

roots

international magazine of endodontology

3²⁰¹⁰

| **clinical report**

Crown preparation techniques utilising the operating microscope

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Endodontic treatment of primary teeth in the general dental practice

| **case report**

Removal of a fractured instrument

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Dear Reader,



Dr Clara Spatafore

It is my pleasure to share with you greetings on behalf of the American Association of Endodontists (AAE). This year, our association set the theme of *Bridging the Gap* in seeking to enhance communication and partnerships with various professional groups: general dentists, dental specialists, dental students and international communities, amongst others. Our efforts in this regard have taken shape in a few significant initiatives. I encourage you to evaluate and take advantage of them, for the benefit of your referral relationships and professional growth.

The first initiative is the pending release of a new clinical resource, the *AAE Treatment Options Guide for the Compromised Tooth*. The guide will be available this autumn and aims to assist in the assessment of and treatment planning for compromised teeth by providing specific case examples that illustrate good outcomes for patients, including treatment considerations and prognoses. The guide will be distributed at national dental meetings in the US, to dental schools and to target groups of general dentists, and will be available in print and electronic format via the AAE website at www.aae.org.

On that note, I am pleased to announce that the AAE website has recently been redesigned to enhance access to reliable content and stimulate dialogue amongst all who have an interest in endodontics worldwide—both dental professionals and patients. Clinical and practice management tools, dental news from various reliable sources, patient education materials, discussion boards, the first AAE blog and Facebook page, and more are all now available on our site. In addition, the AAE Live Learning Center (www.aae.org/livelearningcenter) has expanded its library of online continuing education content, now offering CE credit for articles in the *Journal of Endodontics* and the *ENDODONTICS: Colleagues for Excellence* newsletter, in addition to multimedia presentations from AAE events.

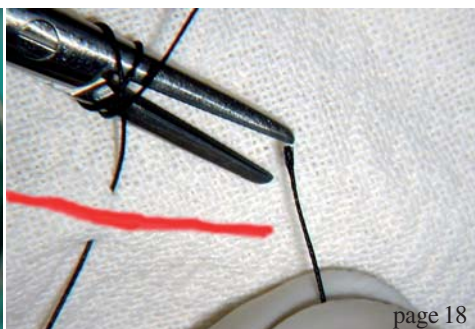
Finally, AAE meetings have never been better, with the upcoming 2011 Annual Session in San Antonio, Texas, promising to be another outstanding venue for learning, networking and volunteering in the local community (www.aae.org/annualsession). Educational sessions will emphasise multidisciplinary speaker panels, hands-on workshops and continued expansion of the Master Clinician series. An *Access to Care* event will also be held to provide complimentary endodontic treatment to underprivileged patients in the area.

Our endodontic community continues to be strong and is constantly growing. I am pleased that the AAE has been able to gather peers from all corners of the world to engage in truly impressive knowledge sharing and camaraderie. If you have not yet considered the possibility, please do join us!

With warm regards,

A handwritten signature in black ink that reads "Clara M. Spatafore".

Dr Clara Spatafore
President of the American Association of Endodontists



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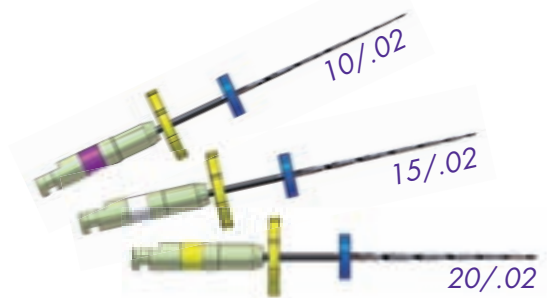
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The Continuous Wave of Obturation Technique for enhanced precision

Author_ Dr L. Stephen Buchanan, USA

_I invented the Continuous Wave of Obturation Technique (CWOT) in 1986 and used it with the Touch'n Heat (SybronEndo) until the winter season of 1988/1989. At this time, Johan Massreillez of AnalyticTechnologiesasked me whether I could use his heat source with temperature control-designed for hospital surgical operating rooms. It worked better for my technique and pluggers, as it was easier to control the heat. In 1994, SybronEndo bought Analytic Technologies and the rest is history. As with any method of obturation, its success is completely dependent upon the cleaning and shaping of the root canal system. The steps for the CWOT are detailed below.

_Step 1: Down-pack

Once cone-fit has been accomplished and radiographically confirmed, the Continuous Wave (CW) plugger that matches the gutta-percha cone is fitted in the canal. The tip should be fitted within 5 mm from the canal terminus, never closer than 3 mm.

The canal is dried and measured one last time with feather-tipped GT Series X paper points, the cone is trimmed to be 1.5 mm short, coated with sealer, and

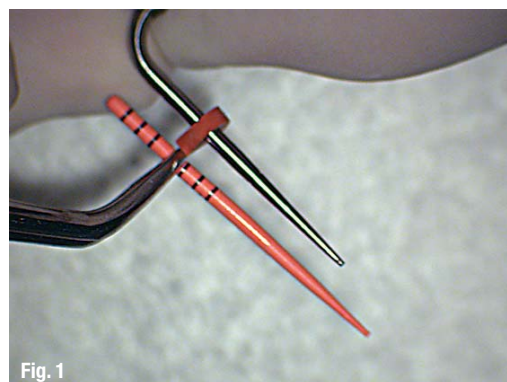


Fig. 1

cemented in the canal. The cone can then be seared at the orifice with the tip of the pre-heated CW plugger at an angle to the cone, and the butt-end can then be removed. The larger stainless-steel end of a CW hand plugger is used to compact the softened gutta-percha at the canal orifice.

The cold CW electric heat plugger is pushed against the gutta-percha and the heated plugger is driven smoothly through the gutta-percha to within 3 mm of the binding point. This single down-pack stroke should take 1.5 to 3.5 seconds, but never more than 4 seconds, for safety. The CW plugger will slow



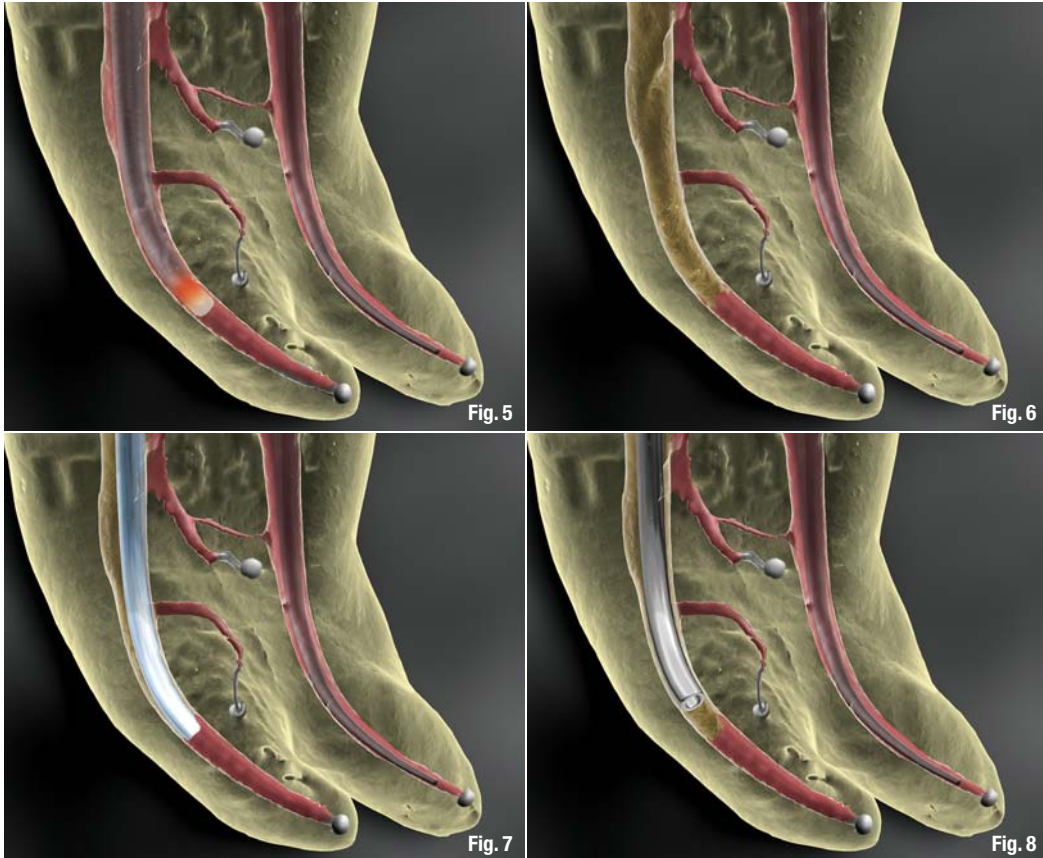
Fig. 2



Fig. 3



Fig. 4



its apical movement and stop just shy of the binding point, about 1 mm short. At this point, any previously cleaned lateral and accessory canals are filled.

Firm apical pressure should be sustained for a full 5-second push in order to take up any shrinkage that might occur upon cooling of the apical mass of gutta-percha. The System-B/Elements unit will sound a click signal 5 seconds after the switch has been released.

Step 2: Separation burst

Still maintaining apical pressure, the button should again be activated for a full second in order to heat the pluggers fully. When the button is released, the clinician should pause for another full second, and then slowly withdraw the pluggers.

After removal of the CW pluggers, the small, flexible NiTi end of the CW hand pluggers can be introduced. With pressure, the clinician should confirm that the apical mass of gutta-percha has not dislodged, and that it has cooled and set. In medium and large canals, the pluggers should not be buried in the apical mass of gutta-percha, as it will create a tubular space—the primary cause of backfill voids.

The canal is now ready for the backfill by any means preferred. If post space is required, this has been achieved. The backfill can be accomplished using one of the following methods: a syringe-backfill technique, using the extruder function of the System-B/Elements, or an optional single-cone technique for back-filling medium and large canals.





_Step 3a: Syringe-backfill technique

The speed of extrusion is set on the control panel of the System-B/Elements unit. After pre-heating is completed (45 seconds), the forward toggle switch on the handpiece is pressed until material extrudes out of the needle tip to 'prime' the needle. The heated needle can then be placed into the canal for 5 seconds, allowing the needle to reheat after being cooled by contact with the dentine.

After the 5-second pause, with the needle lightly held in place, one of the handpiece toggle switches (back button for medium speed, forward button for faster speed) should be activated in order to extrude the gutta-percha. After the extruded material has filled the backfill space ahead of the needle, the back-pressure of the extruded gutta-percha will move the needle back out of the canal. At this point, it is important that the clinician resist the temptation to pull the needle out of the canal. The extruded gutta-percha should be allowed to back it out. Care should be taken to allow approximately 5 to 10 seconds for the needle to reach the orifice level.

Using the rigid, stainless-steel end of the appropriate CW hand plugger, a very firm condensation push should be given to the warm gutta-percha. A void of 4 mm can be filled if sufficient pressure is applied.


_Step 3b: Single-cone backfill option (ideal for medium and large canals)

While the filler material should be down-packed through the master cone as usual, the 1-second separation burst is not necessary. Instead, the plugger should be allowed to cool in the canal for approximately 10 seconds (two clicks from the unit). The plugger can be removed by rotating it back and forth with apical pressure, and the still-cold plugger can be teased out during rotation.

An AutoFit backfill cone (the same size as the plugger used for the down-pack) can be coated with

sealer, and moved in and out of the empty back-filling space three to four times in order to ensure that the sealer material coats the backfill space. The area left by the plugger will exactly match the shape of the backfill cone. The cone can then be seared off at the orifice level with the System-B/Elements electric heat plugger.

The rigid, stainless-steel end of the hand plugger can then be placed against the gutta-percha. With a firm sustained pressure, the coronal mass can be condensed at the orifice level. This technique is ideal for filling voids created during an extruder backfill. The stop on the CW electric heat plugger should be adjusted so that it will reach beyond the existing void. The heated plugger can then be thrust through the void, cooled for ten seconds, then removed so that the backfill can be completed following the steps outlined above.

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| _about the author | roots |
|  | <p>Dr L. Stephen Buchanan is a Diplomate of the American Board of Endodontics and a Fellow of both the International College of Dentists and American College of Dentists. Clinicians interested in his DVD series, <i>The Art of Endodontics</i>, and his hands-on laboratory workshops in Santa Barbara, USA, can call +1 800 528 1590 (US and Canada) or +1 805 899 4529 (for international calls).</p> <p>For more information related to this article and for GTX updates and answers to frequently asked questions, please visit www.endobuchanan.com. Free CE online courses are also available on the GTX System and other topics.</p> |

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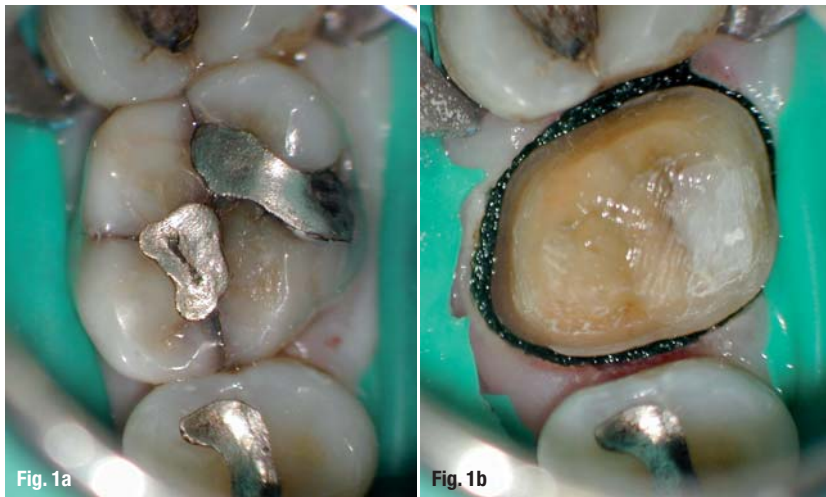
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Crown preparation techniques utilising the operating microscope

Author _ Dr Craig Barrington, USA



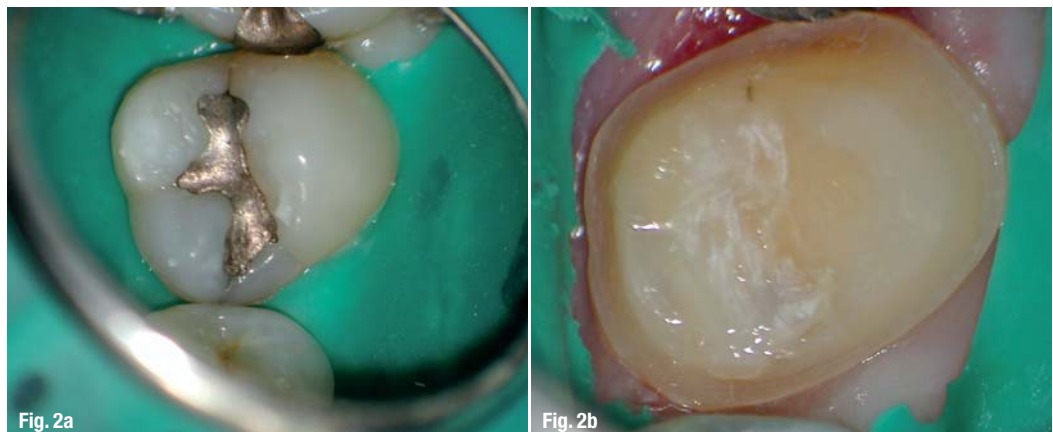
_The importance of vision

The second most important component is vision. The dental operating microscope (OM) has proven to be valuable in endodontics but it is just as valuable—or more valuable—for restorative efforts. High magnification above 4x is necessary to impose/create good finish lines that are easy to impress and temporise. Magnification of 2 to 24x is available with the OM. Management of gingival health and biological width is important to the overall final look of the crown and the cleanability for the patient. A poor finish line and a poorly positioned finish line not only result in poor impressions and final restoration fit, but also make for poor-fitting provisionals.

