

# A LONGITUDINAL CLINICAL STUDY OF ENDODONTICALLY TREATED PATIENTS

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*October 2016*

## **Abstract**

*The acid test of all treatments provided to patients is wholly related to long term outcome. Endodontic follow up is considered successful if the tooth is asymptomatic with an absence of pathology in conjunction with a well obturated canal/s to the radiographic apex/apices. Failures are assigned to the loss of the tooth/teeth. Lenient successes are assigned where the tooth is retained but there are uncertainties about the long term prognosis due to a multitude of factors that will be discussed. This report is presented online so that as patients continue to be reviewed, this allows for the outcomes and statistics to be updated on a regular basis, unlike traditional hard-copy publications.*

## **Introduction**

Most longitudinal endodontic clinical studies reported are sourced from predominantly dental schools with treatment carried out by Specialist Endodontists, Graduates and undergraduate students. A smaller number are sourced from Specialist private practices. These studies have invariably involved Specialist Endodontists with mono-speciality practitioners. This study is unique in that it is a review of a Specialist Private Practice in Restorative Dentistry where the sole practitioner is registered as a Specialist in Restorative Dentistry, Prosthodontics, Periodontics and Endodontics. The demographics of the patients will depart from the traditional endodontic practice with a profile of patient demographics presenting with multifaceted treatment needs extending across the whole range of restorative treatments. Many patients have severe periodontal susceptibilities, parafunctional prosthodontic histories, major systemic disease issues and a high incidence of emotional/mental health neuroses that lead them to attend a Specialist Restorative practice requiring a wide range of complex treatments with co-ordination of therapies. The review of patients for extended periods is routine and may depart from the “sub-contracted” private endodontic practitioner who refers the patient

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back to the referring practitioner for continued care. The author not only carries out the endodontics but sees the patient through with the restorative phase of treatment and for follow-up. Unless the patient falls out with the practitioner, falls into fiscal difficulties, moves away or dies, the patient continues to attend for long term follow-up.

## **Methodology**

It is clear that the gold standard of any follow-up for reporting would be to review every single patient who has undergone endodontic treatment. The author accepts this is not feasible/possible so has included ALL patients who attend for routine follow-up/maintenance who have previously undergone root canal treatment by the author. It is recognised that this is far from ideal and will inevitably lead to accusations that only “successes” return for follow-up. The reader may conclude that most “failures” will simply scurry away and not return due to disappointment. The author TT is also acutely aware that he is reviewing his OWN material with accusations of bias. An attempt to avoid bias has been made by including a blind review of the hard data from the records by his senior dental nurse who personally loves to criticise her OLD MAN whenever she gets the opportunity. Finally, the author would welcome any reader to scrutinise his raw data and carry out their own independent audit of his records. The author will clearly separate the “strict” criteria for success from the “lenient” criteria.

Outcomes of endodontic treatment in the literature are recorded under four categories: Success, Survival with intervention, Survival without intervention and failure. Success using clinical and radiographic parameters for evaluation. Complete radiographic healing and an absence of clinical signs and symptoms are adopted as “strict criteria”. A reduction in size of apical radiolucency/ies in the absence of clinical signs and symptoms is regarded as “lenient” criteria for success. Recurrent symptoms with the need for retreatment, orthograde or surgical with retention of the tooth is regarded as “survival” and loss of the tooth is a strict “failure”. The specific cause of the loss of a tooth will be recorded to differentiate from a “true endodontic failure” which is often times missing in other papers. It is well recognised by the author that a four year follow-up of endodontic cases is now regarded as the minimum although this study includes every patient seen for review September 2014-October 2016 who has undergone previous root canal treatment irrespective of the length of follow up period. Graphs showing all the individual patients follow up periods is shown. Individual graphs differentiate the strict successes, lenient successes and tooth losses.

The method of root canal treatment assessment follows a standardised approach using a recently introduced simple pro forma:

Date:      Name of patient:

Med History	ASA 1	ASA 2	ASA 3-5
Anaesthetic Issues	None	Yes	
Patient Cooperation	Good	Moderate	Uncooperative
Mouth Opening	Good	Limited	Very Poor
Emergency	None	Moderate	Severe
Diagnostic	Clear	Uncertain	
Radiographic difficulties	None	Moderate	Severe
Tooth	Anterior	Premolar	Molar
Tooth Isolation	Rubber Dam Routine		Alternative
Crown morphology	Normal	Altered	Significant Deviation
Canal morphology	Favourable	Challenging	Very unfavourable
Radiograph of canals	Visible	Small	Invisible
Apical lesion	Yes	Uncertain	None
Trauma history	Yes	No	
Previous endo	Yes	No	
Perio susceptibility	Yes	No	
Apical resorption	Yes	No	
Restoration planned			

## Endodontic Protocol

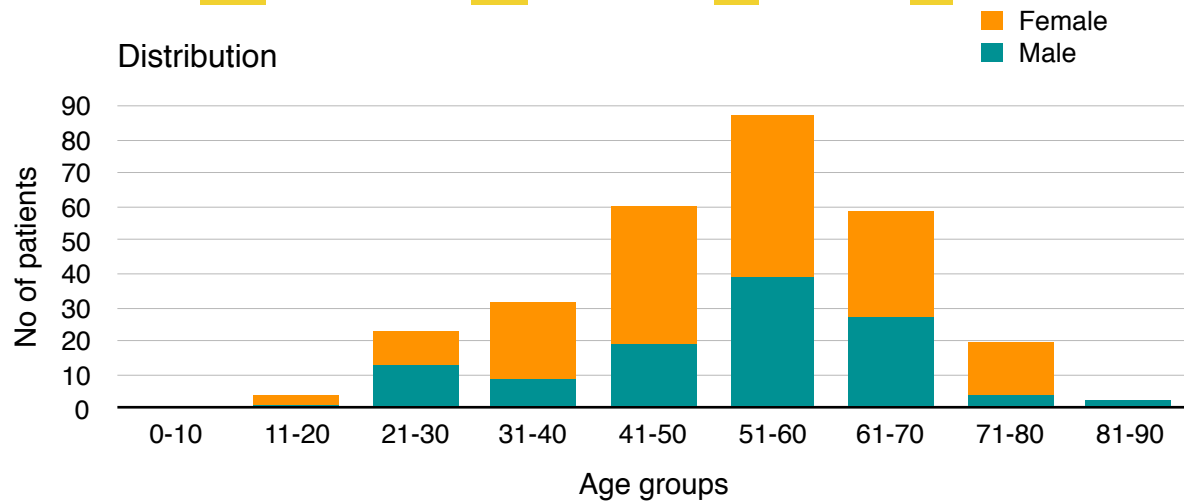
The standard methodology of endodontics by the author has remained largely unchanged during the last 20 years. Like all endodontists, any individual protocols reflect a combination of an individual training programme followed by “influencers” over the years. The author’s methodology includes the following. Access to the pulp chamber is gained with a diamond round bur until the pulp chamber roof is breached. A safe ended tungsten carbide bur is used to open up the entire extent and outline of the pulp chamber using magnification loops which is the authors preference with an LED source of light. Oraface enlargers 1, 2 and 3 are then used to engage and open up the entrances of the root canals followed by gates gliddens 1, 2 and 3. The author often times avoids using local anaesthesia if there is any uncertainty regarding vitality or partial vitality especially in multirouted teeth. The author also likes to restrict all instruments to dirty verses clean canals as he adopts a different protocol for vital or non-vital canal contents. All canals are copiously irrigated with sodium hypochlorite solution to wash dentine and soft tissue debris out of the pulp chamber. A diagnostic length is established using a combination of four methodologies. Pre-operative periapical x-ray length is measured to get some inkling of what to expect. 10% is routinely reduced from the actually x-ray length to allow for an element of magnification. Size 08 and 10 files are then passed to “feel” for the apical constriction and a second measurement is taken. Obviously in the presence of apical resorption, this is not attempted. An apex locator is used followed by a diagnostic x-ray at the length that is indicated by the apex locator. Following the above methods a final working length is established for each canal. Handfiles are used from size 10 serially including golden sizes to size 25 before a crown down methodology using low speed high torque Profile tapers. Straight canals are approached from size 40/06 tapers and curved canals using 40/04 tapers. A minimum size of 25 file must reach the intended working length using copious hypochlorite irrigation between changes of instruments. A lubricant EDTA , Fileze is always used to facilitate instrumentation. Any non-vital canals are dressed with cotton soaked with hypochlorite and left in the canal for one week. Vital canals may be irrigated with 4% citric acid to clear dentine debris and either filled or dressed with Ca(OH)<sub>2</sub> dressing which is always hand mixed using powder and sterile water. The access cavity is provisionally sealed with IRM, intermediate restorative material, with or without a provisional crown. Upon review, assuming the tooth is wholly asymptomatic and non tender to percussion, the author will irrigate all the canals with 4% citric acid and secure a diagnostic x-ray with the master GP cones at the

predetermined working lengths before obturation using GP and System B warm vertical condensation with extra working time Tubliseal. The pulp chamber is often filled with IRM in posterior teeth where lateral/accessory canals are likely in the furcations whether confirmed or not or a backfill of phosphate cement or amalgam is placed to seal. Most posterior teeth are prepared for coronal restorations and metal post preparations, Parapost twist drills, are effected for anterior teeth that have lost considerable coronal tooth tissue. Sometimes fiscal restraints may influence delays for definitive crown work. Post fill x-rays are secured as a base line for follow-up. The author is well aware that individual protocols differ widely between endodontists but the author wants the reader to be aware of the protocol that has been used with very little change for 20 years in this study.

