed over 45 – amalgam tattoos *Inferior alveolar nerve canals (21) Mandibular foramina (not identified) Mental foramina (22) External oblique ridges (23)*
Alveolar processes	Generalised mild horizontal bone loss in maxilla and mandible No furcation involvement any teeth
Teeth	Heavily restored dentition Endodontically treated teeth – 12, 11, 36 One premolar missing in each quadrant Third molars present in each quadrant

Interpretation of panoramic radiographs, Perschbacher (2012). (9)

2.2.9.2 Bitewings

Bitewing – Left	Findings	
 Date: 7/5/2019 Rationale: Examine interproximal areas of teeth	Caries	36D (secondary caries)
	Restorations	25O_a, 26O_a, 27O_a, 28O_a, 38O_a, 37MO_a (M overhang), 36MOD_a (M uneven, M open contact)
	Pulp	36 RCT (RCF radiographically deficient)
	Periodontium	25M PDL widening
	Other	Calculus, overlap between 26D & 27M, 27D & 28M, 38M & 37D

Bitewing – Right	Findings	
 Date: 7/5/2019 Rationale: Examine interproximal areas of teeth	Caries	17M (?)*, 47M (secondary caries)
	Restorations	18O_a, 17 $crown_m$ (over-contoured), 16O_a & MO_a (M overhang), 15MOD_a (M overhang), 45MOD_c (M overhang), 46 pinned core & $crown_m$ (M&D overhangs), 47MO_a (M overhang), 48O_a
	Pulp	46 (retention pins extend close to pulp horns), 47 (history of pulp capping?)
	Periodontium	15D slight PDL widening
	Other	Calculus, overlap between 47D & 48M, radiopacities superimposed over 45 (amalgam tattoos), radiographic artifact superimposed over 48

*Clinically confirmed non-carious.

2.2.9.3 Periapicals

Periapical – 11-12	Findings	
 Date: 7/5/2019 Rationale: Check RCT'ed teeth and for pathology before fixed prosthodontics	Caries	21M (secondary caries)
	Restorations	12 cast post-core and $crown_p$ (post-core wide in relation to root width, gap between post and apical RCF) 11 post-core and $crown_p$ (post long axis not parallel to root long axis, inadequate length, gap between post and apical RCF, margins questionable) 21M_c&D_c
	Pulp	12 RCT (RCF radiographically deficient but satisfactory) 11 RCT (RCF radiographically short of apex and deficient)
	Periodontium	Intact PDL & lamina dura 12, 11, nil PA radiolucency 12, 11
	Other	12 blunted root apex*

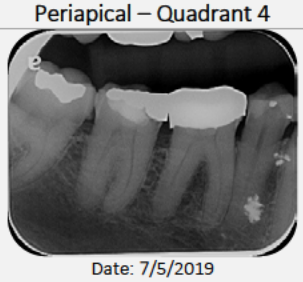
*External apical root resorption, undesirable complication of orthodontic treatment. (31)

Periapical – 21-22	Findings	
 Date: 30/5/2019 Rationale: Check for pathology before fixed prosthodontics	Caries	21 M&D (secondary caries), 22M?*
	Restorations	21 M_c&D_c (M overhang), 22M_c
	Pulp	Nil abnormalities detected
	Periodontium	Intact PDL & lamina dura 21, 22, nil PA radiolucency 21, 22
	Other	

*Clinically confirmed non-carious.

Periapical – Quadrant 3	Findings	
 Date: 7/5/2019 Rationale: Check RCT'ed teeth and for pathology before fixed prosthodontics	Caries	36D (secondary caries)
	Restorations	38O_a, 37MO_a (M overhang), 36MOD_a (M uneven, M open contact)
	Pulp	36 RCT (RCF radiographically deficient), radiopaque liner in pulp chamber
	Periodontium	Intact PDL & lamina dura35, 36, 37, PA radiolucency 36?*, nil PA radiolucency 35, 37
	Other	Calculus, overlap between 38M & 37D

*Consultation with Endodontist – as tooth asymptomatic for many years likely that radiolucency is scar tissue.

Periapical – Quadrant 4	Findings	
 Date: 7/5/2019 Rationale: Check for pathology before fixed prosthodontics	Caries	46M (secondary caries), 47M (secondary caries)
	Restorations	45MOD_c (M overhang), 46 pinned core & $crown_m$ (M&D overhangs), 47MO_a (M overhang), 48O_a
	Pulp	46 (retention pins extend close to pulp horns), 47 (history of pulp capping?)
	Periodontium	Intact PDL & lamina dura 45, 46, 47, nil PA radiolucency 45, 46, 47
	Other	Calculus, overlap between 47D & 48M, radiopacities superimposed over 45 (amalgam tattoos)

2.2.10 Caries risk assessment

2.2.10.1 Dietary assessment

- Generally, diet is:
  - Low sugar
  - Low acid
  - Moderate fermentable carbohydrates
  - Limited snacking frequency
  - Lacking dairy

2.2.10.2 Saliva test

Unstimulated saliva			Stimulated saliva	
Flow rate	Consistency	pH	Quantity at 5 mins	Buffering capacity
>60 s – low	Sticky/frothy	5.0-5.8	<3.5 mL – very low	0-5 – very low
30-60 s – normal	Frothy/bubbly	6.0-6.6	3.5-5.0 mL – low	6-9 – low
<30 s – high	Watery/clear	6.8-7.8	>5.0 mL – normal	10-12 – normal

2.2.10.3 Caries Management By Risk Assessment (CAMBRA)

Disease indicators	Visible cavities or radiographic penetration of the dentine Radiographic approximal enamel lesions (not in dentine)
Risk factors	Visible heavy plaque on teeth
Protective factors	Lives/works/school in fluoridated community Fluoride toothpaste (1000 ppm+) at least once daily Adequate saliva flow (>1.0 mL/min stimulated)

- Caries risk:
  - Moderate
- Suggested management:
  - OTC toothpaste with 1000 ppm fluoride, 2x daily
  - OTC fluoride rinse (0.05% NaF), 1x daily
  - Xylitol candies or gums, 4x daily

(10) Caries Management by Risk Assessment, Featherstone & Chaffee (2018).

2.3 Diagnoses and problem list

2.3.1 Diagnoses

Diagnosis		
Pathological	Caries	Multiple teeth with secondary caries
	Restorations	Heavily restored dentition – RCT, crowns, large amalgam restorations, composite restorations, several unsatisfactory
	Endodontic disease (11, 12)	47 chronic reversible pulpitis and clinically normal periapical tissues due to broken down restoration and secondary caries 36 previous endodontic treatment with no signs of infection and clinically normal periapical tissues 12 previous endodontic treatment with no signs of infection and clinically normal periapical tissues 11 previous endodontic treatment with no signs of infection and clinically normal periapical tissues
	Periodontal disease (13)	Generalised Stage II Grade B unstable periodontitis*
	Oral medicine	Actinic cheilitis Bilateral frictional keratosis of buccal mucosa Amalgam tattoo buccal gingiva 45
	Non-carious tooth surface loss	13I, 23I, 32I
	Cracked teeth	27, 36, 47
Morphological	Angle class	Indications Angle skeletal class II
	Malocclusion	Class II malocclusion, lower anterior crowding
	Overbite/Overjet	2 mm / 3 mm
	Missing teeth	14, 24, 34, 44
	Aesthetic harmony	Incisal plane cant Facial midline and dental midline discrepancy Maxillary midline and mandibular midline discrepancy High smile line, extra wide smile, flat incisal curve Poor pink aesthetics Disharmony of anterior teeth 13-23
	Occlusal stability	Stable occlusion
	Guidance system	Canine guidance
Host-related factors	Psychosocial	Excellent personal presentation High aesthetic concern Slight skepticism towards dental treatment and radiation Good oral hygiene compliance Good dental attitude and motivated to attend appointments
	Habits	Fair oral hygiene Low sugar, low acid, moderate fermentable carbohydrate diet
	Socioeconomic	Uncertainty regarding possible relocation to Sydney Employed and willing to use financial resources for dental care
	Medical	Medically fit and healthy
	Functional	Strong gag reflex

(11) Classification, diagnosis and clinical manifestations of apical periodontitis, Abbott (2004). (12) A clinical classification of the status of the pulp and the root canal system, Abbott & Yu (2007). (13) Periodontitis: Consensus report if workgroup 2 of the 2017 world workshop on the classification of periodontal and peri-implant diseases and conditions, Papapanou et. al. (2018).

*Stage II – RBL 15%-33%, no tooth loss due to periodontitis, max probing depth ≤ 5 mm, mostly horizontal bone loss. Generalised – bone loss affects all teeth. Grade B – %BL/age 0.25-1.0, however heavy biofilm deposits with low levels of destruction, non-smoker, normoglycaemic. Unstable - probing depth ≥5 mm, however limited to one site. (13)

2.3.2 Problem list

- Pulpal pathology: 47
- Secondary caries: 21M&D, 36D, 45MO, 46M, 47M
- Heavily restored dentition with several unsatisfactory restorations
  - Over-contoured: 17 crown
  - Overhangs: 16M, 15M, 21M, 22M, 37M, 45M, 46M&D, 47M
  - Open contact: 36M
  - Poor aesthetics: 12 crown, 11 crown, 21M&D, 22M
- Poor aesthetics
  - Asymmetry of anterior teeth 13-23
  - Discoloured teeth: 13, 21
  - Non-ideal colour: 12, 11, 21, 22
  - Non-ideal size, shape, contours: 12, 21, 22
  - Asymmetry of incisal embrasures: larger on left than right
  - Pink aesthetic: high smile line, 12 gingival recession, loss of interdental papillae, non-ideal gingival zenith height and symmetry, gingival discolouration 12-11
- Cracked teeth: 27, 36, 47
- Asymptomatic endodontically treated teeth with questionable RCF: 12, 11, 36
- Generalised Stage II Grade B unstable periodontitis
- Actinic cheilitis
- Strong gag reflex
- Uncertainty regarding possible relocation to Sydney

2.4 Prognosis (14)

2.4.1 Individual teeth

	18	17	16	15		13	12	11	21	22	23		25	26	27	28
Iatrogenic compromising factors	×	×	×	×		×	✓	×	×	×	×		×	×	✓	×
Anatomic irregularities	×	×	×	×		×	×	×	×	×	×		×	×	×	×
Occlusal plane & tooth position	●	●	●	●		●	●	●	●	●	●		●	●	●	●
Endodontic condition	●	●	●	●		●	●	●	●	●	●		●	●	●	●
Restorability	●	●	●	●		●	●	●	●	●	●		●	●	●	●
Periodontal condition	●	●	●	●		●	●	●	●	●	●		●	●	●	●
	48	47	46	45		43	42	41	31	32	33		35	36	37	38
Periodontal condition	●	●	●	●		●	●	●	●	●	●		●	●	●	●
Restorability	●	●	●	●		●	●	●	●	●	●		●	●	●	●
Endodontic condition	●	●	●	●		●	●	●	●	●	●		●	●	●	●
Occlusal plane & tooth position	●	●	●	●		●	●	●	●	●	●		●	●	●	●
Anatomic irregularities	×	×	×	×		×	×	×	×	×	×		×	×	×	×
Iatrogenic factors	×	✓	×	×		×	×	×	×	×	×		×	✓	×	×

Key: Good, Questionable, Hopeless, Fair, Poor

Evaluation of pathology and scale of severity

	Class A – Good	Class B – Fair	Class C – Questionable
Periodontal condition	80%-100% bone support. Easily maintained.	50%-80% bone support. Can be well maintained.	30%-50% remaining bone support. Difficult to be well maintained.
Restorability	80%-100% remaining sound coronal tooth structure. Easily restored.	50%-80% remaining sound coronal tooth structure. Restoration results in no infringement of biologic width, has adequate ferrule, good crown-root ratio.	30%-50% remaining sound coronal tooth structure. Achieving adequate ferrule would compromise crown-root ratio to some extent or affect adjacent structures.
Endodontic condition	Can receive straightforward primary endodontic treatment, or already has good endodontic therapy.	Failing endodontic treatment can receive predictable re-treatment, or requires a difficult primary endodontic treatment.	Failing endodontic treatment that is difficult to predictably re-treat.
Occlusal plane & tooth position	Tooth in correct occlusal plane, position, slightly deviated from ideal.	Tooth out of correct occlusal plane, can be adjusted to function within correct occlusal plane.	Tooth out of occlusal plane and requires multiple procedures to function within occlusal plane.

Factors that result in drop of determined class

Iatrogenic compromising factors	Perforations, extensive post preparations, minimal tooth structure thickness left after preparation, dental materials that cannot be removed, etc. 12 – extensive post space preparation 27, 36, 47 – cracked teeth from large amalgam restorations

2.4.2 Patient-level risk factors

Biologic risk factors		
Medical conditions that impair immune function and healing	●	Nil
Impaired salivary flow/function	●	Adequate salivary flow
Medical condition or disability limiting oral hygiene	●	Nil
Other missing teeth	●	No missing teeth due to periodontal disease or caries
Behavioural risk factors		
Compromised or poor oral hygiene	●	Fair oral hygiene
Cariogenic diet	●	Low cariogenic diet
Low exposure to fluoride	●	Adequate exposure to fluoride
Parafunctional habits	●	No
Ability and willingness to adhere to long-term maintenance protocol	●	Yes
Smoking	●	Has not smoked in last 40 years
Financial and personal risk factors		
Motivation for treatment	●	Highly motivated
Available resources for dental care	●	Currently employed
Willingness to commit finances, time, and effort	●	Willing to commit finances, time and effort (length of time uncertain)
Attitude toward losing teeth	●	Strong willingness to preserve existing teeth
Understanding of one's condition and needed treatment	●	Yes
Aesthetic expectations	●	Reasonable
Low dental IQ	●	Adequate dental IQ

Key: Favourable
Questionable
Unfavourable

(14)Evaluation of prognosis of individual teeth and patient-level risk factors adapted from Samet and Jotkowitz (2009).

2.4.3 Overall dentition

- All teeth are in the correct occlusal plane and majority of teeth have sound periodontal and pulp health.
- History of extensive restoration of posterior teeth has detrimental effect on restorability and prognosis.
- Patient's unremarkable medical history, low cariogenic, low acid diet and ability to maintain good oral hygiene is favourable to prognosis of dentition.
- Patient has high aesthetic motivation and is willing to commit finances, effort and time to treatment.
- Factors that may affect treatment include patient's uncertainty in future plans, slight skepticism towards dental treatment and apprehension to radiation.
- If patient receives no treatment for current condition:
  - Progression of carious disease process, potential to cause pulpal involvement and consequently infection, pain and tooth loss with no intervention.
  - Longstanding poor aesthetic condition of teeth and soft tissues and likely further deterioration without treatment could potentially further decrease patient's confidence, self-esteem and quality of life.
- Discussion of diagnoses and prognoses of dentition with patient led patient to decide on and commit to treatment.

2.5 Treatment options

Problem	Treatment Option		Benefits	Risks	Decision & Rationale
Tooth 47: - Pulpal pathology - Unsat. restoration (MO_a; ML fracture, M secondary caries, M overhang) - Cracked tooth	1	• No treatment	• No commitment required	• Does not address presenting complaint • Ongoing symptoms • Plaque trapping, gingival inflammation • Crack progression • Caries, pulpal involvement, infection • Breakdown of tooth structure • Extraction	Option 2: • Addresses presenting complaint • Eliminate factor in gingival inflammation • Eliminate cause of pulpal inflammation • Prevent further breakdown of tooth structure due to caries and cracking • Further deterioration of tooth may involve extensive/invasive treatment in future to save tooth or render tooth unrestorable
	2	• Remove caries and restoration • Endodontic assessment • Assess restorability • Temporise and monitor • Restore	• Eliminate cause of symptoms • Tooth preservation	• Pulpal irritation, post-operative sensitivity • Following crack extensions could render tooth unrestorable and indicate tooth for extraction	
Tooth 46: - Unsat. restoration ($crown_m$; M secondary caries, M&D overhang)	1	• No treatment	• No commitment required	• Plaque trapping, gingival inflammation • Caries, pulpal involvement, infection • Breakdown of tooth structure	Option 2: • Eliminate factor in gingival inflammation • Prevent further breakdown of tooth structure due to caries
	2	• Remove caries and restoration • Assess restorability • Restore	• Eliminate plaque trap for gingival healing • Eliminate caries • Tooth preservation	• Pulpal irritation, post-operative sensitivity • Quality and quantity of underlying tooth structure unknown, inadequate remaining coronal tooth structure may involve extensive restorative work	
Tooth 45: - Unsat. restoration (MOD_c; MO secondary caries, M overhang)	1	• No treatment	• No commitment required	• Plaque trapping, gingival inflammation • Caries, pulpal involvement, infection • Breakdown of tooth structure	Option 2: • Eliminate factor in gingival inflammation • Prevent further breakdown of tooth structure due to caries
	2	• Remove caries and restoration • Restore	• Eliminate plaque trap for gingival healing • Eliminate caries • Tooth preservation	• Pulpal irritation, post-operative sensitivity	
Tooth 36: - Unsat. restoration (MOD_a; D secondary caries, M open contact, M uneven contour) - Cracked tooth - Questionable RCT	1	• No treatment	• No commitment required	• Plaque and food trapping, gingival inflammation • Crack progression • Caries, pulpal involvement, infection • Breakdown of tooth structure • Extraction	Option 3: • Eliminate factor in gingival inflammation • Prevent further breakdown of tooth structure due to caries • Asymptomatic, however further deterioration of tooth

	2	• Endodontic assessment • Assess restorability • No endodontic re-treatment • Restore	• Less commitment required than option 3 • Eliminate plaque trap and food trap for gingival healing • Eliminate caries • Tooth preservation	• Less predictable treatment outcome • Inadequate remaining coronal tooth structure may involve extensive restorative work • Following crack extensions could render tooth unrestorable and indicate tooth for extraction	may involve extensive/invasive treatment in future to save tooth or render tooth unrestorable • Quality of RCT controlled resulting in more predictable treatment outcome
	3	• Endodontic assessment • Assess restorability • Endodontic re-treatment • Restore	• Eliminate plaque and food trap for gingival healing • Eliminate caries • Tooth preservation • More predictable treatment outcome	• More commitment required than option 2 • Inadequate remaining coronal tooth structure may involve extensive restorative work • Following crack extensions could render tooth unrestorable and indicate tooth for extraction	
Tooth 37: - Unsat. restoration (MO_a; M overhang)	1	• No treatment	• No commitment required	• Plaque trapping, gingival inflammation • Caries, pulpal involvement, infection • Breakdown of tooth structure	Option 2: • Eliminate factor in gingival inflammation • Reduce risk of caries
	2	• Polish restoration	• Eliminate plaque trap for gingival healing • Conservative	• Over-polishing could result in open contact	
Tooth 27: - Cracked tooth	1	• No treatment and monitor for symptoms or further breakdown	• No commitment required • Conservative	• Crack progression • Caries, pulpal involvement, infection • Breakdown of tooth structure • Extraction	Option 1: • Asymptomatic • Crack investigation could lead to inability to restore tooth
	2	• Restore	• Early intervention may prevent crack progression, caries, pulpal involvement, infection, catastrophic tooth fracture	• Following crack extensions could render tooth unrestorable and indicate tooth for extraction • Inadequate remaining coronal tooth structure may involve extensive restorative work	
Tooth 22: - Unsat. restoration (M_c; M overhang, poor aesthetics)	1	• No treatment	• No commitment required	• Does not address presenting complaint	Option 3. • Recontour first to resolve inflammation • Addresses presenting complaint
	2	• Recontour restoration	• Conservative	• Does not address presenting complaint	
	3	• Restore	• Addresses presenting complaint	• Pulpal irritation, post-operative sensitivity	

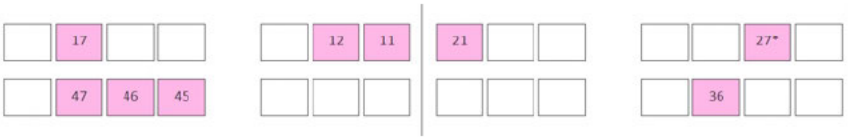
Tooth 21: - Unsat. restoration (M_c&D_c; M&D secondary caries, M overhang, poor aesthetics)	1	• No treatment	• No commitment required	• Does not address presenting complaint	Option 2: • Eliminate factor in gingival inflammation • Prevent further breakdown of tooth structure due to caries • Attempt conservative approach before irreversible invasive approach
	2	• Composite veneer	• Eliminate plaque trap for gingival healing • Eliminate caries • More conservative than option 3 • Can be useful as a mock-up of desired outcome	• Pulpal irritation, post-operative sensitivity • May not meet desired outcome	
	3	• Full coverage crown	• Addresses presenting complaint • Eliminate plaque trap for gingival healing • Eliminate caries • More predictable aesthetic outcome	• Pulpal irritation, post-operative sensitivity • Less conservative than option 2 • Irreversible	
Tooth 11: - Unsat. restoration ($crown_p$; chipped porcelain, poor aesthetics) - Unsat. post (not parallel to root, inadequate length) - Questionable RCT	1	• No treatment	• No commitment required	• Does not address presenting complaint	Option 3: • Addresses presenting complaint • Satisfactory support for coronal restoration • Quality of RCT controlled resulting in more predictable treatment and aesthetic outcomes
	2	• No endodontic re-treatment • Full coverage crown	• Addresses presenting complaint • Less commitment required than option 3 • More predictable aesthetic outcome	• Less predictable treatment outcome • May require removal of unsatisfactory post and core build-up	
	3	• Endodontic re-treatment • Full coverage crown	• Addresses presenting complaint • Removal and replacement of unsatisfactory post to support coronal restoration • More predictable treatment and aesthetic outcomes	• More commitment required than option 2 • Removal of tooth structure causes further weakening of tooth • Inadequate remaining coronal tooth structure may involve extensive restorative work	
Tooth 12: - Unsat. restoration ($crown_p$; poor aesthetics) - Post wide in relation to root - Questionable RCT	1	• No treatment	• No commitment required	• Does not address presenting complaint	Option 2: • Addresses presenting complaint • Post appears biomechanically sound; removal has potential for risk catastrophic root fracture • Although endodontic re-treatment prior to placing new restoration is ideal risk of catastrophic root fracture outweighs benefits
	2	• No endodontic re-treatment • Full coverage crown	• Addresses presenting complaint • Less commitment required than option 3 • More predictable aesthetic outcome • Lower risk of catastrophic root fracture	• Less predictable treatment outcome	
	3	• Endodontic re-treatment • Full coverage crown	• Addresses presenting complaint • More predictable treatment and aesthetic outcomes	• More commitment required than option 2 • Removal of tooth structure causes further weakening of tooth • High risk of catastrophic root fracture	
Tooth 13: - Extrinsic staining	1	• No treatment	• No commitment required	• Does not address presenting complaint	Option 2: • Addresses presenting complaint