Figs. 1–10 _ Before and after photographs of crown preparations.

_Successful crown preparations start at the diagnosis. Early detection of the need for a full-coverage restorative can minimise many difficulties associated with the preparation of a tooth for a crown, obtaining an accurate impression, and the achievement of a precise fitting, long-lasting, aesthetic restoration. Proper diagnosis is the all-important first step.

If the finish line cannot be found, one cannot properly trim and fit the provisional restoration and remove any temporary cement properly. When patients return, gingival tissues can be irritated, making the placement of the final restoration challenging. If by chance one does achieve a good fit, then, when the soft tissue heals, the junction of the final restoration and the tooth may be visible, ruining the overall aesthetics.



Good patient management

Working at high magnification with the OM requires good patient and procedural management. If the patient moves about or is uncomfortable, the operator cannot concentrate on proper reduction or the task of placing a solid, conservative finish line on the tooth. Therefore, the third most important component in crown preparation success is the dental rubber dam.

For most using a dental dam for a crown preparation is a widely misunderstood concept. Simply put, the rubber dam is the most under-utilised, inexpensive and simple piece of equipment an operator can incorporate into his/her crown preparation protocol. With a little training, dentists and assistants can learn techniques that will benefit all individuals involved in the restoration of a tooth. (Please note that in all of the photographs, a dental dam is in place before and after.)

Tissue management is the fourth concern and it points back to the number one concern of early diagnosis versus waiting until a tooth is severely decayed or broken down. Working deep subgingivally and in irritated tissues exponentially complicates the task of crown preparation. Haemorrhagic areas, or those that are deep subgingivally, can be difficult to visualise and



Fig. 3a

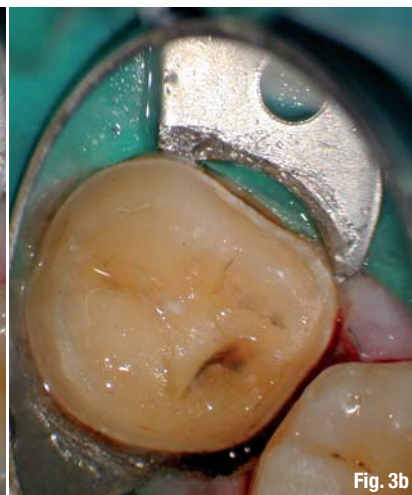


Fig. 3b

control. Early diagnosis can minimise these tissue complications. Good tissue management protocol is paramount to the success of the final restoration.

Radiosurgery: A useful instrument

Lasers have been used in dentistry for quite some time but their cost and other fundamental limitations make them difficult to acquire and use. However, radiosurgery has been in use for years and is an affordable and useful instrument that can solve many problems regarding finish-line visualisation, finish-



Fig. 4a



Fig. 4b

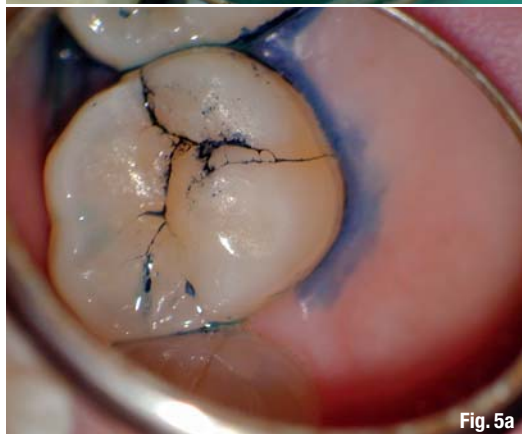
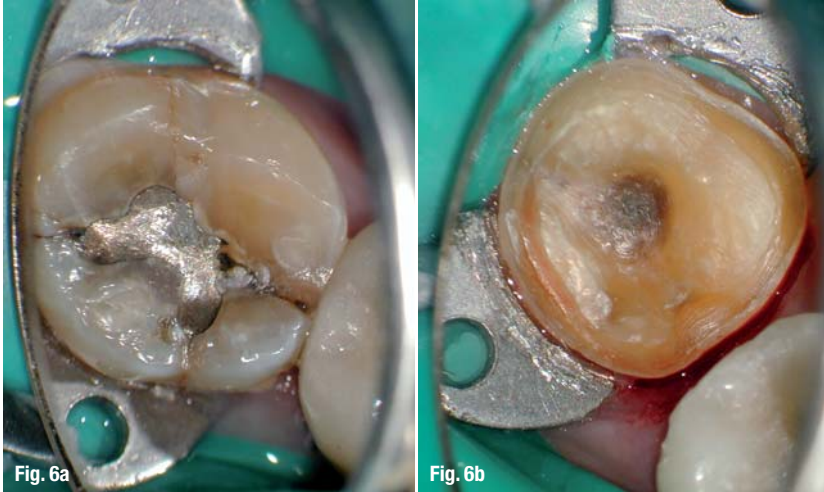


Fig. 5a



Fig. 5b



line exposure and haemorrhage control. In addition, this simple, conservative instrument can make cord placement quick and simple by preserving the gingival architecture.

The Parkell unit with a #118 tip allows the creation of a very conservative trough or trench around a tooth. In combination with good visualisation using the OM and good patient and procedural management with the rubber dam, we can reliably create a finish line, expose it, place a cord if necessary and impress it.

With a radiosurgical unit, inflamed tissue can be removed such that the healthier tissue is exposed to our haemostatic agents. Healthy haemorrhagic tissue responds better to haemostatic agents than inflamed haemorrhagic tissue does. When inflamed tissue is encountered, use of high magnification and the radiosurgical tip to conservatively contour or remove this nuisance tissue can provide a predictable result. Reducing tissue thickness but not modifying tissue height can leave the gingival tissue in proper position such that we achieve nice aesthetics in our final result.

Handpiece and bur choices

The final item and of least concern in this protocol are handpiece and bur choices. There is existing debate between electric versus air-driven handpieces and regarding which bur is best for which task. Specifying a particular handpiece or bur would be similar to directing an artist regarding which paintbrush to use. What works in one's hands is the most important factor and that changes from individual to individual and situation to clinical situation. If a practitioner follows the diagnosis, magnification, isolation and tissue management protocol, then bur and handpiece choices will fall into place on their own with time and experience. I typically use an air-driven handpiece and an assortment of Axis turbo diamonds.





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Fig. 9a

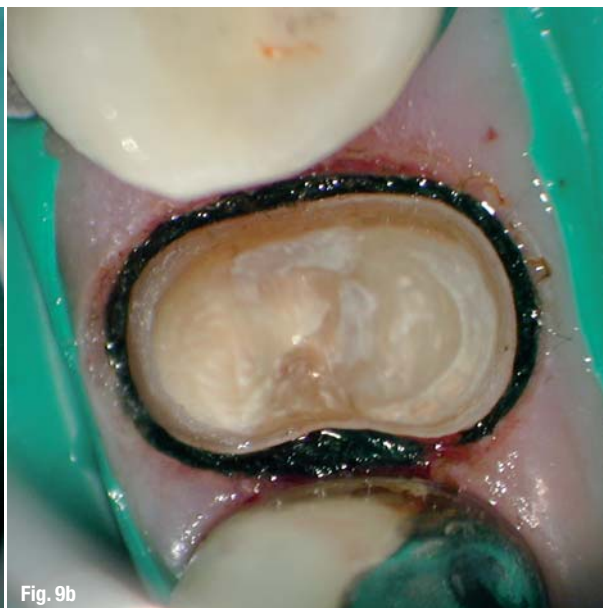


Fig. 9b



Fig. 9c

In a stepwise fashion for an individual crown preparation, the primary concern is achievement of proper anaesthesia such that the patient is comfortable in all capacities. Once this is done, the rubber dam is placed. I use a split- or slit-dam technique. The key to success with this rubber dam technique and crown preparation is the distance at which the holes are placed apart from each other. Generally speaking, holes are punched too close together for this technique. It is best to punch the holes at a distance from each other on the dam that essentially matches the true anatomical distance between the teeth to be isolated.

_Next step: Occlusal reduction

Once the tooth has been isolated and the patient is confirmed to be comfortable, the next step is the occlusal reduction. This makes the tooth shorter and allows better access and visualisation for the axial reduction. If there is an existing restoration in the form of an alloy or composite filling, it is removed and the tooth is reduced to the level of the depth of this restoration. Existing restorations usually provide a good guide to achieving nice occlusal clearance without having to verify prior to the next step. Hopefully, I have not diminished the importance of this step, as I know this can make or literally break a final restoration.

Completing the occlusal reduction first allows me to warm up and work out any kinks in terms of patient issues, patient positioning, handpiece water flow or bur choice etc., before moving to the more complicated axial reduction. On the upper arch, the

full-crown preparation is done with a mirror and indirect vision. The OM places us in an ergonomic position for doing this and the rubber dam creates a nice situation for a high volume suction to create an air flow that will keep our mirrors clean(er) of the water spray from the handpiece. On the lower arch, I conduct three-quarters of the procedure with direct vision and then finish certain corners through indirect vision. Indirect vision on the lower arch is not a common technique but with understanding and desire, it is an easy technique to master.

The axial surface reduced first depends on which tooth is being treated. For example, I am right-handed, so on an upper right first molar I reduce the palatal side first and then move to the interproximals. On that same molar, I break contact on the mesial first, moving from the palatal side, breaking the contact towards the buccal side.

This is the easier of the two surfaces to break. First, it is further forward in the mouth and therefore easier to reach; and, second, it is a shorter contact as it is against a premolar. Following the mesial contact break, I continue around the tooth through the mesio-buccal line angle onto the buccal surface. I then break the distal contact, also moving from the palatal side to buccal direction. The most challenging area to prepare on an upper right first molar is the disto-buccal (DB) line angle. Therefore, I prepare the tooth as far as I can through the distal contact and around the DB line angle. I then complete the buccal reduction and connect the buccal finish line at the DB line angle.

Mirror position is critical in achieving a solid finish line on the entire tooth including the DB line



Fig. 10a

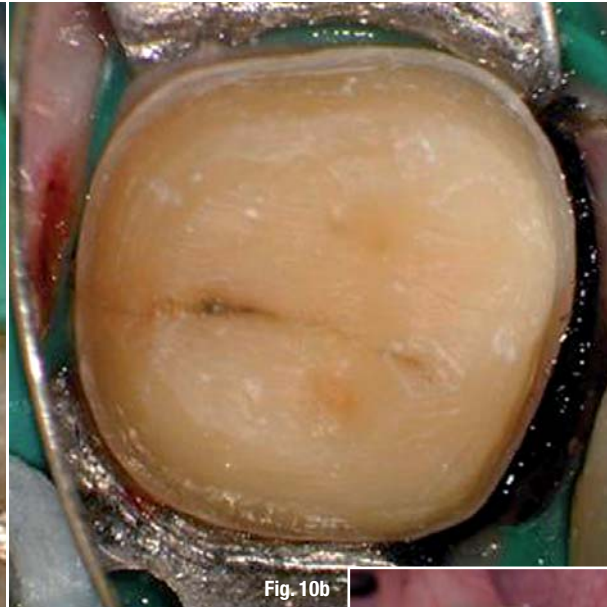


Fig. 10b

angle. These steps, for me, remain true for most upper right teeth, with difficulties being increased as we move more posteriorly and considering patient limitations in anatomy, patient attitude, tooth anatomy and existing restorations or decay.

Axial reduction

The steps for axial reduction on the upper right arch mirror themselves on the upper left arch. On the upper left arch, I initially reduce the buccal and break contact from the buccal to palatal direction. The difficult area to prepare in an upper left tooth is the disto-palatal/lingual line angle. The difficulty varies according to the tooth being treated and/or the patient's tooth limitations.

The lower arch is different to the upper arch in that direct vision can be utilised for most of the preparation. The buccal reduction is initially done on both lower arches and interproximal contact is broken in a buccal to lingual direction, starting with the mesial contact. Once both mesial and distal contacts have been broken, the lingual reduction has been accomplished. For a lower tooth, the disto-lingual line angle tends to be the most difficult area to visualise, so this is the part that is refined using indirect vision.

Tissue management and cord placement

Once all occlusal and axial reduction has been accomplished, the next step is tissue management and cord placement. I start with the radiosurgical unit with a #118 tip to create a conservative trough around the tooth, mostly removing tissue thickness and/or reducing any volume of inflamed tissue. This

is a very conservative step under the OM. The OM allows precise and accurate tissue removal, and increases tactile sense and the steadiness of our hands.

A size 00 cord is placed in a haemostatic agent to soak at the start of the procedure. Literature supports that a cord soaked for 15 to 20 minutes in a haemostatic agent works better than any other alternative cord/haemostatic agent combination or method.¹ Personal clinical experience and observations find this to be true. With the radiosurgical gingival trough in place, the cord placement is a simple, pressureless and quick, followed by copious air/water syringe rinsing. In the time that it takes to place the cord and rinse most haemorrhage will be controlled, if any.