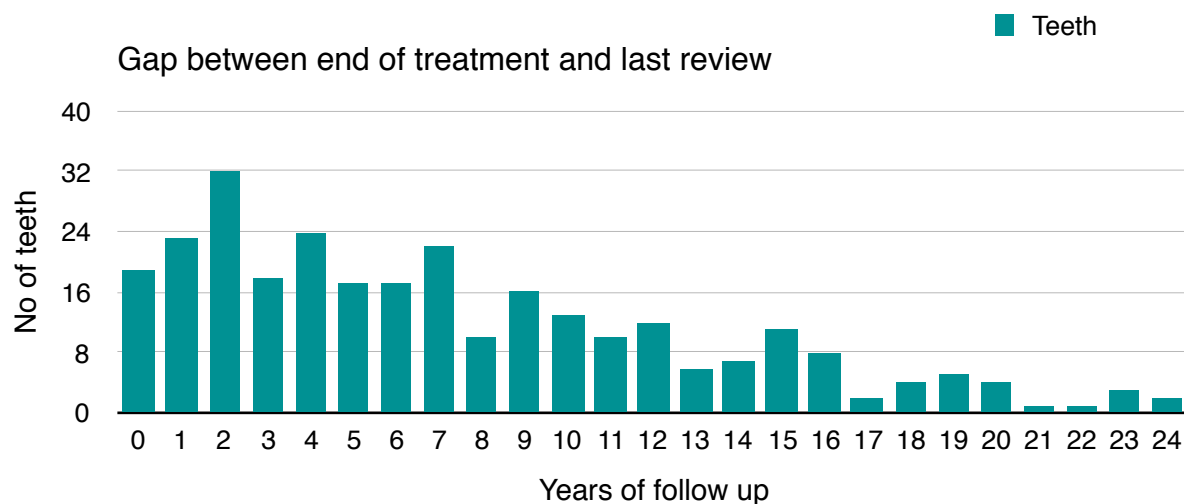
The author has always learnt more from his failures with every treatment modality and therefore each of the lost teeth and “lenient” successes are discussed on an individual case by case basis with respect to what has been learnt from these losses/cases. The author asks the reader to accept these comments to provide the “gems” that influence our experiences over time. We will focus upon lenient successes and outright failures of tooth losses.

## Results

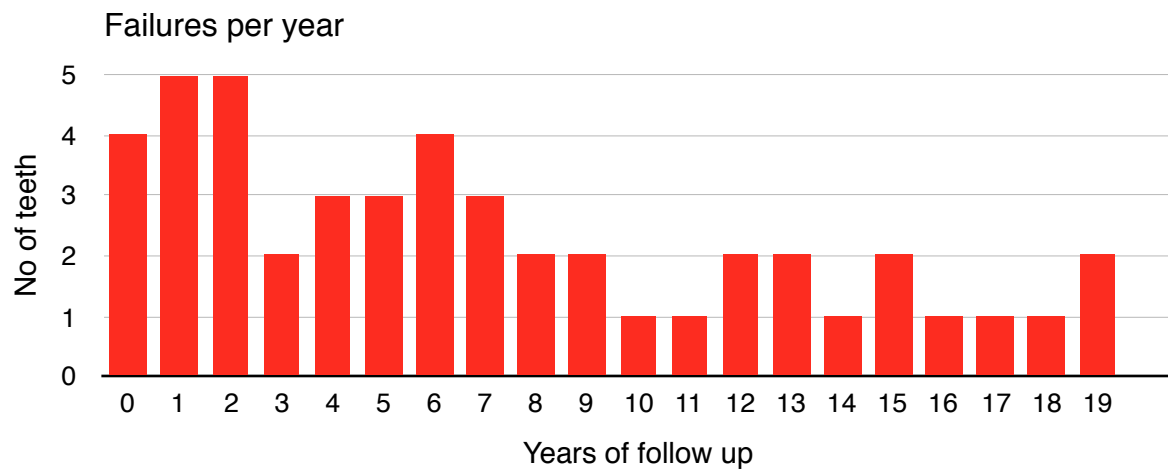
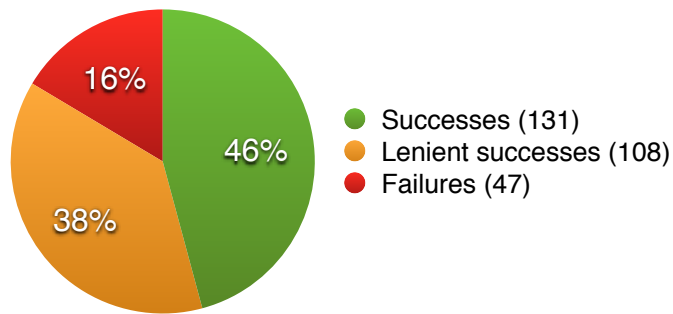
Sample of 287 teeth with 117 patients (65 female, 53 male)



This population group represents those patients with a multitude of complex restorative issues involving periodontal, endodontic and restorative problems that affect an older age range of patient and may well depart from other studies where treatment is provided to younger patients.



## Outcome

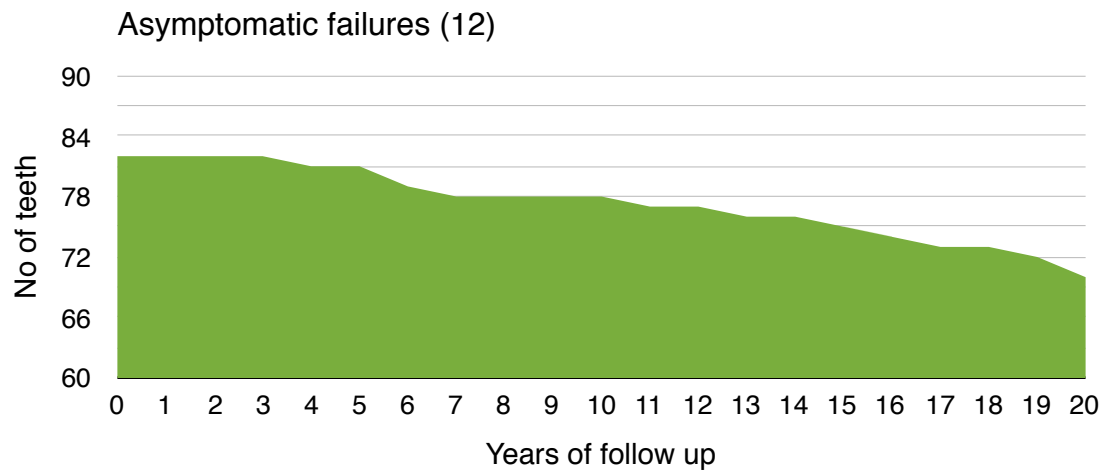
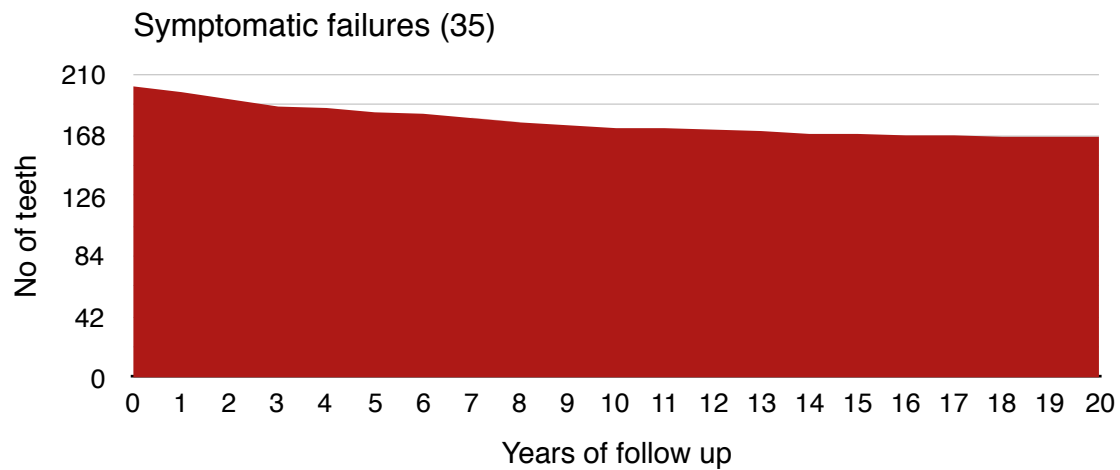


Types of teeth lost: MOLARS (21) PREMOLARS (12) ANTERIORS (14)

It is to be noted that of the teeth that were lost, only 19 teeth were lost in 1-4 years.