	2	• External bleaching	• Conservative • Option to choose irreversible option if treatment fails to address presenting complaint	• Soft tissue chemical burns • Transient tooth sensitivity • Bleaching addiction	• Conservative option that has potential to deliver good outcome • Option to choose irreversible option if treatment fails to address presenting complaint
	3	• Crown	• More predictable aesthetic outcome	• Pulpal irritation, post-operative sensitivity • Less conservative than option 2 • Irreversible	
Tooth 16: - Unsat. restoration (MO_s; M overhang)	1	• No treatment	• No commitment required	• Plaque trapping, gingival inflammation • Caries • Breakdown of tooth structure	Option 2: • Eliminate a factor in gingival inflammation • Precent caries
	2	• Polish restoration	• Eliminate plaque trap for gingival healing • Conservative	• Over-polishing could result in open contact	
Tooth 17: - Unsat. restoration ($crown_m$; over-contoured)	1	• No treatment	• No commitment required	• Plaque trapping, gingival inflammation and localised bone loss • Caries • Breakdown of tooth structure	Option 2: • Eliminate plaque trap for periodontal health • Reduce risk caries and potential for breakdown of tooth structure
	2	• Remove caries and restoration • Assess restorability • Restore	• Eliminate plaque trap for periodontal health • Reduce risk caries	• Pulpal irritation, post-operative sensitivity • Quality and quantity of underlying tooth structure unknown, inadequate remaining coronal tooth structure may involve extensive restorative work	
Generalised unstable periodontitis	1	• No treatment	• No commitment required	• Plaque-induced gingival inflammation • Continue localised bone loss • Poor restorative treatment outcomes	Option 2: • Intervene to allow periodontal healing and health prior to committing to extensive restorative work
	2	• Scale and clean • Local debridement 17	• Remove calculus and plaque for periodontal healing • Conducive to longevity of current and future restorations	• Gingival bleeding and sensitivity	
Actinic cheilitis*	1	• Advise patient to consult GP or alternately refer to Oral Medicine • Advise sun protection during recreation • Avoid sun exposure from 10 am – 2 pm • Regular review	• Duty of care, otherwise supervised neglect • Increase patient awareness and likelihood of changing lifestyle factors with encouragement	• Nil	Option 1: • Clinician's responsibility to carry out duty of care and inform patient of findings and refer appropriately for specialised care

*Potentially premalignant condition of the lower lip. Does not predict malignancy, however all lip carcinomas are associated with pre-existing actinic cheilitis. Expected demographic is usually fair-skinned, middle-aged and with history of accumulated sun exposure to lower lip. Same demographic describes typical patient with general skin changes from sun exposure. Common clinical signs: dryness, atrophy, scaly sites, swelling, erythema, ulceration, vermilion border indistinct. (32)

2.6 Management plan

2.6.1 Treatment plan

Systemic phase	Not applicable
Emergency phase	Not applicable
Control phase *Eliminate pain, infection, inflammation*	Patient education and consent to treatment
	Hygienic phase of periodontal therapy: scale and clean, local periodontal debridement 17MB, fluoride application, oral hygiene instruction
	Recontour existing restorations: 16M, 15M, 37M
	Caries control: 21M&D, 36D, 45MO, 46M, 47M
	Replace unsatisfactory restorations: 22M, 35O*
	Endodontic re-treatment: 11
Holding phase *Preserve residual dentition*	Assess response to periodontal therapy and oral hygiene compliance
	Monitor symptoms: 36, 47
Reconstructive phase *Replace lost tissue and stabilise occlusion*	Indirect restorations: 
	Post-core: 11
	External bleaching: 13
Maintenance phase *Prevention of further breakdown*	Recall exam Periodontal maintenance Reinforce oral hygiene

*Added to treatment plan following changes identified during recall examination 2020.

2.6.2 Treatment sequence

- There was uncertainty regarding patient's potential relocation to Sydney and a reluctance to discuss definite timeframes.
- Discussed with patient risks of commencing complex treatment plan that requires multiple appointments over an extended period of time:
  - Incomplete endodontic treatment and risk of dislodging interim restoration leading to potential for infection of root canal system
  - Incomplete restorative treatment and risk of provisional restorations dislodging which is more of a concern in aesthetic areas
- Discussed with patient ideal sequence for treatment plan considering:
  - Patient's presenting complaints i.e. tooth sensitivity and aesthetics
  - Patient's possibility of relocation and lack of definite timeframe given
  - Clinician's opinion on patient's treatment needs i.e. control active disease and prevent further breakdown
  - Clinician's availability given rotation in final year
- Ideal treatment plan would be sequenced in stages starting in lower arch then upper arch:
  1. Quadrant 4 then quadrant 3
  2. Upper anterior then upper posterior
- Treatment of aesthetic region delayed until adequate rapport with patient established.

	Treatment	Rationale for sequence
Control	• Scale and clean, local debridement 17 • Fluoride application • Oral hygiene instruction	• Build rapport, trust, confidence • Improve current periodontal condition • Assess patient's oral hygiene compliance
	• Caries control 47, 46, 45	• Address presenting complaint as soon as possible • Arrest further tissue destruction in same quadrant • Provisionally restore 47, 46, 45
	• Caries control 36 • Recontour 37	• Arrest further tissue destruction in contralateral quadrant and provisionally restore 36 while monitoring 47 response to treatment • Removal of 36 restoration facilitates access to 37M
Holding	• Monitor 47, 36 for symptoms	• Assess pulp and periodontal condition prior to restoration
Reconstructive	• Indirect restoration 36	• If asymptomatic, definitively restore 36 • Assess patient's response to treatment
	• Indirect restorations 47, 46, 45	• If asymptomatic, definitively restore 47, 46, 45 concurrently to obtain better contours and contacts • Assess patient's response to treatment
Holding	• Review and monitor for changes • Periodontal review and maintenance • Recontour 15, 16	• Monitor restored teeth for symptoms • Maintain periodontal condition • Reassess patient's oral hygiene compliance • Establish lower arch stability prior to commencing treatment in upper arch
Control	• Caries control 21 • Replace unsatisfactory restoration 22	• Arrest further tissue destruction and attempt conservative treatment before extensive treatment
	• Endodontic re-treatment 11	• Commence endodontic re-treatment as soon as possible to gain maximum therapeutic effect of medicament
Reconstructive	• Preparation indirect restorations 12, 21	• Commence crown preparations while waiting for endodontic re-treatment
	• Post-core 11 • Prepare indirect restoration 11	• If asymptomatic, after completion of endodontic re-treatment
	• Indirect restorations 12, 21, 11	• If asymptomatic, definitively restore 12, 11, 21 concurrently to obtain better aesthetics, contours and contacts
Holding	• Review and monitor for changes • Periodontal review and maintenance • Replace unsatisfactory restoration 35*	• Monitor restored teeth for symptoms • Maintain periodontal condition • Reassess patient's oral hygiene compliance
Reconstructive	• Indirect restoration 17 • Indirect restoration 27*	• Arrest further tissue destruction • If asymptomatic, definitively restore 17
	• External bleaching 13	• Least important in relation to other items on treatment plan • Establish occlusal stability prior to fabricating bleaching tray
Maintenance	• Review and monitor for changes • Periodontal review and maintenance • Reinforce oral hygiene	• Monitor restored teeth for symptoms and changes • Early intervention to prevent further breakdown • Maintain periodontal condition • Monitor patient's oral hygiene compliance

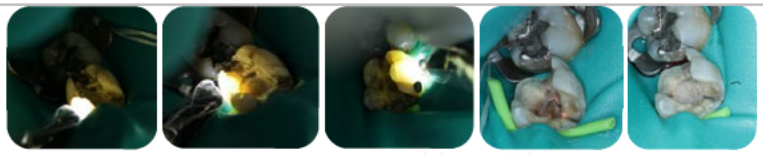
*Added to treatment plan after changes identified during recall examination 2020.

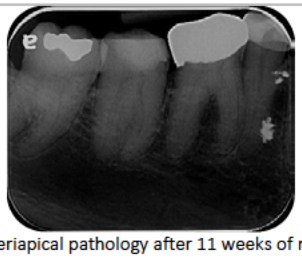
Note: Continuous reassessment of patient's plans to move to Sydney and discussion of potential implication on dental treatment during each phase of treatment.

2.7 Treatment delivery

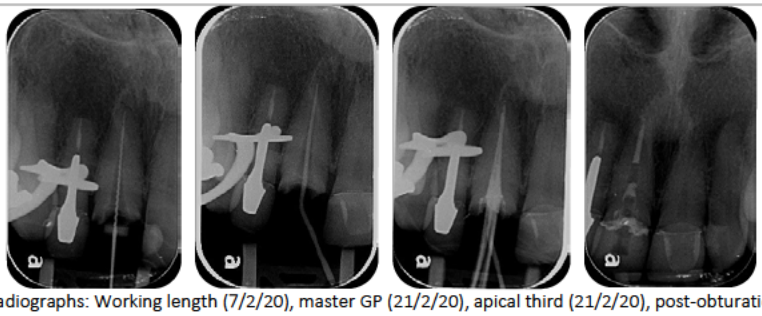
2.7.1 Treatment delivery

Date: May 2019 – July 2020

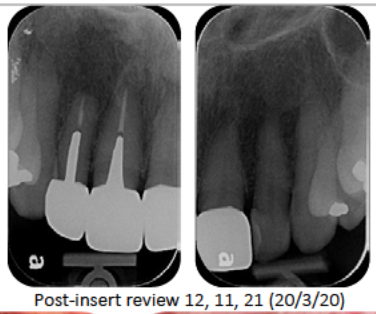
Treatment	Date completed	Comments, photographs and radiographs documenting treatment
Scale and clean Debridement 17 Fluoride application Oral hygiene instruction	July 2019	• Copious gingival bleeding from inflammation. • Demonstrated Modified Bass technique of toothbrushing on model. • Patient advised plans to potentially relocate to Sydney at the end of December 2019. Aim to commence and finish treatment up to reconstructive phase of lower arch by December 2019.
Caries control 47		• 47: Removed caries and existing restoration. Tooth investigation revealed cracks Li, D. Little coronal tooth structure remaining. Temporised with GIC and monitored.
Caries control 36D Recontour 37M Tooth preparation 36, 37	August 2019	 Tooth investigation 36 (12/8/19 & 19/8/19) • 36: Removed caries and existing restoration. Tooth investigation revealed cracks Li, D, MB into MB canal. Endodontist assessed tooth as unrestorable with hopeless prognosis and tooth was indicated for extraction. Patient refused extraction. Prosthodontist assessed tooth as restorable with poor long-term prognosis. As tooth is asymptomatic and remaining tooth structure appears clean and sound, lined pulp chamber with Vitrebond to seal area with plan to restore with Enamic endocrown*. Patient chose to keep tooth with understanding that tooth has poor prognosis and restoration may fail at any time in future. • 37: M re-contoured at same time. However, due to large open contact between 36 and 37 decision made to replace 37MO amalgam with Enamic* overlay for better contact to avoid plaque and food trapping. • 36: Tooth prepared for Enamic endocrown, provisional stainless-steel band with IRM. • 37: Tooth prepared for Enamic MOL overlay, provisional Luxatemp restoration cemented with TempoCem. **Enamic is a hybrid polymer-infiltrated ceramic network (PICN) material comprised of 86 wt% sintered ceramic matrix filled with 14 wt% polymer material (Vita ENAMIC Technical and scientific documentation). Polymeric filling imparts a lower modulus of elasticity and stiffness than conventional ceramics which (i) provides material with degree of elasticity between that of enamel and dentine, allowing higher levels of continuous loading than conventional ceramics before fracturing, (ii) allows milling of thin margin areas without material fracturing (Dental Visionist magazine) . A study suggests that the higher polymer content of Enamic may lead to stronger crack growth resistance, with cracks propagating predominantly through the ceramic network and deflected by the polymer-ceramic interface. (33) The same study has shown that Enamic has lower wear resistance than human enamel with wear mechanism similar to human enamel. (33) Current literature on clinical use, longevity and success rate of PICN is limited. With respect to the mentioned properties, it was decided that 36 and 37 would be restored with Enamic, with the idea that cuspal coverage and crack deflection would help to protect the teeth from further damage by cracking.* **Endocrowns are an adhesive monolithic ceramic restoration anchored in the pulp chamber using micromechanical retention properties of the pulp chamber walls. A systematic review of endocrowns found that endocrowns are a promising treatment alternative for extensively damaged endodontically-treated premolars and molars – good survival rates in the short to long term, fewer catastrophic root fractures (6%) than crowns (29%) with or without posts. Main failure mode was due to loosening (71%). Successful endocrown requires good preparation design to limit displacement and strict adherence to adhesion protocol to prevent marginal leakage and penetration of microorganisms. Nanofill composite resins may be suitable due to their modulus of elasticity similar to that of dentine thus reducing stress in the dentine and limiting irreparable root fracture while retaining high fracture resistance, however this increases stress at the interface predisposing restoration to debonding. Materials with greater adhesion properties such as lithium disilicate may be the best choice. (34) Systematic review and meta-analysis estimates 5-year survival (restoration present in oral cavity but with biological/technical complications) rate 91.4% and 5-year success rate (restorations with no complications) 77.7% for endocrowns. (35)*

Final impressions and cementation indirect restoration 36, 37	September 2019	  Final impression and 3Shape TRIOS® scan 36-37 (5/9/19) • Final impression 36 endocrown and 37 MOL overlay preparations. • Cementation procedure was performed under rubber dam to prevent moisture contamination. Restorations were treated with Ivoclean and then Monobond. Variolink dual cure luting cement was used.
Monitor 47 symptoms Caries control 45, 46 Tooth preparation 45, 46, 47 Final impressions and cementation indirect restoration 45, 46, 47	October – November 2019	 PA 47 to check for periapical pathology after 11 weeks of monitoring (7/10/19) • 47: Temporary GIC restoration remained intact with slight mesial deficiency and open contact. Patient was advised to keep area clean to prevent gingival inflammation. Pulpal pathology resolved and no symptoms were experienced after 11 weeks of temporisation. Tooth prepared for Enamic* MODBL overlay. Provisional stainless-steel band with IRM placed.   Tooth preparations and 3Shape TRIOS® scan 45, 46, 47 • 45: Removed caries and existing restoration. Tooth prepared for MOD inlay. Buccal and lingual walls were preserved to conserve tooth structure. Provisional stainless-steel band with IRM placed. • 46: Removed caries and existing restoration. Clinically satisfactory pinned amalgam core underlying metallic crown. Decision made to retain existing core and restore with zirconia** crown. Tooth prepared for zirconia crown. Provisional Luxatemp restoration cemented with TempoCem placed. Gingival inflammation resolved after removal of restoration and placement of provisional restoration. • Cementation procedure was performed under cotton roll isolation and high-volume suction to prevent moisture contamination. Restorations were treated with Ivoclean and then Monobond. Variolink dual cure luting cement was used for 45 and 47. Panavia dual-cure self-adhesive resin cement was used for 46. **Enamic was the material chosen for the same reasons as 36 and 37. In this case, 47 tooth structure also exhibited cracks. Cuspal overlay was considered to limit crack progression and Enamic for crack deflection in order to preserve the tooth for as long as possible.* ***Zirconia was chosen for the following reasons (i) patient predominantly chews on her back teeth thus strength and durability is required in posterior region (ii) not as important in posterior region to have aesthetic glass-based ceramic (ii) underlying core is dark amalgam which will show through a glass-based ceramic.*

Post-treatment review lower arch Recall exam Scale and clean Recontour 15M, 16M Caries control 21M&D Replace unsatisfactory restoration 22	January 2020	 Post-treatment lower arch (23/1/20) • Recall examination following 10 weeks of absence. Examination revealed all restored teeth were asymptomatic, 27B cracked tooth, 35O GIC restoration crumbling. Treatment plan was amended to incorporate new problems; tooth investigation and restoration 27, replacement of unsatisfactory restoration 35O with composite. • Patient advised plans to potentially relocate to Sydney at the end of May 2020. Aim to commence and finish treatment up to reconstructive phase of upper anterior teeth by March 2019. • 21: Removed caries and existing restorations. Replaced with composite. Following assessment decision made to definitively restore 21 with zirconia crown to achieve desired aesthetic outcomes. • 22: Removed existing restoration. Subgingival caries detected on mesial, removed. Temporised with GIC to allow gingival healing. Replaced with composite after 6 weeks.

Endodontic re-treatment 11 Cast post-core duralay pattern Tooth preparation 12, 21	February 2020	 Radiographs: Working length (7/2/20), master GP (21/2/20), apical third (21/2/20), post-obturation (21/2/20) • 11: Removed existing restoration. Clinically unsatisfactory stainless-steel pin and composite core underlying ceramic-metal crown removed. Assessment of remaining tooth structure revealed adequate coronal tooth structure for post-core and definitive restoration. Adequate ferrule on D and Pa aspects of remaining coronal tooth structure. GP removed. Canal cleaned. Working length obtained. Minimal preparation of canal and irrigation. No clinical or radiographic signs of infection. Medicated with $Ca(OH)_2$. Provisional plastic burnout post and Luxatemp crown cemented with IRM. Two weeks later tooth was asymptomatic and was obturated leaving 5 mm apical GP and space for post-core. **Generally a minimum ferrule width of 2 mm is required to provide fracture resistance. (36) If an endodontically treated anterior tooth is to receive a crown, a post is often indicated as in most cases the remaining coronal tooth structure is thin after root canal treatment and crown preparations. In addition, pulp chambers are too small to provide adequate retention and resistance without a post. (37) Post length should be at least the length of the crown, about 2/3 the root length and no more than 1/3 the root width as non-ideal posts increase the chances of root fracture. At least 5 mm root filling should be maintained for apical seal. The main mode of failure for metal posts is root fracture, due to greater stiffness of metal in comparison to dentine. (38)*  Tooth preparation 12 • 12: Removed existing restoration. Tooth prepared for zirconia crown. Labial margin reduced to equigingival for aesthetics. Height of cast post-core reduced. Provisional Luxatemp restoration cemented with TempoCem placed. Warned patient of risk of provisional restoration dislodging and that colour may not accurately reflect shade of other teeth in mouth. • 21: Removed existing restorations. Tooth prepared for zirconia crown. Undercuts on mesial and distal built up with composite. Provisional Luxatemp restoration cemented with TempoCem placed. Same warnings for 12 given for 21.  Duralay pattern post-core 11 • 11: Duralay pattern for cast post-core 11 fabricated.

Cementation cast post-core 11 Tooth preparation 11 Final impressions and cementation indirect restoration 12, 11, 21	March 2020	 Tooth preparations 12, 11, 21 (3/3/20) • Try-in of the cast-post cure revealed a labial gap < 1 mm on the labial aspect. This is not ideal, however was clinically acceptable. Panavia dual-cure self-adhesive resin cement was used to cement cast post-core 11. Tooth was prepared for zirconia crown.  Final impression and die stone models 12, 11, 21  3Shape TRIOS® scan 12, 11, 21  Zirconia crowns 12, 11, 21 **Generally, glass-based ceramics such as lithium disilicate is chosen for anterior crowns. With new materials on the market, for a single anterior tooth, all ceramics have sufficient longevity based on clinical trial data, so the choice can be made on aesthetic capability alone. (18) In this case, however, 12 and 11 both had cast post-cores to support the coronal restoration. The colour of the metal would show through a glass-based ceramic; hence zirconia was chosen as a safer option. Zirconia was used for 12, 11 and 21 for consistency and more control over the final outcome. Zirconia aesthetics have improved over the years and is available in different translucencies. Use of an opaque cement may also be beneficial to mask the metallic shade under the crowns. Metal-ceramic crowns are another viable option with proven clinical outcomes and aesthetic outcomes. However, due availability and ease of fabrication zirconia was chosen.* • Cementation procedure was performed under cotton roll isolation and high-volume suction to prevent moisture contamination. Restorations were treated with Ivoclean and then Monobond. Panavia dual-cure self-adhesive resin cement was used for 12, 11, 21.

Post-treatment review upper anterior teeth	March 2020	 Post-insert review 12, 11, 21 (20/3/20)  Review photographs (17/3/20) • Patient was very satisfied with outcome to date. • Patient advised plans to potentially relocate to Sydney are uncertain due to COVID-19. Plan to contact patient in July 2020 to reassess patient's situation and adjust treatment plan accordingly.
Post-treatment review upper anterior teeth Recall exam Scale and clean	July 2020	• Examination revealed all restored teeth were asymptomatic. • Patient advised plans to potentially relocate to Sydney have been cancelled due to COVID-19.
Tooth preparation 27	July 2020	• 27: Tooth prepared for Emax onlay, provisional stainless steel band with IRM.
Tooth preparation 17	August 2020	• 17: Tooth prepared for Emax crown. Composite core build-up required as inadequate coronal tooth structure to support a crown remained. Preparation had deep subgingival mesial margin. Provisional Luxatemp restoration cemented with TempoCem.  17 remaining tooth structure after metallic crown removal and before core build-up
Final impressions 17, 27 Cementation 27	August 2020	• Final PVS impressions of 17 and 27 taken. As 17 preparation had deep subgingival mesial margin and there was chronic gingival inflammation and bleeding in the area, it was difficult to take final PVS impression even with use of retraction cord and Expasyl. 3Shape TRIOS® scan was taken, digital impression adequate.  27 onlay preparation PVS impression and 3D CADCAM model printed from 3Shape TRIOS® scan. • 27: cemented with Variolink.

Cementation 17	September 2020	• 17: cemented with Variolink.  Post-insert 17 Emax crown and 27 Emax onlay
External bleaching 13	Ongoing	• Incomplete due to lack of appointments for remainder of year.
Post-treatment review Recall exam Scale and clean Reinforce oral hygiene	Ongoing	• Patient transferred to another student for continuation of care.

Note: Maintained conformative occlusal scheme throughout treatment plan.

2.7.2 Before and after photographs

Date: May 2019 – September 2020

2.7.3 Patient response to treatment

- Patient was very satisfied with overall outcome of treatment provided to date.
  - "I can smile again – I can't stop smiling!"
- Resolution of presenting complaints:
  i. "I don't smile anymore because my front teeth are so bad. The front tooth (21) is brown, they're all mismatched. I want the teeth (13-21) to look the same colour because when I smile, I'm self-conscious."
     ✓ 12-21 indirect restorations placed.
     (Treatment for 13 incomplete)
  ii. "My crown (11) has fallen off and been stuck on again – I'm afraid it will fall off again."
     ✓ 11 endodontically re-treated, crown preparation refined and indirect restoration placed.
  iii. "I had some sensitivity last week when eating sweet foods (47)."
     ✓ 47 investigated, cause of sensitivity resolved and indirect restoration placed.
- Patient was compliant with dental advice and instructions as the months passed despite initial apprehension.
- Patient has never missed an appointment without notice and will continue to attend OHCWA for maintenance.