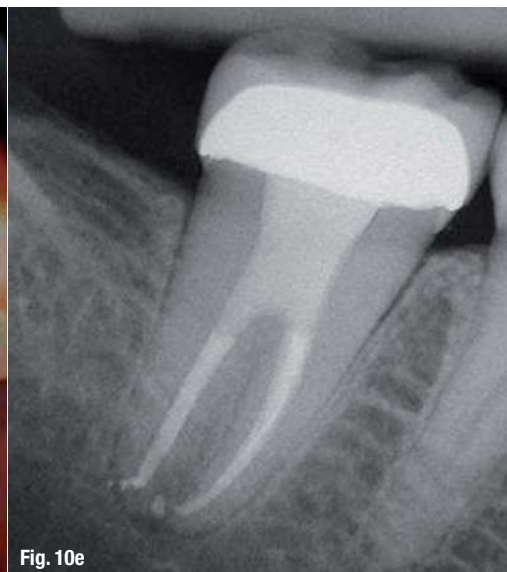
Now the sharpness and position of the finish line can be re-evaluated and refined. An ultrasonic unit is used, with the irrigation on, to clean the crown preparation of calculus and/or other debris. Occasionally, a BUC-1 endodontic tip (Ultradent), which is about the same size and shape as a 1DT diamond bur, can be used in the ultrasonic unit to refine the crown preparation finish lines. This is done with the irrigation feature turned off on the ultrasonic unit. To sharpen, slightly refine, or minimally move a finish line, I occasionally run the handpiece at a very low speed without water.

Rinsing and drying

Once all refinements have been accomplished, the preparation is rinsed and dried and for the first time, the entire preparation is evaluated in one view.



Fig. 10c



The uniformity of the axial reduction and the position of the gums in relation to the cord, and the cord in relation to the finish line are all evaluated.

The axial reduction should have uniform thickness throughout the different positions, as different areas need more reduction, while others need less, based on material and aesthetic demands. There should be no areas where the gingiva is over the cord. If this does occur, that area is refined with the radiosurgical unit to ensure a full view of the cord 360° around the tooth of tooth-tissue-cord.

One of the main reasons we use polyvinyl-siloxane impression materials is because they are re-pourable. If adequate strength and thickness of this material are not obtained through the proper radiosurgical troughing technique, then the impression may tear upon separation of the model. Having an impression tear after the first pour limits the ability to fabricate a well-fitting restoration.

When a clear tooth-tissue-cord and a visible, sharp finish line are present, the rubber dam is removed and the preparation is evaluated in all dimensions with the naked eye. At times the OM can create a 'cannot-see-the-forest-for-the-trees' type of situation, so it is always valuable to take another look from a different perspective without the OM. This can allow one to identify sharp angles or irregularities in the preparation.

_Full-arch impressions


A full-arch impression is taken with a single tray for the arch that contains the prepared tooth. For the opposing arch, a full-arch alginate impression is taken. With full-arch impressions, a bite registra-

tion is usually not required. Most often, one chair-side assistant is utilised for the entire procedure, but for difficult and challenging impressions, a second assistant may be utilised for saliva or tongue control.

Once all the impressions have been taken, a provisional is fabricated, refined, polished and cemented. Shades are taken and the patient is released with post-operative instructions.

_Reference

1. Csempesz F, Vág J, Fazekas A. In vitro kinetic study of absorptency of retraction cords. *J Prosthet Dent.* 2003 Jan;89(1):45–9.

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| _about the author | roots |
|  | <p>Dr Craig M. Barrington is a 1996 graduate of the University of Texas Health Science Center San Antonio. He practices general dentistry in Waxahachie, Texas, with his wife, and has a particular interest in endodontics and microscope dentistry. Dr Barrington was also part-time clinical Associate Professor in the Advanced Education in General Dentistry Residency Programme at Texas A&M University's Baylor College of Dentistry in Dallas. He has lectured to a variety of dental societies and study clubs. He has also authored and co-authored a number of articles for various dental journals.</p> |

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Apical microsurgery— Part VI: Sutures, suturing techniques and healing

Author_ Dr John J. Stropko, USA

Fig. 1 A well planned design of the incision permits gentle and accurate flap re-approximation.



_All steps have been meticulously followed, the root-end fill has been placed, the crypt has re-filled nicely, the final radiograph has been approved and it is time to suture the flap into position. Sadly, most operators now push the operating microscope (OM) aside and suture without it. Doing so robs the operator of an opportunity to demonstrate to themselves and their patients, the amazing capabilities of the OM. The operator must make a commitment to master the suturing technique using the OM. It will never be accomplished with the OM pushed aside at this critical step in the apical microsurgical procedure. The following is based largely on my own experiences over the 12 years of performing, teaching and writing about apical microsurgery.

Dr John Harrison has published some of the most clearly written and comprehensive work on wound-healing associated with peri-apical surgery. There are five publications that are a must read for the endodontic surgeon.¹ After reading these, the microsurgical protocol developed by Dr Gary Carr, Dr Richard Rubinstein and others becomes clearer and is more easily understood. Treating the tissues gently and atraumatically is crucial for achieving predictable wound-healing.

Once the surgical site is ready for closure, the flap should be gently massaged to close approximation with the attached tissue. But, keep in mind, the flap has probably lost dimension or shrunk slightly due to the mere act of retraction over a period of time and has endured a slight decrease of blood flow to it. Fortunately, this is usually not a problem. If the initial incision was planned with this final step in mind, the tissues should re-approximate with minimal manipulation. This is when the operator will appreciate nice scalloping and a sharp scalpel when making the incision at the beginning of the surgery (Fig. 1). Remember the adage: hindsight is always 20/20. The smooth side of a small #2 mouth mirror can be used to hold the tissue in position, while the second surgical assistant (on the same side of the chair as the operator) hands the operator the needle

Fig. 2 Immediate post-op sutures.

Fig. 3 Twenty-four hours post-op, before sutures are removed.

Fig. 4 Immediately after suture removal, 24 hours post-op.



holder, with the needle properly positioned in the beaks, so the sutures can be easily and accurately placed.

All suturing is accomplished using 6-0 black monofilament nylon (Supramid, S. Jackson). Some microsurgeons use 8-0 and even 10-0 sutures. In my opinion, the 6-0 is easy to use, does not tear through the tissue as readily and the results are no different to those obtained with thinner sutures, which are technique demanding. Keep in mind that the sutures will be removed in 24 hours, so it really is a moot point as to whether the suture is 6-0, 8-0 or 10-0. The results achieved with 6-0 suture seem to be well suited to apical microsurgery. The black silk suture, traditionally used in surgery, is a detriment to the rapid healing we are trying to achieve. Not only does bacterial plaque accumulate more readily on braided versus monofilament, but the braiding also acts as a wick for the migration of bacteria into the wound. This can result in an increased inflammatory response and compromised healing.

The type of needle used depends on the type of flap to be sutured. For the Ochsenbein-Luebke Flap, a 3/8 circle, taper point needle (TPN; Supramid, S. Jackson) is used. The TPN is far superior to the reverse cutting needle (RCN) because there is no tendency to cut or tear the flap edges. Additionally, it is easier to guide a TPN to the desired point of exit in the attached tissue than it is to guide a RCN. TPNs are easier to use when suturing this type of flap. One of the nicest things about using this flap design is the ability to see the healing taking place easily (Figs. 2–6).

For the sulcular flap, a 3/8 circle RCN is used. This needle is used because the larger size facilitates passing it through the contacts when doing a sling suture. The sling or mattress suture is routinely used to save time on closure, rather than for individual buccal to lingual sutures. On many occasions, the TPN is also used to suture the attached gingival area of the flap at the coronal aspect of the releasing incision.

While the scope assistant holds the retractor in place, the second assistant uses a small Castroviejo needle holder, ensuring that the beaks of the holder are grasping the needle approximately three-quarters of the distance from the pointed end to where the suture is attached to the needle. The second assistant must pay special attention to keeping the beaks of the holder away from either end of the needle, as these are the areas of its greatest weakness and can be inadvertently bent or broken (Fig. 7). The needle is to be firmly grasped perpendicularly to the beaks of the holder. This allows the operator

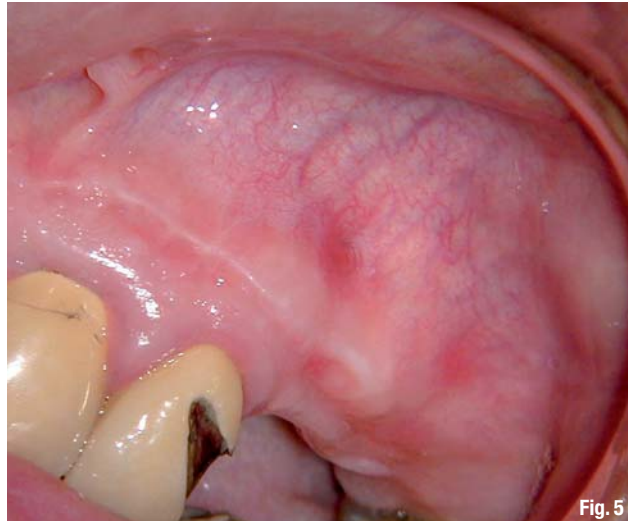


Fig. 5



Fig. 6

more definite control and a better feel of the needle during the suturing process.

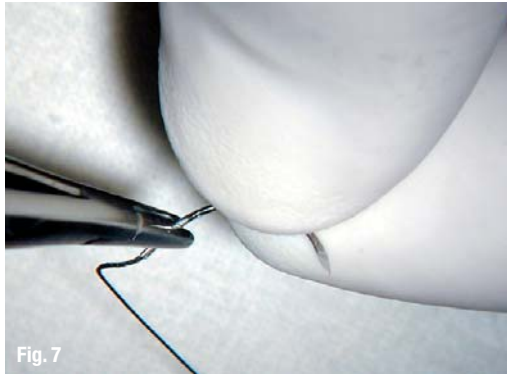
The second assistant passes the needle holder to the operator's working hand (Hand A). The operator begins the suturing process by inserting the needle through both sides of the incision. Once the needle has been inserted completely through both sides of the incision, the needle is grasped between the thumb and index finger of the opposite hand (Hand B). While the operator is doing this, the second assistant holds the end of the suture so it will not inadvertently be pulled through the tissues. The operator proceeds to make the three loose loops around the beaks of the needle holder to start the first knot.

While the operator is making these initial loops, the second surgical assistant places the end of the suture within the operator's visual field. The operator should be able to grasp the end of the suture easily in the beaks of the needle holder. The second assistant ensures that the end of the suture is within the operator's field of vision by looking into a monitor that has been placed within her line of vision (Fig. 8). The loops around the beaks of the needle holder create sufficient friction for a con-

Fig. 5 Two weeks post-op: note scar from ten-year-old prior apical surgery.

Fig. 6 Six months post-op: nothing can be seen but the old scar.

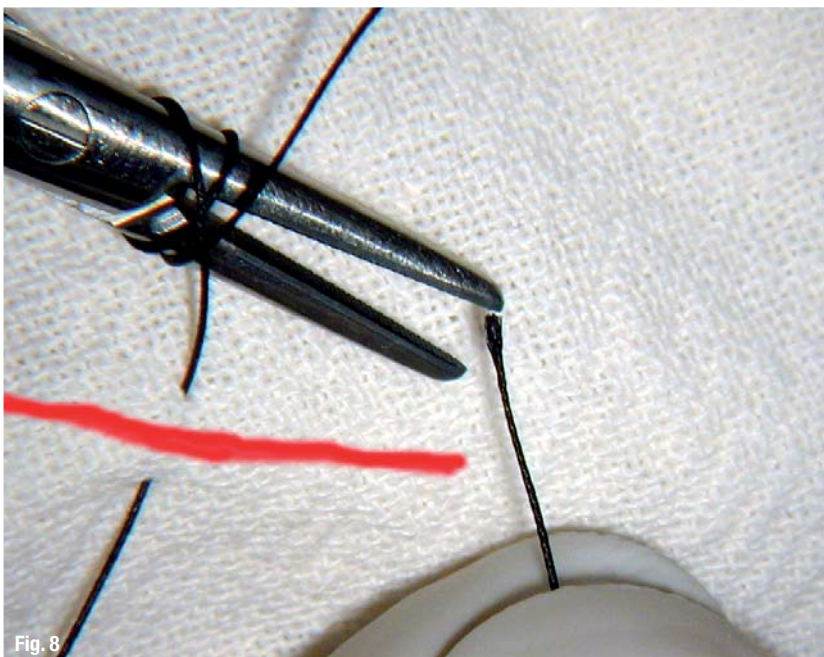
Fig. 7 Grasp the needle approximately three-quarters of the distance from the pointed end.



trollable tension between the operator's Hand B and the beaks of the needle holder in Hand A. Care must always be taken that the tension is only between Hand B and the needle holder in Hand A, so no undesirable tension is exerted on the tissue during the suturing process. The purpose of maintaining some tension is to give the operator a positive tactile sense while taking up the excess suture material in Hand B.

As the suture is drawn through the tissue by Hand B, Hand A is lowered to prevent exerting too much tension on the tissue. The tension on the suture is regulated by the looseness, or tightness, of the loops, which controls the amount of friction for the suture to overcome as it is gathered. Hand B continues gathering as Hand A yields the suture with a descending motion, while still maintaining the desired tension and the beaks of the holder firmly securing the end of the suture. Once the end of the suture is at the desired length relative to the incision, the loops are allowed to slip off the beaks for the initial knot. Then, using the same basic

Fig. 8 The assistant hands the free end to the operator.



rhythm of movements, the securing and locking knots are placed. It is an alternating rhythm of movement that is difficult to describe in writing, but is actually very easy for the beginner microsurgeon to learn.

The operator now allows the second surgical assistant to take the needle holder from Hand A and simultaneously be handed the micro-scissors so that the suture can be cut close to the knot. After the second assistant has taken the scissors and the suture, the operator is handed a micro-forceps to move the knot between the point of insertion and the incision gently, helping to prevent plaque build-up over the incision itself (Fig. 9). Note: When moving the knot with the micro-forceps, it is important that the knot be **pushed** to place, not **pulled** to place. This ensures the knot's original integrity is maintained.

One of the most common mistakes made in suturing is making the suture too tight. It is better to make the suture a little too loose because if the suture is too tight it causes ischaemia and thus compromises rapid healing. In making a sling suture in a sulcular flap, it is easy to be too aggressive when tying the knot, causing the rest of the suture to become too tight. The operator should always re-check the tension over the entire length of the suture before completing the securing knots.