Subsequently 28 teeth were lost at 5-19 years. As a consequence, the author considers that following up periods of 10 years+ should be considered as the new gold standard as 60% of tooth losses occur after the current "gold standard" five year follow-up.

108 teeth (37.6%) were assigned at completion of endodontics with uncertain prognoses due to ongoing periodontal disease, serious health issues, poor patient compliance, parafunction, considerable loss of tooth structure and post-traumatic which were wholly unrelated and independent from the endodontic status of each tooth.

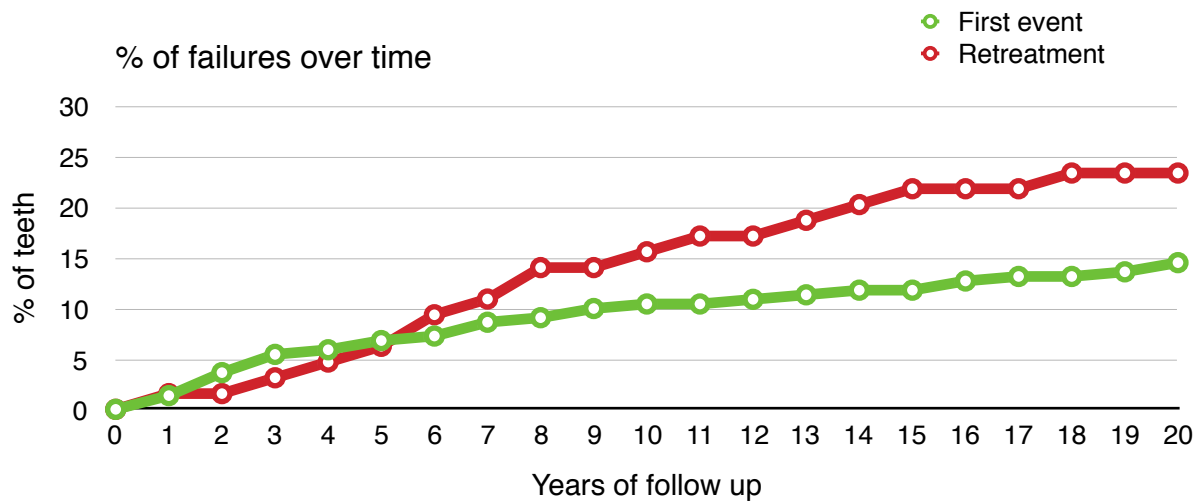


A review of the patients indicated that the vast majority of the endodontic cases were symptomatic (202) at the commencement of treatment that led to an incidence of 17.3% of failures whereas the non-symptomatic (82) led to a failure rate of 14.6%.

The failure rate of symptomatic teeth appears at a greater pace than those asymptomatic teeth.

Refer to - Appendix A : Clinical examples of Success

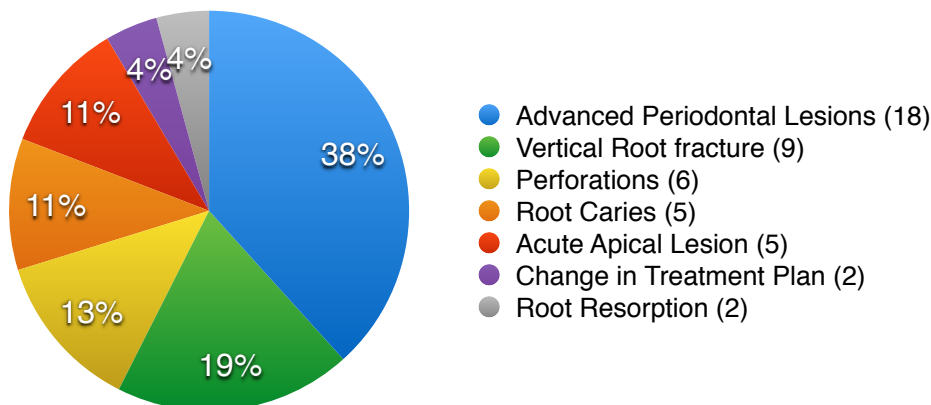




Of 220 teeth that had root canal treatment for the very first time, 32 failed (14.5%) 64 teeth were retreated which led to 15 failures (23.4%).

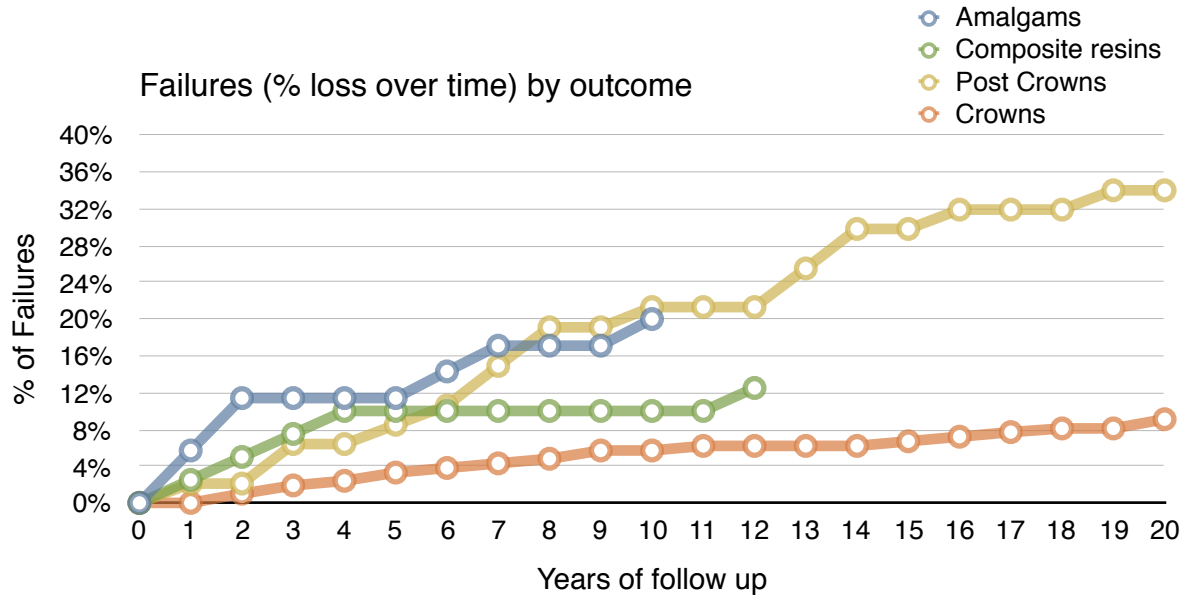
It is to be noted that in the first five years of follow up there is little to distinguish between those teeth that were initially treated compared with the re-treatments. However, after 5 years, the differences became more apparent and again reflects the importance of following up endodontic cases for more than 5 years.

