

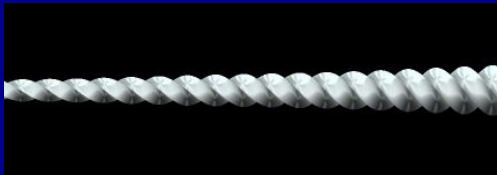
- The Causes of Endodontic Stress**
- . Clogging Canals, losing length and canal distortion in the creation of the glide path
 - . Breaking rotating NiTi instruments
 - . Excessive removal of coronal tooth structure
 - . Shaping canals insufficiently for predictably thorough obturation
 - . Overly expensive instruments that are recommended for single usage.

Clogging Canals

A direct result of the use of K-files

Why K-files, specifically, are the wrong instruments to use

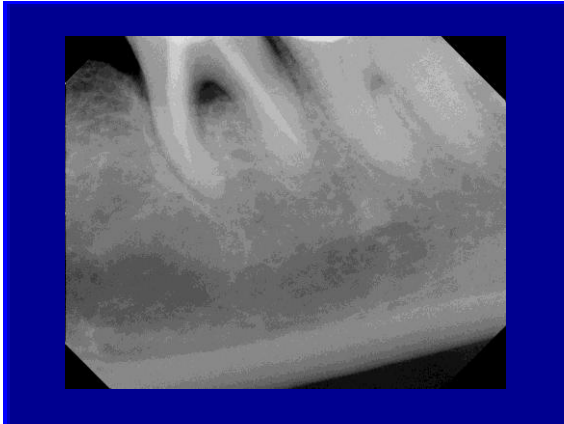
K-File



Horizontal flutes used in a watch winding motion:

- . Impact debris apically on the downstroke
- . Shave on the upstroke straightening curved canals
- . Excessive engagement with the canal walls
- . Poor tactile sense potentially producing ledges



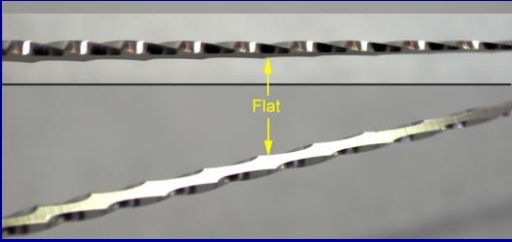


Consequence of the poor design and utilization of the K-file:

- . blocked and distorted canals
- . the desire to find something better

The Solution

Relieved Reamer



- Vertical flutes in watch winding motion:
- . Shave dentin from the canal walls without distortions
 - . Engage far less along length
 - . Superior tactile perception reducing distortions

The Process of Critical Thinking



If the previous video does not drive home the point that the blades must be at right angles to remove dentin, consider the act of shaving one's face or legs.

Cardinal Rule # 1:

The cutting blade must be more or less at right angles to the plane of motion.

Relieved reamer

(aka vertically oriented flutes on a relieved shank)



We use reamers rather than k-files.



Comparing k-reamers to k-files we observe the following:



1. Fewer flutes on the 16 mm of working length of a reamer than on a k-file approximately 16 flutes versus 30.

K-File

Relieved reamer



Consequences of fewer flutes

1. There is less engagement along length.
2. Relieved reamers are more flexible than files because they are less work hardened and thinner in cross section.
3. The flutes are more vertically oriented.



K-File



Relieved reamer



Consequences of less engagement:

1. Less resistance along the shank as we negotiate apically.



Consequences of greater flexibility

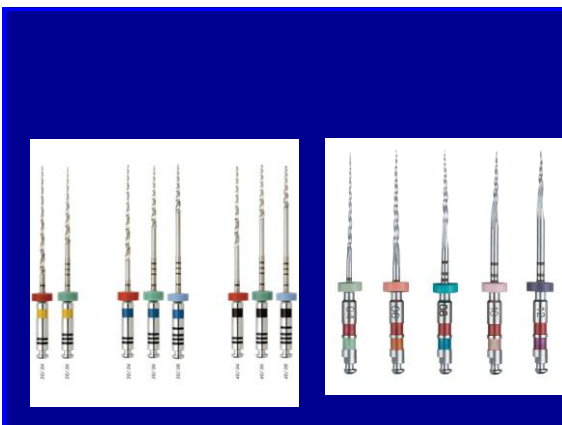
1. Able to negotiate curved canals with less chance of distortion.

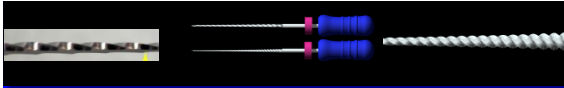


Consequences of more vertically oriented flutes:


1. Able to cut dentin along canal length when the motion of the instrument is either horizontal rotation or reciprocation.

K-File





Taken together, the consequences of greater flexibility, less engagement and more efficient cutting along length produce a **superior tactile perception** along length and at the tip of the instrument.



The consequences of superior tactile perception:

1. Allows the safe incorporation of a cutting tip

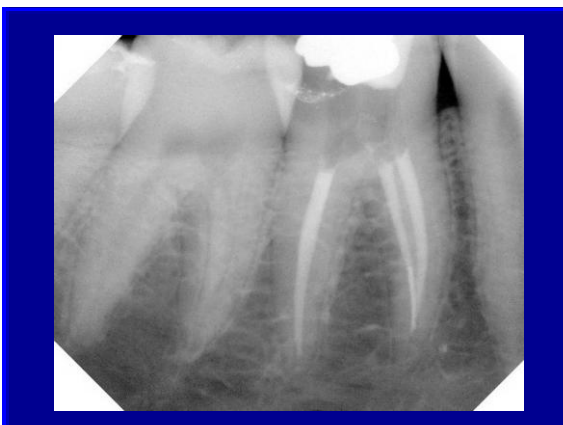
The consequences of a cutting tip:

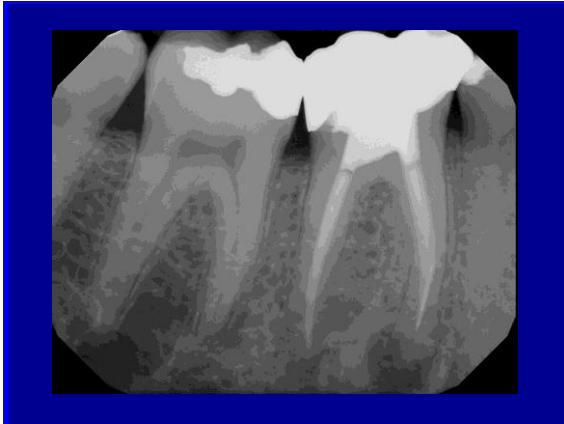
1. The ability to pierce pulpal tissue rather than impact it apically.
2. The ability to distinguish between a tight canal and hitting a wall when used in a watchwinding motion or a reciprocating handpiece.