The suture tension for the **releasing incision** needs to be considered differently compared to that used for the rest of the incision. Normally, the releasing incision is not sutured, but if it is, the suture should be looser than the other sutures. It has been shown that epithelial creep, or streaming, occurs rapidly or at a rate of about 1 mm per side per 24 hours. In other words, a wound whose edges were separated by 2mm would be expected to come together within a 24-hour period. In hundreds of surgeries over the past 12 years, there have only been a few cases in which the releasing incision did not completely close. Of those few that did not close within 24 hours, they did so within 48 hours. Thus, if the operator prefers to suture the releasing incision, it must be sutured loosely (Fig. 10). Another consideration is to suture like tissues to like tissues. Never suture attached gingival tissue to unattached gingival tissue. Should one side of the suture tear out, it will be the attached gingival side.

When using the OM to suture, the incision can be closed accurately with extremely good approximation. It is because of well-planned and nicely scalloped incisions, atraumatic flap elevation procedures and the very close repositioning of the flap with thin, hair-like sutures (6-0) that we can plan on routinely removing sutures in 24 hours (Figs. 3 & 4).

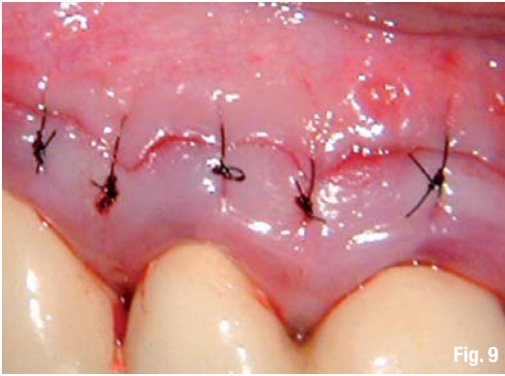


Fig. 9 The suture knot is pushed away from the incision.

The sutures have completed their task after 24 hours and, in fact, then become foreign bodies that can cause irritation and excessive inflammation, be a source of infection and ultimately result in a retardation of the healing process.² For those that doubt the **24-hour suture removal theory**, try the following easy exercise:

1. At the next surgery, place at least five sutures.
2. After 24 hours, have the patient in and remove the suture that looks the worst, the one you think is not healing as well as the others.
3. The next day, remove the next suture that looks the worst.
4. The next day, do the same, and so on. At the end of the fifth day, the area that looks the most inflamed will be around the remaining suture(s). If that does not convince you, nothing will.

Post-operatively, the usual result is little, or no, pain or swelling. The post-operative instructions are ice packs—15 minutes on and then 15 minutes off—for the first six hours only, gentle rinsing with Peridex for the next 24 hours and suture removal the following day. Experience has demonstrated that prescribing 600 mg of Ibuprofen every six hours, along with one to two tablets of over-the-counter Tylenol (taken between the doses of Ibuprofen), has a very effective anti-inflammatory effect. It is the exception, rather than the rule, that a patient requires a stronger medication for post-operative pain. Antibiotics are not usually prescribed.

If everything is within normal limits, the patient is instructed to begin gentle cleaning of the area—

using a facecloth over their index finger—on the third day and gentle brushing with a soft brush on the fifth day. The patient is scheduled for a follow-up visit two weeks after surgery. At the two-week visit, the incision is generally barely visible and, on most occasions, can hardly be detected (Fig. 5). A word of caution: not all patients respond to treatment as well as others. Do not be in a hurry to treat a problem that may not exist. On a few occasions, patients may be slower than normal in response to treatment, sometimes taking several weeks to heal. If there is any doubt, place the patient on an antibiotic and an anti-inflammatory for a week as a precaution, but what is really desired is more time for delayed healing to occur.

The apical microsurgical technique described in the previous six parts of this series has become the new standard of care in endodontic treatment and raises endodontic apical surgery to a new and exciting level. For the first time, apical surgery can be performed with predictable results. These results, however, can only be achieved if the proper protocol is followed meticulously. Each step must be followed without compromise.

Much more could have been written, but hopefully enough of an overview has been given to encourage even one more operator to begin using the OM. It is the finest tool our profession has ever been given. Apical microsurgery can be an enjoyable part of the daily regimen, for both the operator and the newly involved dental team!_

Editorial note: A list of references and copies of all previous parts of this series are available from the publisher.

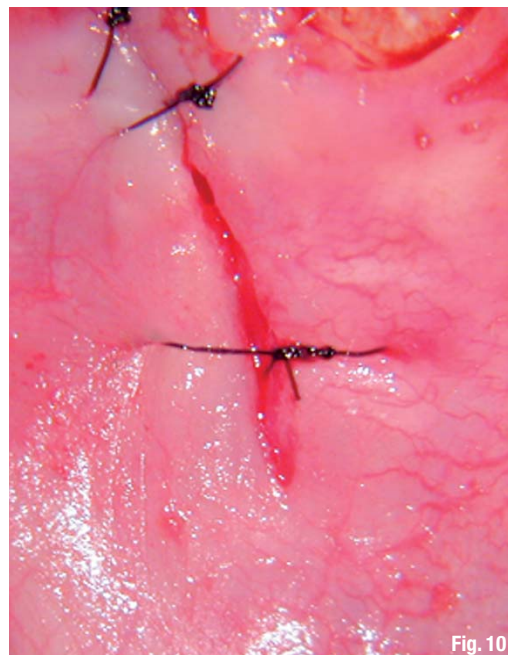


Fig. 10 The vertical releasing incision should be sutured loosely.

_contact

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Introduction of a novel obturation method:

The single-matched, taper-sized gutta-percha cone technique

Author_ Dr Mohammed A. Alshehri, Saudi Arabia

_Root-canal treatment consists of 3-D filling of the root-canal system with gutta-percha and sealer, with the goal of maximising the amount of solid core material and minimising the amount of sealer.¹ Before this can be achieved, the root canal must be chemo-mechanically prepared to a sufficient shape and size in order to eradicate micro-organisms within the root canal system and facilitate filling of the root canal.²

The single-cone obturation technique was introduced in the 1960s with the development of ISO standardisation for endodontic instruments and filling points.³ After reaming a circular stop preparation in the apical 2 mm of the canal, a single gutta-percha was selected to fit with tug-back to demonstrate inlay-like snugness of fit. The single-cone technique consists of a single cone filled at room temperature with a sealer layer whose thickness depends on the fit of the single cone to the walls of the canal.⁴

The introduction of NiTi rotary instruments makes the creation of predictably centred preparations more realistic than ever in curved canals⁵ and, in many cases, may make accurate apical cone fit a possibility.⁶ Preparation of the canal using certain rotary NiTi files and filling the canal with a non-standardised cone may result in a shape that does not match the corresponding gutta-percha point.⁷⁻⁹ This would result in either the pooling of sealer or voids in the inner or outer walls of the canal. Obturation cones are now produced to match the taper and size of canals prepared with rotary instruments in order to provide 3-D obturation of the root canal over its entire length. This obturation can be achieved without requiring accessory cones or spending time on lateral condensation. Manufacturers of matched

taper points claim that they can replicate tapered canals effectively, as they correspond to canal shapes created by instruments of similar tapers. The use of a NiTi file-matched, taper-sized cone system promotes the single-cone cementation technique and has been advocated for obturation of curved root canals.¹⁰ The aim of this study is to describe a root-canal filling method using the single-matched, taper-sized gutta-percha cone technique.

_Description of the technique

Access to the root-canal system was carried out using a size 10 file that was introduced into the canal. Full working length was established by deducting 1 mm from the actual canal length. After introduction of hand files and establishment of a glide path, the canal was prepared with a NiTi rotary system according to the manufacturer's instructions. During preparation and between each file, 2% sodium hypochlorite was used as an irrigant. After completion of instrumentation, a final flush using 17% EDTA was performed and dried with paper points.

A single gutta-percha cone that matches the taper and size of the final rotary instrument was then selected and fitted to the designated working length with tug-back.

AH Plus Root Canal Sealer (DENTSPLY DeTrey) was mixed manually and applied into the root canal using a lentulo spiral. The single-matched cone was then coated with additional sealer to the proper length. A heating instrument was used to cut the match point within 3 mm of the orifice, which was then condensed vertically using an endodontic plugger.



Discussion

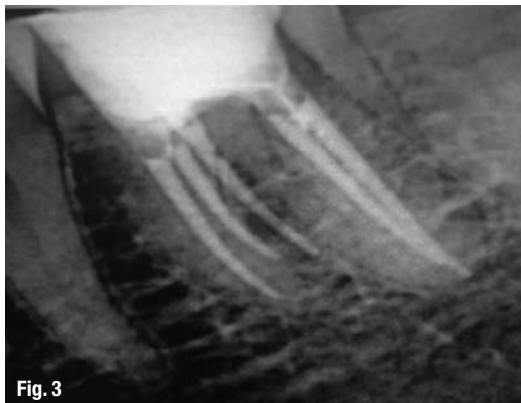
The original single-cone technique performed with conventional sealers has been found to be less effective in sealing root canals than the warm vertical compaction technique.^{11,12} Several root-canal filling techniques have been developed to overcome the shortcomings of the single-cone technique. One is the warm, vertical gutta-percha technique. The primary criticism of this technique is that only a single, uncondensed cone is present in the apical region for sealing the root-canal apex. Unlike the lateral condensation technique, the plugger depth for the continuous wave of obturation technique is recommended to be within 3 to 5 mm of the working length.^{13,14} It has been reported that the filling of the root-canal system using the lateral condensation technique has a better treatment outcome than the single-cone filling technique.¹⁵ However, these fillings were done with standardised 0.02 taper gutta-percha cones, usually with zinc oxide eugenol based sealers. Because large volumes of this soluble sealer were used, dissolution of the sealer may have had a negative effect on the outcome.¹⁶

Schäfer *et al.* compared the solubility of resin-, silicone-, calcium hydroxide-, zinc oxide-eugenol- and glass-ionomer-based sealers in water and artificial saliva, and reported that the resin-based AH Plus lost the least amount of weight of all sealers tested in all liquids.¹⁷ Pommel *et al.* compared single-cone, lateral condensation, vertical condensation, Thermafil and System B techniques using a zinc oxide-eugenol-based sealer, and reported that the single-cone technique had the highest leakage.¹⁸ On the other hand, Wu *et al.* studied the leakage of single-cone fillings using a silicone-based sealer

for one year and concluded that single-cone fillings prevented fluid transport for one year.¹⁶

With NiTi rotary preparation of the root canal and the use of a sealer, single-matched, taper-sized cones could provide 3-D filling of the root canal over its entire length without requiring accessory cones or time spent on lateral condensation. Laboratory evidence suggests that a comparable cross-sectional area of the canal can be occupied by gutta-percha using single-matched, taper-sized cones as compared with lateral condensation, and that this technique can be performed in significantly less time.¹⁹ Hembrough *et al.* compared the root-canal filling quality and efficiency of lateral condensation using variously tapered gutta-percha cones after preparation of single-rooted, straight root canals with ProFile 0.06 tapered rotary files.²⁰ They found that 0.06 tapered gutta-percha cones were more efficient than 0.02 tapered gutta-percha cones in terms of the number of accessory points used, while the filling quality (measured as the linear amount of sealer present between the gutta-percha mass and the canal wall) was not significantly different for either method. Although this was a lateral condensation study, the authors were only able to place an average of one accessory cone in the 0.06 tapered cone group, thereby effectively describing a single-matched, taper-sized cone technique. Bal *et al.* compared the sealing ability of root canals prepared with 0.06 tapered rotary NiTi instruments and filled with either a 0.06 or a 0.02 tapered gutta-percha master cone using lateral condensation and found no difference.²¹ Zmener *et al.* prepared the root canals using a rotary system and filled them using the single-cone and lateral condensation techniques.²² They reported that the difference between single-cone and lateral condensation filling was not significant with the use of a methacrylate-based sealer. De-Deus *et al.* investigated the sealing ability of four





root-canal sealers (Pulp Canal Sealer, Sealapex; both SybronEndo; EndoREZ, Ultradent; AH Plus) at two different thicknesses. In the thin-layer groups, the sealers demonstrated similar results. In the thick-layer groups, AH Plus had the best performance.²³ Overall, greater sealer thickness negatively influenced the sealing ability of the root-canal filling, except in AH Plus samples. Wu *et al.* compared sealer distribution in root canals filled by single-cone, lateral condensation and vertical condensation using epoxy-resin cement. They reported a significantly higher percentage of sealer-coated canals in the single-cone group and a better sealer distribution.²⁴

The matched-cone technique, however, uses master cones with a greater taper that match the geometry of the final NiTi instrumentation systems.¹⁹ The use of contemporary root-canal sealing systems that claim to create bonds along the sealer-gutta-percha interface via modifications of the sealer or the root filling material may also support the use of a single-matched, taper-sized cone technique.²⁵⁻²⁷

It is well known that in order to seal the entire root-canal system, the largest area has to be filled by gutta-percha cones, and the root-canal sealer is only employed as an additional measure to promote better adhesion between root-canal walls and the

cones. Moreover, sealers are able to fill irregular areas that gutta-percha cones are unable to fill.

The single-matched, taper-sized cone technique has many advantages, including:


- _ safe coronal extrusion of excess cement with minimal extrusion of sealer in the apical direction;
- _ a uniform mass of gutta-percha with less sealer at the canal wall interface and within the filling mass;
- _ a higher percentage of sealer-coated canals and a better sealer distribution;
- _ significantly less implementation time;
- _ ease of learning;
- _ elimination of lateral stresses during obturation that may result in overfills and root fractures;
- _ higher quality obturation compared with other methods;
- _ no potential risk of tissue damage due to an increase in root surface temperature;
- _ no potential for obturation material shrinkage; and
- _ lower cost.^{1,19,20,28-32}

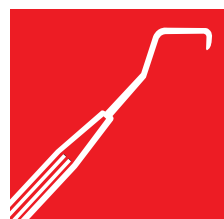
An *in vitro* evaluation of single-matched, taper-sized cone obturation with a fluid filtration method demonstrated results comparable with those of the lateral condensation and Thermafil techniques.³³

_ Conclusion

Use of the single-matched, taper-sized cone technique for cold obturation relies on the original canal shape and the ability to create a tapered circular preparation. A small diameter canal would be suitable for this technique. Oval-shaped and larger diameter root canals would require excessive preparation for this to be effective. Further study is needed to evaluate the sealing ability of the single-matched, taper-sized cone technique in order to determine whether these obturation cones will have an acceptable apical seal.