### Reasons for failures

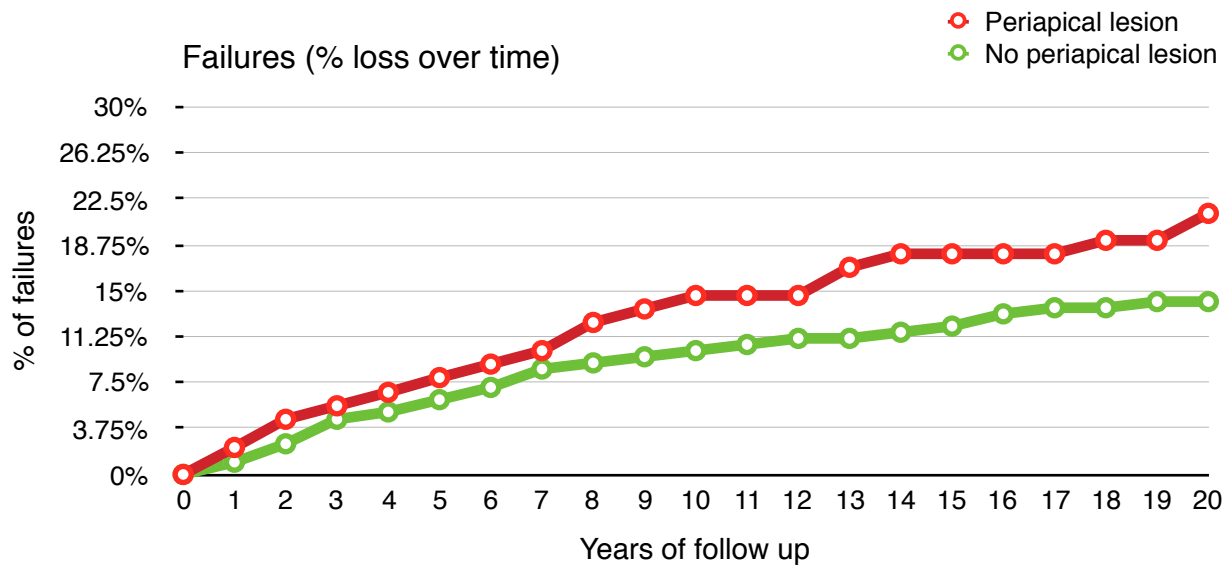


As 38% of our tooth losses is attributed to periodontal disease deterioration which equates to 18 tooth losses. We may therefore refer specifically to the 29 teeth that were lost for non-periodontal reasons. These include: Vertical Root fracture (9), Perforations (6), Root Caries (5), Acute Apical Lesion (5), Change in Treatment Plan (2) and Root Resorption (2).

Leaving aside the periodontal tooth losses we may conclude that tooth loss attributed to a multitude of reasons equates to less than 10% of the original teeth treated. This implies a 90% tooth retention rate overall when we ignore the periodontal losses attributed with the older age range of the population group that were suffering from periodontal disease.



Crowns: 163 (of which 19 teeth failed, or 11.7%)  
 Post-crowns: 48 (of which 16 teeth failed, or 33.3%)  
 Composite resins: 41 (of which 5 teeth failed, or 12.1%)  
 Amalgams: 35 (of which 7 teeth failed, or 20%)



19 teeth out of total 47 losses failed in the first 4 years. 40.4% of teeth lost in first five years of followup indicates that a greater proportion of teeth (59.6%) are lost at 6 years or greater. This would indicate that many previous longitudinal studies may have underestimated future failures if they have not followed up for 10 years or more.

Periodontal disease accounts for the loss of 18 teeth out of 47 failures which equates to 38.2% of the tooth losses.

Periapical lesions : 89 (of which 19 teeth failed, or 21.3%)

Non-periapical lesions : 198 (of which 28 teeth failed, or 14.1%)

In conclusion, the author can find no significant statistical difference between the failure rates of those teeth with or without radiographic periapical lesions.

## Discussion

The author considers a specific review of every failure will assist the reader from the lessons learnt so that we are better able to predict the outcome for our patients before they commit and understand the levels of uncertainty that exist. It is the opinion of the author that a “blanket” statement that 15% of teeth are lost following endodontics lacks the detail that may exist for a specific patient. It is clear from our own observations that half the losses of teeth are wholly unrelated to “endodontic” issues but solely due to severe bone loss as a consequence of periodontal disease in patients exhibiting advanced susceptibility to that disease process. This allows us to warn those patients exhibiting advanced periodontal bone loss as they must be regarded as a very high risk group. It is to be noted that this patient population demographic attending a specialist practice in restorative dentistry exhibited advanced periodontal disease in 12 patients who lost 18 teeth. Loss of teeth was attributed to advanced periodontal lesions accounted for 38.3% of all tooth losses. It may therefore be concluded that non periodontal losses of root filled teeth can be apportioned to 61.7% of the endodontically treated teeth that is as a result of root caries, perforations, split roots and recurrent apical lesions. Root caries (5) may be attributed to poor patient compliance. All the affected patients had exhibited periodontal disease with gingival recession in this group and had failed to return to the practice for number of years. Perforations (6) are assigned to iatrogenic causes. Split roots (3) only involved those teeth in severely parafunctional patients. Root resorption (Internal and External) was only seen in 2 cases and recurrent apical lesions in four cases. The author considers if we combine perforations, split roots, root resorption and recurrent apical lesions as true “endodontic” failures, the loss of true endodontic failures has been 13 teeth from 287 teeth, 4.5%. It has to be recognised that a third of these losses were as a consequence of iatrogenic perforations and the four true recurrent apical periodontitis cases were all associated with difficulties with canal negotiation.

Following conclusion of treatment, all patients are given a “guestimation” of the long term prognosis. A degree of uncertainty is always allocated to all trauma cases in view of the long term consequences of root resorption and replacement boney ankylosis. None of the patients had experience an avulsed tooth but many had fractured teeth or displaced teeth that required reducing back into position. All the patients were seen within 24 hours of the traumatic event reflecting the on-call services 24/7 provided by the practice. If difficulties are ever encountered with canal negotiation or perforations are effected,

the patient is informed. This uncertainty label is also given to all severe periodontal and parafunctional patients, the latter of whom appear susceptible to vertical root fractures especially with post crowns and if the teeth are not restored with a crown. It has also been noted that those patients with significant systemic disease are placed in this group. One of the patients who lost 4 teeth following endodontics, developed a particularly aggressive rapidly progressive periodontal disease before kidney failure was diagnosed. Another patient failed to return when she responded unfavourably to surgery, radiotherapy and chemotherapy for cancer and whose whole oral health deteriorated rapidly. One patient who developed acute periodontitis with tooth loss shortly after endodontics of an maxillary second molar had severe parkinson's disease that made instrumentation particularly challenging. One patient had only undergone the first stage of endodontic treatment in an acutely pulpitis lower second molar tooth. Diagnostic lengths of the canals were established and instrumentation to the working length was concluded but in view of the acute symptoms and the tenderness to percussion due to a total pulpitis, I dressed the tooth to complete at his next visit. He visited Germany two days later and experienced a return of acute symptoms. An oral surgeon extracted the tooth. Whether it is relevant, the patient was HIV but sero-negative with anti-viral medication.

In addition to the lenient successes, the author also notes an element of uncertainty regarding the long term prognoses due to a multitude of factors that is not evident when looking at follow-up radiographs. This group includes all trauma cases which may lead to root resorption/bone replacement with ankylosis. The author often sees these patients within 24 hours of the traumatic event when the pulps remain vital at presentation but also later after the pulps have become necrotic. It is impossible to quantify the forces of the trauma or the damage effected to bone and root. Some teeth are displaced, some are not. Some teeth may exhibit fractures and some do not. Oblique fractures may extend subgingivally to varying degrees making restoration challenging. This can lead to lateral periodontal issues later wholly unrelated to the endodontic outcome. It is the opinion of the author that all post crowns in the presence of parafunctional activity must be regarded uncertain. Equally so, if there has been gross loss of coronal tooth tissue requiring large foundation restorations for supporting crowns, these must also be regarded as high risk in the presence of parafunctional activity. The presence of severe periodontal disease always includes the patients into the uncertain category. This is particularly of concern when there there has been a significant downturn in general

health which leads to rapid periodontal deterioration. Patients who developed renal failure, autoimmune disorders with high systemic steroid medication and heavy smokers inevitably led to further tooth losses irrespective of the quality of the endodontics. All irregular attenders make these patients vulnerable to root caries and considered high risk.

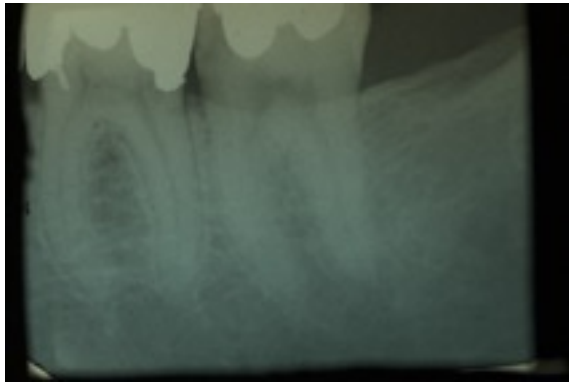
The author has concluded that having first hand knowledge of each patient that has undergone endodontics gives insight into explanations for failures that would be impossible to ascertain by just restricting the follow-up with radiographs by other researchers/clinicians or a telephone re-call to conduct the review. The author is also cognisant that mono Specialist Endodontic practitioners often times refer the patient back to their general dental practitioners and lose the opportunity to follow-up the patients following restoration. The author has now learnt to assume responsibility for restoration of the coronal tissues and place a provisional crown to avoid inadvertent perforations and to optimise the foundation if the patient is referred back to the general practitioner.

The author, does however, recognise bias that is well documented when clinicians review their own clinical material. The author has attempted to minimise this issue by consulting his experienced nursing assistant for her feedback and by focussing upon some of the details of failures and lenient successes for the reader to consider.