2.7.4 Reflection

	Challenges	Management
Patient-related	Strong gag reflex	• For impressions: - Salt on tongue - Xylocaine spray - Distraction techniques - Breathing techniques - Encouragement and guidance • For radiographs: - Alternative radiographic techniques e.g. occlusal PA - Encouragement and guidance • Rubber dam clamps - Local anaesthetic - Wingless or tucked wing clamps
	Lack of trust in student clinician	• Build rapport, trust, confidence • Factual and transparent communication • Proceed through treatment plan slowly and involve patient in all aspects to provide patient with a sense of control
	Apprehension towards radiation	• Patient education to put radiation exposure into context • Explain risk of substandard care if radiographs not available for diagnosis and certain procedures
	Possible relocation	• Regular open communication regarding likely date for relocation and potential impacts on treatment plan • Appropriate revision and sequencing of treatment plan in line with patient's situation • Avoiding over-promising treatment that can be delivered and providing patient with what can be achieved realistically to an acceptable standard *Due to COVID-19 patient was able to attend appointments through 2020*
Clinical	45 preparation	• Initially aimed to be conservative of tooth structure, however the preparation shape and outline was not ideal for CAD-CAM fabrication of restoration • Preparation shape also left remaining tooth structure susceptible to cuspal flexure and cracking. *Preparation was refined by further occlusal reduction to overlay remaining tooth structure to prevent cuspal flexure and to produce preparation shape and contours favourable to CAD-CAM processes*
	11 cast post-core cement gap	• At try-in of 11 cast post-core there was a cement gap left after insert which although not ideal, was accepted clinically • Reasons for poor fit include error in post-space impression, casting error
	Changes to treatment plan	• Additions to treatment plan included: - Restoration for 22 due to mesial subgingival caries - Restoration for 35 due to crumbling GIC - Restoration for 27 due to cracked tooth

CASE 3

Removable Aesthetic

CASE 3
Removable Aesthetic

3.1.1 Details

- 82 year-old male

3.1.2 Presenting complaint/s

- Presented in July 2020 for initial examination with the following complaints:
  i. "My fillings (21, 22) have broken off."
  ii. "I have a missing tooth (11) that bothers me."

3.1.3 History of presenting complaint/s

- 22 restored with pinned composite July 2020.
- 21 restored with pinned composite twice, in July then August 2020.
- 11 missing for some time.

3.1.4 Medical history

Medical condition	Description	Dental implications (1)
History of myocardial infarction (MI) Bypass surgery 2005 Stent procedure 2017	Blockage of coronary artery. Most common sign is chest discomfort or pain which can spread to arms, neck, jaw, back and can often last longer than 10 minutes. Requires emergency treatment.	Heart attack in dental chair. Basic life support. Call 000.
History of stroke Carotid surgery 2019	Haemorrhagic stroke; bleeding into the brain, or ischaemic stroke; blockage of carotid arteries. Both cause brain damage. FAST check for stroke: Face – smile (is one side droopy?) Arms – raise both arms (is one side weak?) Speech – speak a simple sentence (slurred?) Time – get to hospital fast (emergency)	Stroke in dental chair. Basic life support. Call 000.
Arrhythmia Subdermal loop recorder 2020	Fault in the heart's electrical signalling system which affects heartbeat.	Patient discomfort in dental chair. Offer to reschedule appointment and send patient home.
Hard of hearing	Age-related hearing loss. Wears hearing aids.	Hearing impairment. Requires high volume speech.
Peripheral vision loss (tunnel vision)	Unknown cause of vision loss.	Peripheral vision impairment. Requires clinician to present directly in front of the patient.

(1) Therapeutic guidelines: oral and dental (2019).

Medication	Dosage	Use & Mechanism of action (2, 3)	Dental implications (2, 3)
Lorstat (Atorvastatin)	20 mg tab q.d.	HMG-CoA reductase (involved in cholesterol synthesis) inhibitor. Increases hepatic cholesterol uptake from blood, reduce concentrations of total cholesterol, LDL and triglycerides. For hypercholesterolaemia and hypertensive patients with additional risk factors for coronary heart disease.	Nil.
Cardiprin (Aspirin)	100 mg tab q.d.	Anti-platelet to reduce risk of MI/stroke. Inhibits platelet aggregation by binding to $P2Y_{12}$ platelet receptor and inhibiting cyclo-oxygenase (COX), reducing synthesis of thromboxane (induces platelet aggregation).	Prolongs bleeding time. NSAIDs may be contraindicated due to drug interaction with aspirin.
Bispro (Bisoprolol fumarate)	2.5 mg tab q.d.	β-blocker for hypertension, MI, chronic heart failure. Reduces heart rate, blood pressure and cardiac contractility via unknown mechanism.	Potential for drug interactions used in General Aesthesia resulting in severe bradyarrhythmia, attenuation of reflex tachycardia and hypotension, decreased reflex to compensate for blood loss and hypovolaemia, regional sympathetic blockade, increased propensity for vagal induced bradycardia. May increase sensitivity to allergens and severity of anaphylaxis, adrenaline treatment may not always give expected therapeutic effect.

Uremide (Furosemide)	40 mg q.d.	Loop diuretic, inhibits reabsorption of sodium and chloride in kidney. For oedema associated with heart failure and hypertension.	May increase ototoxic and nephrotoxic potential of aminoglycoside and cephalosporin antibiotics. NSAIDs may reduce natriuretic and antihypertensive effect.
Multivitamin		Dietary supplement.	Nil.
Garlic		Dietary supplement.	May inhibit platelet aggregation and increase bleeding risk.
Horseradish		Dietary supplement.	Nil.
Vitamin C complex		Dietary supplement.	Nil.

(2) Monthly Index of Medical Specialities Australia. (3) Australian Medicines Handbook.

Allergy	Description	Dental implications
No known allergies.		

Alcohol & Tobacco Use	Amount, Frequency & Duration	Dental implications
Current drinker	1 standard drink per week.	Alcohol consumption raises risk of cancer including on lip and in oral cavity. (5)
Non-smoker	N/A.	Nil.

3.1.5 Dental history and dental attitude

- Dental history
  - History of regular attendance at OHCWA.
  - Co-Cr partial upper dentures made in the past – not worn due to poor fit.
  - Presented to student clinic for initial examination in July 2020 following transfer from another DMD student.

- Dental attitude
  - Aesthetic motivation.
  - Concerned about broken front teeth.
  - Experiences no issues with function – chews food slowly on back teeth.
  - Motivated; attends all appointments using public transport.

3.1.6 Oral hygiene

- Poor oral hygiene:
  - Uses manual toothbrush and fluoride toothpaste twice daily.
  - Does not use interproximal cleaning aids.
  - Does not use any other cleaning adjuncts.

3.1.7 Social history

- Retired.
- Wife also attends OHCWA.
- Spends time reading poetry, tending to farm, maintaining light aircraft.

3.2 Examination and diagnostics

Date: July 2020

3.2.1 Extra-oral examination

Findings	
Facial symmetry	Absence of facial swelling
Facial skin	Hyperpigmentation
Lips	Hydrated, smooth lips and distinct vermillion border
Temporomandibular joint	Clicking on opening and closing bilaterally Absence of clicking and in excursion bilaterally Absence of pain and tenderness on palpation
Lymph nodes	No sign of lymphadenopathy Absence of pain and tenderness on palpation
Muscles of mastication	Absence of pain and tenderness on palpation
Thyroid gland	No obvious abnormal enlargement

3.2.2 Extra-oral photographs

*Patient refused to show teeth when smiling.

3.2.3 Intraoral examination

Findings	
Labial mucosa	Nil abnormalities detected
Buccal mucosa	Nil abnormalities detected
Hard palate	Nil abnormalities detected
Soft palate	Nil abnormalities detected
Gingivae	Nil abnormalities detected
Tongue	White coat on dorsum
Floor of mouth	Nil abnormalities detected

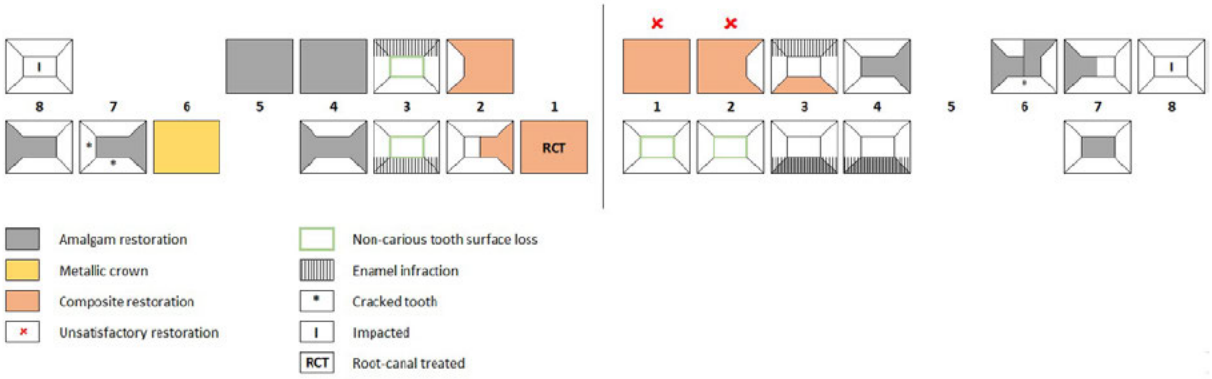
3.2.4 Intraoral photographs and findings

View	Findings	
Maxillary occlusal	Teeth	Partially dentate: Kennedy-Applegate Class II Mod 2 (6) Heavily restored posterior teeth and heavily worn anterior teeth Fractured 21, 22 and crack 26 Distally rotated 24, mesially rotated 26 Missing 17, 16, 11, 25
	Restorations	Amalgam restorations 15, 14, 24, 26 Exposed pins 21, 22 Missing restorations 21, 22 Rest seats 15, 24
	Soft tissues	Marginal gingival inflammation Narrow alveolar ridge 11
Mandibular occlusal	Teeth	Partially dentate: Kennedy-Applegate Class III Mod 1 (6) Heavily restored posterior teeth and heavily worn anterior teeth Discolouration 41 Missing 36, 35, 45
	Restorations	Amalgam restorations 36, 34, 33, 44, 47 Composite restoration 41 Metallic crown 46
	Soft tissues	Marginal gingival inflammation Narrow alveolar ridge 36-35 area
Right buccal	Teeth	Discolouration 41 Moderate plaque build-up at gingival margin Missing 11, 45 Uneven occlusal plane Posterior crossbite
	Restorations	Amalgam restoration 15, 14, 44 Composite restoration 41 Metallic crown 46
	Soft tissues	Marginal gingival inflammation Gingival recession 14, 15, 43, 44, 46
Left buccal	Teeth	Fractured 21, 22 Enamel infraction 33 Mild plaque build-up at gingival margin Missing 36, 35 Supraerupted 26 Uneven occlusal plane Posterior crossbite
	Restorations	Amalgam restorations 24, 26, 27 Exposed pins 21, 22
	Soft tissues	Marginal gingival inflammation Gingival recession 24, 26, 34, 33
Anterior	Teeth	Enamel infraction 23, 33 Plaque build-up at gingival margin Missing 11, 36, 35, 45 Supraerupted 26 Uneven occlusal plane Bilateral posterior crossbite
	Restorations	Amalgam restoration 24, 26, 34, 33,44 Composite restoration 41 Exposed pins 21, 22 Metallic crown 46
	Soft tissues	Marginal gingival inflammation Marked gingival oedema 21 Gingival recession 14, 13, 23, 24, 26, 34, 33, 43, 44, 46 Loss of interdental papilla

3.2.5 Occlusion

Findings	
Overjet	Edge to edge
Overbite	Edge to edge
Canine class	LHS: Class III, RHS: Class III
Molar class	LHS: -, RHS: Class III
Crossbite	Bilateral posterior crossbite
Crowding / Spacing	Absent
Rotation	24, 26
Supraeruption	26
Occlusal scheme	Group function

3.2.6 Odontogram



3.2.7 Periodontal assessment

3.2.7.1 Community Index of Periodontal Treatment Needs (CPITN)

Findings		
CPITN 3 1 1 1 1 1	Sextant 1	15MP 4 mm
	Sextant 2	Generalised staining
	Sextant 3	Generalised staining and gingival recession especially around 26
	Sextant 4	Generalised staining and gingival recession
	Sextant 5	Generalised staining
	Sextant 6	Generalised staining and gingival recession

3.2.7.2 Periodontal examination

	Findings	
Clinical	Gingival tissues	Bleeding on probing interproximally Oedematous texture Pink with red marginal inflammation Blunted papillae around lower anterior teeth Thick biotype
	Plaque distribution	Interproximal areas
	Plaque score	-
	Calculus distribution	Posterior teeth
	Plaque-retentive factors	Open contacts between 21-24, 31-43 Buccal groove 46
	Furcation involvement	46, 47
	Halitosis	No
Radiographic	Bone levels	Generalised mild horizontal bone loss in maxilla and mandible

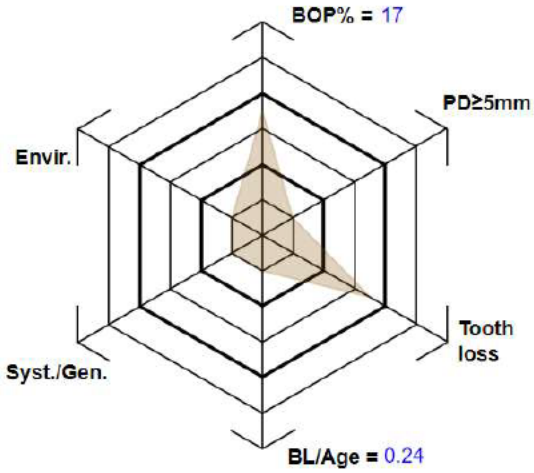
3.2.7.3 Periodontal tests

Mobility				0	0	0	0		I	0	0	0		0	0	
TTPalp				-	-	-	-		-	-	-	-		-	-	
TTP				-	-	-	-		-	-	-	-		-	-	
				15	14	13	12		21	22	23	24		26	27	
	48	47	46		44	43	42	41	31	32	33	34		36	37	
TTP	-	-	-		-	-	-	-	-	-	-	-		-	-	
TTPalp	-	-	-		-	-	-	-	-	-	-	-		-	-	
Mobility	0	0	0		0	0	0	0	0	0	0	0		0	0	

3.2.7.4 Periodontal chart

- Lack of periodontal pocketing >3 mm and general risk assessment did not warrant full periodontal chart.

3.2.7.5 Periodontal Risk Assessment (PRA) (7, 8)



Polygon surface: 11.25833

Periodontal Risk: medium

Suggested Recall Interval: **6** Months

Age	82
Number of teeth and implants	22 (1 - 32)
Number of sites per tooth / implant	○ 2 ○ 4 ◉ 6
Number of BOP-pos. sites	22 of 132
Number of sites with PPD≥5mm	0
Number of missing teeth	7
% alveolar bone loss (estimated in % or 10% per 1mm)	20 %
Syst./Gen.	○ Yes ◉ No
Envir.	◉ Non-smoker (NS) ○ Former smoker (FS) ○ Occasional smoker (OS) ○ Smoker (S) ○ Heavy smoker (HS)

Periodontal Risk Assessment (PRA) for patients in Supportive Periodontal Therapy (SPT). (7) PRA tool. (8)

3.2.8 Pulp sensibility tests

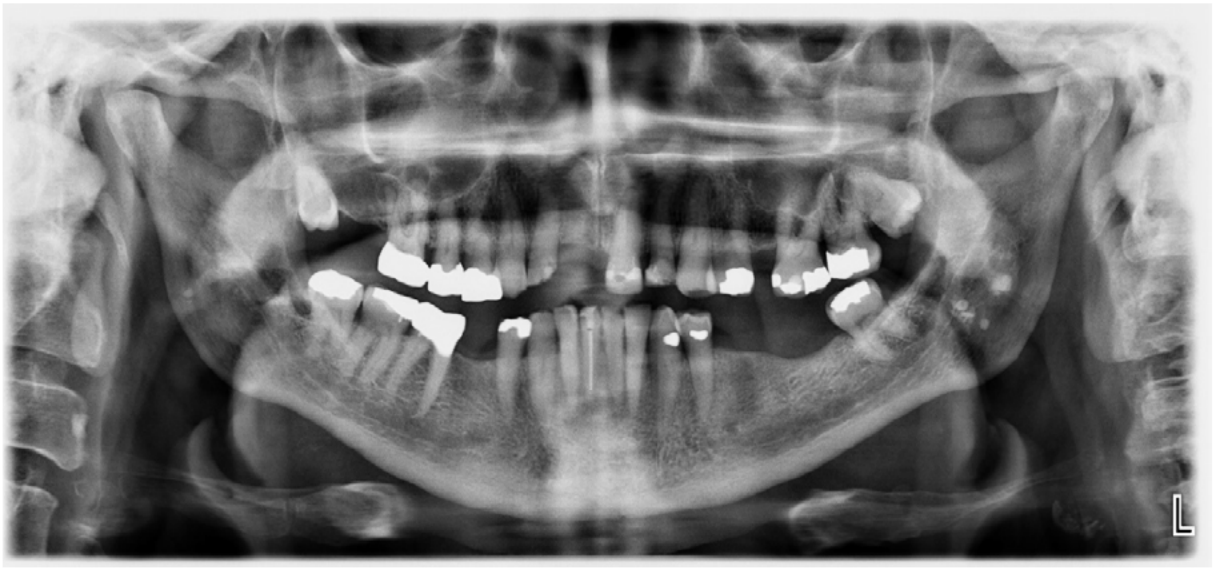
- Not applicable.

3.2.9 Radiographs

Rationale: each radiograph taken has rationale where stated – ALARA
Note: Subscript a = amalgam, c = composite, m = metallic, p = metal-ceramic

3.2.9.1 Orthopantogram

Date: 24/1/2018



Findings (9)	
Periphery and corners	Radiopacities anterior to spine bilaterally*
Cortices of mandible	Radiopacities superimposed over body of mandible**
Cortices of maxilla	Nil abnormalities detected
Zygomatic bones	Nil abnormalities detected
Maxillary sinuses	Internal density of sinuses: Radiopaque shadow within sinuses – superimposition of inferior nasal conchae and zygomatic buttresses
Nasal cavity and palate	Nil abnormalities detected
Bone pattern of maxilla	Normal density and trabeculation
Bone pattern of mandible	Normal density and trabeculation One radiopaque spot on left angle of mandible inferior to mandibular canal One radiolucent spot on apex of distal root of 38
Alveolar processes	Generalised mild horizontal bone loss in maxilla and mandible Radiopacity at apices 16 Possible furcation involvement 46, 47
Teeth	Heavily restored dentition Endodontically treated 41 Metallic crown 46 Amalgam restorations 16, 15, 14, 24, 26, 27, 37, 34, 33, 44, 47, 48 Composite restorations 12, 21, 22, 41 Long, thin roots 46 Missing 17, 25, 36, 35, 38, 45 Impacted 18, 28

Interpretation of panoramic radiographs, Perschbacher (2012). (9)

*Consultation with Radiology – Ddx tonsilloliths, sialoliths, lymph node calcification. Confirmed tonsilloliths as superimposed over body of mandible, the latter are superimposed in submandibular region.
**Consultation with Radiology – Ddx atherosclerosis of carotid arteries, cricoid cartilage calcification. Confirmed atherosclerosis of carotid arteries.

3.2.9.2 Bitewings

Bitewing – Left	Findings	
 Date: 26/3/2018 Rationale: interproximal caries detection	Caries	24D (?)*
	Restorations	24DO$_a$, 26MO & OP$_a$, 27MO$_a$ (M overhang), 37O$_a$, 34B$_a$
	Pulp	Nil abnormalities detected
	Periodontium	23D, 34D PDL space widening Generalised crestal bone loss Alveolar ridge resorption 36 region
	Other	26 supraeruption 37 mesial tilt

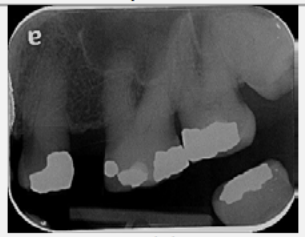
*Clinically non-carious and asymptomatic.

Bitewing – Right	Findings	
 Date: 26/3/2018 Rationale: interproximal caries detection	Caries	15M (?)*
	Restorations	16MODBP$_a$ (M overhang/over-contoured), 15MODBP$_a$ (M overhang), 14MODBP$_a$, 44MOD$_a$, 47MO$_a$ (pinned), 46 metallic crown (pinned core)
	Pulp	Nil abnormalities detected
	Periodontium	44D, 43D PDL space widening Generalised crestal bone loss Alveolar ridge resorption 45 region Furcation involvement 46
	Other	13, 12 incisal wear Tight contact 46D & 47M

*Clinically non-carious and asymptomatic.

3.2.9.3 Periapicals

Periapical – 21 & 22	Findings	
 Date: 2/9/20 Rationale: Check for pathology	Caries	Nil detected
	Restorations	21 pinned composite (failed), 22 pinned composite (failed)
	Pulp	Nil abnormalities detected
	Periodontium	Intact PDL space & lamina dura 21, 22 Nil PA radiolucency 21, 22
	Other	Missing 11

Periapical – 26	Findings	
 Date: 2/9/2020 Rationale: Check for pathology	Caries	24D (?)*
	Restorations	24DO$_a$, 26MO & OP$_a$, 27MO$_a$, 37O$_a$
	Pulp	Nil abnormalities detected
	Periodontium	Intact PDL space & lamina dura 24, 26, 27 Nil PA radiolucency 24, 26, 27
	Other	Missing 25 Impacted 28

*Clinically non-carious and asymptomatic.

3.2.10 Caries risk assessment

3.2.10.1 Dietary assessment

- Generally, diet is:
  - High fermentable carbohydrates
  - Low sugar
  - Low acid
  - Limited snacking frequency

3.2.10.2 Saliva test

Unstimulated saliva			Stimulated saliva	
Flow rate	Consistency	pH	Quantity at 5 mins	Buffering capacity
>60 s – low	Sticky/frothy	5.0-5.8	<3.5 mL – very low	0-5 – very low
30-60 s – normal	Frothy/bubbly	6.0-6.6	3.5-5.0 mL – low	6-9 – low
<30 s – high	Watery/clear	6.8-7.8	>5.0 mL – normal	10-12 – normal

3.2.10.3 Caries Management By Risk Assessment (CAMBRA) (10)

Disease indicators	Radiographic approximal enamel lesions
Risk factors	Visible heavy plaque on teeth Exposed roots
Protective factors	Lives/works/school in fluoridated community Fluoride toothpaste (1000 ppm+) at least twice daily Fluoride varnish in last 6 months Adequate saliva flow (>1.0 mL/min stimulated)

- Caries risk:
  - Low
- Suggested management:
  - OTC toothpaste with 1000 ppm fluoride, twice daily
  - 12-month recall

(10) Caries Management by Risk Assessment, Featherstone & Chaffee (2018).