Editorial note: A list of references is available from the publisher.

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|---|-------|
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Endodontic treatment of primary teeth in the general dental practice

Author_ Dr Robert Teeuwen, Germany

| | Total | | 1 VitA | | 2 Dev/MoA | | 3 MoA | | 4 r.c.f./Fist | | 5 r.c.f. kons | | Total 3–5 | | Total 2–5 | |
|--------------------------|-------|------|--------|------|-----------|------|-------|------|---------------|------|---------------|------|-----------|------|-----------|------|
| | n | % | n | % | n | % | n | % | n | % | n | % | n | % | n | % |
| Total | 559 | | 460 | | 29 | | 37 | | 22 | | 11 | | 70 | | 99 | |
| Author | 216 | 38,6 | 170 | 37,0 | 11 | 37,9 | 14 | 37,8 | 19 | 86,4 | 2 | 18,2 | 35 | 50,0 | 46 | 46,5 |
| Assistant Doctor | 343 | 61,4 | 290 | 63,0 | 18 | 62,1 | 23 | 62,2 | 3 | 13,6 | 9 | 81,8 | 35 | 50,0 | 53 | 53,5 |
| no-shows after treatment | 66 | 11,8 | 47 | 10,2 | 8 | 27,6 | 7 | 18,9 | 2 | 9,1 | 2 | 18,2 | 11 | 15,7 | 19 | 19,2 |
| without no-shows | 493 | | 413 | | 21 | | 30 | | 20 | | 9 | | 59 | | 80 | |
| Extractions | 71 | 14,4 | 55 | 13,3 | 1 | 4,8 | 7 | 23,3 | 5 | 25,0 | 3 | 33,3 | 15 | 25,4 | 16 | 20,0 |
| 0–23 months | 17 | 23,9 | 11 | 20 | – | | 2 | 28,6 | 3 | 60,0 | 1 | 33,3 | 6 | 40,0 | 6 | 37,5 |
| ≥ 24 months | 54 | 76,1 | 44 | 80 | 1 | | 5 | 71,4 | 2 | 40,0 | 2 | 66,7 | 9 | 60,0 | 10 | 62,5 |
| Failure | 28 | 5,7 | 18 | 4,4 | 5 | 23,8 | 3 | 10,0 | 1 | 5,0 | 1 | 11,1 | 5 | 8,5 | 10 | 12,5 |
| 0–23 months | 22 | 78,6 | 14 | 78 | 4 | 80,0 | 2 | 66,7 | 1 | | 1 | | 4 | 80,0 | 8 | 80,0 |
| ≥ 24 months | 6 | 21,4 | 4 | 22 | 1 | 20,0 | 1 | 33,3 | – | | – | | 1 | 20,0 | 2 | 20,0 |

Table I N2-therapy of primary teeth 1992–1998.

- 1 VitA = vital amputation = pulpotomy;
- 2 Dev/MoA = mortal amputation post devitalisation;
- 3 MoA = mortal amputation of gangrenous teeth; only the pulp-chamber is filled by N2;
- 4 r.c.f./Fist = root-canal filling with artificial fistulation;
- 5 r.c.f. kons = root-canal filling, conservative treatment).

The most common endodontic treatment of primary teeth is pulpotomy, which is used in the case of carious, iatrogenic or traumatic damage of the pulp. As prerequisite for such a procedure, the patient has to be free of clinical symptoms, according to the DGZMK.¹ As per UK Guideline² and Weisshaar,³ this condition is still met in cases of temporary discomfort or short, spontaneous pain.

Various materials are used for pulpotomy and pulpectomy. The standard preparation for pulpotomy is still Formocresol—19% formaldehyde, 35% cresol, 15% glycerine, 31% distilled water—used in a 1:5 dilution. Weisshaar³ reported that 92.4% of paediatric dentists in Canada and 76.8% of paediatric dentists worldwide used Formocresol for pulpotomy in 1989. While there have always been objections to the use of formaldehyde, Tagger and Tagger⁴ state that Formocresol pulpotomy assists the retention of primary teeth and outperforms any other current method.

In their 2002 statement, the DGZMK advised using calcium hydroxide—Ca(OH)₂—for pulpotomy.¹ The 2006 UK Guideline however considers this treatment inappropriate.² Furthermore, the UK Guideline emphasised that pulpotomy with 15.5% ferric sulphate (Astringent, Ultradent) is as effective as a five-minute treatment with Formocresol. However, ferric sulphate only acts haemostatically when applied to the bleeding pulp stump for 15 seconds. Subsequently, ferric sulphate is removed from the pulp cavity and zinc oxide-eugenol is directly applied to the root canals. The UK Guideline cites a study that achieved 55% internal resorption—as with Ca(OH)₂—and 71% obliteration of the root canal radiologically with this pulpotomy method.² Peng *et al.*⁵ demonstrated equivalent results in a meta-analysis of 11 studies that compared Formocresol and ferric sulphate pulpotomies. The ferric sulphate pulpotomies demonstrated a clinical success rate of 78 to 100% and a radiological success of 42 to 97%. For inclusion

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Figs. 1–4 11-year-old patient. Treatment of the lower gangrenous second primary molar.

- Fig. 1** 19.06.1992: Ante treatment.
- Fig. 2** 19.06.1992: X-ray control of the incomplete r.c.f.
- Fig. 3** 12.10.1993: Follow-up X-ray after 16 months.
- Fig. 4** 19.06.1992: Fistulation through the gum.

in the analysis, the teeth were required to have remained *in situ* for at least 12 months in order to avoid the inclusion of early failures in the baseline studies.

According to Einwag,⁶ the 90 to 100% clinical success rate of pulpotomies using N2 Endodontic cement (Ghimas) is the same as that achieved using the five-minute Formocresol technique, which is not surprising owing to their similar composition. Prior to the EU certification of 14 June 1998, N2 contained 7% formaldehyde, which was subsequently reduced to 5%.

Bürkle⁷ reported a low technical sensitivity and good clinical results for all aldehyde-containing materials, such as Formocresol, glutaraldehyde and N2.

Materials and method

A prerequisite for treatment was the restorability of the respective teeth. An exclusion criterion was

increased mobility without advanced root resorption. In accordance with these, the following endodontic treatments between 1992 and 1998 were recorded. X-rays were only routinely available for mortal amputations and root-canal treatments of gangrenous primary teeth. Where possible, follow-up X-rays of the latter were taken.

Vital amputations (pulpotomies), mortal amputations and root-canal fillings were performed using the root-canal filling material N2 under relatively dry conditions. For the root-canal filling, N2 powder and N2 liquid were mixed to a creamy consistency and applied near the apex following preparation using a manual reamer or mechanical HERO 642 endodontic files (MICRO-MEGA).

For vital or mortal amputations, N2 was mixed to a relatively solid consistency. First, deep carious defects were removed with an excavator. The remaining caries was excavated using a thick spherical bur without water-cooling, followed by cavity preparation with elimination of the coronal pulp using a turbine.

Frequently, the remaining pulp bleeds from the canals. Light bleeding can be disregarded, but N2 must be firmly applied to the cavity for several minutes in the case of heavier bleeding. Owing to the formaldehyde level, the bleeding can be stopped relatively quickly. The blood-soaked N2 is then removed from the cavity and replaced with freshly mixed N2 of a solid consistency.





Fig. 5



Fig. 6



Fig. 7



Fig. 8



Fig. 9

The mortal amputations were attributed partly to Toxavit-devitalisation and partly to treatment of gangrenous teeth. Devitalised teeth were treated in the same manner as vital teeth. Gangrenous teeth were treated with different methods. Simple mortal amputations were performed in a manner similar to a vital amputation. Root-canal fillings (partial or complete) were simply filled with paste. In some cases, the roots were finished through artificial fistulation, which was done interradicularly—mostly with a Cavit lifter through the mucosa—and in a few cases after the mucosa had been shifted with a turbine bur.

All endodontic measures, including the fillings, were performed in one appointment. Additional visits were only necessary when massive bleeding occurred, when a composite filling was required and in devitalisation cases. In the first two cases, the cavity was filled with excess N2 or with zinc oxide-eugenol following N2 application. N2 application and immediate amalgam sealing of the cavity without lining materials is still the most time-saving method. In exceptional cases, stainless-steel crowns served as definitive restoration.

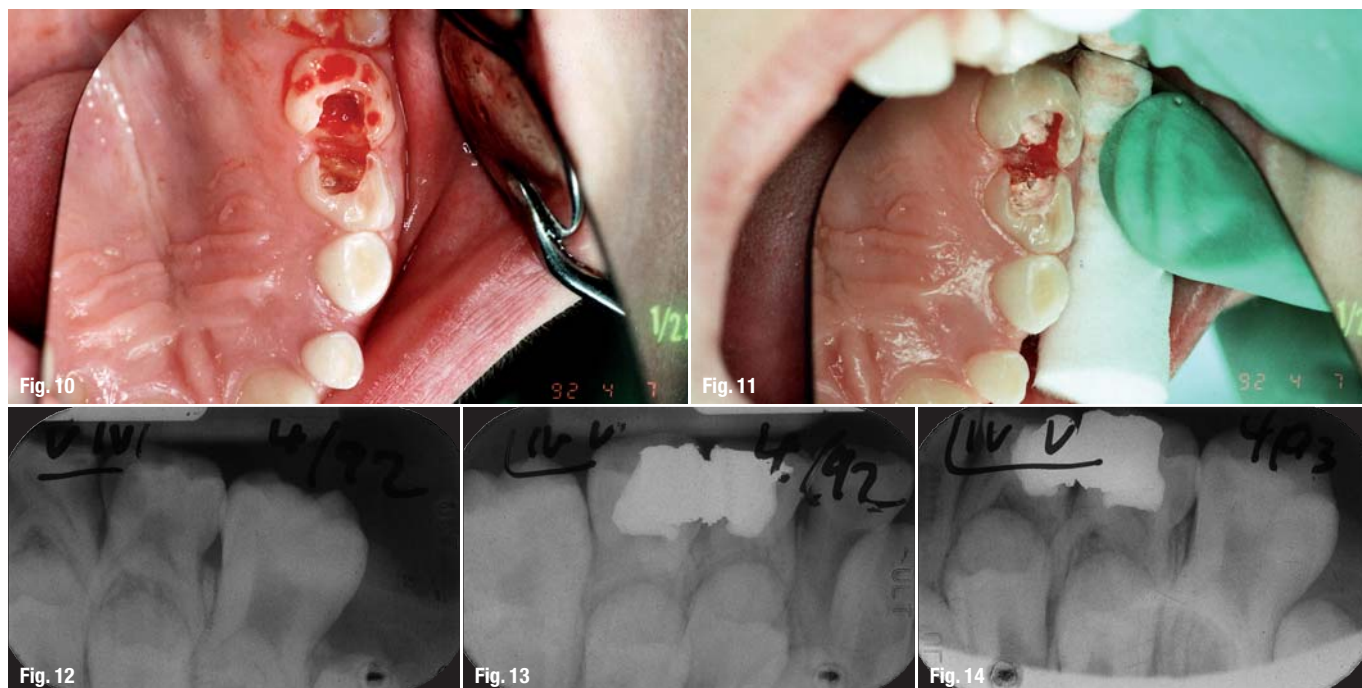
Results

A total of 559 primary teeth were treated endodontically between 1992 and 1998. I treated about 39% of these myself. Pulpotomies were conducted on 460 primary molars, 29 to Toxavit devitalisation with subsequent mortal amputation was performed on 29 primary molars. Of the 70 gangrenous primary molars treated, 37 were treated by simple mortal amputation. In 22 cases, root filling or mortal amputation was followed by artificial fistulation. Root-canal treatment of 11 gangrenous primary molars was performed without fistulation. The following gives the average age of the patients who underwent a pulpotomy:

- maxillary first molar: 7 years, 6 months
- maxillary second molar: 7 years, 5 months
- mandibular first molar: 6 years, 6 months
- mandibular second molar: 6 years, 6 months

After treatment, 11.8% ($n = 66$) of the young patients did not return to the practice, which left only 88.2% of the original patient group ($n = 493$) for

- Figs. 5–9** 13-year-old patient. Treatment of the lower gangrenous first primary molar.
- Fig. 5** 11.04.1995: Ante treatment.
- Fig. 6** 11.04.1995: Post mortal-amputation.
- Fig. 7** 11.04.1995: Natural fistula represented.
- Fig. 8** 11.04.1995: Bleeding of the pulp, pulp-chamber completely filled by N2.
- Fig. 9** 17.04.1995: Fistula has disappeared (05.01.1996: panoramic X-ray shows treated tooth still in situ; 30.01.1997: file-card shows permanent first premolar erupted).



Figs. 10–14 10-year-old patient. Pulpotomy of upper first and second primary molar.

Fig. 10 07.04.1992: Post cavity-preparation: slight bleeding of first molar, moderate bleeding of second molar.

Fig. 11 07.04.1992: Post N2-application.

Fig. 12 07.04.1992: Ante treatment.

Fig. 13 07.04.1992: Post treatment (N2, Amalgam-filling).

Fig. 14 15.04.1993: 12 months after vital-amputation.

observation in the practice. During the observation period, clinical failure (pain, swelling and fistulas) was registered in 5.7% ($n = 28$) of the patients. The symptoms of clinical failure occurred within 23 months after treatment in 78.6% of patients ($n = 22$). In one patient, these symptoms occurred only several hours after devitalisation followed by mortal amputation. Of the extractions done, 76.1 per cent ($n = 54$) occurred 24 months or more post-treatment. Problems with tooth eruption of or enamel damage to the permanent teeth were not observed.

In summary, we observed that the number of extractions and failures in the observation period was twice as high in necrotic teeth when comparing vital amputation with treatment of gangrenous teeth (column 1 compared to column 3 to 5 in Table I).

Discussion

The number of young patients that did not return to the dental practice after treatment may be attributed to the discomfort of the treatment. However, the DMS III (Third German Oral Health Study) found a social attachment to the dentist ("always the same dentist") as high as 92.5% in 12-year-old patients in West Germany in 1997.⁸ It is possible that a significant number of those who did not return were clinical failures, prompting the patients' parents to consult another dentist, but this is rather unlikely.