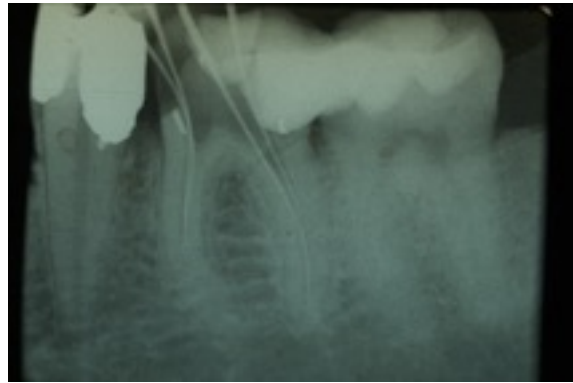
Finally, this audit task was inspired after two patients made formal complaints following perforations. Regrettably both patients attended practices promoting the use of implants and as a consequence, their teeth were lost. It was at that time, the author did not know the number of perforations effected with his patient population nor their outcome. This longitudinal study has now allowed the author to quantify the specific complications and be better able to inform patients of the attendant risks.

*Appendix A: Clinical examples of successes*

**Lower Left 6 (first molar tooth)**



2007, 14 August  
Pre-op with pulpitis no periapical lesion

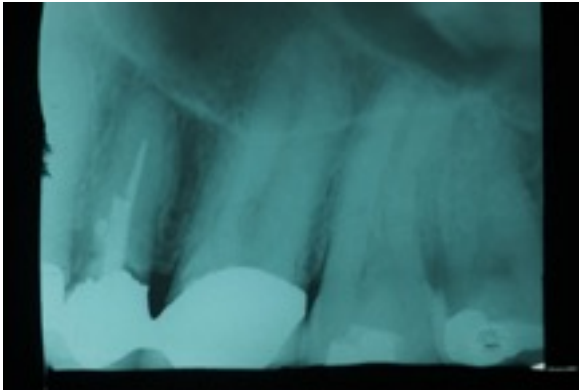


2007, 09 September  
Ongoing endo

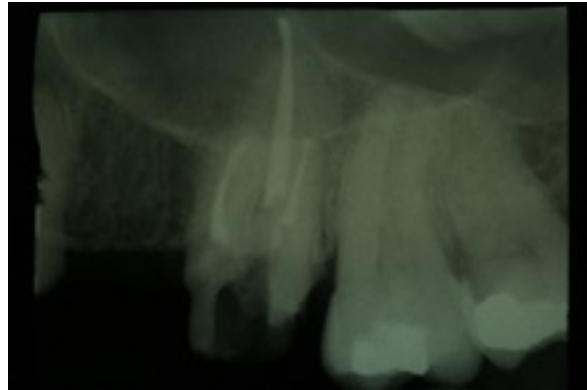


2016, 25 April  
Follow-up at 8 years, 7 months

### Upper left 6 (first molar tooth)



1995, 25 May  
Pre-op



1997, 11 December  
Ongoing endo + slight palatal over fill



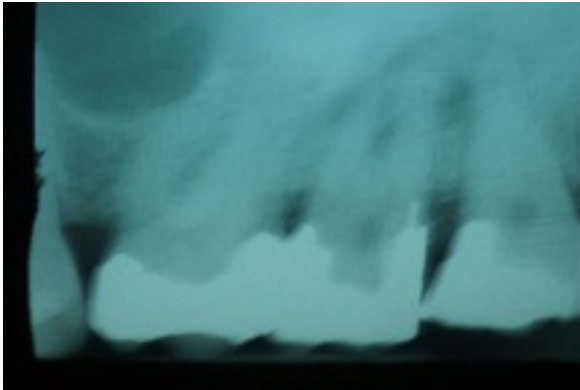
2016, 19 January  
Restored coping supporting bridge at  
19 years

It was decided that the second premolar root was un-restorable and earmarked for extraction. The previous failing crown on the first molar was removed and root canal

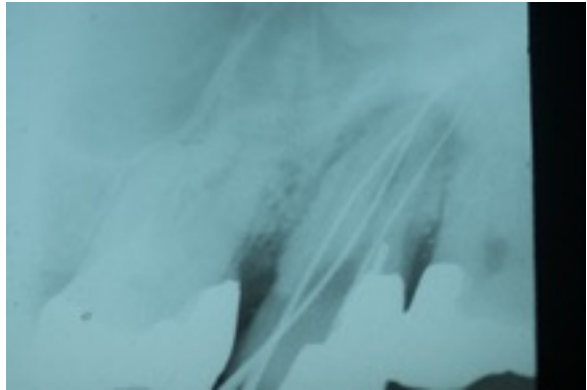


treatment completed. Slight over fill of sealer was evident. The tooth was re-prepared for a crown to support a fixed movable bridge supported by the root filled first premolar. These teeth were marked as uncertain prognoses following completion of the endodontics due to the vulnerable coronal tooth structure remaining which are prone to mechanical breakdown. The patient did not exhibit parafunctional activity.

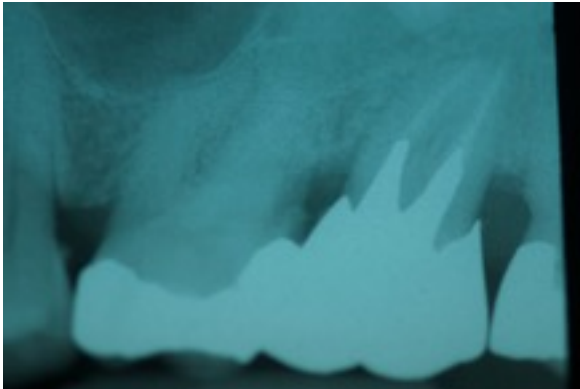
### Upper left 7 (second molar tooth)



2002, 23 July  
Pre-op with PA lesion



2002, 7 August  
Ongoing endo



2015, 10 June  
Follow up No PA Lesion at 13 years

## Upper left 6 (first molar tooth)



1996, 2nd October  
Ongoing endo

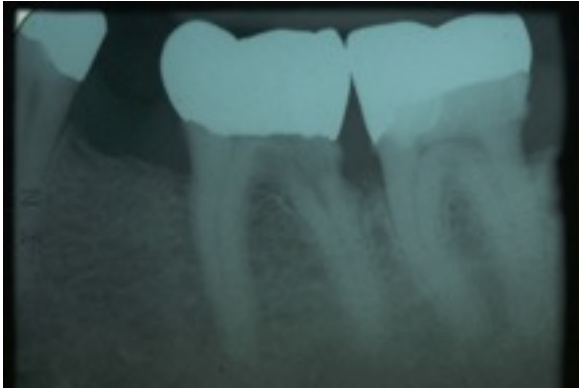


2015, 11th December  
Restored follow up at 19 years

The upper left first molar was considered as an uncertain prognosis due the presence of extreme parafunctional activity.