Breaking rotating NiTi instruments

This is what we want to eliminate completely







The Solution

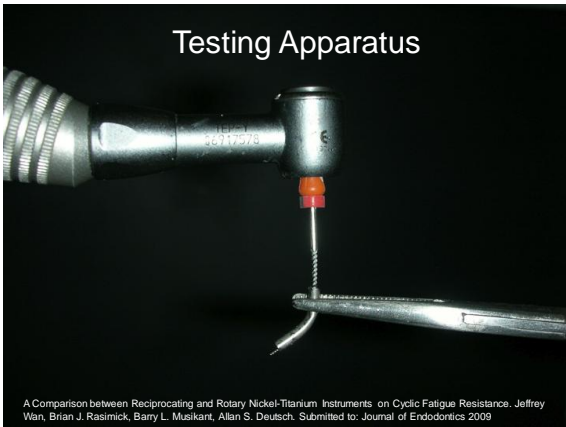


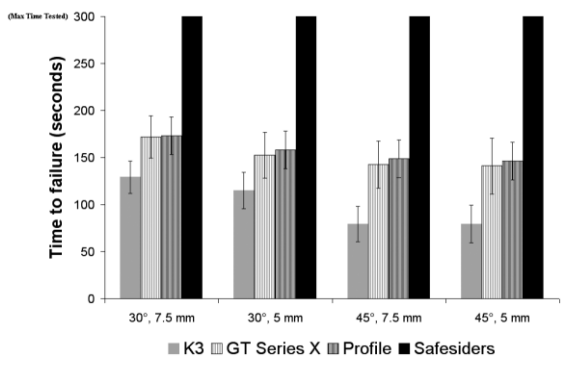
The incorporation of the reciprocating handpiece allows a 30° arc of motion oscillating at 3000-4000 cpm.

A 30° arc of motion represents 1/12 of a circle or 5 minutes on the face of a clock.

The motion is so limited it virtually **eliminates** the 2 major factors that cause rotary NiTi files to break and unwind, namely, torsional stress and cyclic fatigue.

Safety, Safety, Safety, Safety



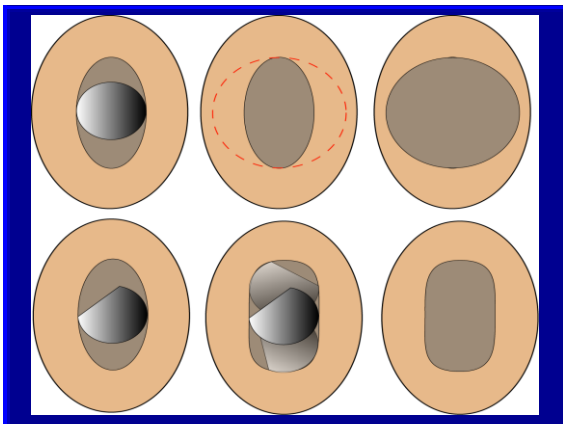


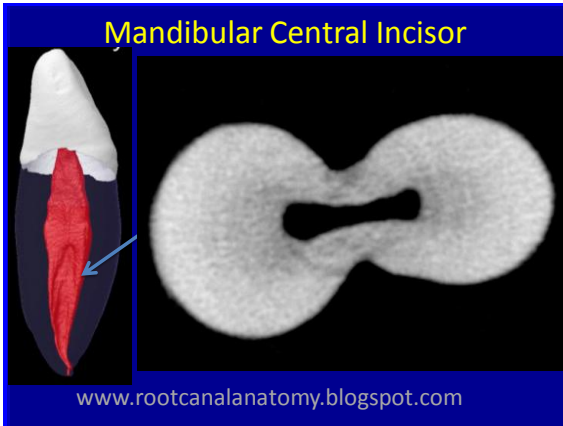
A Comparison between Reciprocating and Rotary Nickel-Titanium Instruments on Cyclic Fatigue Resistance. Jeffrey Wan, Brian J. Rasimick, Barry L. Musikant, Allan S. Deutsch. Submitted to: Journal of Endodontics 2009

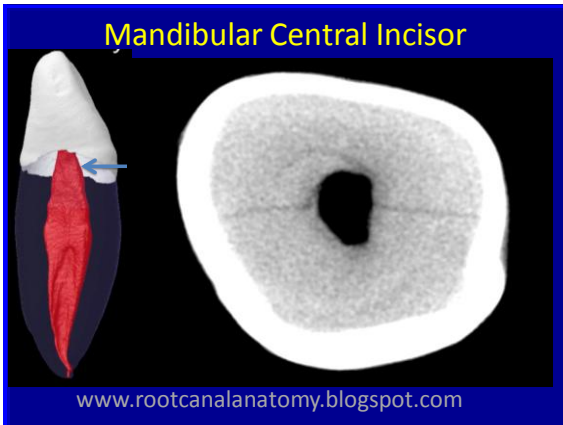
Reasonable conclusion:

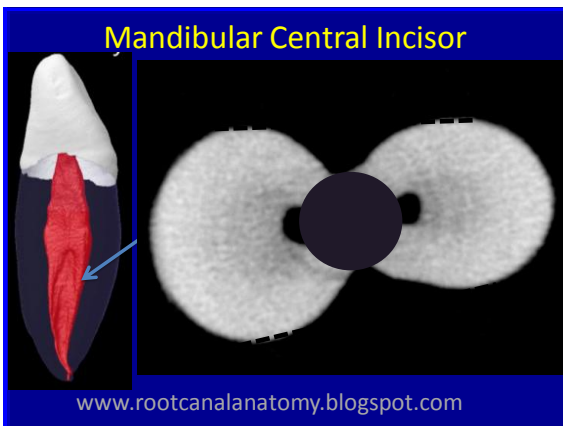
30° symmetric reciprocation is far safer than rotation in keeping instruments intact.

Excessive removal of coronal tooth structure









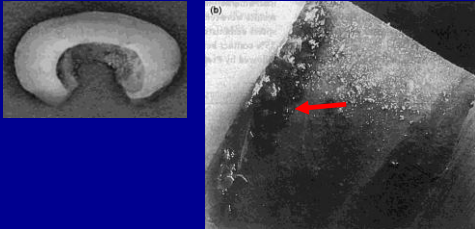
The Solution

The use of predominantly .02 tapered stainless steel relieved reamers to shape the canal from start to finish

Used with a short amplitude of motion both manually and in the 30° reciprocating handpiece, the .02 tapered stainless steel relieved reamers can be used with significant lateral pressure to cleanse oval canals without concern for instrument separation

Shaping canals insufficiently for predictably thorough obturation

Quality of preparation of oval distal root canals in mandibular molars using nickel-titanium instruments. Rädig T, Hülsmann M, Mühge M, Schäfers F. Int Endod J. 2002 Nov;35(11):919-28.