Huber⁹ analysed 179 N2 vital amputations in 105 patients and documented a failure rate of 9.5%. The age of tooth loss corresponded to the average age of premolar eruption. The N2 pulpotomies had a low

failure rate of 4.4% in this study. This was confirmed by Einwag, who gives the clinical success rate of N2 pulpotomies as 90 to 100%.⁶

Although not documented in detail in this study, pain anamnesis appears to be insignificant in determining the success of a N2 pulpotomy. Acute exacerbations, as often observed following pulpotomy with Ca(OH)_2 , almost never occurred after N2 pulpotomy. Against this background, it is incomprehensible that German universities continue to favour Ca(OH)_2 pulpotomies. The UK Guideline is a step ahead in this respect.²

It is important for the dental practice that the outcome of the treatment be guaranteed, that both the young patient and the dentist be comfortable with one another, that the treated tooth remains *in situ* until development of the permanent teeth and that the erupted permanent teeth are not damaged.

Dental practitioner Garry¹⁰ aptly expresses the use of N2 in endodontic treatment of primary teeth, which reflects my personal opinion: "When endodontic treatment is recommended for primary teeth, the concept 'careful selection of cases' is often used to warn the practitioner against treating gangrenous teeth. The technique herein does not require 'careful selection' for treatment [...]. The goal of endodontic intervention on primary teeth is not to obtain radiographic images which meet standards used in treating adult teeth, but to retain deciduous teeth as long as possible as entities and space maintainers."[—]

Editorial note: A list of references is available from the publisher.

| | |
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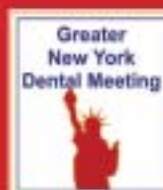
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Removal of a fractured instrument: Two case reports

Author_ Dr Rafaël Michiels, Belgium

Fractured instruments pose a challenge to every endodontist. The difficulty in the retrieval of these instruments ranges from surprisingly easy to downright impossible. The clinical outcome of cases with fractured instruments depends on several factors, such as the position of the instrument in the canal, the type of material, the instrument size and canal anatomy.¹ Failure in retrieval of the fractured instrument does not automatically result in failure of the case.² One can still try to bypass the instrument, choose a surgical approach, or even wait and see. However, if we bear 'nothing ventured, nothing gained' in mind, then we should always at least try to retrieve the fractured instrument.

Case I

A 27-year-old female patient was referred to our practice. She was in good health and had an American Society of Anesthesiologists (ASA) score of 1. The patient had some mild clinical symptoms on tooth #30 due to apical periodontitis. She had been told, by the referring dentist, that there was a fractured instrument in her tooth and that the instrument had to be removed first in order to allow for decent retreatment.

Before starting with the treatment, a new diagnostic radiograph was taken. In this case, the diag-

Fig. 1 Diagnostic radiograph, showing two separated instruments in the mesial root.

Fig. 2 A modified Gates-Glidden bur used for creating a plateau above the instrument.



Fig. 1

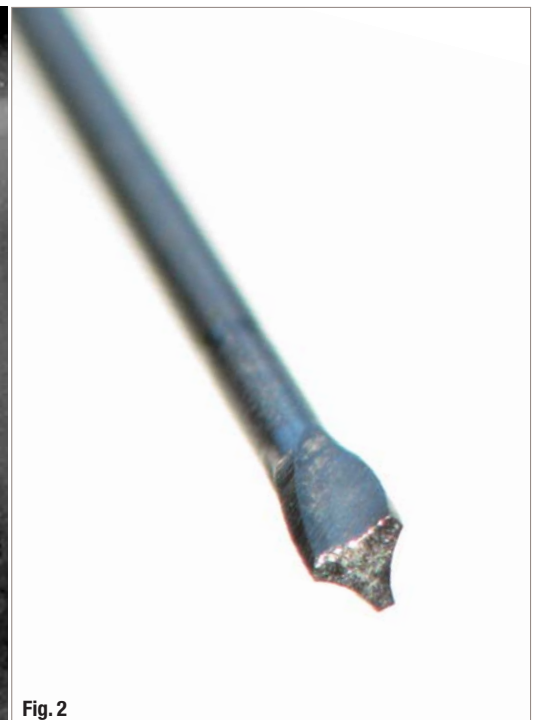


Fig. 2



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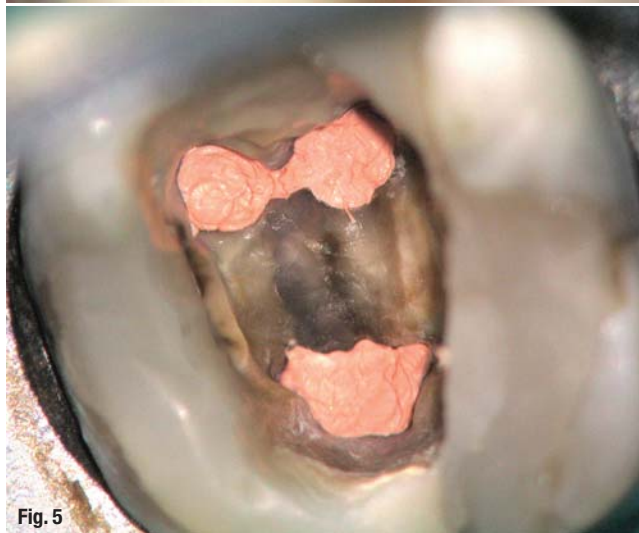
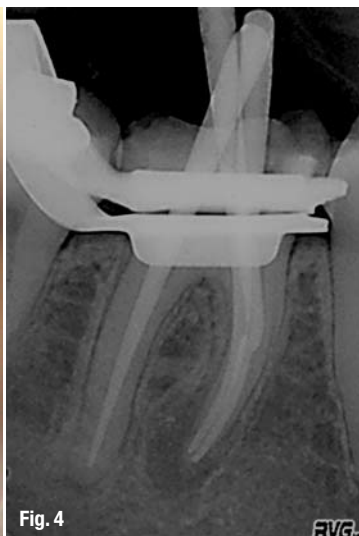


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the time being and made a new appointment. Calcium hydroxide paste (UltraCal XS, Ultradent) was put into the coronal part of the mesial canals and the tooth was sealed with glass-ionomer cement (Fuji IX GP Fast, GC) and a cotton pellet.

During the next visit, the tooth was again isolated and opened. The calcium hydroxide paste was removed, using 10 % citric acid and passive ultrasonics with the IRRISAFE tip (Satelec). Again, ultra-

Fig. 3_ One of the separated instruments.
Fig. 4_ Gutta-percha cone fitting.
Fig. 5_ The pulp chamber after obturation with gutta-percha.
Fig. 6_ Final radiograph (parallel).
Fig. 7_ Final radiograph (angled).

nostic radiograph (Fig. 1) showed not one but two broken instruments in the mesial root. Thereafter, the tooth was isolated with the rubber dam and the coronal filling was removed. Straight-line access was established, as this is imperative in order to be able to reach and see the fractured instruments. Gates-Glidden burs (DENTSPLY Maillefer) were used to enlarge the mesial orifices coronally.

After reaching the instrument in the mesio-buccal canal, I modified a size 3 Gates-Glidden bur by removing the tip of the bur (Fig. 2). In this manner, one gains an aggressive bur that allows one to create a platform above the instrument. At this moment, the instrument could be clearly visualised (Fig. 3). Ultrasonics were then used to loosen the fragment. ProUltra tips (DENTSPLY Maillefer), both zirconium nitride and titanium, were used for this purpose.

One-and-a-half hours after starting the treatment, the fragment had been loosened but was still stuck in the canal. We decided to leave it in place for

ultrasonics were used to retrieve the instrument. After five minutes, the fragment in the mesio-buccal canal was removed. Another five minutes later, the instrument in the mesio-lingual canal was also removed. While removing the instrument in the mesio-buccal canal was very time-consuming, removing the instrument from the mesio-lingual canal was surprisingly easy. This clearly highlights the above-mentioned difficulty range of instrument retrieval.

After the removal of both instruments, working length was determined in both mesial canals with the electronic apex locator (Root ZX Mini, Morita). A glide path was established and the mesial canals were initially shaped with a ProTaper S1 (DENTSPLY Maillefer). Copious irrigation was performed using 3% sodium hypochlorite. Next, the gutta-percha in the distal canal was removed with a size 25.06 ProFile (DENTSPLY Maillefer), which was rotated at 500rpm in an X-smart Easy endodontic motor (DENTSPLY Maillefer). No chemical was required for gutta-percha softening. The canals walls were

scraped with Micro-Debriders (DENTSPLY Maillefer) in order to remove the last remnants of gutta-percha. All canals were shaped to a size 40.06 ProFile. Final apical shaping was performed with K-Flexo-files (DENTSPLY Maillefer). Smear-layer removal was carried out by irrigating the canal with 10% citric acid. A final wash of the canal was performed with sterile saline. Tapered gutta-percha cones were then fitted (Fig. 4) and tug-back was confirmed. Topseal (DENTSPLY Maillefer) was used as a root-canal sealer.

Obturation was performed according to the continuous wave of condensation technique with the Elements Obturation Unit (SybronEndo). After

obturation (Fig. 5), a temporary restoration of glass-ionomer cement was placed (Fuji IX GP Fast). Final radiographs (Figs. 6 & 7) were taken, both parallel and angled. The radiographs show two completely separated mesial canals; hence, instrument removal in both canals was favourable. The prognosis of this case was good and the patient was referred to her general dentist for a definitive coronal restoration.

Case II

A 19-year-old male patient was referred to our practice. He was in good health and had an ASA score of 1. The referring dentist had fractured a small instrument—most likely a size 10 or 15 K-file,

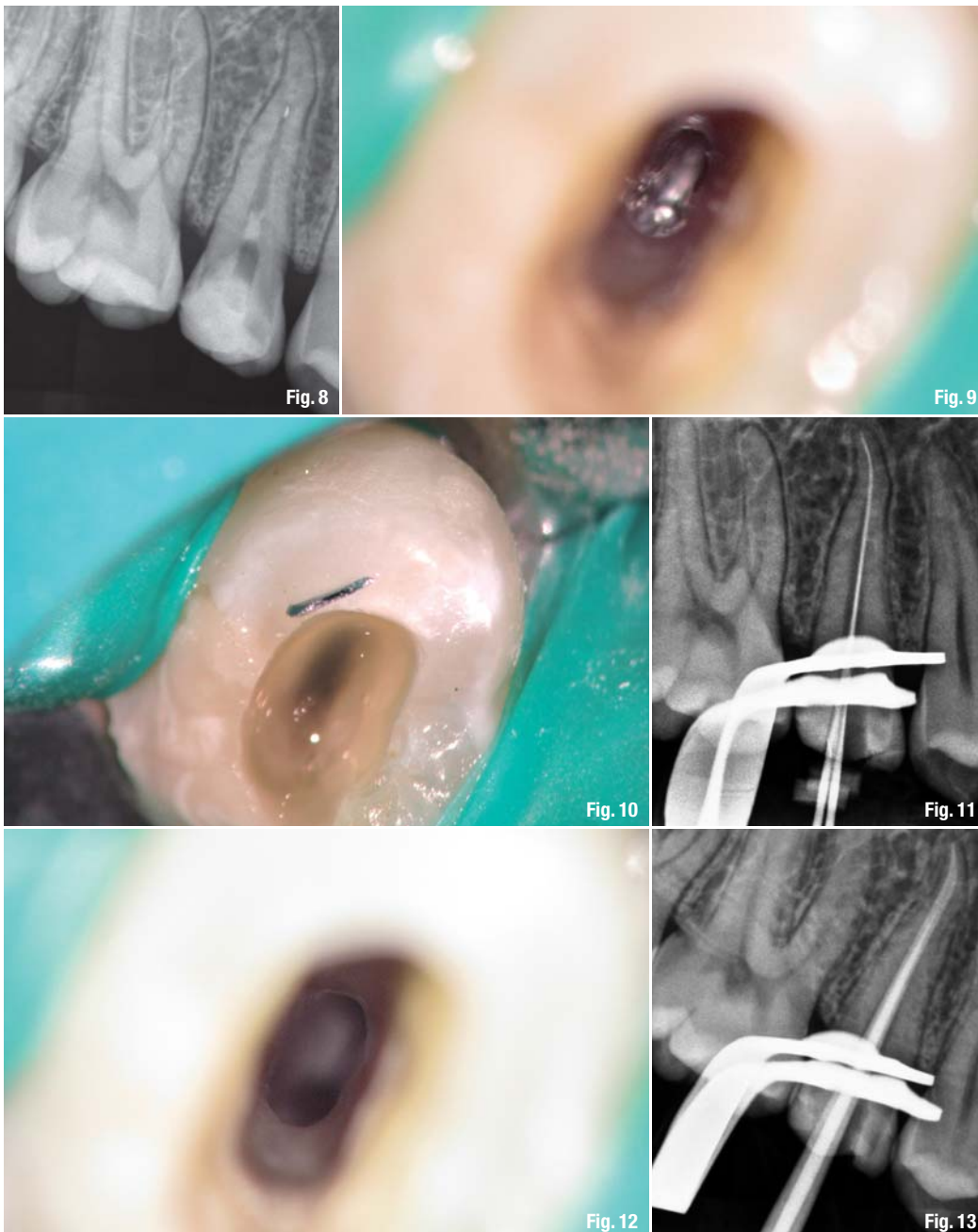


Fig. 8 Diagnostic radiograph, showing the separated instrument at approx. 5 mm from the apex.
Fig. 9 The separated instrument.
Fig. 10 The separated file after retrieval.
Fig. 11 Working length determination.
Fig. 12 Deep apical split.
Fig. 13 Gutta-percha cone fitting.