3.3 Diagnoses and problem list

3.3.1 Diagnoses

Diagnosis		
Pathological	Restorations	Heavily restored dentition – large posterior amalgam restorations, large anterior composite restorations with history of multiple failures, crown
	Endodontic disease (11, 12)	41 clinically and radiographically satisfactory root canal treatment with no clinical signs of infection
	Periodontal disease (13)	Generalised Stage II Grade A stable periodontitis*
	Non-carious tooth surface loss	Attrition 13-12, 21-23, 34-43
	Cracked teeth	13, 23, 26, 34, 33, 43, 47
	Traumatic occlusion	21
	Medical	Atherosclerotic carotid arteries bilaterally Tonsilloliths
Morphological	Malocclusion	Class III malocclusion – habitual forward posture of mandible Bilateral posterior crossbite Rotated 24, 26
	Overbite/Overjet	Edge to edge
	Impacted teeth	18, 28
	Missing teeth	17, 16, 11, 25, 36, 35, 45
	Anterior impairment	Loss of vertical dimension / prosthetic space
	Posterior impairment	Supraerupted 26 Mesially tilted 37
	Aesthetic harmony	Missing 11 Fractured 21, 22 Discolouration 41
	Occlusal plane	Uneven
	Occlusal stability	Stable occlusion
	Guidance system	Group function
Host-related factors	Psychosocial	Excellent personal presentation Aesthetic concern Good dental attitude and motivated to attend appointments
	Habits	Fair oral hygiene High fermentable carbohydrate diet
	Socioeconomic	Financial resources available for dental care
	Medical	Medically compromised Limited manual dexterity
	Functional	Possible parafunction

(11) Classification, diagnosis and clinical manifestations of apical periodontitis, Abbott (2004). (12) A clinical classification of the status of the pulp and the root canal system, Abbott & Yu (2007). (13) Periodontitis: Consensus report if workgroup 2 of the 2017 world workshop on the classification of periodontal and peri-implant diseases and conditions, Papapanou et. al. (2018).

*Stage II – RBL 15%-33%, no tooth loss due to periodontitis, max probing depth ≤ 5 mm, mostly horizontal bone loss. Generalised – bone loss affects all teeth. Grade B – %BL/age 0.25-1.0, however heavy biofilm deposits with low levels of destruction, non-smoker, normoglycaemic. Unstable - probing depth ≥5 mm, however limited to one site. (13)

3.3.2 Problem list

- Carotid artery disease
- Poor aesthetics:
  - Missing 11
  - Failed composite restorations 21, 22
  - Discolouration 41
- Tight contact: 46D & 47M
- Generalised Stage II Grade A stable periodontitis with furcation involvement 46, 47
- Generalised anterior tooth wear:
  - Loss of vertical dimension / prosthetic space
  - Uneven occlusal plane
  - Group function
- Missing posterior teeth: 17, 16, 25, 36, 35, 45
- Impacted 18, 28
- Tonsilloliths

3.4 Prognosis (14)

3.4.1 Individual teeth

				15	14	13	12		21	22	23	24		26	27	
	48	47	46		44	43	42	41	31	32	33	34			37	
Iatrogenic compromising factors				×	×	×	✓		✓	✓	×	×		✓	×	
Anatomic irregularities				×	×	×	×		×	×	×	×		×	×	
Occlusal plane & tooth position				●	●	●	●		●	●	●	●		●	●	
Endodontic condition				●	●	●	●		●	●	●	●		●	●	
Restorability				●	●	●	●		●	●	●	●		●	●	
Periodontal condition				●	●	●	●		●	●	●	●		●	●	
Periodontal condition	●	●	●		●	●	●	●	●	●	●	●			●	
Restorability	●	●	●		●	●	●	●	●	●	●	●			●	
Endodontic condition	●	●	●		●	●	●	●	●	●	●	●			●	
Occlusal plane & tooth position	●	●	●		●	●	●	●	●	●	●	●			●	
Anatomic irregularities	×	×	×		×	×	×	×	×	×	×	×			×	
Iatrogenic factors	×	✓	×		×	×	×	×	×	×	×	×			×	

Key: Good, Fair, Questionable, Poor, Hopeless

Evaluation of pathology and scale of severity

	Class A – Good	Class B – Fair	Class C – Questionable	Class D – Poor
Periodontal condition	80%-100% bone support. Easily maintained.	50%-80% bone support. Can be well maintained.	30%-50% remaining bone support. Difficult to be well maintained.	<30% one support. Cannot be cleaned or maintained well and has evidence of active periodontal disease.
Restorability	80%-100% remaining sound coronal tooth structure. Easily restored.	50%-80% remaining sound coronal tooth structure. Restoration results in no infringement of biologic width, has adequate ferrule, good crown-root ratio.	30%-50% remaining sound coronal tooth structure. Achieving adequate ferrule would compromise crown-root ratio to some extent or affect adjacent structures.	<30% sound tooth structure. Extent of lost tooth structure does not enable good ferrule to be achieved without totally compromising support of adjacent tooth structures or crown-root ratio.
Endodontic condition	Can receive straightforward primary endodontic treatment, or already has good endodontic therapy.	Failing endodontic treatment can receive predictable re-treatment, or requires a difficult primary endodontic treatment.	Failing endodontic treatment that is difficult to predictably re-treat.	Failing endodontic treatment that cannot be predictably re-treated.
Occlusal plane & tooth position	Tooth in correct occlusal plane, position, slightly deviated from ideal.	Tooth out of correct occlusal plane, can be adjusted to function within correct occlusal plane.	Tooth out of occlusal plane and requires multiple procedures to function within occlusal plane.	Tooth severely out of occlusal plane, severely tilted that after extensive treatment will exhibit reduced crown-root ratio, prevent from serving as long-term unit in arch. Position impacts health of adjacent structures.

Factors that result in drop of determined class

Iatrogenic compromising factors	Perforations, extensive post preparations, minimal tooth structure thickness left after preparation, dental materials that cannot be removed, etc. 12, 21, 22 – minimal tooth structure thickness left after preparation 26, 47 – cracked teeth from large amalgam restorations

3.4.2 Patient-level risk factors

Biologic risk factors		
Medical conditions that impair immune function and healing	●	Nil
Impaired salivary flow/function	●	Adequate salivary flow
Medical condition or disability limiting oral hygiene	●	Limited manual dexterity
Other missing teeth	●	History of missing teeth due to caries
Behavioural risk factors		
Compromised or poor oral hygiene	●	Fair oral hygiene
Cariogenic diet	●	Low cariogenic diet
Low exposure to fluoride	●	Adequate exposure to fluoride
Parafunctional habits	●	Yes
Ability and willingness to adhere to long-term maintenance protocol	●	Depends on mood
Smoking	●	Non-smoker
Financial and personal risk factors		
Motivation for treatment	●	Highly motivated
Available resources for dental care	●	Yes
Willingness to commit finances, time, and effort	●	Yes
Attitude toward losing teeth	●	Strong willingness to preserve existing teeth
Understanding of one's condition and needed treatment	●	Yes
Aesthetic expectations	●	Reasonable
Low dental IQ	●	Adequate dental IQ with education

Key: Favourable
Questionable
Unfavourable

(14)Evaluation of prognosis of individual teeth and patient-level risk factors adapted from Samet and Jotkowitz (2009).

3.4.3 Overall dentition

- All teeth have sound periodontal health with exception of 46, 47 which have furcation involvement.
- All teeth have sound pulpal health with exception of 41 which has questionable root canal treatment.
- History of extensive restoration of posterior teeth has detrimental effect on restorability and prognosis.
- Anterior teeth 12, 21, 22 have poor to hopeless prognosis given little remaining tooth structure.
- Patient's medical history reveals high risk factors for stroke, therefore dental issues are of low priority.
- Despite this, low cariogenic, low acid diet and ability to maintain fair oral hygiene is favourable to prognosis of dentition.
- Patient has aesthetic motivation and is willing to commit finances, effort and time to treatment.
- If patient receives no attention for current condition:
  - High risk of stroke (carotid artery disease)
  - Detrimental effect on psychosocial wellbeing (poor aesthetics)
  - Loss of teeth (wear)
- Discussion of diagnoses and prognoses of dentition with patient led patient to decide on and commit to treatment.

3.5 Treatment options

Problem	Treatment Option		Benefits	Risks	Decision & Rationale
Carotid artery disease	1	• Immediate referral to General Practitioner	• Immediate management of atherosclerotic calcification • Reduce risk of stroke	• Patient refusal to listen to advice	Option 1: • Clinician's responsibility to diagnose disease from available information and refer patient to appropriate health care practitioner for management
Poor aesthetics: Missing 11	1	• No treatment	• No commitment required	• Does not address presenting complaint	Option 2: • Patient does not want commitment to extensive treatment plan involved with full mouth rehabilitation • Option addresses problem adequately with known risks
	2	• Partial denture	• Addresses presenting complaint • Moderate time and financial commitment	• Patient may feel uncomfortable and be unable to adapt to denture • History of unsatisfactory dentures, likelihood of similar outcome • Minimal prosthetic / material space, risking failure to provide aesthetics and durability	
	3	• Referral to Prosthodontist for full mouth rehabilitation • Implant?	• Addresses presenting complaint • Predictable outcome	• Substantial time and financial commitment • Surgical and post-surgical risks	
Poor aesthetics: Failed composite 21	1	• No treatment	• No commitment required	• Does not address presenting complaint	Option 3: • Patient wants to keep tooth as long as possible; tooth has hopeless prognosis • Immediate acrylic partial denture can function as transitional denture before committing to Co-Cr partial denture
	2	• Remove remaining restoration • Restore tooth	• Addresses presenting complaint • Minimal commitment required	• Tooth has hopeless prognosis • Little remaining tooth structure • History of failed restorations, likelihood of similar outcome	
	3	• Extraction • Immediate partial denture	• Addresses presenting complaint • Moderate time and financial commitment	• Extraction complications • Post-extraction complications • Patient may feel uncomfortable and be unable to adapt to denture • History of unsatisfactory dentures, likelihood of similar outcome • Minimal prosthetic / material space, risking failure to provide aesthetics and durability	

Poor aesthetics: Failed composite 22	1	• No treatment	• No commitment required	• Does not address presenting complaint	Option 3: • Patient wants to keep tooth as long as possible; tooth has poor prognosis • Tooth is restorable but longevity likely short-lived
	2	• Remove remaining restoration • Restore tooth	• Addresses presenting complaint • Minimal commitment required	• Tooth has poor prognosis • Little remaining tooth structure • History of failed restorations, likelihood of similar outcome • Minimal prosthetic / material space, risking failure to provide aesthetics and durability	
	3	• Extraction • Immediate partial denture	• Addresses presenting complaint • Moderate time and financial commitment	• Extraction complications • Post-extraction complications • Patient may feel uncomfortable and be unable to adapt to denture • History of unsatisfactory dentures, likelihood of similar outcome • Minimal prosthetic / material space, risking failure to provide aesthetics and durability	
Poor aesthetics: Discolouration 41	1	• No treatment	• No commitment required	• Poor aesthetics	Option 1: • Patient does not want treatment; discolouration does not bother patient
	2	• Remove restoration • Restore tooth	• Minimal commitment required	• Little remaining tooth structure, likelihood of restoration failure	
Tight contact 46D & 47M	1	• No treatment • Monitor	• No commitment required	• Plaque and food trapping, gingival inflammation • Caries, pulpal involvement, infection • Breakdown of tooth structure • Tooth loss	Option 1: • Patient does not want treatment
	2	• Remove restoration • Assess restorability • Restore tooth	• Eliminate plaque and food trap • Reduce risk of caries and periodontal problems • Restore with contours favourable for oral hygiene	• Inadequate remaining coronal tooth structure may involve extensive restorative work • Margins likely to be subgingival, difficult to restore	

Generalised Stage II Grade A stable periodontitis	1	• No treatment	• No commitment required	• Plaque and calculus accumulation • Deterioration of periodontal condition • Caries • Tooth loss • Systemic health effects	Option 2: • Favour periodontal and systemic health • Reduce risk of caries, potential for breakdown of tooth structure • Reduce risk of tooth loss • Create favourable environment for indirect and direct restoration procedures
	2	• Non-surgical periodontal therapy • Oral hygiene instruction	• Remove plaque and calculus to promote periodontal and systemic health • Reduce risk of caries • Reduce risk of tooth loss	• Post-operative pain, bleeding, swelling, bruising, infection • Increased tooth sensitivity • Gingival recession • Root surface exposure	
Generalised tooth wear: Attrition	1	• No treatment	• No commitment required	• Tooth wear • Tooth sensitivity • Cracked tooth syndrome • Pulpal involvement • Possibility of extensive treatment to save teeth • Loss of vertical dimension and prosthetic space • Aesthetic changes • Occlusal changes • Functional changes • Tooth loss	Option 1: • Patient does not want to wear occlusal splint • Patient does not want commitment to extensive treatment plan involved with full mouth rehabilitation
	2	• Occlusal splint	• Simple to use • Quick to fabricate • Reduce tooth wear and sequelae of tooth wear	• Patient may not use appliance	
	3	• Referral to Prosthodontist • Full mouth rehabilitation	• Potential to addresses presenting complaints with predictable outcome	• Substantial time and financial commitment	
Missing upper teeth: 17, 16, 25	1	• No treatment	• No commitment required	• Does not address presenting complaint	Option 1: • Patient does not want treatment; missing upper posterior teeth does not bother patient
	2	• Partial denture	• Moderate time and financial commitment • May improve function	• Patient may feel uncomfortable and be unable to adapt to denture • History of unsatisfactory dentures, likelihood of similar outcome	
Missing lower teeth: 36, 35, 45	1	• No treatment	• No commitment required	• Does not address presenting complaint	Option 1: • Patient does not want treatment; missing lower teeth does not bother patient
	2	• Partial denture	• Moderate time and financial commitment • May improve function	• Patient may feel uncomfortable and be unable to adapt to denture • History of unsatisfactory dentures, likelihood of similar outcome	
	3	• Implants	• Predictable outcome • May improve function	• Substantial time and financial commitment • Surgical and post-surgical risks	

Impacted: 18, 28	1	• No treatment	• No commitment required	• Root resorption adjacent tooth • Pericoronitis	Option 1: • Asymptomatic • Present for long time, unlikely to cause issues • Patient's concurrent medical issues higher priority • Risks outweigh benefits of extraction
	2	• Surgical extraction	• Complete removal of non-functional teeth	• Surgical extraction complications • Post-extraction complications	
Tonsilloliths	1	• Self-management (asymptomatic) • Oral hygiene • Warm salt water rinses	• Easy to manage • Potential for deposits to dislodge	• Patient refusal to listen to advice • Patient not able to maintain oral hygiene and consequent development of problems	Option 1: • Asymptomatic • Referral to General Practitioner if symptoms develop
	2	• Referral to General Practitioner (symptomatic)	• Complete removal of large/symptomatic deposits	• Surgical risks	

3.6 Management plan

Systemic phase	Referral to General Practitioner for management of carotid artery disease
Emergency phase	Not applicable
Control phase *Eliminate pain, infection, inflammation*	Patient education and consent to treatment
	Hygienic phase of periodontal therapy: scale and clean, local periodontal debridement 46 & 47, fluoride application, oral hygiene instruction
	Replace unsatisfactory restorations: 22MDLa
	Extraction: 21
Holding phase *Preserve residual dentition*	Assess response to periodontal therapy and oral hygiene compliance
	Monitor cracked teeth: 26, 47
Reconstructive phase *Replace lost tissue and stabilise occlusion*	Indirect prosthesis: Immediate acrylic upper partial denture replacing 16, 11, 21
Maintenance phase *Prevention of further breakdown*	1-week post-insert review
	Recall exam: 6 monthly periodontal maintenance Reinforce oral hygiene Monitor cracked teeth 26, 47
	Review immediate acrylic upper partial denture and replace with Co-Cr upper partial denture if appropriate

*Conformative approach taken.

3.7 Treatment delivery

3.7.1 Treatment delivery

Date: July 2020 – September 2020

	Date	Treatment
2020	July	Comprehensive exam
		Patient education and consent to treatment
		Supragingival scale and clean
		Fluoride application
		Oral hygiene instruction
		Referral to General Practitioner for management of carotid artery disease
	August	22 MIDLa composite replaced
		Immediate maxillary partial acrylic final impressions
	September	Immediate maxillary partial acrylic try-in
		21 extraction and immediate maxillary partial acrylic insert
		1 week post-operative review

*Note: Maintained conformative occlusal scheme throughout treatment plan.

- Patient education and consent to treatment:
  - Informed patient that due to lack of prosthetic space and current occlusal scheme, acrylic in anterior region will be thin and highly likely to fracture
  - Metal reinforcement will be requested to increase strength in anterior region
  - Immediate maxillary partial acrylic denture to be used as a transitional denture for partial Co-Cr denture
  - Patient understood issues, chose to follow through with treatment plan and consented to treatment
- Referral to General Practitioner management of carotid artery disease:
  - Patient underwent carotid surgery in 2019
- Immediate maxillary partial acrylic final impressions:
  - Maxillary PVS impression

  - Sent to lab for pour-up and fabrication of base and rim with teeth 16 and 11
  - Discussion of edge to edge placement: Unaesthetic due to short incisal length, decision to create increased overjet and minimal overbite



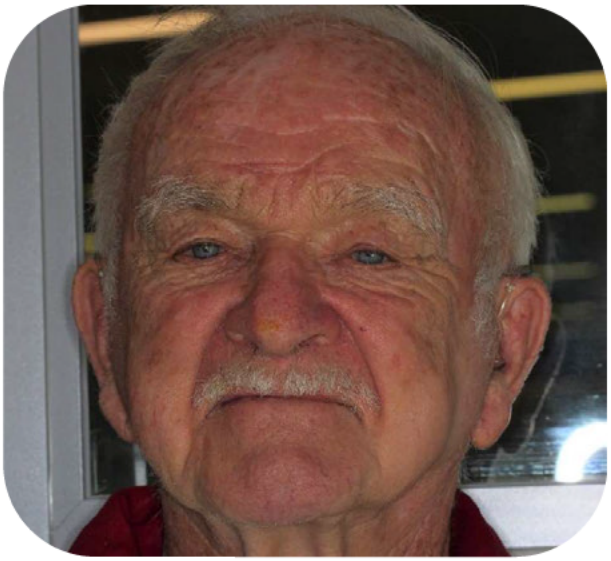
- Immediate base and rim try-in:
  - Confirmed shade selection Dentsply Portrait IPN A4
  - Midline satisfactory
  - Incisal width satisfactory, length could be shortened
  - Bilateral even contacts in occlusion and no interference in excursive movements in current overbite and overjet
  - Circumferential periodontal probing depth <2 mm around 21 noted for decoronation and tooth addition
  - Enameloplasty 32DI to create prosthetic space for 21 tooth addition
  - Note 22MIDLa composite was built up on the labial surface only

  - Sent to lab for immediate denture fabrication


  -
- 21 extraction and immediate maxillary partial acrylic insert:
  - Extraction uneventful
  - Immediate denture acrylic and clasps adjusted to fit, patient satisfied
  - Post-operative instructions for immediate denture given: leave in for 24 hours and remove if painful, warm salt water rinses
  - Oral and denture hygiene instruction
- 1-week post-operative review:
  - 21 extraction site has been sore and patient is not chewing on front
  - 21 extraction site healing normally with minimal bleeding and inflammation, granulation tissue present
  - Advised to continue warm salt-water rinses and to leave denture out until extraction site has healed and denture is tolerable
  - Immediate denture acrylic relieved and clasps tightened, assessed fit, stability and retention satisfactory
  - Prophy and reinforced oral and dental hygiene

3.7.2 Before and after photographs






*Note: After immediate denture insertion, open bite present due to thick acrylic on palatal which was relieved to close bite.

3.7.3 Patient response to treatment

- Patient was satisfied with overall outcome of treatment.
  - "It looks good."
- Resolution of presenting complaints:
  i. "My fillings (21, 22) have broken off."
     - 21 extracted and replaced with immediate denture.
     - 22 restored with composite.
  ii. "I have a missing tooth (11) that bothers me."
     - 11 replaced with immediate denture.
- Patient was compliant with dental advice and instructions and attended all dental appointments as scheduled despite serious ongoing medical issues.

3.7.4 Reflection

	Challenges	Management
Patient	Unwillingness to communicate	• Built rapport, trust, confidence over multiple appointments
Clinical	Edge to edge occlusion and Lack of prosthetic space	• Pathological and physiological tooth wear has resulted in loss of vertical dimension, tooth structure and occlusion • Due to patient age, medical issues and general unwillingness to undertake extensive treatment, decision made to undertake rehabilitation with conformative approach with the knowledge that treatment would not be ideal but a compromise • Denture teeth could be set with edge to edge occlusion, however tooth length would be excessively short resulting in poor aesthetic outcome • Therefore denture teeth set with increased overjet • In addition, palatal acrylic would be very thin due to lack of space • Patient was warned that acrylic is highly likely to fracture, but immediate denture with metal mesh reinforcement could function as transitional denture for future Co-Cr denture

CASE 4

Fixed Occlusal Rehabilitation

CASE 4

Fixed Occlusal Rehabilitation

4.1.1 Details

- 70 year-old male

4.1.2 Presenting complaint/s

- Presented in January 2019 for initial examination with the following complaints:
  i. "My teeth are stained."
  ii. "My back tooth on the left feels sensitive when I bite and it's wobbly."
  iii. "I feel like I'm chewing on my gums on the left side (27, 36) and have been avoiding chewing on that side for a long time."

4.1.3 History of presenting complaint/s

- 27 surgically extracted in February 2018 due to deep buccal caries.
- 28 gradually became mobile and sensitive on biting after extraction of 27.
- Predominantly been chewing on right side for about a decade due to soreness when chewing on edentulous spaces (27, 36).

4.1.4 Medical history

Medical condition	Description	Dental implications (1)
History of myocardial infarction (heart attack) Stent procedure 2001	Blockage of coronary artery. Most common sign is chest discomfort or pain which can spread to arms, neck, jaw, back and can often last longer than 10 minutes. Requires emergency treatment.	Heart attack in dental chair. Call 000.
Hypertension (controlled)	Blood pressure reading >140/90 mmHg. Medical emergency when >180/110 mmHg. Can lead to serious problems including heart attack, stroke, heart failure, kidney failure.	Hypertensive emergency in dental chair. Call 000.
Asthma (controlled)	Triggered by exposure to airborne irritants. Wheezing, coughing, chest tightness or shortness of breath. Medical emergency when symptoms worsen rapidly, speaking becomes difficult, lips look blue or little relief from reliever inhaler.	Asthma attack in dental chair. Sit person upright, reassure. Give water. Give 4 puffs blue/grey reliever every 4 minutes. If symptoms do not improve call 000.

(1) Therapeutic guidelines: oral and dental (2019).