*Appendix B: Lenient successes*

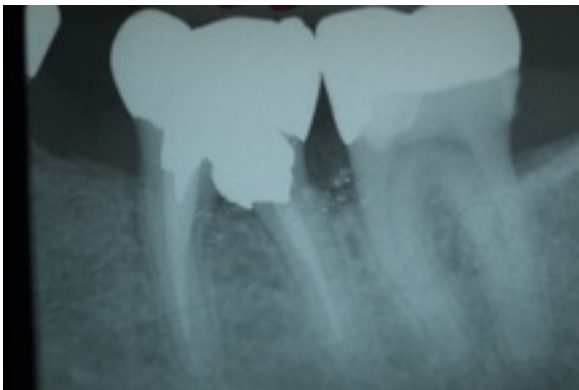
**Lower left 6 (first molar tooth)**



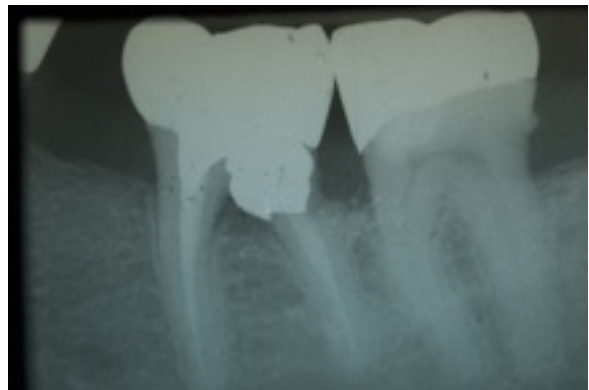
2009, 16 April  
Pre-op



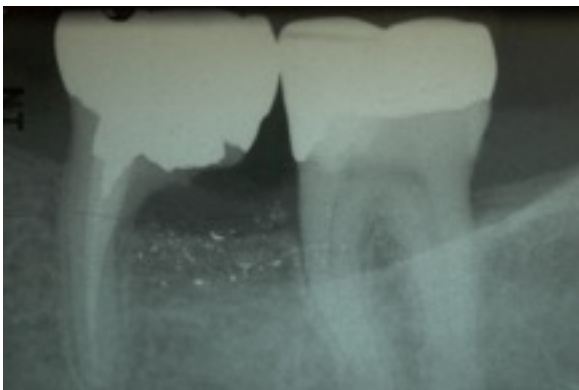
2011, 16 June  
Follow up



2011, 10 August  
Follow up



2012, 22 November  
Follow up



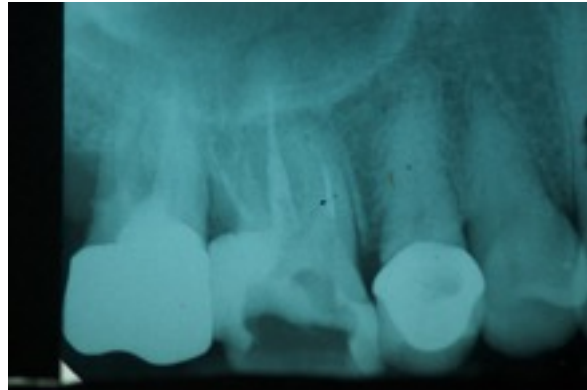
2012, 2 April  
Distal root amputation

## Upper right 6 (first molar tooth)



2006, 7 March

Pre-op

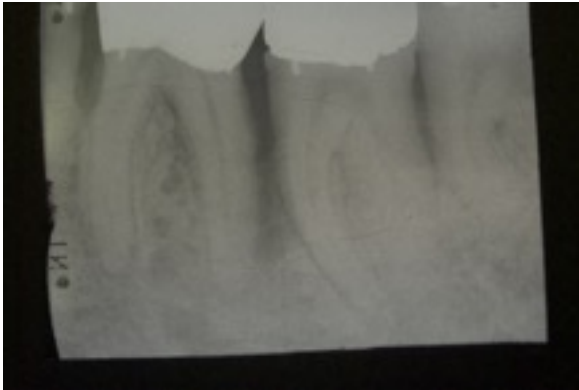


2006, 11 April

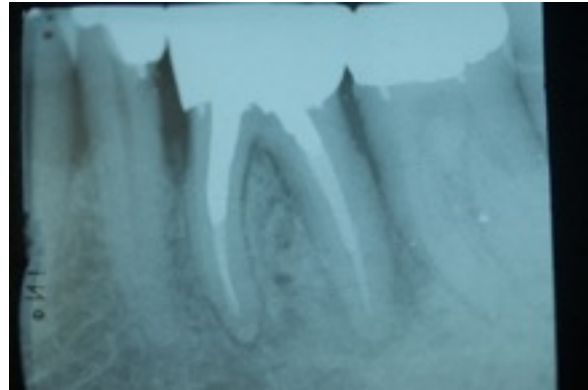
Access to canal compromised

The upper right first molar was categorised as an uncertain prognosis due to difficulties establishing access down the mesiobuccal root in patient with poor compliance and subject to previous root caries

## Lower left 6 (first molar tooth)



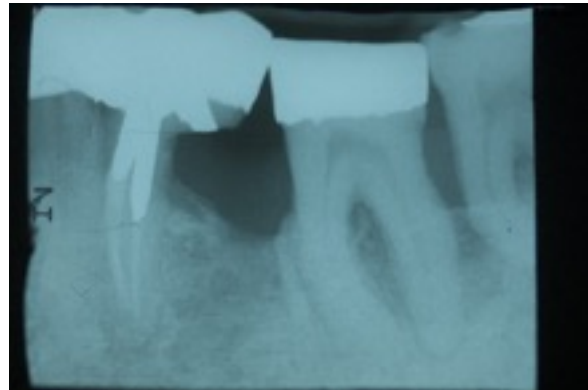
2005, 18 March  
Pre-op Adv distal perio lesion



2005, 29 March  
Restored with crown



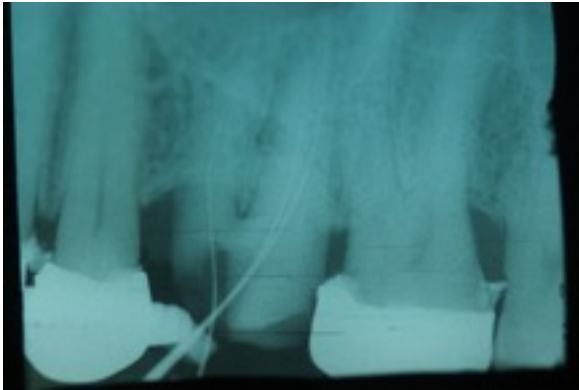
2011, 15 July  
Advanced perio leading to distal root  
amputation



2016, 13 May  
Follow up 11 years, 2 months

It is clear that this particular case, although successful, endodontically could easily lead to the future category of a periodontal failure.

### Upper left 6 (first molar tooth)



2009, 19 February  
Ongoing endo



2009, 20 February  
Zipped MB1 canal



2014, 6 October  
Follow up after 5 years, 8 months

On the basis of the radiograph alone, this case would be classified as successful.  
However, as we have the insight of MB1 canal, we must assign this as a lenient success.

### Upper right 1 (central incisor tooth)



2001, 17 December  
Pre-op - Pre-treatment



2002, 15 February  
Diagnostic x-ray Hedstrom  
to retrograde root filling



2003, 11 April  
Extrusion of sealer



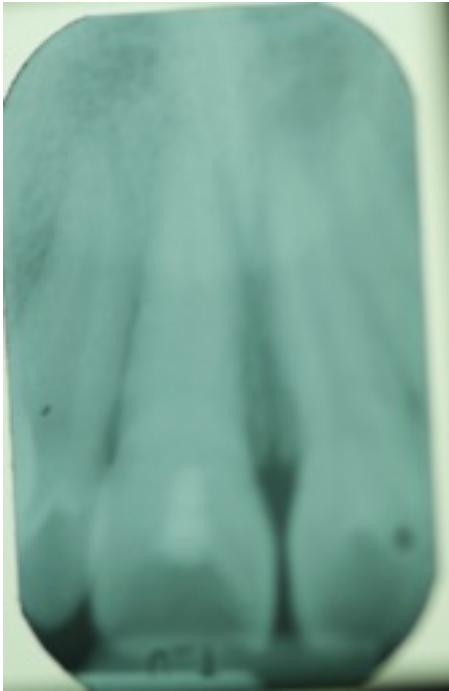
2006, 5 April  
Follow up at 3 years -  
Sealer absorbed



2015, 9 February  
Follow up at 13 years -  
Apical lesion evident.  
Asymptomatic.



### Upper right 1 (central incisor tooth)



1998, 17 December  
Pre-op buccal perf by previous  
dentist. Referred.



1998, 17 December  
Gooseneck in situ



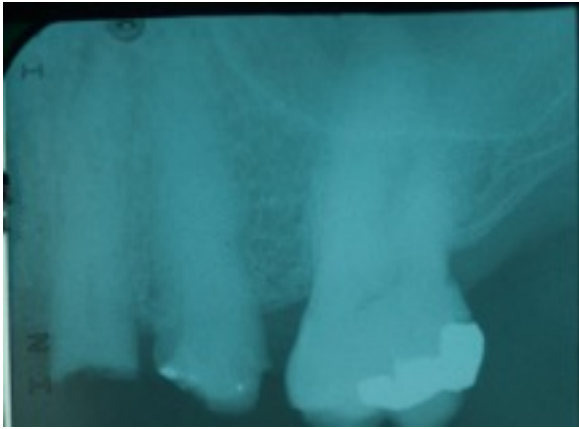
1998, 17 December  
Diagnostic WL: 25.0mm



2002, 18 December  
Follow up - Post-fill

This patient was referred by their practitioner when the patient was 12 years old, following the unsuccessful attempt to locate the root canal that had become sclerosed 3 years following a traumatic incident. The perforation was located and the root canal proper was cleaned and filled. A telephone call effected to the patient 18 years following treatment revealed that the tooth was retained, asymptomatic and exhibited no colour change. I am anticipating to see the patient again later in 2016 when they return from overseas for a follow up radiograph. It is because of the presence of the original perforation repair and the in ability to secure a recent followup radiograph that I have assigned this case as a lenient success.

## Upper left 4 (first pre-molar tooth)



2012, 3 November

Pre op retained root + PA lesion.



2014, 17 April

Post-fill. Slight buccal overfill.

Last seen 2016, 10 February (no xray).