CONCLUSIONS: The flexibility of the NiTi instruments investigated in this study did not allow controlled preparation of the buccal and lingual extensions of oval root canals. The instruments frequently produced a circular bulge in the canal while the buccal and lingual extensions remained unprepared, leaving smear layer and debris.

Root canal cleanliness was not good with much remaining debris and smear layer in the unprepared extensions.

Articles discussing micro-computed tomography sparked immediate interest among dental researchers, especially in the area of rotary file design.

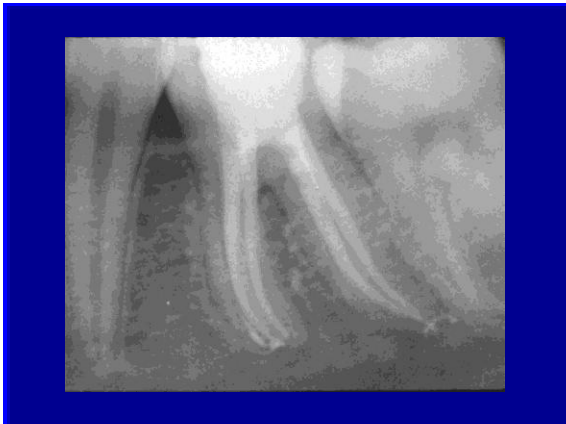
Bench-top micro-computed tomography (CT) allowed groundbreaking research, which has shown, despite the use of endodontic rotary file systems, 35% to 50% of the root canal system remained untouched.

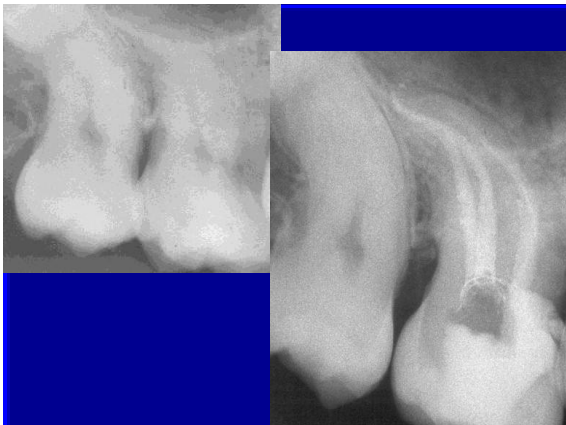


O. A. Peters, A. L. Laib, T. N. Gohring and F. Barbakow. Changes in Root Canal Geometry after Preparation Assessed by High-Resolution Computed Tomography. J Endodon, January 2001; 27:1:1-6.

The solution

It helps if the shaping instruments touch all the walls of the canals or at least shape the canals to a minimum of 35











Abilash, R. Mensudar, Vivekandhan, Subbiya, VG Sukymanan. Cutting Efficiency, Surface Change and hardness: EZ-fill SafeSider Instruments vs K-files. Indian J of Multidisciplinary Dentistry 2011;1:110-114.

Conclusion

Under the conditions of this study, EZ-fill safe-sided instruments proved:

.More efficient than the conventional K-files

.Aids in better removal of debris

.Causes less fatigue to the operator

.Shows less cold working and therefore less chance of instrument separation

.Maintained a smooth reproducible glide path

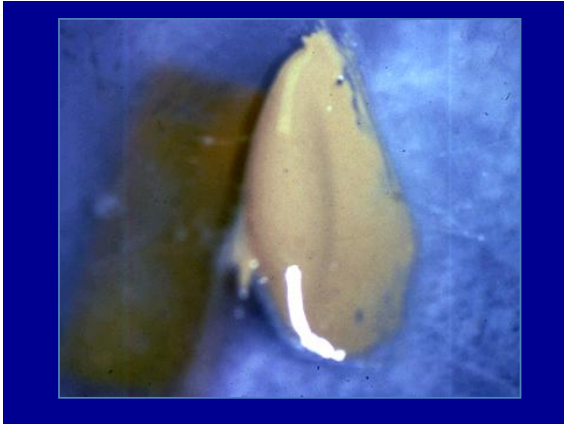
Obturation:

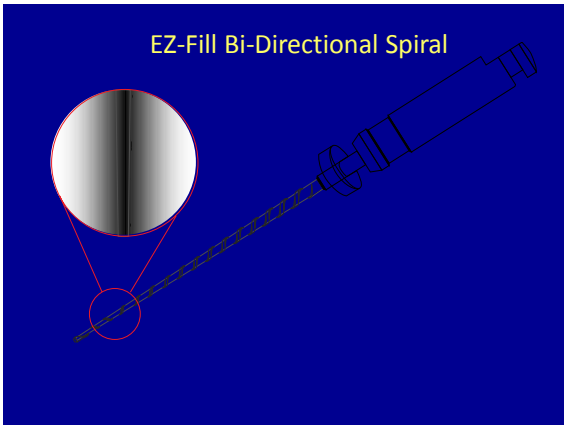
How to do it with the least stress

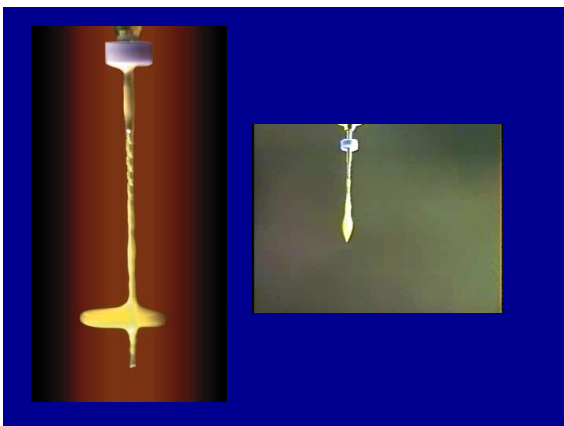
Coat the canal thoroughly with room temperature epoxy-resin cement using the bidirectional spiral.