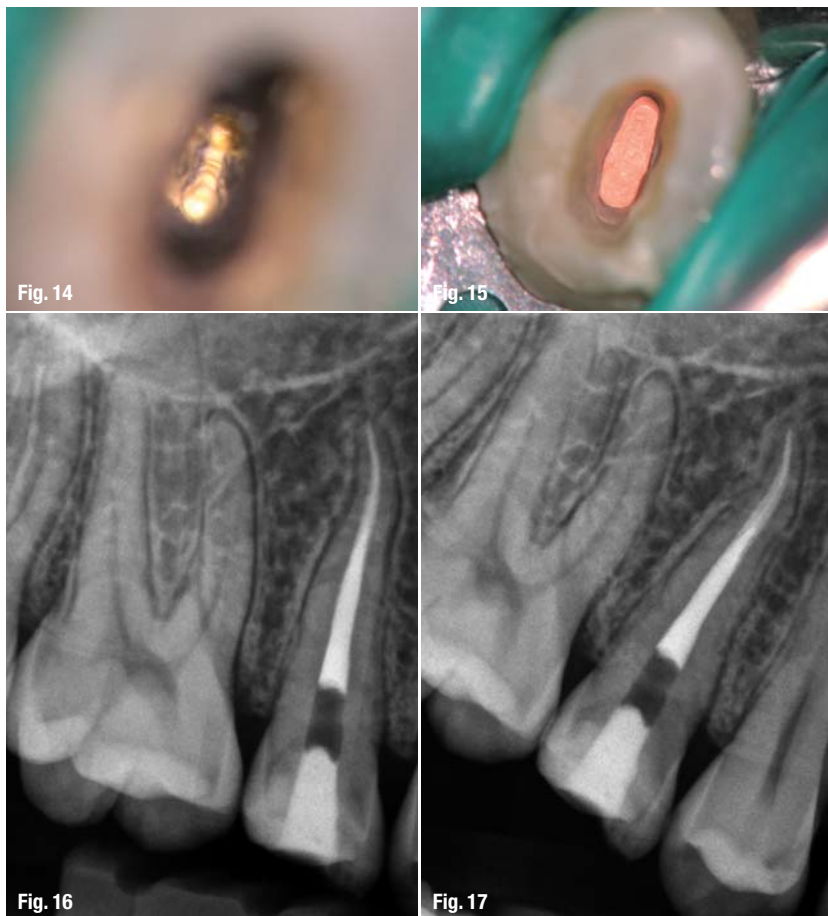


Fig. 14 Apical obturation with gutta-percha.
Fig. 15 The pulp chamber after complete obturation with gutta-percha.
Fig. 16 Final radiograph (parallel).
Fig. 17 Final radiograph (angled).

according to his referral letter—while performing root-canal treatment on tooth #4. The root-canal treatment was necessary because of a trauma that the patient suffered. The buccal cusp had fractured and the pulp was exposed.

A new diagnostic radiograph (Fig. 8) was taken, which showed the fragment approx. 5 mm from the apex. The tooth was isolated with a rubber dam and access was gained through the temporary restoration, which was placed by the referring dentist.

After opening, the remnants of calcium hydroxide paste were removed with 10% citric acid and passive ultrasonics. The fractured instrument could be visualised immediately (Fig. 9), because the canal was very large in the middle and coronal part. This allowed a very conservative and tissue-saving approach. Given the position in the canal and the shape of the canal, a deep apical split of the canal was suspected. After probing with small K-files, a patent palatal was confirmed.


The instrument was fractured in the buccal canal. A titanium ProUltra tip #8 (DENTSPLY Maillefer) was used to loosen the instrument. In the meantime, copious irrigation with 5% sodium hypochlorite was performed.

The fractured instrument was retrieved (Fig. 10) and after determining working length (Fig. 11), shaping with rotary nickel-titanium instruments (Twisted Files, SybronEndo) was started. Both canals were shaped to a size 25.08 Twisted File. The master apical file was kept small due to the deep split (Fig. 12) and the tension felt while shaping, thus minimising new instrument fracture. Apical finishing was carried out with size 25 K-flexofiles. Smear-layer removal was performed with a rinse of 10 % citric acid. A final wash of the canal was carried out with sterile saline. Tapered gutta-percha cones were then fitted and tug-back was confirmed (Fig. 13). Topseal was used as a root-canal sealer. Both canals were obturated according to the continuous wave of condensation technique with the Elements Obturation Unit. After obturation (Figs. 14 & 15), a temporary restoration in glass-ionomer cement was placed together with a cotton pellet, which was soaked in an alcohol and chlorhexidine mixture first and then air-dried after it had been placed in the access cavity. Final radiographs (Figs. 16 & 17) were taken, both parallel and angled. The prognosis of this case was good and the patient was referred to his general dentist for a definitive coronal restoration.

Conclusion

In the end, removal of a fractured instrument can be very difficult and it may take a long time to accomplish. Dr Marga Ree once said on the ROOTS forum that she was being taught that endodontics is all about the three Ps: Passion, Persistence and Patience. This hits the nail right on the head as far as instrument retrieval is concerned.

Editorial note: A list of references is available from the publisher.

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Root-canal retreatment: To treat or not to treat?

Author_ Dr Daniel Flynn, UK



Fig. 1

Fig. 1 _Pre-op radiograph.

Root-canal retreatment is a predictable treatment modality. When patients were informed about this treatment option in the past, the dentist often over-emphasised the possibility of failure. This still occurs today, however more and more practitioners are realising that root-canal retreatment can be a hugely successful treatment modality and can save the patients natural teeth while still maintaining prosthetic replacement options for the future should it become necessary. In our private practice, approximately 50 per cent of referred cases are endodontic retreatments and, using modern state-of-the-art techniques, success rates from 70 to 95 per cent are possible, which is in line with recently published outcome studies.¹

Prior to initiating any complex treatment, the overall dentition is examined. The position of the tooth in the mouth, its functional and aesthetic requirements, the periodontal condition and the amount of remaining tooth structure are critical parameters to assess.

A discussion of the treatment options has become more complex over the years, as patients demand more detailed information about prospective treatments. Additionally, the number of treatment options has increased. A tooth with previous root-canal treat-

ment that has failed may be monitored, extracted, re-root-canal treated, either surgically or non-surgically or occasionally an intentional re-implantation may be preformed. In an ideal world, a cost-benefit analysis of each possible treatment should be discussed with the patient. This is a challenging discussion as the number of variables both known and unknown are significant.

When assessing a tooth for the possibility of root-canal retreatment, I try to establish the source of infection. Failure is almost exclusively due to the presence of bacteria. In the majority of cases, the bacteria will be located within the root-canal system. On rare occasions, there will be an extra-radicular infection. Bacteria such as *Actinomyces* species have been shown to be able to survive in resorbed regions of the external root surface. A practitioner is unable to distinguish, however, whether the bacteria are extra- or intra-radicular.

Non-microbial causes of failure include presence of cysts, foreign body reactions and possibly the presence of scar tissue rather than healing with bone and connective tissue. In the past, 50 per cent of periapical radiolucencies were believed to be cysts.² Our current understanding, however, suggests that the incidence of true cysts is around six per cent.³ Another possible cause of failure is a foreign-body reaction to materials such as talc powder from gutta-percha points, but this is unlikely to be a common cause of failure. Finally, large lesions that extend and perforate the bony cortex buccally and lingually can sometimes heal with scar tissue and be misdiagnosed as not healed radiographically.

The critical question one must ask before initiating treatment is: Can I reach the area of infection and eliminate sufficient bacteria to create conditions conducive to health/healing? The most likely common cause of failure is missed canals that have a bacterial biofilm extending to the apical foramen. Remember, the mesio-buccal root of maxillary molars has two canals around 95 per cent of the time. Magnification, adequate light and knowledge of where to

look are necessary for locating this canal. Lower incisors also have a second canal more than 40 per cent of the time, with the second canal often placed more lingually.

We regularly treat teeth that have no peri-apical infections but have technically inadequate root-canal treatments. The conventional wisdom is that if planning to place crowns or bridges on teeth with technically inadequate treatments, one takes responsibility for such treatment, as it will form the foundation for subsequent work. Success rates are expected to be 94 per cent in this situation, which is phenomenally high and offers predictability for subsequent work.

Case report

The following case is an example of a retreatment case that was referred to our practice for an opinion and treatment, if required. The patient was asymptomatic on presentation for the initial consultation was no history of symptoms. Initial root-canal treatment had been initiated over ten years ago.

The #32 was unrestored while the #31 had an amalgam and a previous root-canal filling. Sensitivity tests revealed that the #32 responded positively, whereas the #31 gave a negative response. There were no probing defects greater than 3 mm. There was no buccal swelling or expansion of the bone, and the teeth were not tender to percussion or palpation. A large multilocular peri-apical lesion measuring 25 mm by 10 mm was noted to be associated with the #31 and #32 (Fig. 1).

A provisional diagnosis of chronic apical periodontitis was made. The likely cause of the lesion was intra-radicular bacteria. During a recent course, the majority of dentists suggested that the treatment of choice was to extract the tooth and possibly enucleate the lesion. It is important to remember that one cannot diagnose whether a lesion is odontogenic or non-odontogenic by radiography alone. There are two types of cysts: true cysts and bay cysts. Bay cysts are connected to the root-canal system and would be expected to heal following conventional endodontic therapy. Theoretically, true cysts are independent of the root-canal space and may not heal by root-canal treatment alone. (Much evidence suggests that the size of the lesion does not influence the outcome of healing, although it may be true that the greater the size of the lesion, the greater the likelihood of its being cystic.) The treatment recommended to the patient in this instance was root-canal retreatment with a review in six months to assess healing. There was an obvious possible source of infection in the untreated mesial canals, while the distal canals had had a technically inadequate root-canal treatment (Fig. 1).

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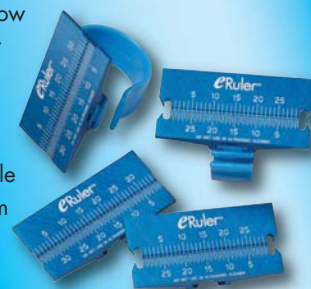




Fig. 2

Fig. 2 Post-op radiograph with temporary restoration.

Fig. 3 Post-op radiograph at six months.



Fig. 3

In the above case, the restoration was removed and the operating microscope was used to identify the mesial canals. Methylene blue was used to stain the tooth to check for and assess cracks. The silver points were removed by bypassing them with small files using solvent to dissolve the surrounding sealer and braiding three size 15 files around each point to remove each one intact. The remaining paste and obturation material apically was bypassed and patency was achieved as demonstrated by obtaining a consistent reading on the apex locator.

As the mesial canals had a double curvature, a serial step-back approach was initiated with NiTi rotary files in order to minimise the stress on the instruments. Patency was achieved and the canals were dressed with calcium hydroxide for a week.

At a subsequent visit, no symptoms were recorded and the canals were irrigated with sodium hypochlorite and EDTA to remove any remaining calcium hydroxide and any organic and inorganic debris. The canals were then obturated with a warm vertical condensation technique using System B and Obtura (both SybronEndo). There was some extrusion of sealer, which does not affect the outcome of treatment but may delay healing (Fig. 2).

Conclusion

It is well established that it takes time for a lesion of endodontic origin to heal. We expect 25 per cent of lesions to heal completely after six months and 50 per cent to return to health after one year. Outcome studies suggest 74 to 86 per cent of lesions will completely heal after initial treatment or orthograde retreatment.⁴ These high retreatment success rates may surprise many practitioners; however, an even more impressive 91 to 97 per cent will be asymptomatic and functional over time.

Modern advances, such as the operating microscope, NiTi instrumentation, ultrasonic irrigation and thermoplastic obturation techniques, are combined with the traditional use of rubber dam and chemical debridement using sodium hypochlorite and calcium hydroxide to obtain these outstanding success rates (Figs. 1 & 3).

Success in root-canal retreatment depends on preventing contamination of the canals during treatment and disrupting the bacterial biofilm to create conditions conducive to healing. The patient was advised to return to his general dental practitioner immediately following treatment for placement of a cuspal coverage restoration. The importance of this was again emphasised following the review appointment. There is evidence that posterior teeth not crowned following endodontic treatment are six times more likely to be lost. Thus, root-canal retreatment is a predictable treatment strategy that may enable patients to retain their natural teeth for an extended period of time.

Editorial note: A list of references is available from the publisher.

about the author

roots



Dr Daniel Flynn qualified from the Dublin Dental School and Hospital, Trinity College (Ireland), in 2002. Dr Flynn recently joined the EndoCare team headed by Dr Michael Sultan. He has lectured in both the UK and Ireland and provides hands-

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“The **goals of treatment** for primary teeth are not much different to that for permanent teeth”

An interview with Prof Jill Fernandez and Drs Neal Herman and Lily Lim, New York University, USA



Prof Jill Fernandez

_In July, paediatric dentistry specialists gathered in Pasay City, the Philippines, for the 7th biennial congress of the Pediatric Dentistry Association of Asia. **roots** spoke with presenters Prof Jill Fernandez and Drs Neal Herman and Lily Lim from the New York University about their participation and recent developments in the field.

_roots: *The US congress recently approved a new proposal for health care reform. In your opinion, what impact will this policy change have on children's dental care?*

Prof Fernandez: It is still too early to know what the final health reform bill will entail exactly, but as of now it does include mandatory paediatric dental care that requires dental coverage be offered as part of any essential benefits package for children under the age of 21. The new law will enable stand-alone dental plans to offer dental benefits as part of any health insurance exchange and/or subcontract with medical plans. The impact of this on the public and the profession could be monumental—the message is to begin oral-health preventive interventions early in the lives of children, and that oral health is an integral part of overall health.

_The oral health of children in the US is poor and caries figures are at an all-time high. What are the reasons for this?

Prof Fernandez: Actually, the oral health of children in the US has improved significantly over the past few decades, when you look at a national sample across all age groups. Today, most American children have excellent oral health, but a significant

subset suffers from a high level of oral disease. The most advanced disease is found primarily amongst children living in poverty, some racial/ethnic minority populations, children with special needs, and children with HIV/Aids infection.

You might be referring to the National Health and Nutrition Examination Survey that demonstrated an increase in dental caries from 24 per cent to 28 per cent in the two to five-year-old group. The reasons for this are presently unclear, but this increase has reignited efforts in the US to improve access to care for this age group and motivate more dentists to treat very young children in our population.

_Early Childhood Caries (ECC) has increased not only in the US, but also worldwide. Should this area be considered a new priority in paediatric dentistry?

Prof Fernandez: ECC, and efforts in the intervention and treatment of early dental decay, has always been a major priority. In order to combat the current national epidemic of ECC in young children effectively, a more comprehensive, collaborative approach to the education of parents by all newborn and paediatric health-care providers, such as nurses, paediatric and general dentists, dental hygienists, paediatricians, paediatric nurse practitioners, obstetricians and gynaecologists, is essential.

The American Academy of Pediatrics (AAP) began a collaborative effort with paediatric dentists to address the issue of ECC. The AAP has made strides in developing educational programmes for paedia-

tricians and family physicians to identify at-risk children and refer them for dental treatment.