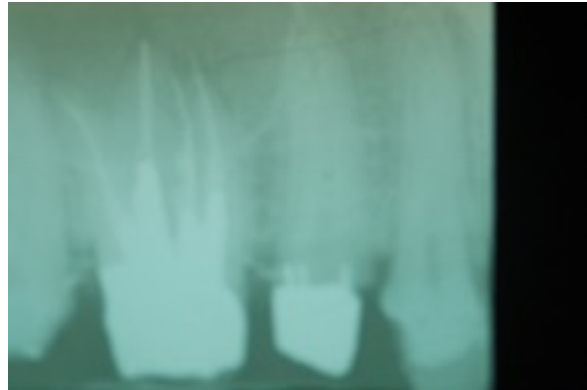
Asymptomatic.

There was a small extrusion of gutta percha point during vertical warm condensation that marked the uncertainty of long term success.

## Upper right 6 (first molar tooth)

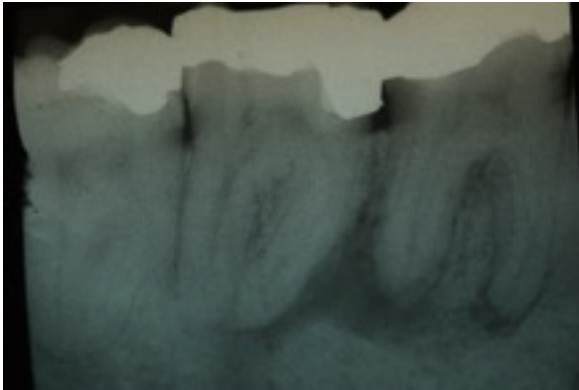


2007, 9 January  
Pre op distal caries

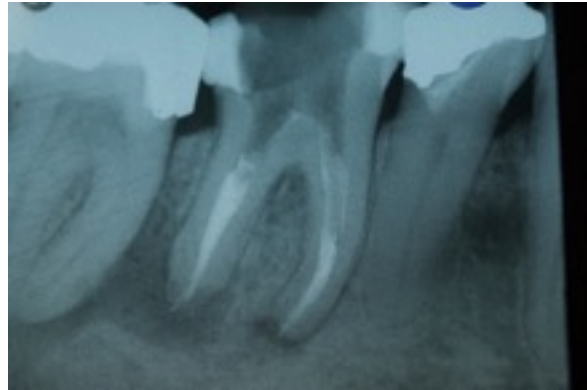


2007, 26 January  
Follow up - Post-fill.  
Perf MB canal + slight overfill

## Lower right 6 (first molar tooth)



2006, 10 February  
Pre op very large PA lesion in lower right first molar.

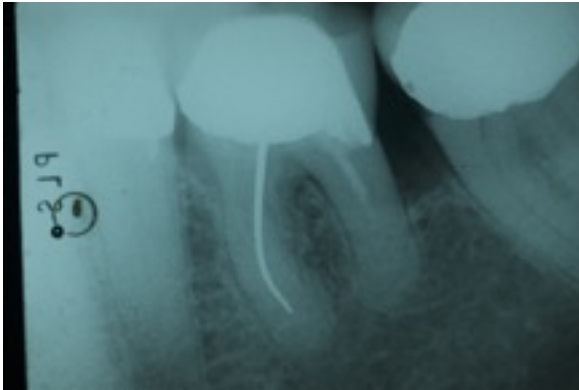


2006, 3 March  
Root filling completed. Post-fill X-ray

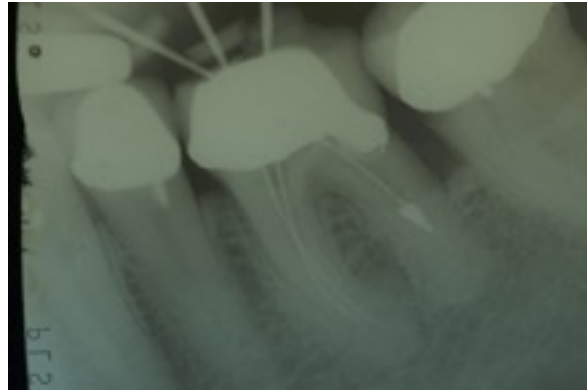


2009, 26 February  
Crown follow up. Small apical lesions diminishing but remain at 3 years.  
Asymptomatic.

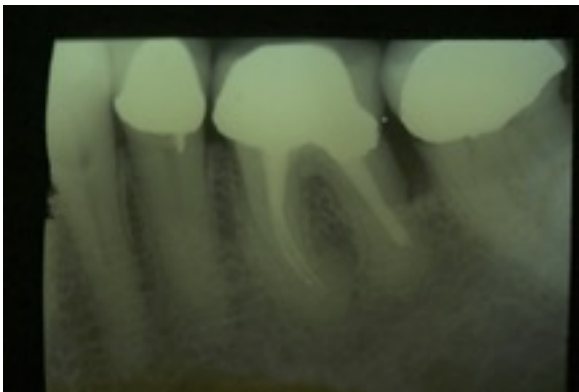
## Lower left 6 (first molar tooth)



1995, 12 June  
Pre op retreat from previous dentist.  
Referred.



1996, 11 January  
Endo ongoing



1996, 18 January  
Restored

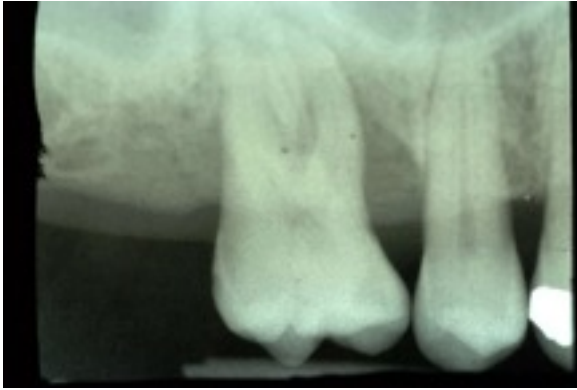


2004, 23 September  
Follow up - Root caries failed.  
Patient absent for 8 years, 7 months

There were difficulties attempting access down the distal canal due to sclerosis that led to a “short” fill. However, the patient “disappeared” without review for over 8 years due to fiscal circumstances. Severe root caries and furcation caries compromised the consideration for a distal root amputation which led to loss of the tooth. The irony in this story is that the patient has now resolved her financial restraints and is scheduled for an implant supported crown for the future.

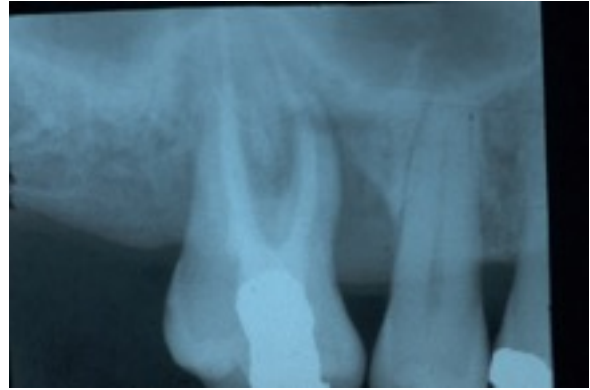
## *Appendix C: Failures*

### Upper right 6 (first molar tooth)



2015, 13 August

Perio endo lesion -> Acute pulpitis



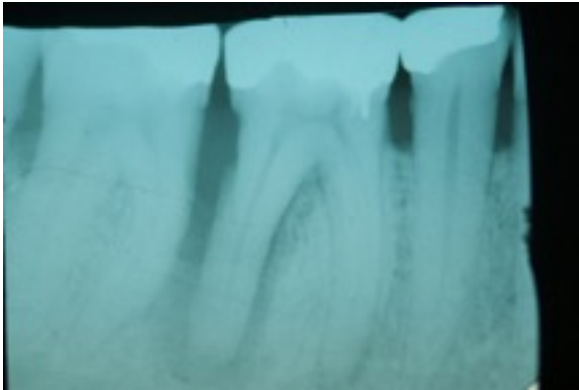
2016, 8 March

Perio Failure, Furcation

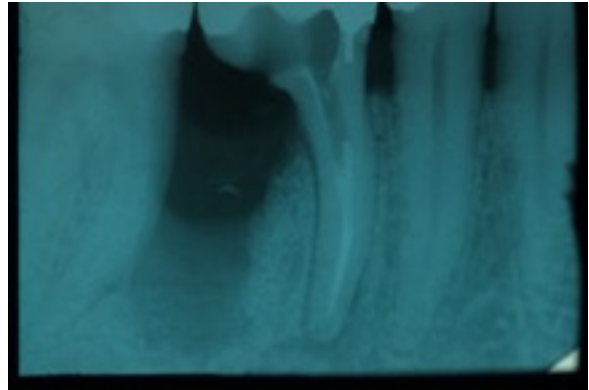
Right sinus pain right max pain persistent  
indicating extraction

The maxillary right first molar was severely periodontally compromised which had led to the loss of other teeth in this patient. Advanced loss of attachment led to irreversible pulpitic disease. Endodontics resolved the acute pulpitis symptoms but an acute lateral periodontal lesion in the furcation led to the loss of the tooth only 7 months later.