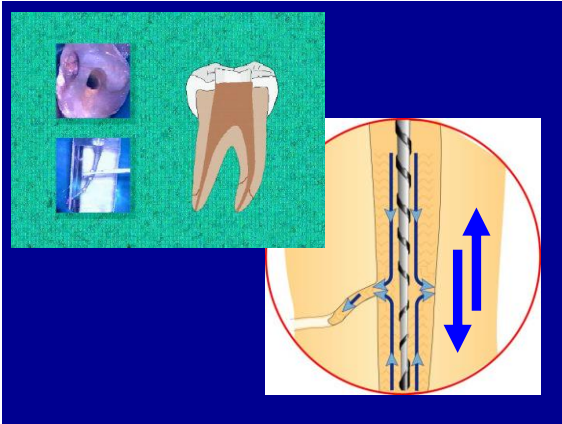
EZ-Fill®
Bi-Directional Spiral
and Epoxy Root Canal Cement













EZ-Fill[®] Obturation

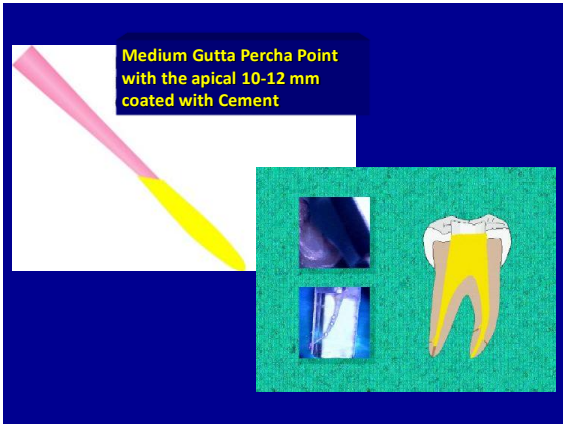


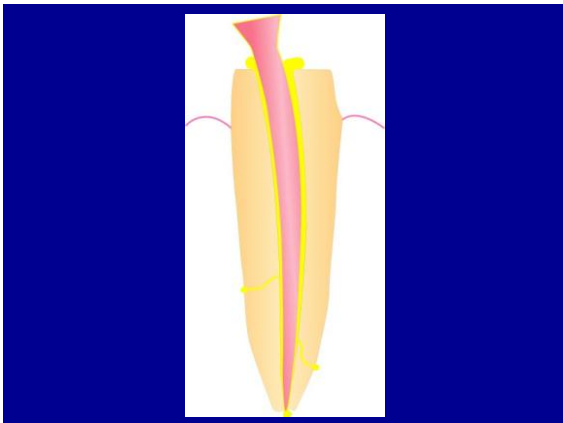
Lateral Flow of EZ-Fill[®] Epoxy Resin Cement in Block



The Sequence

- Fit a medium gutta percha point.
- Place EZ-Fill epoxy root canal cement with the EZ-Fill bi-directional spiral.
- Repeat application of EZ-Fill epoxy root canal cement with the EZ-Fill bi-directional spiral.
- Place master point.



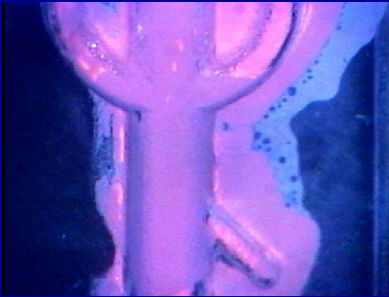


Benefits of the EDS EZ-Fill® Obturation System

- Retains accurate placement of the prefitted gutta percha point.
- No lateral stress to create potential fracture.
- No shrinkage of thermoplastic filling materials.
- An epoxy interphase that seals better than the best placed gutta percha point.
- The elimination of the apical extrusion of cement into vital periodontal ligaments.

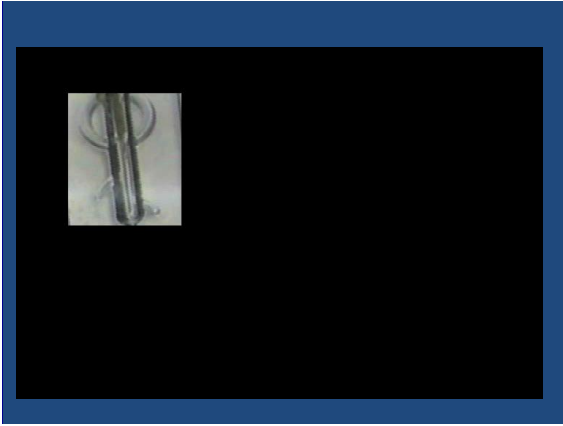
EZ-Fill epoxy root canal cement, a derivative of AH-26, first introduced to the US in 1957:

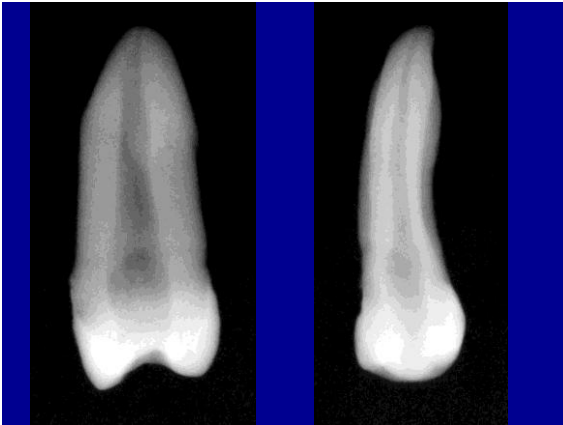
- A. Does not shrink or expand chemically due to its epoxy base.
- B. Has excellent flow due to its adjustable viscosity.
- C. Is not clinically irritating to the periapical tissues.
- D. Does not degrade over time.
- E. Adheres to tooth structure and gutta percha chemically and mechanically.

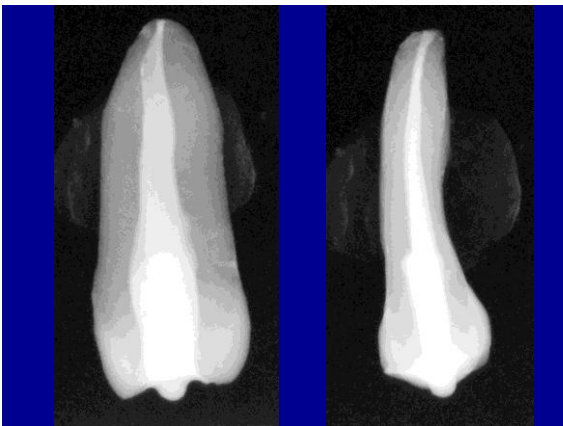


Shrinkage is an inherent property of all thermoplastic techniques be they carrier based, the squirt technique or heated spreaders.

Shrinkage produces gaps

















Single point systems are the best suited to prevent voids

How is this possible?