Medication	Dosage	Use & Mechanism of action (2, 3)	Dental implications (2, 3)
CoPlavix (Clopidogrel/Aspirin)	75/100mg tab q.d.	Anti-platelet to reduce risk of stent clotting and post-MI. Inhibits platelet aggregation by binding to $P2Y_{12}$ platelet receptor and inhibiting cyclo-oxygenase (COX), reducing synthesis of thromboxane (induces platelet aggregation)	Prolongs bleeding time. NSAIDs may be contraindicted due to drug interaction.
Tryzan (Ramipril)	10mg tab q.d.	ACE inhibitor to reduce blood pressure and post-MI. Blocks conversion of Angiotensin I to Angiotensin II (induces vasoconstriction, sodium retention, and aldosterone release which mediates sodium retention). Inhibits breakdown of bradykinin (vasodilator and diuretic)	NSAIDs may be contraindicated due to drug interaction.
Dilatrend (Carvedilol)	25mg tab q.d.	Non-selective vasodilating β-blocker to reduce blood pressure. Reduces heart rate, blood pressure and cardiac contractility.	May increase sensitivity to allergens and severity of anaphylaxis, adrenaline treatment may not always give expected therapeutic effect.
Azotet (Ezetimibe/Atorvastatin)	10/80mg tab q.d.	Cholesterol intestinal absorption inhibitor and HMG-CoA reductase (involved in cholesterol synthesis) inhibitor for hypercholesterolaemia.	Nil.
Temazepam (Benzodiazepine)	10mg tab p.r.n.	Sedative/hypnotic used as adjunct in short term management of insomnia. Depresses central nervous system.	Nil. Note: drug of dependence
Symbicort (Budesonide/Formoterol)	p.r.n.	Inhaled corticosteroid and long-acting β_2-adrenergic agonist for maintenance and symptom relief of asthma. Anti-inflammatory action and bronchodilation.	Increases susceptibility to dental caries, dental erosion, periodontal disease, oral candidiasis. (4)
Zyrtec (Cetirizine hydrochloride)	p.r.n.	Antihistamine for symptom relief of allergic rhinitis. Anti-inflammatory action.	Nil.

Nasonex (Mometasone furoate)	p.r.n.	Topical corticosteroid for symptom relief of allergic rhinitis. Anti-inflammatory action.	Nil.
Nurofen (Ibuprofen)	p.r.n.	Analgesic, antipyretic and anti-inflammatory action for temporary relief of back pain. Inhibits synthesis of COX-1 and COX-2 which mediate synthesis of prostaglandins (involved in inflammatory process).	Nil.
Panadol (Paracetamol)	p.r.n.	Analgesic and antipyretic action for temporary relief of back pain. Unknown mechanism of action.	Nil.
Turmeric	b.d.	Naturopathic medicine to delay dementia.	Nil.
Magnesium	b.d.	Muscle relaxant for muscular twitches.	Nil.
Coenzyme Q10	q.d.	Antioxidant for general wellbeing skin health.	Nil.

(2) Monthly Index of Medical Specialities Australia. (3) Australian Medicines Handbook.

Allergy	Description	Dental implications
Hay fever (allergic rhinitis)	Allergic response to indoor and outdoor allergens. Immune response releases histamine triggering inflammation causing runny and itchy nose, sneezing, itchy and watery eyes.	Nil.

Alcohol & Tobacco Use	Amount, Frequency & Duration	Dental implications
Current smoker	35 cigarettes per week for > 50 years.	Staining of teeth and restorations. Reduced ability to taste, smell Impaired wound healing. Susceptibility to oral candidosis, caries, periodontal disease, implant failure. Development of oral mucosal diseases and oral cancer. (39)
Current drinker	1 – 2 standard drinks per year.	Alcohol consumption raises risk of cancer including on lip and in oral cavity. (5)

4.1.5 Dental history and dental attitude

- Dental history
  - History of irregular attendance to dentist.
  - Presented for extraction of infected 27 due to buccal caries in February 2018.
  - Presented to student clinic for initial examination in February 2019.

- Dental attitude
  - Functional and aesthetic motivation.
  - Concerned about bad breath and stained teeth.
  - Concerned about damage to teeth from dental procedures.
  - Never missed an appointment.

4.1.6 Oral hygiene

- Good oral hygiene
  - Uses electric toothbrush and fluoride toothpaste twice daily.
  - Uses oral irrigator daily, struggles to use floss.
  - Does not use any other cleaning adjuncts.

4.1.7 Social history

- Works as a casual removalist.
- Separated with adult children.
- Enjoys socialising with friends.

4.2 Examination and diagnostics

Date: February 2019

4.2.1 Extra-oral examination

Findings	
Facial symmetry	Absence of facial swelling
Facial skin	Hyperpigmentation
Lips	Hydrated, smooth lips and distinct vermillion border
Temporomandibular joint	Clicking and crepitus on opening left hand side Absence of clicking and crepitus on closing and in excursion bilaterally Absence of pain and tenderness on palpation
Lymph nodes	No sign of lymphadenopathy Absence of pain and tenderness on palpation
Muscles of mastication	Absence of pain and tenderness on palpation
Thyroid gland	No obvious abnormal enlargement

4.2.2 Extra-oral photographs

4.2.3 Intraoral examination

Findings	
Labial mucosa	No abnormalities detected
Buccal mucosa	Bilateral horizontal white lines level with occlusal plane* 8mm x 8mm white patch left buccal mucosa**
Hard palate	No abnormalities detected
Soft palate	No abnormalities detected
Gingivae	Generalised brown spots on gingiva***
Tongue	White coat on dorsum Scalloping on lateral borders
Floor of mouth	No abnormalities detected

*Frictional hyperkeratosis.
**Oral medicine referral confirmed frictional hyperkeratosis
***Racial pigmentation.

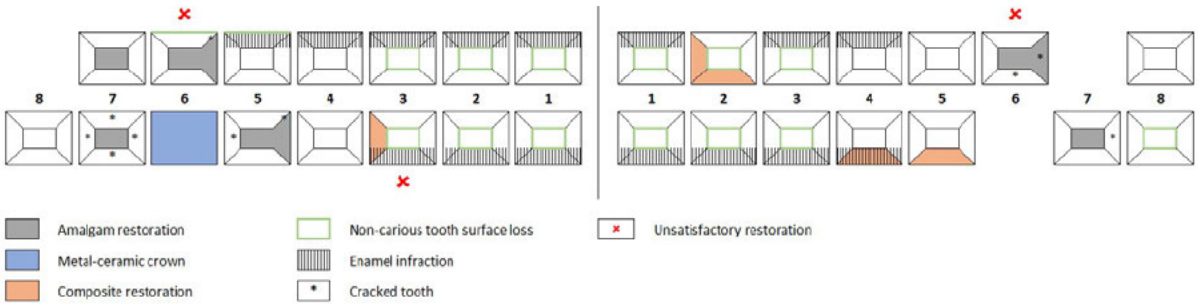
4.2.4 Intraoral photographs and findings

View	Findings	
Maxillary occlusal	Teeth	Stained dentition Spacing between 14 and 13, 23 and 24 Non-carious tooth surface loss 13, 21, 23
	Restorations	Amalgam restorations 17, 16, 26
	Soft tissues	Generalised racial pigmentation
Mandibular occlusal	Teeth	Stained dentition Missing 36 Non-carious tooth surface loss incisal 33-43
	Restorations	Amalgam restorations 37, 45, 47 Metal-ceramic crown 46
	Soft tissues	-
Right buccal	Teeth	Stained dentition Spacing between 14 and 13
	Restorations	Amalgam restoration 16 Metal-ceramic crown 46 (stained margin)
	Soft tissues	Gingival recession at 16, 44, 45, 47 Generalised racial pigmentation
Left buccal	Teeth	Stained dentition Non-carious tooth surface loss 24B, 26B, 37B Missing 27, 36 Present 28, 38
	Restorations	Amalgam restoration 37 Composite restoration 35, 34
	Soft tissues	Gingival recession at 24, 26, 35, 34 Generalised racial pigmentation
Anterior	Teeth	Stained dentition White opacities labial 12-22 Non-carious tooth surface loss 16, 13, 21, 23, 33-43 Spacing between 31 and 41 Supraeruption of anterior teeth Uneven occlusal plane
	Restorations	Metal-ceramic restoration 46 Composite restoration 35, 34
	Soft tissues	Gingival recession at 16, 13, 23, 35, 34, 33, 43, 44, 45 Loss of interdental papilla 33-43 Generalised racial pigmentation

4.2.5 Occlusion

Findings	
Overjet	1.5 mm
Overbite	1 mm
Canine class	LHS: Class III, RHS: Class III
Molar class	LHS: -, RHS: Class III
Crossbite	Absent
Crowding / Spacing	Between 14 and 13, 23 and 24, 31 and 41
Rotation	Absent
Supraeruption	26
Occlusal scheme	Group function

4.2.6 Odontogram



4.2.7 Periodontal assessment

4.2.7.1 Community Index of Periodontal Treatment Needs (CPITN)

Findings		
CPITN 1 1 0 2 2 1	Sextant 1	Generalised staining and gingival recession 16B, 17B
	Sextant 2	Generalised staining
	Sextant 3	Generalised staining and gingival recession 26BPD
	Sextant 4	Generalised staining and gingival recession 34B, 37B, 38B
	Sextant 5	Generalised staining
	Sextant 6	Generalised staining and gingival recession 46B, 47B

4.2.7.2 Periodontal examination

	Findings	
Clinical	Gingival tissues	Firm stippled texture Pink with racial pigmentation Blunted papillae around lower anterior teeth No bleeding on probing
	Plaque distribution	Interproximal areas around molars
	Plaque score	13%
	Calculus distribution	Lingual lower anterior teeth
	Plaque-retentive factors	Tight contact 46D
	Furcation involvement	No
	Halitosis	Yes
Radiographic	Bone levels	Generalised mild horizontal bone loss in maxilla and mandible

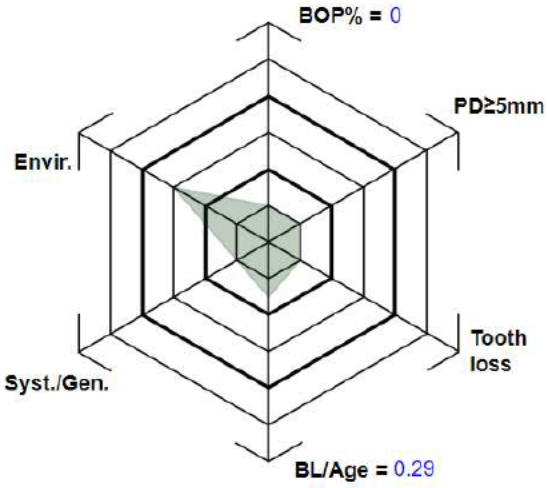
4.2.7.3 Periodontal tests

Mobility		-	-	-	-	-	-	-	-	-	-	-	-	-		GI
TTPalp		-	-	-	-	-	-	-	-	-	-	-	-	-		-
TTP		-	-	-	-	-	-	-	-	-	-	-	-	-		+
		17	16	15	14	13	12	11	21	22	23	24	25	26		28
	48	47	46	45	44	43	42	41	31	32	33	34	35		37	38
TTP	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
TTPalp	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
Mobility	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-

4.2.7.4 Periodontal chart

- Lack of periodontal pocketing >3 mm and general risk assessment did not warrant full periodontal chart.

4.2.7.5 Periodontal Risk Assessment (PRA) (7, 8)



Polygon surface: 6.928203

Periodontal Risk: low

Suggested Recall Interval: **12** Months

Age	70
Number of teeth and implants	29 (1 - 32)
Number of sites per tooth / implant	○ 2 ○ 4 ◉ 6
Number of BOP-pos. sites	0 of 174
Number of sites with PPD≥5mm	0
Number of missing teeth	2
% alveolar bone loss (estimated in % or 10% per 1mm)	20 %
Syst./Gen.	○ Yes ◉ No
Envir.	○ Non-smoker (NS) ○ Former smoker (FS) ◉ Occasional smoker (OS) ○ Smoker (S) ○ Heavy smoker (HS)

Periodontal Risk Assessment (PRA) for patients in Supportive Periodontal Therapy (SPT). (7) PRA tool. (8)

4.2.8 Pulp sensibility tests

EPT												27	24	19		19
CO_2												-	-	+		+
		17	16	15	14	13	12	11	21	22	23	24	25	26		28
	48	47	46	45	44	43	42	41	31	32	33	34	35		37	38
CO_2												-	-		+	+
EPT												27	25		9	15

*26, 35, 37 tested prior to fixed prosthodontics. 28 tested as symptomatic.

4.2.9 Radiographs

Rationale: each radiograph taken has rationale where stated – ALARA

Note: Subscript a = amalgam, c = composite, m = metallic, p = metal-ceramic

4.2.9.1 Orthopantogram

Date: 24/1/2018

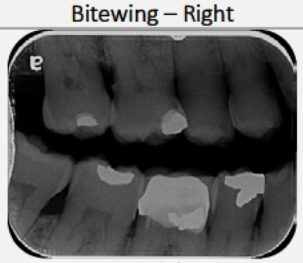
Findings (9)	
Periphery and corners	Nil abnormalities detected
Cortices of mandible	Continuous and even
Cortices of maxilla	Nil abnormalities detected
Zygomatic bones	Nil abnormalities detected
Maxillary sinuses	Internal density of sinuses: radiopaque shadow within sinuses
Nasal cavity and palate	Nil abnormalities detected
Bone pattern of maxilla	Normal density and trabeculation
Bone pattern of mandible	Normal density and trabeculation One radiopaque spot on left angle of mandible inferior to mandibular canal One radiolucent spot on apex of distal root of 38
Alveolar processes	Generalised mild horizontal bone loss in maxilla and mandible Possible furcation involvement 46
Teeth	Endodontically treated 27 Caries 35M? Large restorations 27, 46 Amalgam restorations 16, 26, 37, 45, 47 Composite restorations 22, 43 Missing 36, present 28, 38

Interpretation of panoramic radiographs, Perschbacher (2012). (9)

4.2.9.2 Bitewings

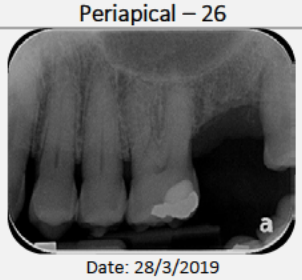
Bitewing – Left	Findings	
 Date: 11/2/2019 Rationale: interproximal caries detection	Caries	Nil detected
	Restorations	26DO$_a$ (deep radiopaque lining), 37O$_a$, 35B$_c$, 34B$_c$
	Pulp	Receded pulp horns all teeth
	Periodontium	26M, 37M slight PDL space widening Generalised crestal bone loss Lower bone height 27 extraction site
	Other	26 supraeruption 37 & 38 mesial tilt Overlapping contact points

*Clinically confirmed non-carious.

Bitewing – Right	Findings	
 Date: 11/2/2019 Rationale: interproximal caries detection	Caries	15MO (?)*, 46D (?)**
	Restorations	17O$_a$, 16MO$_a$, 45MO$_a$, 46 pinned core & crown$_p$, 47O$_a$
	Pulp	Receded pulp horns all teeth
	Periodontium	Generalised crestal bone loss
	Other	Calculus 16D Overlapping contact points

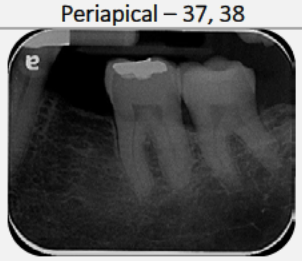
*Clinically non-carious and asymptomatic.
**Clinically satisfactory.

4.2.9.3 Periapicals

Periapical – 26	Findings	
 Date: 28/3/2019 Rationale: Check for pathology before fixed prosthodontics	Caries	Nil detected
	Restorations	26MO$_a$ (deep radiopaque lining)
	Pulp	Receded pulp horns all teeth
	Periodontium	Intact PDL space & lamina dura 24, 25 Slightly widened PDL space 26M, 28M Generalised crestal bone loss Lower bone height 27 extraction site Nil PA radiolucency 24, 25, 26
	Other	-

Periapical – 28	Findings	
 Date: 28/3/2019 Rationale: Check for pathology as tooth symptomatic	Caries	Nil detected
	Restorations	Nil
	Pulp	Receded pulp horn
	Periodontium	Widened PDL space 28M Nil PA radiolucency
	Other	Calculus 28D

Periapical – 35	Findings	
 Date: 28/3/2019 Rationale: Check for pathology before fixed prosthodontics	Caries	Nil detected
	Restorations	$35B_c$
	Pulp	Receded pulp horn
	Periodontium	Intact PDL & lamina dura Generalised crestal bone loss Nil PA radiolucency
	Other	-

Periapical – 37, 38	Findings	
 Date: 28/3/2019 Rationale: Check for pathology before fixed prosthodontics	Caries	Nil detected
	Restorations	$47O_a$
	Pulp	Receded pulp horns
	Periodontium	Intact PDL space & lamina dura 24, 25 Widened PDL space 37M Generalised crestal bone loss Nil PA radiolucency 37, 38
	Other	37 & 38 mesial tilt 37 blurring of distal root* Overlapping contact points

*Mental foramen

Periapical – 46	Findings	
 Date: 11/2/2019 Rationale: Check for pathology due to large restoration	Caries	45M (secondary caries)
	Restorations	$45MO_a$, 46 pinned core & $crown_p$, $47O_a$
	Pulp	Receded pulp horns all teeth
	Periodontium	Widened PDL space 44D, 45M&D, 46M&D Generalised crestal bone loss PA radiolucency 45?*
	Other	44 bulbosity lower third root 45 bulbosity middle third root 46 blurring of distal root?**

*Mental foramen

**Possibly ankylosed

4.2.10 Caries risk assessment

4.2.10.1 Dietary assessment

- Generally, diet is:
  - High in fatty foods
  - Moderate fermentable carbohydrates
  - Low sugar
  - Low acid
  - Limited snacking frequency

4.2.10.2 Saliva test

Unstimulated saliva			Stimulated saliva	
Flow rate	Consistency	pH	Quantity at 5 mins	Buffering capacity
>60 s – low	Sticky/frothy	5.0-5.8	<3.5 mL – very low	0-5 – very low
30-60 s – normal	Frothy/bubbly	6.0-6.6	3.5-5.0 mL – low	6-9 – low
<30 s – high	Watery/clear	6.8-7.8	>5.0 mL – normal	10-12 – normal

4.2.10.3 Caries Management By Risk Assessment (CAMBRA) (10)

Disease indicators	Visible cavities or radiographic penetration of dentine
Risk factors	Exposed roots
Protective factors	Lives/works/school in fluoridated community Fluoride toothpaste (1000 ppm+) at least twice daily Adequate saliva flow (>1.0 mL/min stimulated)

- Caries risk:
  - Low
- Suggested management:
  - OTC toothpaste with 1000 ppm fluoride, twice daily
  - 12-month recall

(10) Caries Management by Risk Assessment, Featherstone & Chaffee (2018).

4.3 Diagnoses and problem list

4.3.1 Diagnoses

Diagnosis		
Pathological	Caries	45M (secondary)
	Restorations	Posterior amalgams and composite restorations, 16, 26, 43, unsatisfactory Metal-ceramic crown 46, unsatisfactory
	Periodontal disease (13)	Generalised Stage II Grade B stable periodontitis modified by smoking*
	Oral medicine	Bilateral frictional keratosis of buccal mucosa
	Non-carious tooth surface loss	16-15, 13-23, 35-45
	Cracked teeth	16, 21-22, 37, 31, 43, 45, 47
	Trauma	28 traumatic occlusion
Morphological	Angle class	Indications Angle skeletal class III
	Malocclusion	Class III malocclusion Supraerupted 26 and lower anterior teeth Mesially tilted 37, 38
	Overbite/Overjet	1 mm / 1.5 mm
	Missing teeth	18, 27, 36
	Occlusal stability	Stable occlusion
	Guidance system	Group function
Host-related factors	Psychosocial	Excellent personal presentation High aesthetic and functional concern Good oral hygiene compliance Good dental attitude and motivated to attend appointments
	Habits	Good oral hygiene Low sugar, acid and fermentable carbohydrate diet Current smoking habit with no intention to quit - Tar and nicotine staining of teeth - Halitosis
	Socioeconomic	Unlikely to use financial resources for dental care
	Medical	Compromised cardiovascular and respiratory health
	Functional	Parafunctional habits

(11) Classification, diagnosis and clinical manifestations of apical periodontitis, Abbott (2004). (12) A clinical classification of the status of the pulp and the root canal system, Abbott & Yu (2007). (13) Periodontitis: Consensus report if workgroup 2 of the 2017 world workshop on the classification of periodontal and peri-implant diseases and conditions, Papapanou et. al. (2018).

*Stage II – RBL 15-33%, no tooth loss due to periodontitis, max probing depth ≤ 5 mm, mostly horizontal bone loss. Generalised – bone loss affects all teeth. Grade B – %BL/age 0.25-1.0, smoker, normoglycaemic. Stable - probing depth ≤ 5 mm (13)

4.3.2 Problem list

- Secondary caries: 45M
- Unsatisfactory restorations: 16MB fractured, 26DO cracked, 43D debonded, 46D tight contact and catch at buccal furcation
- Traumatic occlusion: 28
- Missing 27 and 36 causing discomfort during function
- Generalised Stage II Grade B stable periodontitis modified by smoking
- Generalised staining and halitosis related to smoking
- Non-carious tooth surface loss 16-15, 13-23, 35-45 and cracked teeth 16, 21-22, 37, 31, 43, 45, 47 likely related to parafunction
- Current smoking habit with no intention to quit

4.4 Prognosis (14)

4.4.1 Individual teeth

		17	16	15	14	13	12	11	21	22	23	24	25	26		28
Iatrogenic compromising factors		×	✓	×	×	×	×	×	×	×	×	×	×	✓		×
Anatomic irregularities		×	×	×	×	×	×	×	×	×	×	×	×	×		✓
Occlusal plane & tooth position		●	●	●	●	●	●	●	●	●	●	●	●	●		●
Endodontic condition		●	●	●	●	●	●	●	●	●	●	●	●	●		●
Restorability		●	●	●	●	●	●	●	●	●	●	●	●	●		●
Periodontal condition		●	●	●	●	●	●	●	●	●	●	●	●	●		●
	48	47	46	45	44	43	42	41	31	32	33	34	35		37	38
Periodontal condition	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●
Restorability	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●
Endodontic condition	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●
Occlusal plane & tooth position	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●
Anatomic irregularities	×	×	×	×	×	×	×	×	×	×	×	×	×		×	×
Iatrogenic factors	×	✓	×	✓	×	×	×	×	×	×	×	×	×		✓	×

Key: Good; Fair; Questionable; Poor; Hopeless

Evaluation of pathology and scale of severity

	Class A – Good	Class B – Fair	Class C – Questionable
Periodontal condition	80%-100% bone support. Easily maintained.	50%-80% bone support. Can be well maintained.	30%-50% remaining bone support. Difficult to be well maintained.
Restorability	80%-100% remaining sound coronal tooth structure. Easily restored.	50%-80% remaining sound coronal tooth structure. Restoration results in no infringement of biologic width, has adequate ferrule, good crown-root ratio.	30%-50% remaining sound coronal tooth structure. Achieving adequate ferrule would compromise crown-root ratio to some extent or affect adjacent structures.
Endodontic condition	Can receive straightforward primary endodontic treatment, or already has good endodontic therapy.	Failing endodontic treatment can receive predictable re-treatment, or requires a difficult primary endodontic treatment.	Failing endodontic treatment that is difficult to predictably re-treat.
Occlusal plane & tooth position	Tooth in correct occlusal plane, position, slightly deviated from ideal.	Tooth out of correct occlusal plane, can be adjusted to function within correct occlusal plane.	Tooth out of occlusal plane and requires multiple procedures to function within occlusal plane.