Lower right 6 (first molar tooth)



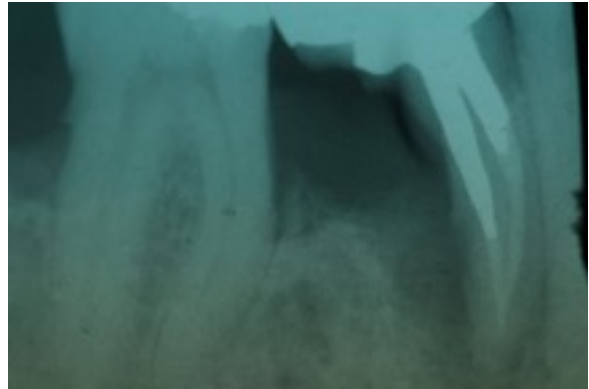
2002, 12 May  
Pre-op Distal Perio/endo



2002, 28 May  
Ongoing endo + root amp



2003, 7 March  
Crown restoration



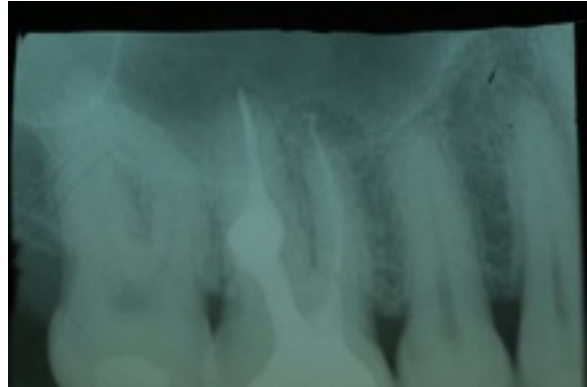
2008, 14 May  
Failing perio



### Upper right 6 ( first molar tooth)



2000, 7 June  
Ongoing end DB canal totally sclerosed



2001, 22 March  
Restored + MB over fill + palatal int  
resorption



2004, 22 January  
Post Apicectomy MB



2005, 12 August  
Follow up - Failed due to lateral perio  
palatal abscess -> Immunosuppressed  
medications for ulcerative colitis

## Upper left 1 (central incisor tooth)



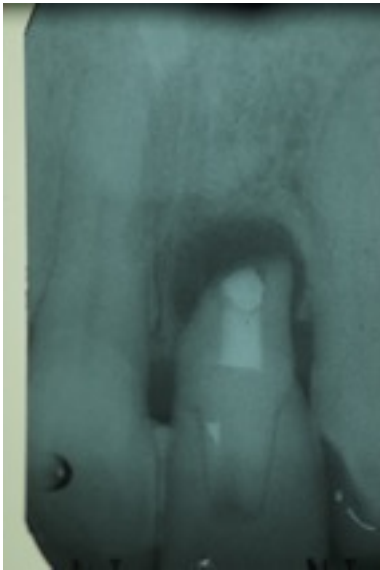
2007, 13 March  
Pre-op - Failed endo/root  
resorption endo perio lesion



2007, 4 December  
Conventional root filling  
with over fill



2008, 19 March  
Apical curettage

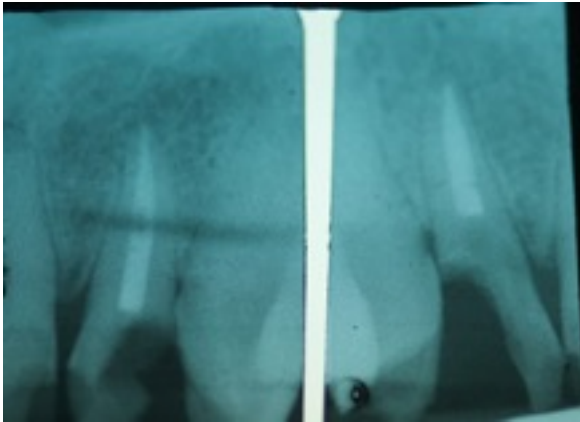


2014, 14 October  
Follow up - Apical lesion



2015, 26 January  
Loss of tooth -> partial  
denture -> bone graft ->  
Implant/crown

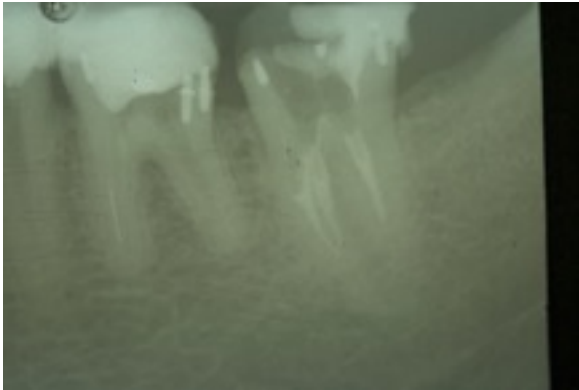
## Upper right 2 and upper left 2 (lateral incisor teeth)



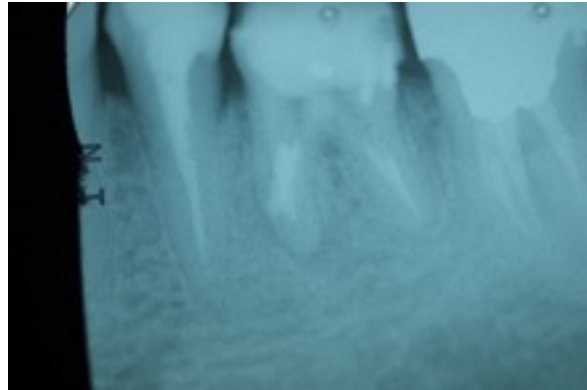
2012, 25 September

Upper right and upper left lateral incisors root treated. Decoronated for over denture abutments. Elected extractions for implants -> then the patient changed their mind and therefore proceeded with Removable Partial Denture.

## Lower left 6 (first molar tooth)



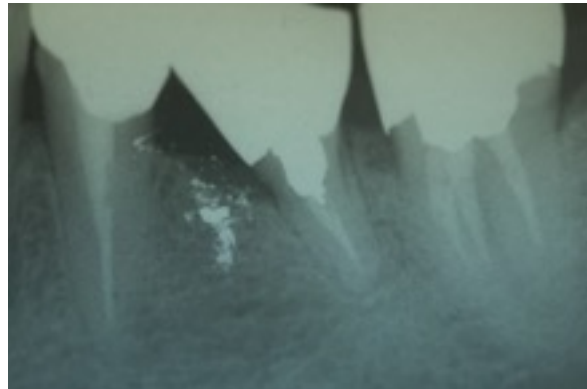
2005, 5 December  
Pre op with separated instrument in MB canal



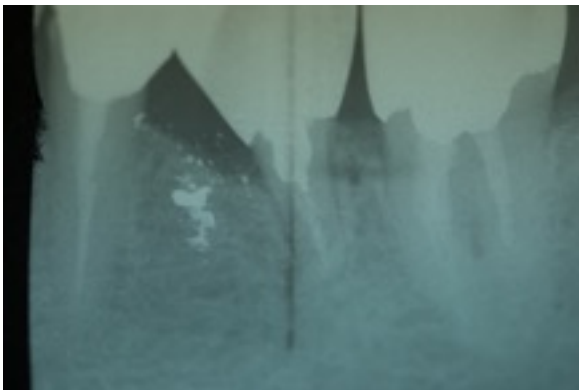
2005, 19 December  
Post fill -> mesial root perf when attempting to remove separated instrument -> mesial PA lesion. Root amputation 2007, 20 July



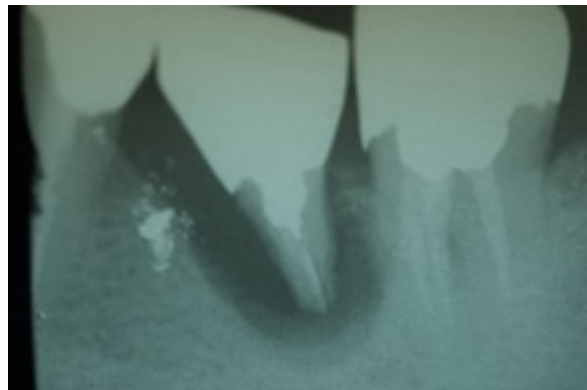
2009, 3 August  
Follow up



2011, 2 November  
Follow up



2012, 12 December  
Follow up



2016, 17 May  
Failure - after 4 years of absence

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