We all remember the description of single point fills: A single point sitting in a sea of cement!

To seal three dimensionally long term requires

- . Flowability of the cement
- . Adequate quantity of cement placed
- . No shrinkage of the cement and gutta percha
- . Some expansion (preferably)
- . Stability of the sealing materials
- . Cement that bonds chemically and physically to the dentin and the gutta percha

We recommend obturation systems that have all these characteristics.

Wu, MK, Ozok AR, Wesselink PR. Sealer distribution in root canals obturated by three techniques. Int Endodon Journal 2000;33:340-345.

At both 3 mm and 6 mm from the apex the sealer coated canal perimeter (PSCP) was significantly higher after single cone (no condensation) than after vertical or lateral condensation. Please note: The EZ-Fill obturation technique employs the use of a single cone with the patented EZ-Fill bidirectional spiral and epoxy root canal cement (an AH26 derivative).

Evaluation of the Apical Seal of Root Canal Fillings with Different Methods

Antonopoulos KG, Attin T and Helwig E
J Endodon 1998;24(10):655.

Evaluation of the Apical Seal of Root Canal Fillings with Different Methods.
Antonopoulos KG, Attin T and Helwig E. J Endodon 1998;24(10):655.

The purpose of the study was to compare dye penetration methods conducted passively, under negative pressure, or under high pressure conditions. Ninety human maxillary incisors were instrumented and obturated with either the lateral condensation or single cone technique.
Lateral condensation and single cone techniques yielded similar sealing abilities.

Comparison of Apical Leakage in Root Canals Obturated with Various Gutta-Percha Techniques Using a Dye Vacuum Tracing Method.

Dalat DM, Spangberg LSW.
J Endodon 1994;20:315-319.

Conclusions:

Tested Leakage for Following Techniques: All used AH-26

- Single Cone
- Lateral Condensation
- Vertical Condensation
- Thermafil
- Ultrafil



All Statistically the Same

Single cone technique had the least deviation in results.

Comparison of Apical Leakage in Root Canals Obturated with Various Gutta-Percha Techniques Using a Dye Vacuum Tracing Method. Dalat DM, Spangberg LSW. J Endodon 1994;20:315-319.

Basics:

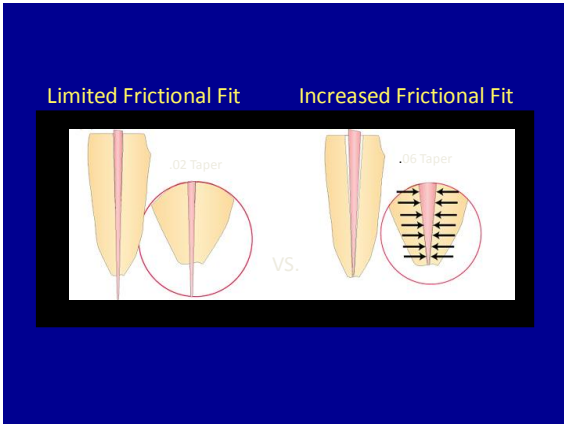
How to fit the point

Problems:

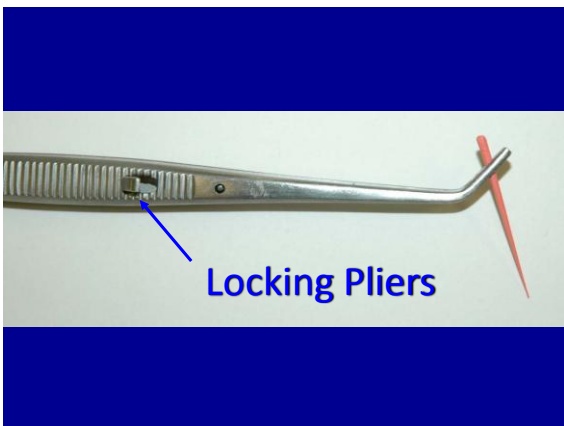
1. Canals shaped with .02 tapers produce little resistance form.
2. Gutta percha points of .02 tapers have little lateral driving force.

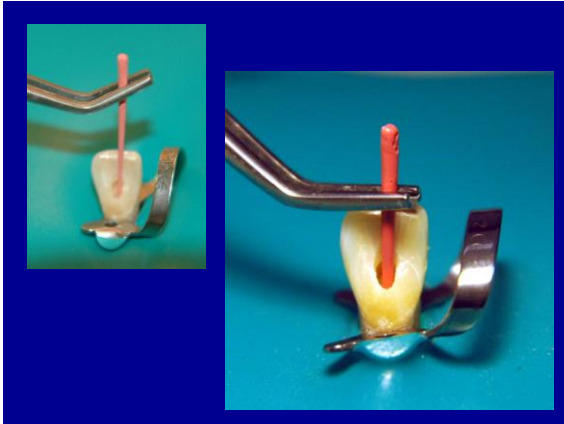
Producing:

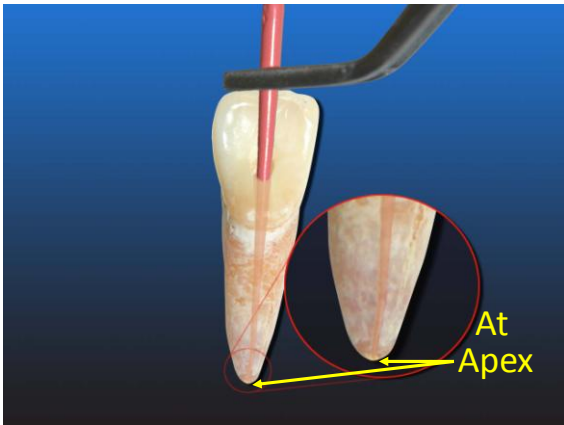
- . Overextensions and underfills
- . Voids both apically and along length