Factors that result in drop of determined class

Anatomic irregularities	Irregularly shaped roots, multiple canals and/or roots, thin and/or short roots, and excessively conical roots, etc.
Iatrogenic compromising factors	Perforations, extensive post preparations, minimal tooth structure thickness left after preparation, dental materials that cannot be removed, etc. 16, 26, 37, 45, 47 – cracked teeth from amalgam restorations, parafunction

4.4.2 Patient-level risk factors

Biologic risk factors		
Medical conditions that impair immune function and healing	●	Nil
Impaired salivary flow/function	●	Adequate salivary flow
Medical condition or disability limiting oral hygiene	●	Nil
Other missing teeth	●	History of missing teeth due to periodontal disease or caries
Behavioural risk factors		
Compromised or poor oral hygiene	●	Good oral hygiene
Cariogenic diet	●	Low cariogenic diet
Low exposure to fluoride	●	Adequate exposure to fluoride
Parafunctional habits	●	Yes
Ability and willingness to adhere to long-term maintenance protocol	●	Yes
Smoking	●	Current smoker
Financial and personal risk factors		
Motivation for treatment	●	Highly motivated
Available resources for dental care	●	Maybe
Willingness to commit finances, time, and effort	●	Yes
Attitude toward losing teeth	●	Strong willingness to preserve existing teeth
Understanding of one's condition and needed treatment	●	Yes
Aesthetic expectations	●	Reasonable
Low dental IQ	●	Adequate dental IQ with education

Key: Favourable
Questionable
Unfavourable

(14)Evaluation of prognosis of individual teeth and patient-level risk factors adapted from Samet and Jotkowitz (2009).

4.4.3 Overall dentition

- All teeth have sound periodontal and pulp health, and are in the correct occlusal plane or require little occlusal adjustment
- History of amalgam restorations in posterior teeth and parafunction has detrimental effect on restorability and prognosis of 16, 26, 37, 45, 46, 47.
- High occlusal loading and conical root pattern of 28 gives tooth questionable prognosis
- Patient's unremarkable medical history, low cariogenic diet, overall dental attitude and motivation, and ability to maintain good oral hygiene is favourable to prognosis of dentition however smoking habit has detrimental effect on periodontal condition
- If patient receives no treatment for current condition:
  - Aesthetic and social issues associated with stained teeth and halitosis
  - Functional issues due to inability to comfortably function using left side
  - Progression of periodontal disease and worsening of periodontal condition
  - Progression of carious disease process, potential to cause pulpal involvement and consequently infection, pain and tooth loss with no intervention
  - Potential for pulpal involvement of cracked teeth
- Discussion of diagnoses and prognoses of dentition with patient led patient to decide on and commit to treatment.

4.5 Treatment options

Problem	Treatment Option		Benefits	Risks	Decision & Rationale
45: secondary caries under MO amalgam	1	• No treatment	• No commitment required	• Pulpal involvement, infection • Breakdown of tooth structure • Tooth loss	Option 2: • Prevent further breakdown of tooth structure due to caries • Further deterioration of tooth may involve extensive/invasive treatment in future to save tooth or render tooth unrestorable
	2	• Remove caries and restoration • Restore tooth	• Tooth preservation	• Pulpal irritation, post-operative sensitivity	
16: unsatisfactory MO amalgam; MB fracture	1	• No treatment	• No commitment required	• Plaque trapping • Caries, pulpal involvement, infection • Breakdown of tooth structure	Option 2: • Eliminate plaque trap • Prevent breakdown of tooth structure due to caries
	2	• Remove restoration • Restore tooth	• Eliminate plaque trap • Tooth preservation	• Pulpal irritation, post-operative sensitivity	
26: unsatisfactory DO amalgam; cracked tooth (asymptomatic)	1	• No treatment • Monitor	• No commitment required • Conservative	• Crack progression • Caries, pulpal involvement, infection • Breakdown of tooth structure • Tooth loss	Option 1: • Asymptomatic • Crack investigation could lead to inability to restore tooth Option 2: • After tooth became symptomatic (cold sensitivity, TTP)
	2	• Remove restoration • Assess restorability • Restore tooth with direct/ indirect restoration	• Early intervention may prevent crack progression, caries, pulpal involvement, infection, catastrophic tooth fracture	• Pulpal irritation, post-operative sensitivity • Inadequate remaining coronal tooth structure may involve extensive restorative work • Following crack extensions could render tooth unrestorable and indicate tooth for extraction	
43: unsatisfactory D composite; open margins	1	• No treatment	• No commitment required	• Plaque trapping • Caries, pulpal involvement, infection • Breakdown of tooth structure • Tooth loss	Option 2: • Eliminate plaque trap • Prevent breakdown of tooth structure due to caries
	2	• Remove restoration • Restore tooth	• Eliminate plaque trap • Eliminate caries • Tooth preservation	• Pulpal irritation, post-operative sensitivity	
46: unsatisfactory metal-ceramic crown; D tight contact, catch at buccal furcation	1	• No treatment • Monitor • Oral hygiene instruction	• No commitment required	• Plaque and food trapping, gingival inflammation • Caries, pulpal involvement, infection • Breakdown of tooth structure	Option 1: • Patient did not want treatment • No gingival inflammation, bleeding or pocketing in area

	2	• Remove restoration • Assess restorability • Restore tooth	• Eliminate plaque and food trap • Restore with contours favourable for oral hygiene	• Inadequate remaining coronal tooth structure may involve extensive restorative work	• Provide oral hygiene instruction, monitor, reassess
28: traumatic occlusion	1	• No treatment	• No commitment required • Conservative	• Does not address presenting complaint	Option 2: • Tooth is in function • Extraction still an option if occlusal adjustment does not alleviate symptoms
	2	• Occlusal adjustment	• Addresses presenting complaint • Conservative	• May be ineffective	
	3	• Extraction	• Addresses presenting complaint • Irreversible	• Extraction complications • Post-extraction complications	
27: missing tooth; discomfort during function	1	• No treatment	• No commitment required	• Does not address presenting complaint	Option 1: • Patient does not want removable prosthesis • 28 is not a sound abutment due to poor periodontal support and size of tooth • Patient cannot afford implant, OHCWA waitlist is long with strict requirements, high risk of implant failure
	2	• Partial denture	• Addresses presenting complaint • Low cost • Easy to remove and maintain • Relatively quick to fabricate	• Patient may feel uncomfortable and be unable to adapt to denture • Preparation of sound teeth to replace one tooth	
	3	• Conventional bridge	• Addresses presenting complaint • Moderate cost • Comfortable and easier for patient to adapt to denture • Preparation of one previously restored tooth and one sound tooth • Relatively quick to fabricate	• More difficult to maintain • 28 is not a sound abutment due to poor periodontal support and size of tooth • Loss of abutment tooth	
	4	• Implant	• Addresses presenting complaint • Comfortable and easy for patient to adapt to denture • No preparation of sound teeth	• Expensive • Surgical and post-surgical risks • High risk of peri-implantitis and implant failure	
36: missing tooth; discomfort during function	1	• No treatment	• No commitment required	• Does not address presenting complaint	Option 3: • Patient does not want removable prosthesis • Patient cannot afford implant, OHCWA waitlist is long with strict requirements, high risk of implant failure • Only option that addresses presenting complaint with low risk
	2	• Partial denture	• Addresses presenting complaint • Low cost • Easy to remove and maintain • Relatively quick to fabricate	• Patient may feel uncomfortable and be unable to adapt to denture • Preparation of sound teeth to replace one tooth	
	3	• Conventional bridge	• Addresses presenting complaint • Moderate cost • Comfortable and easier for patient to adapt to denture • Abutment teeth are previously restored and have good periodontal support • Relatively quick to fabricate	• More difficult to maintain	

	4	• Implant	• Addresses presenting complaint • Comfortable and easy for patient to adapt to denture • Minimal preparation of sound teeth	• High cost • Surgical and post-surgical risks • High risk of peri-implantitis and implant failure	
Generalised Stage II Grade B periodontitis Generalised tar and nicotine staining Halitosis	1	• No treatment	• No commitment required	• Plaque and calculus accumulation • Deterioration of periodontal condition • Caries • Tooth loss • Systemic health effects • Poor aesthetic appearance and effect on self-esteem • Halitosis and effect on self-esteem	Option 2: • Favour periodontal and systemic health • Reduce risk of caries, potential for breakdown of tooth structure • Reduce risk of tooth loss • Create favourable environment for indirect and direct restoration procedures • Removal of stains to create aesthetic appearance • Reduce halitosis for self confidence
	2	• Non-surgical periodontal therapy • Oral hygiene instruction • Counsel cessation of smoking habit	• Remove plaque and calculus to promote periodontal and systemic health • Reduce risk of caries • Reduce risk of tooth loss • Remove tar and nicotine staining • Reduce halitosis	• Post-operative pain, bleeding, swelling, bruising, infection • Increased tooth sensitivity • Gingival recession • Root surface exposure	
Parafunction	1	• No treatment	• No commitment required	• Tooth wear • Tooth sensitivity • Cracked tooth syndrome • Pulpal involvement • Possibility of extensive treatment to save teeth • Loss of vertical dimension • Aesthetic changes • Occlusal changes • Functional changes • Tooth loss	Option 2: • Reduce potential for further breakdown of tooth structure
	2	• Occlusal splint • Counsel awareness of parafunctional habit	• Simple to use • Quick to fabricate • Reduce tooth wear and sequelae of tooth wear	• Patient may not use appliance	
Smoking habit	1	• Counsel cessation of smoking habit	• Eliminate source of tar and nicotine staining on teeth • Eliminate major cause of halitosis • Reduce risk of unstable periodontitis • Reduce risk of oral (and other) cancers • Reduce risk of post-operative infections and poor healing • Reduce adverse effects on systemic health	• Patient refusal to listen to advice	Option 1: • Failure to counsel cessation of habit and discuss oral health implications constitutes supervised neglect

4.6 Management plan

Systemic phase	Counsel cessation of smoking and discuss oral health implications Counsel development of awareness of parafunctional habit
Emergency phase	Not applicable
Control phase *Eliminate pain, infection, inflammation*	Patient education and consent to treatment
	Hygienic phase of periodontal therapy: Supragingival scaling, fluoride application, oral hygiene instruction
	Occlusal adjustment: 28
	Caries control: 45MO
	Replace unsatisfactory restorations: 16MO, 43D 26DOP*, 16B & 17B**, 21MI & 31DIL***, 32D****
	Referral to Oral Medicine: Investigation of white patch left buccal mucosa
Holding phase *Preserve residual dentition*	Assess response to periodontal therapy and oral hygiene compliance
	Monitor for symptoms: 28, 26
Reconstructive phase *Replace lost tissue and stabilise occlusion*	Indirect restorations: 35-37 conventional bridge 26 onlay
Maintenance phase *Prevention of further breakdown*	1 week post-insert review Occlusal splint 12-monthly recall examination and clean

*Added to treatment plan following development of symptoms (thermal sensitivity, tenderness to percussion, crack progression) in 2020

**Added to treatment plan following development of dentine hypersensitivity in 2020

***Added to treatment plan following patient complaint of poor aesthetics in 2020

****Added to treatment plan following cavitation in 2020

4.7 Treatment delivery

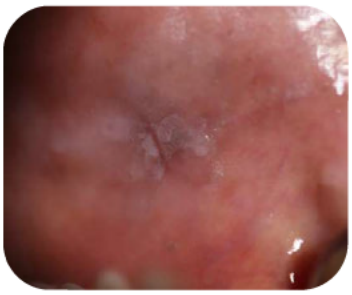
4.7.1 Treatment delivery

Date: February 2019 – September 2020

	Date	Treatment
2019	January	Comprehensive exam
		Counsel cessation of smoking
		Counsel development of awareness of parafunctional habits
		Patient education and consent to treatment
		28 occlusal adjustment
		Supragingival scale and clean Fluoride application Oral hygiene instruction
		Referral to Oral Medicine for white lesion left buccal mucosa
	February	45 MO amalgam replaced
		16 MO amalgam replaced
	March	43DB composite placed
	April	28 review following occlusal adjustment
		35-37 bridge preparation commenced
	May	35-37 bridge preparation continuation
	June	-
	July	35-37 bridge preparation completed
		35-37 bridge shade selection and final impressions
		35-37 bridge bisque try-in
		35-37 bridge insert
	August	35-37 bridge post-insert review
		28 review
	September	-
	October	-
	November	-
	December	-

	Date	Treatment
2020	January	Recall exam
	February	Supragingival scale and clean Fluoride application Reinforce oral hygiene instruction
		16B composite
		22MI composite
		26 investigation
	March	-
	April	-
	May	-
	June	-
	July	-
	August	26 onlay preparation
		26 shade selection and final impressions
	September	17B composite
		31DIL composite
		32D composite
		26 onlay insert
		26 onlay post-insert review

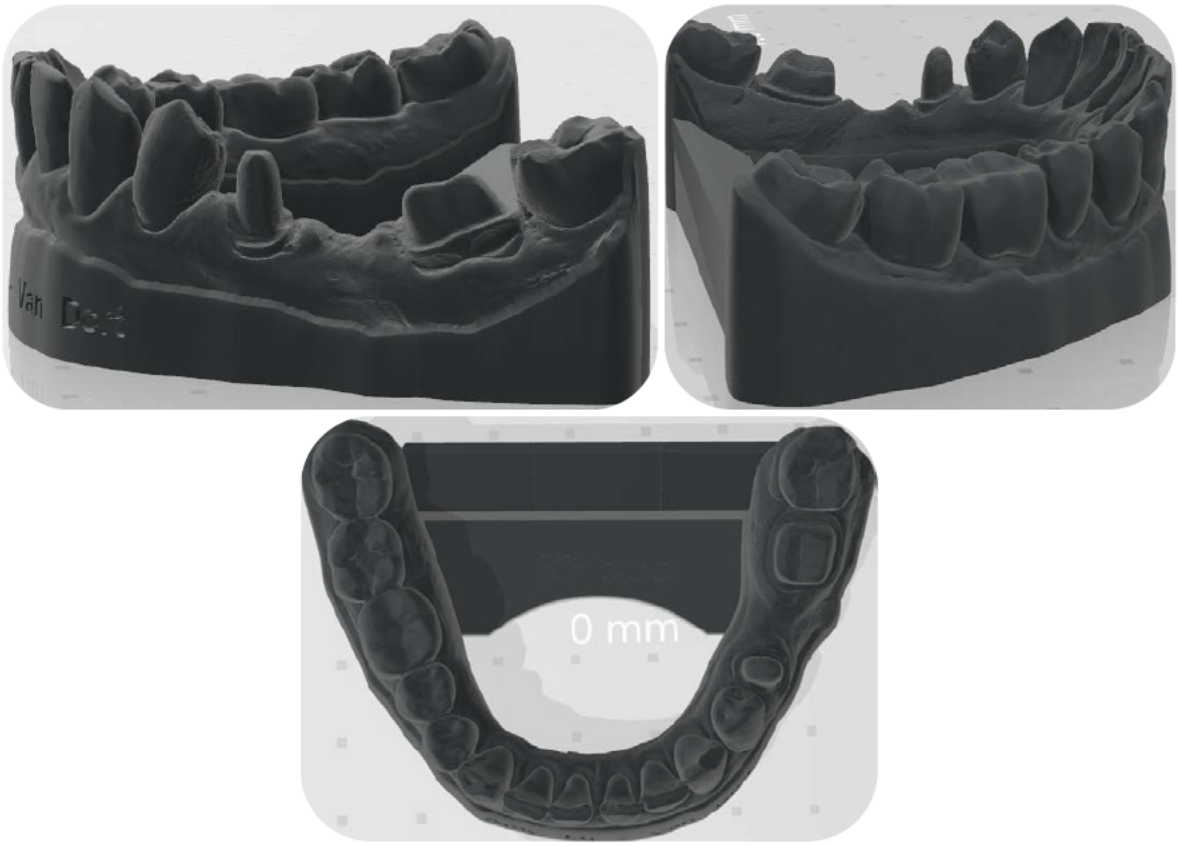
- Counsel cessation of smoking:
  - Educated patient on health risks, staining of teeth and halitosis due to cigarette smoking and advised cessation.
  - Patient had no intention to quit, however had reduced amount of cigarettes smoked for financial reasons.
- 28 occlusal adjustment:
  - Tooth adjusted out of occlusion to reduce loading and monitored.
- Referral to Oral Medicine for white lesion on left buccal mucosa:



  - Confirmed diagnosis of frictional hyperkeratosis.
- Scale and clean:
  - Minimal calculus, excessive tar and nicotine staining removed, difference shown to patient in mirror.
- 28 review following occlusal adjustment:
  - Patient reported reduction of symptoms and mobility and chose to leave tooth.
- 35-37 bridge preparation:
  - Pulp and periodontal status of teeth checked prior to commencement of tooth preparations.
  - 35 gross preparation and temporised with provisional Luxatemp crown.
  - 37 composite core build-up to increase preparation height and retention, then gross preparation and temporised with provisional Luxatemp crown.
  - 35-37 bridge preparation refined and temporised with provisional Luxatemp bridge fabricated from wax-up.

  - Multiple appointments required for preparation and refinement due to issues with path of insertion, inadequate reductions and uneven margins.

- 35-37 shade selection and final impressions
  - Shade Vitapan C4 selected with lab assistance and patient input.
  - Assessed gingiva underlying future pontic, firm and incompressible.
  - Final PVS impression and Trios digital scan taken and sent to lab.



  - Trios scan used to mill 3D model.
  - 35-37 zirconia bridge milled from CAD-CAM machine.

- 35-37 bridge bisque try-in:
  - Bisque try-in to confirm shade of bridge and check path of insertion.

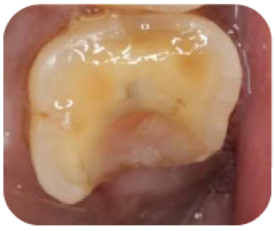
- 35-37 bridge insert:
  - Satisfactory fit, stability, retention, contacts, margins, contours
  - Occlusion high, adjusted.


- 35-37 bridge post-insert review:
  - Patient reported nil symptoms.
  - Intraoral exam found nil abnormalities.
  - Patient has maintained good oral hygiene and routinely uses oral irrigator to clean teeth and around bridge.
  - Final periapical radiograph taken – good marginal adaptation 35 & 37, PDL widening 37M, possible excess cement on 37M cleaned off, nil pathology.

- Recall exam:
  - Intraoral exam revealed 26 fractured amalgam and cracked tooth structure.
  - Maintained good oral hygiene.
- 26 investigation:
  - Radiograph taken to check for pathology, nil detected.

  - Removed fractured amalgam and cracks in tooth.
  - Assessed restorability, tooth requires full cuspal coverage for protection from cuspal flexure.
  - Temporised with GIC and monitored.

- 26 onlay preparation:
  - Deep preparation on supraerupted tooth with sound enamel margins.
  - Flowable composite liner placed at base of preparation.
  - Temporised with spot-etch and Luxatemp onlay.



- 26 shade selection and final impressions:
  - Shade Vitapan C4 selected.

  - Final PVS impression and Trios digital scan taken and sent to lab.

  - PVS impression poured up and used to fabricate 26 emax onlay.

- 26 onlay insert
  - Satisfactory fit, stability, retention, contours.
  - Distal vertical discrepancy <1.0 mm, clinically accepted.
  - Mesial horizontal discrepancy, adjustable, clinically accepted.
  - Light contact with 25, clinically accepted.
  - Even occlusion.

- 26 onlay post-insert review
  - Patient reported nil symptoms, 28 remained asymptomatic.
  - Intraoral exam found nil abnormalities.
  - Patient has maintained good oral hygiene and routinely uses oral irrigator to clean teeth and around all indirect restorations (26 onlay, 35-37 bridge, 46 crown).

Zirconia was material of choice for 3-unit bridge. Systematic review of published studies on zirconia-based fixed dental prostheses concluded that these perform reasonably well and may be considered a viable alternative to metal-ceramic fixed dental prostheses. (40) Common complications include abutment teeth needing endodontic therapy, re-cementation, repair of carious lesions. (41) The percentage of complete failures resulting from framework fracture (insufficient connector size) or loss of retention (under-reduction of tooth structure) was less than 10%. (41) Marginal discrepancy resulting in secondary caries was another issue. (41) As mechanical properties of zirconia, except modulus of elasticity is superior to other tooth-coloured restorations, and rate of fracture of zirconia was low or non-existent. (41) Prospective clinical study confirmed effectiveness of zirconia as clinical option to fabricate short-span posterior fixed dental prostheses with the material performing satisfactorily long-term, functionally and aesthetically, in posterior areas and in patients with standard biomechanical conditions (>90% cumulative survival rate). As the patient exhibits parafunction, metal-ceramic is another viable option for restoration of posterior area. (42)

Emax was material of choice for onlay due to evidence around survival of emax partial coverage restorations. (21) Tooth had good amount of enamel around margins after preparation available for bonding.

4.7.2 Before and after photographs

Date: February 2019 – September 2020

4.7.3 Patient response to treatment

- Patient was satisfied with overall outcome of treatment.
  - "I can chew on my left side now."
- Resolution of presenting complaints:
  i. "My teeth are stained."
     ✓ Tar and nicotine stains cleaned and advice given regarding cessation of smoking habit.
  ii. "My back tooth on the left feels sensitive when I bite and it's wobbly."
     ✓ Occlusal adjustment and placement of indirect restorations to 28 resulted in resolution symptoms.
  iii. "I feel like I'm chewing on my gums on the left side (27, 36) and have been avoiding chewing on that side for a long time."
     ✓ 35-37 bridge placement resolved issue however 27 edentulous site remained unchanged due to limited treatment options available.
- Patient was compliant with dental advice and instructions, but continues smoking habit.
- Patient has attended all appointments to date and will continue to attend OHCWA for maintenance.

4.7.4 Reflection

	Challenges	Management
Patient-related	Smoker's cough	• Patient has chronic cough associated with cigarette irritants, causing difficulty with certain procedures. For example, during 35-37 bridge preparation laceration to floor of mouth occurred. - Sit patient up for water breaks - Use tongue guard - Use assistance - Offer to reschedule appointments
Clinical	35-37 bridge preparation	• Issues with path of insertion, reductions, margins - Practice - Principle of conservation of tooth structure is important, however in some circumstances it is not a priority for success of restoration - More aggressive preparation of margins sometimes necessary to increase axial wall height for increased retention
	35-37 bridge provisional restoration	• Provisional Luxatemp crown dislodged and bridge fractured - Call patient in for re-make to protect exposed tooth structure - Adjust putty index to increase width of connector for increased strength - Fill in provisional deficiencies with flowable composite - Use provisional restorations as a guide to check adequacy of reductions
	35-37 bridge final impressions	• Bubble on external margin 37 - Practice impression technique
	35-37 try-in	• Loose point contact with 34 due to distal tilt of 34 - Enameloplasty of 34D would have broadened contact area and reduced potential for plaque and food trapping
	26 cementation	• Difficulty locking in restoration onto tooth - Preparation of positive groove to lock in restoration

CASE 5

Removable Occlusal Rehabilitation

CASE 5
Removable Occlusal Rehabilitation

5.1.1 Details

- 62 year-old female.

5.1.2 Presenting complaint/s

- Presented in July 2019 for initial examination with the following complaints:
  i. "My denture (F/-) is hurting me, I think it's too high (labial flange)."
  ii. "I don't have any teeth left."

5.1.3 History of presenting complaint/s

- Maxillary clearance due to severe periodontal disease and immediate maxillary full denture insert August 2018.
- Experienced no issues with soft tissue and bone healing following maxillary clearance.
- Teeth extracted over the years predominantly due to periodontal disease.

5.1.4 Medical history

Medical condition	Description	Dental implications (1)
Hypertension	Blood pressure reading >140/90 mmHg. Medical emergency when >180/110 mmHg. Can lead to serious problems including heart attack, stroke, heart failure, kidney failure.	Hypertensive emergency in dental chair. Call 000.
Hypercholesterolaemia	Increased triglycerides and LDL cholesterol and decreased HDL cholesterol. Increases chance of atherosclerosis and cardiovascular disease.	Nil.
Iron deficiency anaemia	Low (quality or quantity) red blood cell count or low haemoglobin level. Caused by blood loss or problems with red blood cells (diet, illness, medication side effects).	Anaesthetic risk – anoxia and increased risk of myocardial/ cerebral ischaemia resulting in cardiac arrest. Delayed wound healing. Post-operative haemorrhage, aggravation of anaemia, interference with haemostasis. Susceptibility to glossitis and angular cheilitis. Susceptibility to oral ulceration. Susceptibility to *Candida albicans* infection. (43, 44)
Reflux oesophagitis	Reflux of stomach contents into oesophagus resulting in chemical insult to oesophagus from gastric acid, enzymes, bile.	Difficulty tolerating horizontal position. Acid erosion and accelerated tooth wear.
Osteoarthritis	Inflammation and/or damage of joints affecting bone, cartilage, ligaments, muscles and causing pain, swelling, difficulty moving.	Physical difficulty maintaining oral hygiene. Unmanaged chronic pain may affect psychological wellbeing and capacity to maintain self-care, including oral hygiene.
History of Bells Palsy 2018 Managed by ENT specialist	Sudden weakness or paralysis on one side of the face. Thought to be caused by viral infection causing inflammation or damage to facial nerve. Symptoms include unilateral drooping of face to affected side, difficulty eating/drinking, drooling, pain/sensitivity around affected area, headache, taste impairment, changes in amount of tears/saliva. Usually temporary with full recovery in 3-6 months.	Drooling and susceptibility to angular cheilitis. Xerostomia and higher caries risk Inability to function normally (eating, speaking). Food trapping and plaque accumulation. (45)

(1) Theraeutic guidelines: oral and dental (2019).

Medication	Dosage	Use & Mechanism of action (2, 3)	Dental implications (2, 3)
Atenolol	50 mg tab q.d.	β-blocker for hypertension. Reduces heart rate, blood pressure and cardiac contractility via unknown mechanism.	Potential for drug interactions used in General Aesthesia resulting in severe bradyarrhythmia, attenuation of reflex tachycardia and hypotension, decreased reflex to compensate for blood loss and hypovolaemia, regional sympathetic blockade, increased propensity for vagal induced bradycardia. May increase sensitivity to allergens and severity of anaphylaxis, adrenaline treatment may not always give expected therapeutic effect.
Ranitidine	150 mg tab b.d.	Selective parietal cell H_2-receptor antagonist reducing gastric acid secretion. For short term symptomatic treatment of reflux oesophagitis unresponsive to conservative anti-reflux treatment e.g. antacids.	Nil.
Rabeprazole	20 mg tab t.d.	Proton pump inhibitor that binds to hydrogen-potassium ATPase enzyme system inhibiting stimulated and basal gastric acid production and secretion. For reflux oesophagitis.	Nil.
Ezetrol (Ezetimibe)	10 mg tab q.d.	Reduces absorption of dietary and biliary cholesterol by inhibiting transport across intestinal wall leading to increased LDL uptake and reduced plasma cholesterol.	Nil.
Panadol (Paracetamol)	p.r.n.	Analgesic and antipyretic action for temporary relief of back pain. Unknown mechanism of action.	Nil.
Echinacea	q.d.	Dietary supplement.	Long term use may have potential for immunosuppression and increased risk of poor wound healing and opportunistic infections. (46)
Omega-3	q.d.	Dietary supplement.	May inhibit platelet aggregation and increase bleeding risk. (46)
Magnesium	q.d.	Dietary supplement.	Nil.

(2) Monthly Index of Medical Specialities Australia. (3) Australian Medicines Handbook.

Allergy	Description	Dental implications
Bees	Anaphylactic reaction to bee venom.	Nil.

Alcohol & Tobacco Use	Amount, Frequency & Duration	Dental implications
Current drinker	1 – 2 standard drinks per year.	Alcohol consumption raises risk of cancer including on lip and in oral cavity. (5)

5.1.5 Dental history and dental attitude

- Dental history
  - History of irregular attendance at OHCWA.
  - Maxillary clearance due to severe periodontal disease and immediate maxillary full denture insert August 2018.
  - Nil issues with soft and hard tissue healing following extractions.
  - Maxillary immediate denture soft relined twice.
  - Unhappy with maxillary denture stability, retention and comfort.

- Dental attitude
  - Aesthetic and social motivation.
  - General negative attitude and apathy.
  - Poor adaptive capacity.
  - Tendency to attend dental appointments in unwell state.

5.1.6 Oral hygiene

- Poor oral hygiene
  - Uses manual toothbrush and sensitivity toothpaste twice daily.
  - Does not use interproximal cleaning aids.
  - Uses non-alcohol mouthwash.

5.1.7 Social history

- Part-time Red Cross volunteer.
- Unstable family relationships; main support sister and friends.
- Significant psychosocial issues caused by marriage breakdown and imprisonment of son in Laos.

5.2 Examination and diagnostics

Date: July 2019

5.2.1 Extra-oral examination

Findings	
Facial symmetry	Absence of facial swelling
Facial skin	Nil abnormalities detected
Lips	Hydrated, smooth lips and distinct vermillion border
Temporomandibular joint	Clicking on opening bilaterally Pain on palpation and opening right hand side Deviation to right hand side
Lymph nodes	No sign of lymphadenopathy Absence of pain and tenderness on palpation
Muscles of mastication	Pain on palpation
Thyroid gland	No obvious abnormal enlargement

5.2.2 Extra-oral photographs

5.2.3 Intraoral examination

Findings	
Labial mucosa	Nil abnormalities detected
Buccal mucosa	Nil abnormalities detected
Hard palate	Nil abnormalities detected
Soft palate	Nil abnormalities detected
Gingivae	Nil abnormalities detected
Tongue	Plaque on dorsum
Floor of mouth	Shallow

5.2.4 Intraoral photographs and findings

View	Findings	
Maxillary occlusal	Teeth	Edentulous
	Restorations	Nil
	Soft tissues	Flat U-shaped palate
Mandibular occlusal	Teeth	Heavily restored dentition Missing 34-42, 46-47 Non-carious tooth surface loss incisal/occlusal 43-44
	Restorations	Amalgam restorations 37, 36, 45
	Soft tissues	Marginal gingival inflammation Severe generalised gingival recession Thin, flat alveolar ridge Plaque on tongue dorsum
Anterior	Teeth	Partially dentate: Kennedy Applegate Class I (6) Miissing 34-42, 46-47 Supraeruption of anterior teeth Root exposure all teeth Uneven occlusal plane
	Restorations	Amalgam restorations 36, 45
	Soft tissues	Marginal gingival inflammation Severe generalised gingival recession, loss of interdental papilla Thin, flat alveolar ridge

5.2.5 Occlusion

Findings	
Overjet	-
Overbite	-
Canine class	LHS: -, RHS: -
Molar class	LHS: -, RHS: -
Crossbite	-
Crowding / Spacing	-
Rotation	Absent
Supraeruption	37-35, 43-45
Occlusal scheme	Group function

5.2.6 Odontogram

5.2.7 Periodontal assessment

5.2.7.1 Community Index of Periodontal Treatment Needs (CPITN)

Findings		
CPITN - - - 2* 2* 2*	Sextant 1	-
	Sextant 2	-
	Sextant 3	-
	Sextant 4	Generalised gingival recession >5 mm Furcation involvement 37-36 Abundant plaque, calculus Bleeding on probing
	Sextant 5	Generalised gingival recession >5 mm Abundant plaque, calculus Bleeding on probing
	Sextant 6	Generalised gingival recession >5 mm Abundant plaque, calculus Bleeding on probing

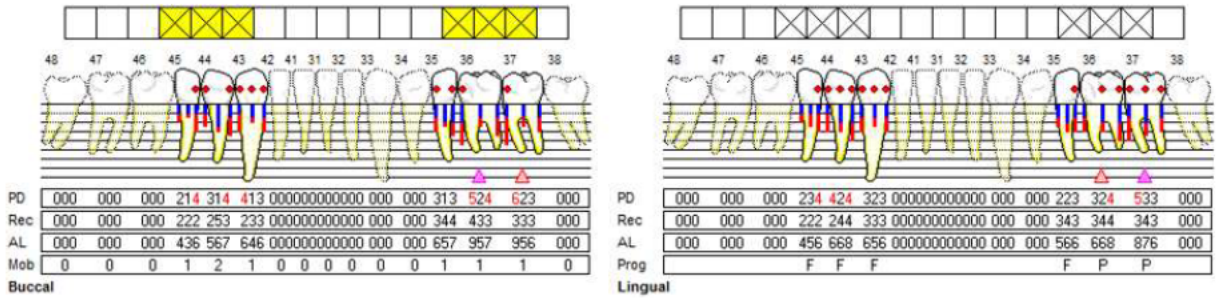
5.2.7.2 Periodontal examination

		Findings
Clinical	Gingival tissues	Copious bleeding on probing Marginal red, inflamed gingiva Soft, smooth, oedematous Blunted papillae
	Plaque distribution	Heavy around interproximal areas Heavy on mesial 35, 43
	Plaque score	100%
	Calculus distribution	Interproximal areas Mesial 35, 43 Furcation areas
	Plaque-retentive factors	Large interproximal areas Furcation areas Tooth anatomy – rounded crown contours
	Furcation involvement	Yes 37-36
	Halitosis	No
Radiographic	Bone levels	Generalised severe horizontal bone loss in maxilla and mandible

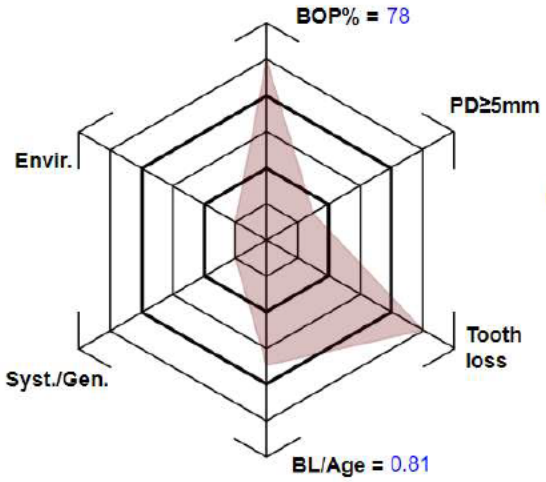
5.2.7.3 Periodontal tests

	45	44	43	35	36	37
Mobility						
TTPalp						
TTP						
TTP	-	-	-	-	-	-
TTPalp	-	-	-	-	-	-
Mobility	I	II	I	I	I	I

5.2.7.4 Periodontal chart



5.2.7.5 Periodontal Risk Assessment (PRA) (7, 8)



Age	62
Number of teeth and implants	6 (1 - 32)
Number of sites per tooth / implant	○ 2 ○ 4 ◉ 6
Number of BOP-pos. sites	28 of 36
Number of sites with PPD≥5mm	3
Number of missing teeth	22
% alveolar bone loss (estimated in % or 10% per 1mm)	50 %
Syst./Gen.	○ Yes ◉ No
Envir.	◉ Non-smoker (NS) ○ Former smoker (FS) ○ Occasional smoker (OS) ○ Smoker (S) ○ Heavy smoker (HS)

Polygon surface: 45.89934

Periodontal Risk: high

Suggested Recall Interval: **3** Months

Periodontal Risk Assessment (PRA) for patients in Supportive Periodontal Therapy (SPT). (7) PRA tool. (8)

5.2.8 Pulp sensibility tests

EPT																
CO_2																
				45	44	43							35	36	37	
CO_2				++	++	++							+	++	++	
EPT				32	30	33							21	40	28	

*26, 35, 37 tested prior to fixed prosthodontics. 28 tested as symptomatic.

5.2.9 Radiographs

Rationale: each radiograph taken has rationale where stated – ALARA

Note: Subscript a = amalgam, c = composite, m = metallic, p = metal-ceramic

5.2.9.1 Orthopantogram

Date: 23/8/2019

Findings (9)	
Periphery and corners	Nil abnormalities detected
Cortices of mandible	Continuous and even
Cortices of maxilla	Nil abnormalities detected
Zygomatic bones	Nil abnormalities detected
Maxillary sinuses	Nil abnormalities detected
Nasal cavity and palate	Nil abnormalities detected
Bone pattern of maxilla	Normal density and trabeculation
Bone pattern of mandible	Normal density and trabeculation
Alveolar processes	Generalised severe horizontal bone loss in maxilla and mandible Furcation involvement 37-36
Teeth	Edentulous maxilla Missing 34-42, 46-47 38, 48 retained roots Unusual bend 43 Amalgam restorations 37, 36, 45

Interpretation of panoramic radiographs, Perschbacher (2012). (9)

5.2.9.2 Bitewings

- Nil taken.

5.2.9.3 Periapicals

Periapical – 37-36	Findings	
 Date: 29/10/19 Rationale: Check for pathology	Caries	Nil detected
	Restorations	$37O_a$, $36O_a$
	Pulp	Nil abnormalities detected
	Periodontium	Intact PDL space & lamina dura 37-36 Widened PDL space 36M Generalised crestal bone loss Furcation involvement 37-36 Bulbous roots 37-36 Nil PA radiolucency 37-36
	Other	-

Periapical – 35	Findings	
 Date: 28/3/2019 Rationale: Check for pathology	Caries	Nil detected
	Restorations	$36O_a$
	Pulp	Nil abnormalities detected
	Periodontium	Intact PDL space & lamina dura 36-35 Widened PDL space 35M&D Generalised crestal bone loss Furcation involvement 36 Bulbous roots 36-35 Nil PA radiolucency 36-35
	Other	Cone cut

Periapical – 43-44	Findings	
 Date: 28/3/2019 Rationale: Check for pathology	Caries	Nil detected
	Restorations	$45O_a$
	Pulp	Nil abnormalities detected
	Periodontium	Intact PDL space & lamina dura 36-35 Widened PDL space 43M&D, 44M Generalised crestal bone loss Nil PA radiolucency 43-44
	Other	Unusual bend 43 Cone cut

Periapical – 44-45	Findings	
 Date: 28/3/2019 Rationale: Check for pathology	Caries	Nil detected
	Restorations	$45O_a$
	Pulp	Nil abnormalities detected
	Periodontium	Intact PDL space & lamina dura 45 Widened PDL space 44M Generalised crestal bone loss Nil PA radiolucency 44-45
	Other	Occlusal PA

5.2.10 Caries risk assessment

5.2.10.1 Dietary assessment

- Generally, diet is:
  - High in fermentable carbohydrates
  - Low sugar
  - Low acid
  - Limited snacking frequency

5.2.10.2 Saliva test

Unstimulated saliva			Stimulated saliva	
Flow rate	Consistency	pH	Quantity at 5 mins	Buffering capacity
>60 s – low	Sticky/frothy	5.0-5.8	<3.5 mL – very low	0-5 – very low
30-60 s – normal	Frothy/bubbly	6.0-6.6	3.5-5.0 mL – low	6-9 – low
<30 s – high	Watery/clear	6.8-7.8	>5.0 mL – normal	10-12 – normal

5.2.10.3 Caries Management By Risk Assessment (CAMBRA) (10)

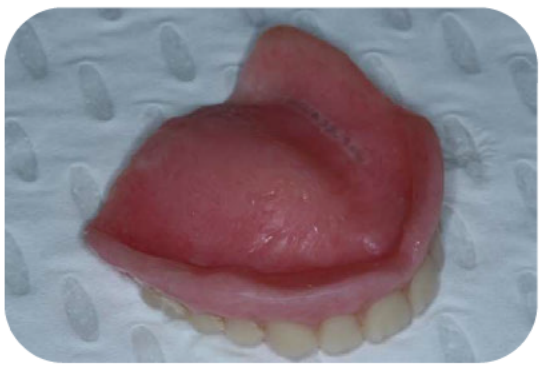
Disease indicators	Nil
Risk factors	Visible heavy plaque on teeth Exposed roots
Protective factors	Lives/works/school in fluoridated community Fluoride toothpaste (1000 ppm+) at least twice daily Adequate saliva flow (>1.0 mL/min stimulated)

- Caries risk:
  - Moderate
- Suggested management:
  - OTC toothpaste with 1000 ppm fluoride, 2x daily
  - OTC mouthrinse with 500 ppm fluoride, daily
  - Xylitol candies or gum, 4x daily
  - 6-month recall

(10) Caries Management by Risk Assessment, Featherstone & Chaffee (2018).

5.2.11 Prosthetic assessment

- Immediate maxillary full denture assessment:
  - Poor fit: patient finds denture uncomfortable in anterior flange area. Anterior flange overextended and interferes with labial frenum.
  - Poor retention: Patient uses large amount of denture adhesive to maintain retention during function. Large gap in post dam area allowing food trapping and breakage of posterior seal. Buccal flange right side heavily relieved.
  - Reasonable stability: denture has some movement while seated intraorally
  - Good aesthetics: Patient satisfied with appearance of denture, including tooth shape, size, colour, midline and contours.
  - Adequate saliva quantity for denture retention.
- Denture hygiene assessment:
  - Denture removed at night and soaked in sterilising solution.
  - Denture cleaned in morning using soft toothbrush.
  - Mouth cleaned using soft toothbrush.
  - Denture replaced with denture adhesive.
- Consultation with Prosthodontist:
  - First line of management for immediate denture is to check extensions – as soft tissue heals and bone resorbs the sulcus depth will be shorter and there will be over-extension. When soft tissue heals after 6-8 weeks, check extensions and soft reline. Over time, check extensions again and soft reline again.
  - Hard reline to improve fit, retention and stability is possible, however there will be minimal improvement and a remake is preferable.
  - Costs involved for either option.



5.3 Diagnoses and problem list

5.3.1 Diagnoses

Diagnosis		
Pathological	Periodontal disease (13)	Generalised Stage IV Grade B unstable periodontitis*
	Temporomandibular joint disorder	Right temporomandibular joint: anterior disk displacement without reduction with significant synovitis in inferior compartment and along under surface of bilaminar zone Left temporomandibular joint: anterior disk displacement with medial reduction without arthritis or condylar remodelling Secondary masticatory myalgia and stress perpetuating chronic pain**
	Non-carious tooth surface loss	43, 44
	Cracked teeth	37, 36, 43
	Prosthesis	Ill-fitting immediate maxillary full denture
Morphological	Angle class	Indications Angle skeletal class I
	Malocclusion	Class III malocclusion – habitual slide into forward posture Posterior crossbite left side
	Retained roots	38, 48
	Missing teeth	34-42, 46-47
	Aesthetic harmony	Unaesthetic smile: Missing lower anterior teeth Different shades between upper and lower arches Maxillary facial and dental midlines coincide Low smile line, normal width smile, flat incisal curve
	Anterior impairment	Loss of vertical dimension
	Posterior impairment	Loss of posterior occlusal support
	Occlusal plane	Uneven Mesially tilted teeth 35, 43
	Occlusal stability	Unstable occlusion
	Guidance system	Imbalance between left and right sides Non-reproducible centric relation due to habitual slide
Host-related factors	Psychosocial	Heavy psychosocial component to poor health and wellbeing Reasonable personal presentation with some aesthetic concern General negative attitude and apathy Possibly poor adaptive capacity Lacking oral hygiene compliance Motivated to attend appointments for companionship
	Habits	Poor oral hygiene Low sugar, low acid, moderate fermentable carbohydrate diet
	Socioeconomic	Limited financial resources but willing to invest in dental care
	Medical	Medically compromised: Iron deficiency anaemia Reflux oesophagitis Osteoarthritis Bell's Palsy
	Functional	Temporomandibular joint disorder

(11) Classification, diagnosis and clinical manifestations of apical periodontitis, Abbott (2004). (12) A clinical classification of the status of the pulp and the root canal system, Abbott & Yu (2007). (13) Periodontitis: Consensus report if workgroup 2 of the 2017 world workshop on the classification of periodontal and peri-implant diseases and conditions, Papapanou et. al. (2018).

*Stage IV – RBL 50%, >5 teeth lost due to periodontitis, max probing depth ≥5 mm, mostly horizontal bone loss, masticatory dysfunction, bite collapse, drifting of teeth, <20 teeth remaining. Generalised – bone loss affects all teeth. Grade B – %BL/age 0.25-1.0, heavy biofilm deposits with commensurate levels of destruction, non-smoker, normoglycaemic. Unstable - probing depths ≥5 mm. (13)
**Consultation and management by Oral Medicine.