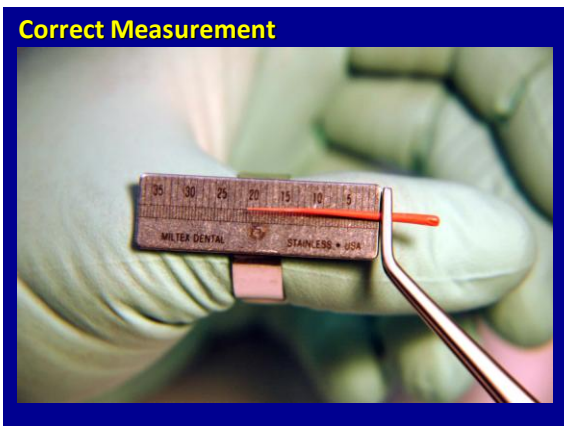


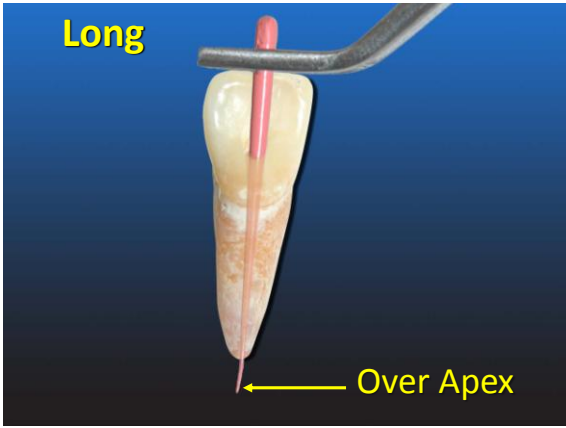


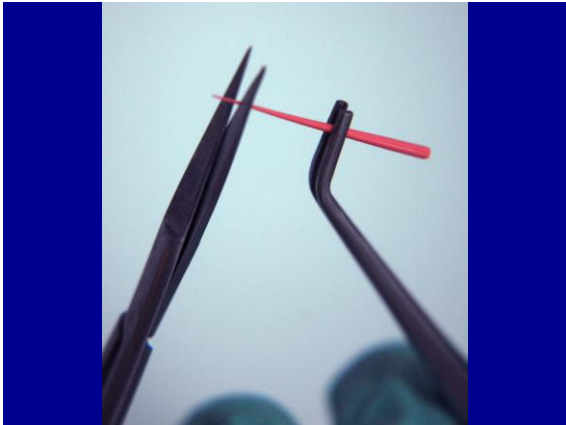


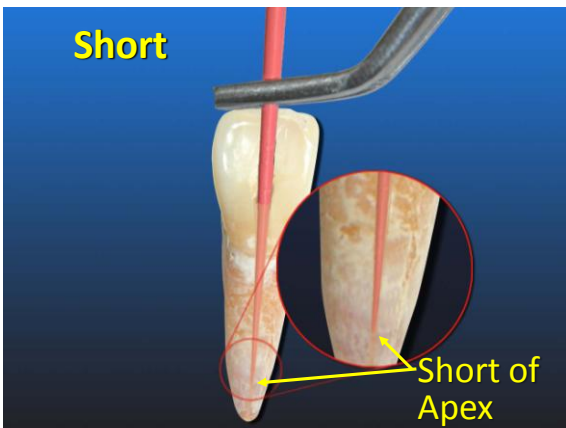




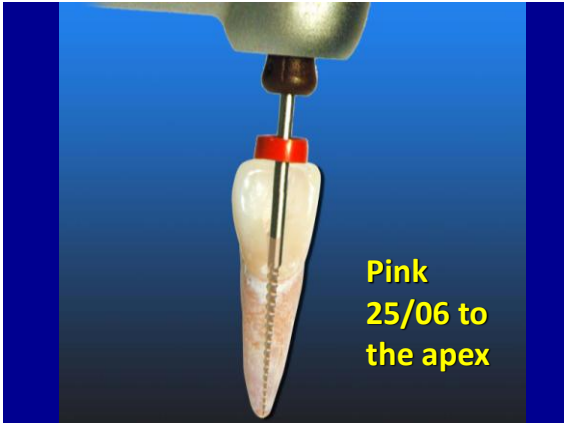


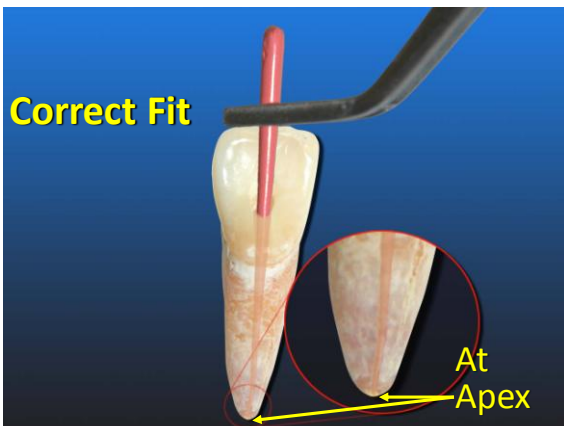






1. Make sure the apex is patent by going 0.5 mm beyond the constriction with the 25 relieved reamer.
2. Check patency to the constriction to a 35.
3. If the tooth is longer than 22 mm take the relieved reamer into the coronal third of the root and work a few strokes against both the mesial and distal walls.





Interrelationship between shaping and obturation: They are mutually reinforcing in producing a superior seal.









Summary for obturation:

1. Three dimensional obturation is achieved with room temperature systems.
2. The bidirectional spiral is key to flooding the canal with cement without driving excess over the apex.
3. The fill is now mainly dependent upon the cement rather than the carrier (gutta percha).



RESTORATION AND REHABILITATION OF ENDODONTICALLY TREATED TEETH

Mark H. Docktor DDS

HISTORY OF POST AND CORES

- USE OF "TENONS" AS POSTS 250 YEARS AGO (1732)
- MID 1800'S, WOOD RATHER THAN METAL WAS POPULAR
- LATE 19TH CENTURY, "RICHMOND CROWN" AS SINGLE P/C
- 1930'S, CUSTOM CAST POST/CORE
- CREATION OF VARIOUS PRE-FABRICATED POSTS
- INTRODUCTION OF THE "FLEXIPOST"
- INTRODUCTION OF FIBERPOSTS

• COURTESY OF DOUGLAS TERRY, DDS AND EDWARD SWIFT, JR., DDS, DENTISTRY TODAY, 12.2009

MOST POPULAR POST/CORE OPTIONS

- CUSTOM CAST POST/CORE
- FLEXIPOST/FLEXIFLANGE
- FIBERPOST
- CERAMIC/ZIRCONIUM
- VARIOUS BRANDS OF METAL PRE-FAB POSTS
- VARIOUS COMPOSITE CORE BUILDUP MATERIALS
- VARIOUS CEMENTS AND ADHESIVE MATERIALS
- THE OPTION TO USE WHAT YOU FEEL IS MOST COMFORTABLE, WITH MOST ADVANTAGEOUS LONG TERM RESULTS

FACTORS TO CONSIDER IN POST SELECTION

- ANATOMY OF TOOTH...ROOT CURVATURE/MD & BILDMETER,ROOT SIZE
- LENGTH OF ROOT
- WIDTH OF CANAL/CANAL CONFIGURATION AND POST PREPARATION
- REMAINING CORONAL TOOTH STRUCTURE
- POSITION OF TOOTH IN THE ARCH
- STRESSES AND TORSIONAL FORCES...COMPRESSIVE,TENSILE, AND SHEAR
- HYDROSTATIC PRESSURE/ISSUES WITH CEMENTATION
- DESIGN OF POST/POST MATERIAL...SIMILAR TO DENTIN, BIOCOMPATIBLE, SHOCK ABSORBER
- MATERIAL COMPATABILITY/WITH TOOTH AND RESTORATIVE, MATERIALS
- RETENTION OF POST AND CORE...PROPER FIT, CEMENTATION, OR BONDING
- RETRIEVABILITY/IF REMOVAL IS NECESSARY
- COURTESY OF DR. REEM AL-DHALALAN PROSTHODONTIC MANAGEMENT OF ENDOODONTICALLY TREATED TEETH

FLEXIPOSTS

- PROVIDES MAXIMUM RETENTION WITH MINIMAL STRESS
- SPLIT SHANK CLOSSES UPON INSERTION, ADAPTS TO ROOT, AND ELIMINATES POTENTIAL FOR VERTICAL ROOT FRACTURE
- DISTRIBUTES FUNCTIONAL STRESSES EVENLY
- MAXIMIZES RETENTION WITHOUT CONTRIBUTING TO THE PRODUCTION OF TENSILE STRESSES
- RELEASES INTERNAL HYDROSTATIC PRESSURE UPON CEMENTATION WITH APPROPRIATE VENTING
- HORIZONTAL AND VERTICAL GROOVES IN HEAD SECURELY ANCHOR CORE MATERIALS
- OFFERS RETENTION COMPARABLE TO NATURAL DENTIN
- REDUCES LAB COSTS, SAVES TIME, EXPEDITES TREATMENT

ADVANTAGES/DISADVANTAGES TO VARIOUS TYPES OF POSTS AND CORES

- CAST POSTS:...LAB EXPENSE, TWO VISITS, BUT ADAPT WELL TO CANALS, ESPECIALLY WITH NON-CIRCULAR CROSS SECTIONS, AND PROVIDE SUPPORT WITH MINIMAL CORONAL REMAINS. GREAT WITH LARGE FUNNEL SHAPED CANALS. THE MODULUS OF ELASTICITY MUCH HIGHER THAN DENTIN, AND OCCLUSAL FORCES CAN CREATE GREAT STRESS ON TOOTH, YIELDING POTENTIAL FOR FRACTURE.
- METAL PRE-FAB POSTS:...EASY TO USE, ONE-VISIT FACTOR, EXCESSIVE STIFFNESS AND MODULUS OF ELASTICITY FACTORS RELATED TO ROOT FRACTURES. PARALLEL-SIDED AND SERRATED ARE THE MOST RETENTIVE.
- NON-METALLIC, CERAMIC OR FIBER-REINFORCED:...THEY ARE BIOCOMPATIBLE AND CORROSION-RESISTANT, ONE VISIT, AND LESS POTENTIAL FOR ROOT FRACTURE. DUE TO MORE SIMILAR MODULUS OF ELASTICITY, VERY DIFFICULT TO CUT OR REMOVE IF NECESSARY. CARBON-FIBER EASIER TO REMOVE. GREAT ADHESIVE POTENTIAL WITH CEMENT.
- COURTESY OF DOUGLAS TERRY, DDS AND EDWARD SWIFT, JR, DMD, 2009

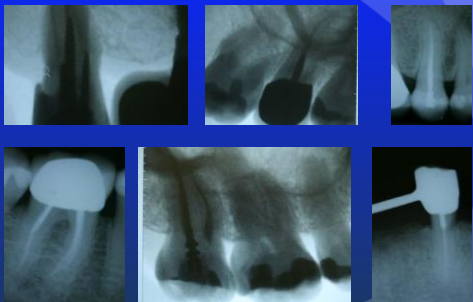
PRE-FAB POST DESIGNS

- PARALLEL, TAPERED, OR PARALLEL AND TAPERED
- SMOOTH-SIDED VS. SERRATED VS. THREADED
- ACTIVE OR PASSIVE PLACEMENT
- POST VS. VARIOUS NOTCHES OR CORE-SUPPORT DESIGN
- LONGER BETTER THAN SHORTER
- BUT NOT WITHIN 3-5 MM OF APEX...NOT TO DISTURB APICAL SEAL
- IDEALLY WITH GOOD ROOT SUPPORT/CROWN-ROOT RATIO
- MUST HAVE APPROPRIATE DIAMETER FOR TOOTH SUPPORT, BUT IDEALLY NOT GREATER THAN 1/3 ROOT DIAMETER

FLEXIPOSTS



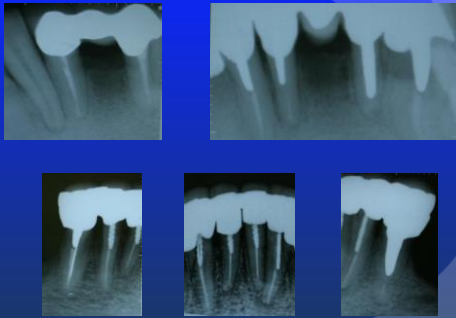
FLEXIPOSTS



CAST POST & CORES



CAST POST AND CORES



VARIOUS MATERIALS AND TECHNIQUES



CAUSES OF FAILURE OF POSTS AND CORES

- FAILURE OF RESTORATIONS ON POST-RETAINED PULPLESS TEETH HIGHER THAN ON VITAL TEETH
- ENDODONTIC FAILURE
- RECURRENT DECAY
- PERIODONTAL BREAKDOWN
- POST DISLODGE MENT
- CEMENT FAILURE
- POST/CORE OR CROWN/CORE SEPARATION
- POST FRACTURE
- LOSS OF CROWN RETENTION
- POST DISTORTION
- TOOTH OR ROOT FRACTURE
- CORROSION OF METALLIC POSTS
- COURTESY OF DOUGLAS TERRY, DDS AND EDWARD SWIFT, JR, DMD