5.3.2 Problem list

- Ill-fitting immediate maxillary full denture
- Generalised Stage IV Grade B unstable periodontitis
- Temporomandibular joint disorder
- Unaesthetic smile mainly due to missing lower anterior teeth
- Retained roots 38, 48
- Class III malocclusion with habitual slide into forward posture
- Unstable occlusion and uneven occlusal plane
- Combination of medical and psychosocial issues affecting health and wellbeing
- Poor oral hygiene

5.4 Prognosis (14)

5.4.1 Individual teeth

Evaluation of pathology and scale of severity

	Class A – Good	Class B – Fair	Class C – Questionable
Periodontal condition	80%-100% bone support. Easily maintained.	50%-80% bone support. Can be well maintained.	30%-50% remaining bone support. Difficult to be well maintained.
Restorability	80%-100% remaining sound coronal tooth structure. Easily restored.	50%-80% remaining sound coronal tooth structure. Restoration results in no infringement of biologic width, has adequate ferrule, good crown-root ratio.	30%-50% remaining sound coronal tooth structure. Achieving adequate ferrule would compromise crown-root ratio to some extent or affect adjacent structures.
Endodontic condition	Can receive straightforward primary endodontic treatment, or already has good endodontic therapy.	Failing endodontic treatment can receive predictable re-treatment, or requires a difficult primary endodontic treatment.	Failing endodontic treatment that is difficult to predictably re-treat.
Occlusal plane & tooth position	Tooth in correct occlusal plane, position, slightly deviated from ideal.	Tooth out of correct occlusal plane, can be adjusted to function within correct occlusal plane.	Tooth out of occlusal plane and requires multiple procedures to function within occlusal plane.

Factors that result in drop of determined class

Anatomic irregularities	Irregularly shaped roots, multiple canals and/or roots, thin and/or short roots, and excessively conical roots, etc.
Iatrogenic compromising factors	Perforations, extensive post preparations, minimal tooth structure thickness left after preparation, dental materials that cannot be removed, etc. 37, 36, 43 – cracked teeth

5.4.2 Patient-level risk factors

Biologic risk factors		
Medical conditions that impair immune function and healing	🟡	Iron deficiency anaemia
Impaired salivary flow/function	🟢	Adequate salivary flow
Medical condition or disability limiting oral hygiene	🟡	Bell's Palsy
Other missing teeth	🔴	History of missing teeth due to periodontitis
Behavioural risk factors		
Compromised or poor oral hygiene	🔴	Poor oral hygiene
Cariogenic diet	🟢	Low cariogenic diet
Low exposure to fluoride	🟢	Adequate exposure to fluoride
Parafunctional habits	🟢	No
Ability and willingness to adhere to long-term maintenance protocol	🟡	Depends on personal circumstances and mood
Smoking	🟢	Non-smoker
Financial and personal risk factors		
Motivation for treatment	🟡	Depends on personal circumstances and mood
Available resources for dental care	🟢	Yes
Willingness to commit finances, time, and effort	🟢	Yes
Attitude toward losing teeth	🟢	Wishes to keep remaining teeth
Understanding of one's condition and needed treatment	🟡	Surface understanding of problems
Aesthetic expectations	🟢	Reasonable
Low dental IQ	🟡	Adequate dental IQ with education

Key: Favourable
Questionable
Unfavourable

(14)Evaluation of prognosis of individual teeth and patient-level risk factors adapted from Samet and Jotkowitz (2009).

5.4.3 Overall dentition

- Fair-poor periodontal support due to untreated chronic periodontal disease.
- All teeth have adequate remaining tooth structure.
- All teeth have sound pulpal health.
- Teeth in quadrant 4 are not in the correct occlusal plane, adjustments possible.
- Several teeth have cracks, lowering overall prognosis.
- Patient's medical and psychosocial history impacts on motivation and ability for self-care, affecting overall health and wellbeing.
- Patient's diet appears to have low contribution to caries risk, may have contribution to plaque accumulation and heightened periodontal risk.
- Patient has some motivation to keep remaining teeth and appears willing to commit finances, effort and time to treatment.
- Overall prognosis of dentition is not favourable.
- If patient receives no treatment for current condition:
  - Progression of periodontal disease and tooth loss.
  - Decrease in confidence, self-esteem and quality of life.
  - Added burden to current psychosocial issues and potential for further deterioration of overall health and wellbeing.
- Discussion of diagnoses and prognoses of dentition with patient led patient to decide on and commit to treatment.

5.5 Treatment options

Problem	Treatment Option		Benefits	Risks	Decision & Rationale
Ill-fitting immediate maxillary full denture	1	• No treatment	• No commitment required	• Does not address presenting complaint • Ongoing pain and discomfort • Ongoing inability to function • Poorer quality of life	Option 3: • Addresses presenting complaint • Better fit of new denture possible as soft tissues and bone levels stabilised • Patient proven adaptation to maxillary full denture and can adapt to new denture easily • Better to concurrently fabricate mandibular partial denture
	2	• Immediate maxillary full denture hard reline	• Low cost • Low time commitment required • Marginal improvement of current denture	• Relined denture will not fit as well as new denture • Patient likely to need new denture in future	
		• Maxillary full denture remake	• 18 months since maxillary clearance elapsed allowing soft tissues and bone levels to stabilise • Patient proven adaptation to maxillary full denture • Patient proven adequate denture care regime • Better fitting denture • Can concurrently fabricate mandibular partial denture for better outcome	• More cost involved than option 2 • More time involved than option 2	
Generalised Stage IV Grade B periodontitis	1	• No treatment	• No commitment required	• Plaque and calculus accumulation • Deterioration of periodontal condition • Caries • Tooth loss • Systemic health effects • Poor aesthetic appearance and effect on self-esteem	Option 2: • Favour periodontal and systemic health • Reduce periodontal disease progression • Reduce risk of caries, potential for breakdown of tooth structure • Reduce risk of tooth loss • Create favourable environment for commencement and maintenance of indirect prostheses
	2	• Non-surgical periodontal therapy • Oral hygiene instruction	• Remove plaque and calculus to promote periodontal and systemic health • Reduce progression of periodontal disease • Reduce risk of caries • Reduce risk of further tooth loss	• Post-operative pain, bleeding, swelling, bruising, infection • Increased tooth sensitivity • Gingival recession • Root surface exposure	
Temporomandibular joint disorder	1	• No treatment	• No commitment required	• Ongoing pain • Ongoing dysfunction • Poorer quality of life	Option 2: • Alleviation of pain • Rehabilitation to return to normal function • Patient learns management techniques for self-care
	2	• Referral to Oral Medicine – soft diet, heat, anti-inflammatory, education, reassurance, MRI.	• Accurate diagnosis • Appropriate management advice • Adequate follow-up care	• Patient refusal to listen to advice	

Unaesthetic smile: Missing lower anterior teeth	1	• No treatment	• No commitment required	• Does not address presenting complaint	Option 2: • Addresses presenting complaint • Cost and time commitment acceptable to patient • Ability to add teeth onto denture in event of loss of mandibular teeth • Can function as transitional denture to mandibular full denture given fair-poor prognosis of remaining teeth
	2	• Mandibular partial denture	• Addresses presenting complaint • Low cost • Low time commitment • Easy to fabricate • Simple to repair fractures and add teeth onto denture • Possibility to function as transitional denture to mandibular full denture • Consideration of fair-poor prognoses of remaining teeth • Patient proven adequate denture care regime	• Teeth missing for long time, never worn mandibular denture; habitual slide into new forward posture – possible difficulties in work-flow and patient ability to adapt • Possible low adaptive capacity • Patient discomfort • Patient unwillingness or inability to adapt to new denture • Requires meticulous oral hygiene to retain remaining teeth and maintain oral health	
	3	• Full clearance • Immediate mandibular full denture	• Addresses presenting complaint • No teeth to maintain at home and at dentist • Patient proven adequate denture care regime	• Extraction complications • Post-extraction complications • Teeth missing for long time, never worn mandibular denture; habitual slide into new forward posture – possible difficulties in work-flow and patient ability to adapt • Possible low adaptive capacity • Patient discomfort • Patient unwillingness or inability to adapt to new denture • Mandibular full dentures difficult to adapt to due to poor retention, stability	
Retained roots: 38, 48	1	• No treatment	• No commitment required	• Risk of denture-induced spontaneous tooth eruption • Oral infection • Pain	Option 1: • Asymptomatic • Mandibular partial denture base design not to extend over area of third molars
	2	• Extraction	• Reduce risk of denture-induced spontaneous tooth eruption	• Surgical extraction complications • Post-extraction complications	
Medical and psychosocial issues: Iron deficiency anaemia Bell's Palsy	1	• Oral health counselling • Oral hygiene instruction	• Decrease susceptibility to opportunistic infections • Decrease caries risk • Decrease periodontal disease risk	• Patient refusal to listen to advice	Option 1: • Clinician responsibility to inform patient of risk factors for disease or deterioration of oral health and advise on management to maintain and preserve oral health

5.6 Management plan

Systemic phase	Not applicable
Emergency phase	Immediate maxillary full denture adjustment
Control phase *Eliminate pain, infection, inflammation*	Patient education and consent to treatment
	Advise continuation of medical and psychological management with GP and mental health professional
	Hygienic phase of periodontal therapy: Scale and clean Periodontal debridement: 37, 36, 43, 44, 45 Fluoride application to interproximal areas, exposed roots, furcations Oral hygiene instruction
	Restorations: 37B restoration*
	Level occlusal plane: 45O restoration, 44 & 43 enameloplasty
	Referral: Oral Medicine for TMJ disorder management
Holding phase *Preserve residual dentition*	Assess response to periodontal therapy and oral hygiene compliance
	Follow-up progress on medical and psychological management
Reconstructive phase** *Replace lost tissue and stabilise occlusion*	Removable prostheses: Immediate maxillary full denture Acrylic mandibular partial denture
Maintenance phase *Prevention of further breakdown*	Recall exam 3-monthly periodontal maintenance Reinforce oral hygiene and denture hygiene

*Added to treatment plan following exposure of furcation following periodontal therapy and patient complaint of extreme sensitivity.

**Reorganised approach to occlusal rehabilitation.

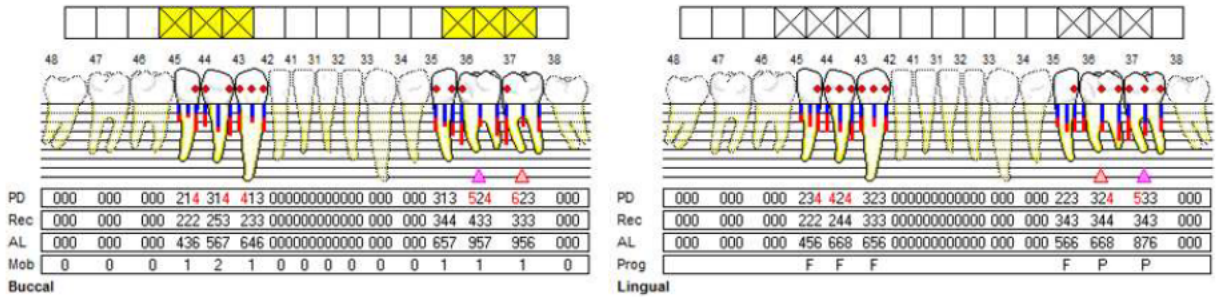
5.7 Treatment delivery

5.7.1 Treatment delivery

Date: July 2019 – October 2020

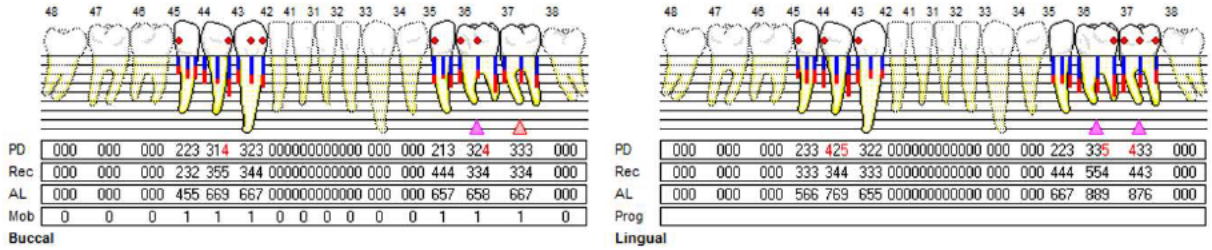
	Date	Treatment
2019	July	Emergency denture adjustment
		Comprehensive exam
		Patient education, treatment plan discussion, consent to treatment
		Initial periodontal charting
		Referral to Oral Medicine for TMJ disorder
	August	First round periodontal debridement Fluoride application Oral hygiene instruction
		Special tray fabrication and survey models
	September	-
	October	Review periodontal charting #1
		Second round periodontal debridement Fluoride application Reinforce oral hygiene
2020	Date	Treatment
	February	Recall exam
		Review periodontal charting #2
		Third round periodontal debridement Fluoride application Reinforce oral hygiene
		Levelling of occlusal plane: 45MODBL composite 44, 43 enameloplasty
	March	Review peiodontal charting #3
	April	-
	May	Scale and clean Fluoride application Reinforce oral hygiene
		Denture adjustment
		Try-in special trays
	June	-
	July	Recall exam
		Fourth round periodontal debridement
		Denture adjustment
	August	TMJ inflammatory fluid drainage and cortisone injection by specialist
		37B GIC
		Maxillary and mandibular final impressions #1
	September	Maxillary and mandibular final impressions #2
		Relations
		Anterior-Posterior try-in
		Maxillo-mandibular relations & try-in
	October	Maxillary full denture and mandibular partial denture insert
		Post-operative review

- Emergency denture adjustment:
  - Immediate maxillary full denture fit and extensions checked
  - Reduced acrylic at labial frenum and buccal extensions
- Patient education and consent to treatment:
  - Major problem is periodontal disease caused by plaque accumulation and poor oral hygiene
  - Loss of teeth brought about changes in oral cavity that make rehabilitation challenging (uneven occlusal plane, bone resorption and loss of alveolar ridge height)
  - In addition, oral morphology (shallow palate, shallow sulci, high frenal attachments) unfavourable for retention and stability of dentures
  - For best rehabilitation treatment outcomes, periodontal disease needs to be treated and condition stabilised, and occlusal plane levelled for denture retention and stability
  - Patient has not had teeth for a long time and never worn lower denture making adaptation to mandibular dentures difficult
  - Remaining teeth have fair to poor prognoses due to poor periodontal support, eventual tooth loss is inevitable
  - As such, mandibular denture will function as transitional denture as remaining mandibular teeth are lost
  - Managed expectations by warning patient that new maxillary denture will not be perfect but will be an improvement on immediate denture, and new mandibular denture
- Initial periodontal chart (July 2019):
  - Plaque score 100%
  - Bleeding on probing 23/36 sites (64%)
  - Periodontal probing depth ≥4 mm 11/36 sites (31%)
  - Attachment loss ≥6 mm on at least one site on all teeth, maximum 9 mm 36, 37
  - Grade II furcation involvement 36, 37
  - Grade I mobility 37, 36, 35, 43, 45 and Grade II mobility 44
  - Extreme gingival pain
  - Oral hygiene extremely poor, instruction to use electric toothbrush, Sensodyne

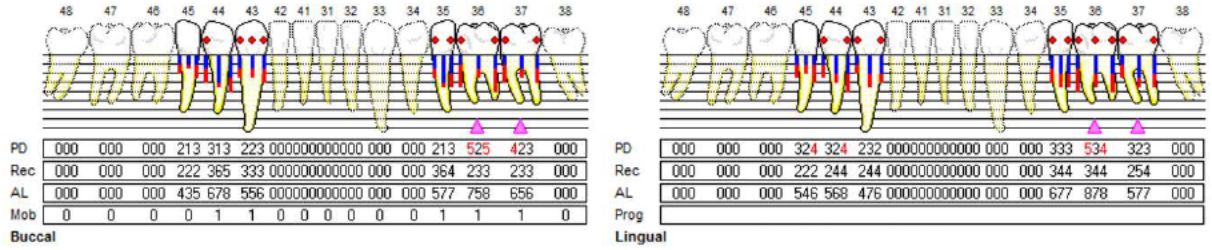


  - First round periodontal debridement completed; local anaesthetic given however patient is difficult to anaesthetise

- Review periodontal chart #1 (October 2019):
  - Plaque score 71% ↓
  - Bleeding on probing 14/36 sites (39%) ↓
  - Periodontal probing depth ≥4 mm 6/36 sites (17%) ↓
  - Attachment loss ≥6 mm all teeth, maximum 9 mm 36, 44
  - Grade II furcation involvement 37 only ↓
  - Grade I mobility on all teeth ↓
  - Reduced gingival pain ↓
  - Oral hygiene still poor but improved



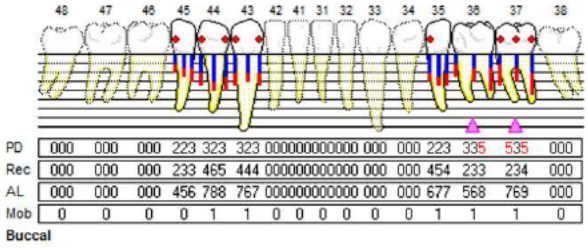
  - Second round periodontal debridement completed
- Review periodontal chart #2 (February 2020):
  - Bleeding on probing 21/36 sites (58%) ↑
  - Periodontal probing depth ≥4 mm 7/36 sites (19%) ↑
  - Attachment loss ≥6 mm all teeth, maximum 8 mm 36, 44 ↓
  - Grade I furcation involvement 36, 37 ↓
  - Grade I mobility 37, 36, 35, 43, 44 and Grade 0 mobility 45 ↓
  - Reduced gingival pain
  - Oral hygiene still poor but improved

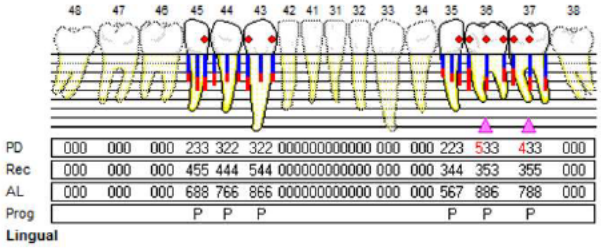


  - Third round periodontal debridement completed
  - Patient appears to be in better head space, overall appearance and oral hygiene improvement noticeable

- Levelling of occlusal plane:
  - Wax-up to required level on study model
  - Build-up 45MODBL composite and enameloplasty 44, 43 using guide


- Review periodontal chart #3 (March 2020):
  - Plaque score 50% ↓
  - Bleeding on probing 18/36 sites (50%) ↓
  - Periodontal probing depth ≥4 mm 5/36 sites (14%) ↓
  - Attachment loss ≥6 mm all teeth, maximum 9 mm 37 ↑
  - Grade I furcation involvement 36, 37
  - Grade I mobility 37, 36, 35, 43, 44 and Grade 0 mobility 45
  - Reduced gingival pain
  - Oral hygiene still poor but improved





  - Fourth round periodontal debridement completed
- Final impressions maxillary and mandibular #2:
  - Border moulding of maxillary custom tray

  - First attempt at final impressions unsatisfactory, second attempt satisfactory
  - Shade selected Dentsply Portrait IPN A3.5

- Relations:
  - Maxillary and mandibular base and rims fabricated
  - Attempted to record relations in centric, however found it difficult to get patient into reproducible position
  - Attributed to loss of teeth for long duration, loss of guidance, development of habitual forward posture of mandible and muscle memory
  - Maxillary and mandibular base and rims tried in and evaluated for fit, retention and stability
  - Approximate centric record taken and models mounted
  - Anterior and posterior teeth set on maxillary and mandibular base and rims, note unilateral posterior crossbite



- Try-in appointment #1:
  - Try-in unsuccessful as centric record was inaccurate, all teeth were set rather than anterior teeth only, and in centric occlusion rather than centric relation due to miscommunication with lab
  - With assistance from Prosthodontist, posterior teeth removed, centric record re-taken and mandibular model re-mounted

- Try-in appointment #2:
  - Anterior try-in successful; aesthetics, midline, overbite and overjet satisfactory
  - With assistance from Prosthodontist, centric record re-tested and found incorrect
  - Lucia jig fabricated in chair to de-program jaw; patient asked to hold centric for a few minutes, bite in de-programmed position, centric record re-taken
  - Mandibular model re-mounted and posterior teeth set while patient in the chair
  - Posterior try-in successful; aesthetics, midline, occlusion re-checked and found satisfactory, phonetics checked and found to be difficult with 's' sound, OVD kept at 58 mm, noted slight slide from centric
  - Accepted work and dentures processed

- Maxillary full denture and mandibular partial denture insert:
  - Maxillary full denture fit, retention and stability satisfactory
  - Mandibular partial denture fit unsatisfactory, required adjustment to over-extended distal extension and anterior flange to fit comfortably
  - Phonetics and function felt “different” but not uncomfortable or painful
  - Aesthetics excellent, patient satisfied
  - Static occlusion checked, posterior crossbite left hand side, bilateral even posterior contacts and anterior open bite
  - Dynamic occlusion checked, practiced biting in centric position, however patient tended to regress to habitual bite.
  - Oral hygiene and denture care instructions given, emphasised importance to success and longevity of treatment considering periodontal condition.
  - Advised patient time and persistence required to adapt to wearing and functioning with new dentures and encouraged patient to do so, otherwise will not be able to adapt.
  - Encouragement based on excellent aesthetics and improvement in patient’s appearance.

- Review
  - Maxillary full denture stable, retentive, comfortable, worn consistently.
  - Mandibular partial denture not worn consistently due to pain; denture extensions checked, adjusted and replaced.
  - Encouraged patient to give it time and persistence to allow adaptation.

5.7.2 Before and after photographs

Date: July 2019 – October 2020

5.7.3 Patient response to treatment

- Patient was satisfied with overall outcome of treatment.
  - 'I look 10 years younger!'
- Resolution of presenting complaints:
  - i. "My denture (F/-) is hurting me, I think it's too high (labial flange)"
    - ✓ New maxillary full denture fabricated
  - ii. "I don't have any teeth left"
    - ✓ New mandibular partial denture fabricated
- Significant improvement in aesthetics.
- Psychosocial component to overall health and wellbeing noticeably improved over course of 16 months, and this was reflected in general demeanour and physical appearance at dental visits.
- Continues to be compliant with dental advice and instructions and will return for periodontal maintenance and denture adjustments as required.

5.7.4 Reflection

	Challenges	Management
Patient-related	Reflux oesophagitis	• Reflux in the chair - Patient reclined to semi-supine position to avoid triggering reflux
	Medical issues	• Generally felt unwell and spent most of the time at medical appointments - Dental treatment was not a priority - Constantly checked in with patient before, during and after visits and rescheduled appointments as required - Encouraged to seek medical attention as required and dental visits would be arranged around medical appointments
	Shallow palate Shallow sulci High frenal attachments	• Manage patient expectations - Under-promise and over-deliver treatment outcomes (if possible) - Ample warnings of likely difficulties in denture fabrication, adaptation and use • Constant encouragement
	Loss of teeth over years	• Patient education - Discuss cause of and processes to rectify current oral issues • Manage patient expectations - Under-promise and over-deliver treatment outcomes (if possible) - Ample warnings of likely difficulties in denture fabrication, adaptation and use • Constant encouragement
	Negative attitude and apathy	• Patient management
Clinical	Difficulty taking periapical radiographs	• Shallow floor of mouth and long roots • Used occlusal PA or OPG
	Difficulty achieving anaesthesia for periodontal debridement	• Practice locating anatomical landmarks • Used greater volume of local anaesthetic with adrenaline
	Difficulty taking centric record	• Practice manipulation of mandible for reproducible centric • Engaged help of Prosthodontist • Consider de-programming exercises

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