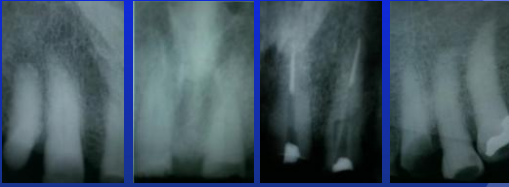
TOTAL LOSS OF VERTICAL DIMENSION AND DENTAL REHABILITATION



CROWN PREPARATIONS AND POST/CORE DESIGN AND IMPRESSION



ROOT CANALS ON UPPER SIX TEETH.
PATIENT HAD GREAT BONE SUPPORT



COMPLETION OF TREATMENT



COMPLETE DENTAL REHABILITATION



ENDODONTIC THERAPY, POST & CORES,
PROVISIONAL CROWN AND BRIDGEWORK



CAST POST/CORE #6, AND FLEXIPOSTS ON #8,
#12, AND #23 WITH COMPOSITE CORE BUILDUPS



UPPER AND LOWER ANTERIOR CROWN AND
BRIDGEWORK WITH SEMI-PRECISION PARTIALS



TOOTH #8 WITH SEVERE STAINING AFTER ROOT CANAL AND PAPER CLIP POST/CORE



OLD POST REMOVAL, DEBRIDEMENT, INTERNAL BLEACHING, FLEXIPOST AND BONDING



BEFORE AND AFTER CLEANUP OF HAPHAZARD DENTISTRY



FLEXIPOSTS/CORES WITH GOLD COPINGS, IMPLANTS, CROWN AND BRIDGEWORK. 1994



ONE-VISIT PROVISIONALIZATION OF CASE WITH LAB-PROCESSED TEMPORARY CROWNS



PHOTOS, MODELS, PROVISIONALS, AND LINING OF PROVISIONAL, EXTRACTION #7.8.9, TEMPS

ALSO WITH FLEXIPOST IN TOOTH #15 FOLLOWING HEMISECTION OF PALATAL ROOT



17 YEARS LATER, PERIO BREAKDOWN OF UPPER
TEETH, IMPLANTS, NEW POST/CORES ON #3,4,5
AND NEW BRIDGEWORK



COMPLETION OF INVOLVED DENTAL REHAB.
PATIENT FIRST PHASE DONE AROUND 1990,
PHASE 2 AROUND 2007



INTERNAL RESORPTION OF ROOT #9.
EXTRACT #9 AND TEMPORARY CROWNS #7-10



ENDO AND POST/CORE #7. ROOT RESORPTION, EXTRACTION, IMPLANT #9, AND CROWNS



FINAL RESTORATIONS WITH XRAY



PROVISIONAL REHABILITATION OF DENTISTRY THAT DID NOT HAVE LONG-RANGE PLANNING. LASER RECONTOURING OF UPPER CENTRALS



CAST POST/CORES #19 AND #20



BEFORE AND AFTER VIEWS OF AESTHETIC IMPROVEMENTS WITH THIS INVOLVED REHAB



CROWN AND BRIDGE RECONSTRUCTION, WITH IMPLANTS, POST/CORES, AND AESTHETICS



PROVISIONALIZATION WITH FULL MOUTH LAB TEMPS, AND FINAL RESTORATIONS



RADIOGRAPHS SHOWING ENDO AND POST/CORES



COMPLETED CROWN AND BRIDGEWORK WITH ENDO, POST/CORES, IMPLANTS



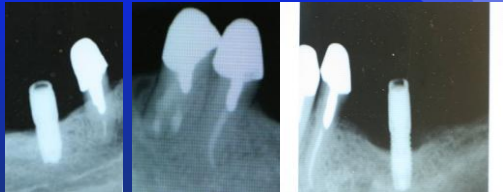
COMPLETED CROWN AND BRIDGE CASE



FOUR CAST POST/CORES WITH COPINGS AND THREE LOCATOR IMPLANT ABUTMENTS FOR VERY SECURE OVERDENTURE



RADIOGRAPHIC IMAGES OF IMPLANTS FOR LOCATORS AND CAST POST/CORE COPINGS



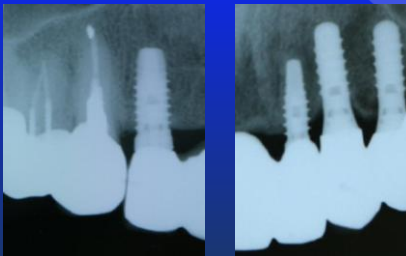
COMPLETED IMPLANT, ENDO AND POST/CORE SUPPORTED OVERDENTURE



PROVISIONAL CROWNS, IMPLANTS, AND ENDO W. POST/CORES ON #4, 5, 6. FINAL BRIDGEWORK



RADIOGRAPHS OF ENDO AND POST/PORES AND IMPLANTS SUPPORTING UPPER BRIDGEWORK



SEVERELY NEGLECTED TEETH AND RESTORATIONS, ENDO, POSTS AND PLACEMENT OF PROVISIONALS



DUE TO PERIO BREAKDOWN, TEETH HAD TO BE REMOVED, IMPLANTS INSTALLED



ONCE OSSEointegration COMPLETE, THE PROVISIONAL ONE-VISIT IMPLANT-SUPPORTED UPPER WAS INSTALLED



SIMPLE BONDING AND RECONTOURING
TO CREATE A BEAUTIFUL, HEALTHY SITUATION
WAS CREATED ON THIS UPPER IMPLANT CASE



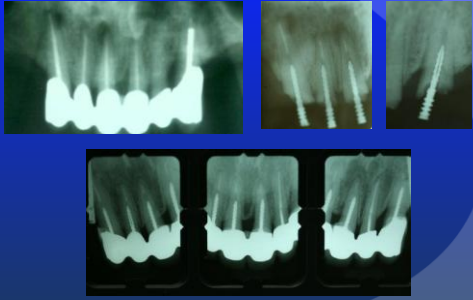
ENDO COMPLETED, POST/CORES BUILT IN,
AND FINAL COMPLETION OF THIS CASE



IMPLANT-SUPPORTED UPPER HYBRID OVERDENTURE.
IMPLANTS W. LL BRIDGE. ENDO,P/C W. LR BRIDGE



THIRTY YEAR OLD BRIDGEWORK WITH ENDO FAILURES. ALL ENDO REDONE. FLEXIPOSTS AND CORES BUILT IN, SALVAGED BRIDGEWORK IN '06



2013...DECAY AND BREAKDOWN #6. POST STILL STRONG. REMOVED DECAY. REBUILT W.BONDING



ENDO ON #6,8,9 AND 11. FLEXIPOSTS AND A ONE-VISIT PROVISIONAL BIOTEMP BRIDGE TO RE-ESTABLISH MORE HARMONIOUS OCCLUSION



SEVERE EROSION, ABRASION, AND OCCLUSAL STRESS. BONDING DONE TO RESTORE TEETH. PATIENT WAS 99 YEARS OLD



DRAMATIC RESULT. PATIENT LIVED 'TIL 103. NO REPAIRS EVER NEEDED