However, for many children access to dental care remains a problem and the number with dental caries seems to be growing. Many parents do not have dental insurance; thus, they postpone dental treatments until the problem is so advanced that it can no longer be ignored. It is unfortunate that even parents who have third-party coverage for dental care (Medicaid, Child Health Plus) and are from lower socioeconomic backgrounds often fail to seek dental care as part of general health-care services. As a result, pre-school children with Medicaid may still have untreated decayed teeth.

—Frequent bottle-feeding at night has been identified as a driving factor for ECC. Other studies have found a microbiological connection between mother and child, labelling ECC a transmissible disease. What is your opinion on the latest research and how will it affect the way children should be treated?

Dr Herman: The nursing bottle is only one of many confounding factors in ECC. What we conclude from the latest research is that dental caries is highly complex and perplexing, not easily prevented

or treated in the most susceptible children. It is believed these days that there are nutritional, behavioural, immunological and bacterial factors that must be considered in order to understand and prevent dental caries.

The surgical approach to ECC—the 'drill and fill' solution of placing restorations in teeth as they become cavitated—has long been proven futile and often counter-productive. Therapeutic interventions, particularly utilising fluoride varnish, have shown promise in preventing, arresting and reversing carious lesions. Much more work must be done to document its success, but at least this 'medical model' has begun to address the fact that ECC is a bacterial disease that requires more than just filling up the holes that are merely its symptoms.

—Root-canal treatments in primary teeth are also becoming more common. Does the treatment differ in any way from that of permanent teeth?

Dr Lim: We're not sure that pulp therapy is on the increase but if it is, it's probably because more parents (and dentists) realise it's best to try to preserve a primary tooth rather than extract it (whenever possible). The goals of treatment for primary teeth

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Dr Lily Lim (middle) with colleagues bringing smiles to a child after treatment.

are not much different to that for permanent teeth; in both cases, diseased portions of the dental pulp are removed in an effort to preserve the hard structure of the tooth for functional or cosmetic purposes.

Anatomical and physiological differences between primary and permanent teeth make a difference to the principle of root-canal treatment. A permanent tooth requires an inert, solid, non-resorbable material that can last a lifetime, and gutta-percha fits that bill. The ideal root-canal filling material for primary teeth should resorb at a similar rate to the primary root in order to permit normal eruption of the successor tooth; not be harmful to the underlying tissues or to the permanent tooth germ; fill the root canals easily; adhere to the walls and not shrink; be easily removed, if necessary; be radiopaque; be antiseptic; and not cause discoloration of the tooth. There is currently no material that meets all these criteria, but the filling materials most commonly used for primary pulp canals are non-reinforced zinc-oxide-eugenol paste, iodoform-based paste (KRI), and iodoform and calcium hydroxide (Vitapex).

A study in the Netherlands has found that prevention involving the counselling of parents on caries-promoting feeding behaviour is often ineffective in the long term. Is there a lack of quality intervention strategies?

Dr Herman: If we (or the WHO) could answer this question, we'd have found the key to unlocking the mystery of improving or enhancing human motivation. It is probably true that without continual and periodic follow-up, counselling will wear off even amongst highly motivated individuals. We think the key lies with education that begins early and pro-

Dr Neal Herman.

motes a sound nutritional and sustainable oral-hygiene model for parent and child alike. As you might imagine, this is a task not well suited to the traditional dental-care delivery model, and will require some serious paradigm changes to permit effective implementation.

What preventative measures do you recommend based on your clinical experience in New York?

Dr Herman: Preventive measures and conservative therapies that confront the cause of the disease, rather than treat the symptoms, are the most effective and work the best. Fluoride varnish has proven to be a godsend, although most of the evidence to date is empirical and anecdotal. Good long-term longitudinal studies are needed to prove conclusively what we already know as clinicians—an intensive regimen of fluoride varnish, along with adjunctive measures, can control and often reverse dental decay, as well as prevent it.

Dr Lim: Starting in infancy, children at-risk for dental decay should be receiving twice-yearly applications of fluoride varnish, whether by a dentist or dental professional, or as part of their well-baby care from their paediatricians. More than 40 states in the US have implemented such programmes, and the outcomes are impressive—as much as 40 per cent fewer children with early signs of ECC.

Prof Fernandez: Collaboration between other health providers and the dental professions is key to combating the incidence of ECC.

Editorial note: The interview questions were kindly provided by Daniel Zimmermann, DTI.





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SUNDAY, NOVEMBER 28

10:00 - 11:00 Howard Glazer, DDS, FAGD

BEAUTIFIL: GO WITH THE FLOW - COURSE: 3020

11:20 - 12:20 John Flucke, DDS

LIGHT CURED ADHESIVE DENTISTRY - SCIENCE AND SUBSTANCE - COURSE: 3030

1:20 - 2:20 Martin Goldstein, DMD

A SIMPLIFIED APPROACH TO MULTI-LAYER DIRECT COMPOSITE BONDING - COURSE: 3040

2:40 - 3:40 Jay Reznick, DMD, MD

3D IMAGING AND CT-GUIDED DENTAL IMPLANT SURGERY - 3050

4:00 - 5:00 Louis Malcmacher, DDS, MAGD

TOTAL FACIAL ESTHETICS FOR EVERY DENTAL PRACTICE - COURSE: 3060

MONDAY, NOVEMBER 29

10:00 - 11:00 Mrs. Noel Brandon-Kelsch

ECO-FRIENDLY INFECTION CONTROL-UNDERSTANDING THE BALANCE - COURSE: 4120

11:20 - 12:20 Gregori Kurtzman, DDS

INCORPORATING NEW ADVANCES IN DENTAL MATERIALS AND TECHNIQUES INTO YOUR RESTORATIVE PRACTICE - COURSE: 4130

1:20 - 2:20 Various Speakers

OPTIMIZING YOUR PRACTICE WITH 3D CONE-BEAM TECHNOLOGY - COURSE: 4140

2:40 - 3:40 Daniel McEowen, DDS

HIGH RESOLUTION CONE BEAM WITH PREXION 3D - COURSE: 4150

4:00 - 5:00 Maria Ryan, DDS, PhD

DETECTING CORONARY HEART DISEASE THROUGH PERIODONTITIS AND PERIIMPLANTITIS - COURSE: 4160

TUESDAY, NOVEMBER 30

10:00 - 11:00 Fotinos Panagakos, DMD, PhD

DENTIN HYPERSENSITIVITY - NEW MANAGEMENT APPROACHES - COURSE: 5110

11:20 - 12:20 Greg Diamond, DDS

LASERS IN PERIODONTAL THERAPY - COURSE: 5120

1:20 - 2:20 Dov Almog, DMD

INTRODUCTION TO CONE BEAM CT (CBCT), ESPECIALLY AS IT PERTAINS TO PREVENTION OF FAILURES IN ORAL IMPLANTOLOGY - COURSE: 5130

2:30 - 3:30 Maria Ryan, DDS, PhD

DETECTING CORONARY HEART THROUGH PERIODONTITIS AND PERIIMPLANTITIS - COURSE: 5140

4:00 - 5:00 Dwayne Karateew, DDS

CONTEMPORARY CONCEPTS IN TOOTH RELACEMENT: PARADIGM SHIFT - COURSE: 5150

WEDNESDAY, DECEMBER 1

10:00 - 11:00 Mr. Al Dube

BEST MANAGEMENT PRACTICE, WASTE MANAGEMENT FOR THE DENTAL OFFICE, AND OSHA COMPLIANCE - COURSE: 6060

11:20 - 12:20 Glenn van As, DMD

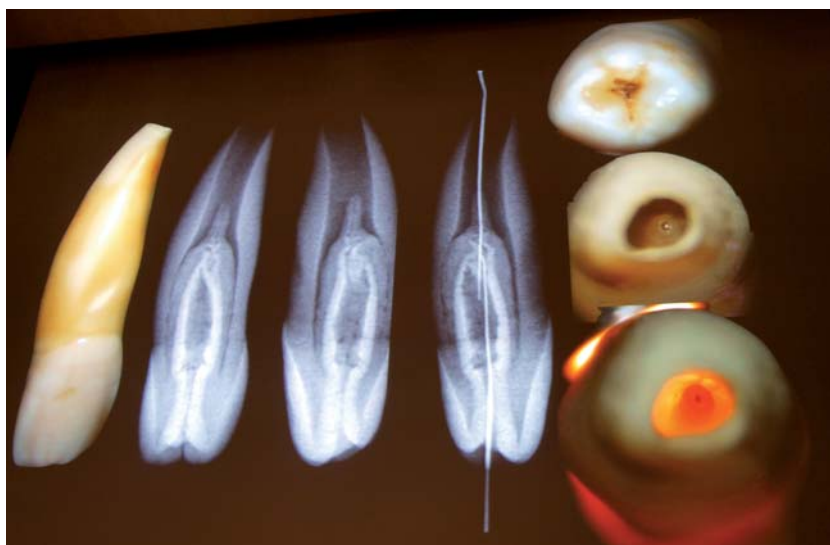
HARD AND SOFT TISSUE LASERS - COURSE: 6070

12:45 - 4:45 Drs. David Hoexter, Jeffrey Hoos, Dwayne Karateew, Enrique Merino, Kenneth Serota, Marius Steigmann

REVOLUTIONARY IMPLANT DESIGN UNVEILED: A COLLECTION FROM THE MASTERS - COURSE: 6080

Beyond endodontics: Roots Summit 2010

Author_Claudia Salwiczek, Germany



What do Barcelona and endodontics have in common? For me, the answer was nothing, until this year's Roots Summit, which was held from 3 to 5 June 2010. From now onwards, I will forever connect Gaudí, Paella and La Sagrada Familia with root canals.

It is certainly not an exaggeration to say that Roots Summit 2010 had all of those lucky enough to attend falling in love with endo all over again. Organised by Drs Noemi Pascual and Nuria Campo and their team, the meeting was a grand success. Long hours in the dark, yet always crowded lecture hall, despite the perfect weather, were followed by a wonderful social

programme with a distinct Spanish touch. Dr Fred Barnett, who lectured on *Trauma injuries: Long-term treatment planning based on Dx and Pulpar regenerative technique*, commented: "Congratulations to Nuria and Noemí for organising a fantastic Roots Summit. The venue was awesome and the lectures top notch. Roots should be proud of their efforts."

The impressive list of international speakers included Dr Giuseppe Cantatore from Italy, Drs José María Malfaz and Enrique Martínez Merino from Spain, and Drs Hans-Willi Herrmann and Jörg Schröder from Germany, to name a few.

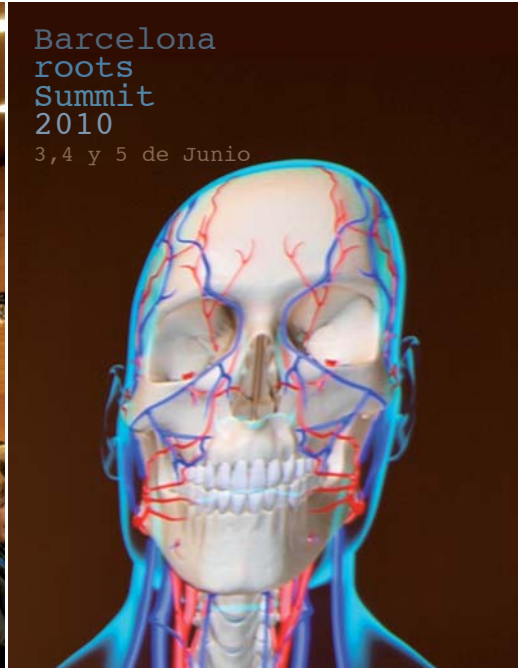
Dr Sashi Nallapati from Jamaica held two very interesting lectures on rare and challenging cases: *Dens invaginatus: Treatment options* and *Three canal premolars: An endodontic challenge*. Many in the audience had never encountered such cases and, thus, were absorbed in these presentations.

Dr Marga Ree from the Netherlands held two very entertaining lectures on the *Disassembly of root-canal treated crowned teeth* and *Fibre posts and adhesive build-ups*. She began her first lecture with limited visibility—she had forgotten to bring her glasses—and aching feet. However, without further ado, Dr Ree sent her husband to their hotel room to collect her glasses and more comfortable shoes. He promptly returned, carrying a big bag filled with an estimated ten pairs of shoes, which he then set out on stage, one by one.





Barcelona
roots
Summit
2010
3,4 y 5 de Junio



Needless to say, the audience was roaring with laughter at this point.

In fact, many of the lectures were very entertaining and of extremely high quality with regard to the content as well as presentation. "It was great to see presentations that staggered me with the quality of the material and the multimedia that were shown," commented Dr Glen van Ass, who lectured on *Microscope centred practice: Ergonomics and documentation*. "Video through the operating microscope and still photos from some of the experts was incredible. It is impressive to see the quality of the work that these teachers and talented clinicians can provide in a humble yet confident manner."

The meeting was sponsored by major industry players, like VDW, Zeiss, DENTSPLY Maillefer, Sybron-Endo Europe and Kodak. Dr John Schoeffel from the US, who introduced EndoVac—an endodontic irrigation technology system—in his lecture, also presented the product to interested attendees at the Discuss booth. EndoVac enables safe irrigation to apical termination with an abundant supply of fresh irrigant.

Unlike positive pressure systems that use cannulas to deliver irrigants into the canal, the EndoVac is a true apical negative pressure system that draws fluid apically by way of evacuation.

"It's not often that meetings inspire and rejuvenate people and make them look forward to future meetings," commented Dr Nallapati. "To me, certainly, this Roots Summit has done all that. And that is a testimony to the wonderful effort of Nuria, Noemi and their team." Attendee Dr Mahalaxmi Sekar agreed, saying that he pitied all those who had missed this event in Barcelona.

A majority of the lectures, for which CE credits can be obtained, were recorded live and will be made available for review on www.dtstudyclub.com. For more information on how to register and how to obtain credits, please contact Ms Julia Wehkamp at julia.wehkamp@dtstudyclub.com.

The date and venue for next year's meeting are yet to be decided. But one thing is for sure: this year's attendees are counting down the days.



International Events

2010

SkandEndo 2010

Where: Espoo, Finland
Date: 19–21 August 2010
Website: www.osf.fi

COSAE 2010

Where: Buenos Aires, Argentina
Date: 26–28 August 2010
E-mail: sae@aoa.org.ar

FDI Annual World Dental Congress

Where: Salvador da Bahia, Brazil
Date: 2–5 September 2010
E-mail: congress@fdiworldental.org
Website: www.fdiworldental.org

International Congress of the Turkish Endodontic Society

Where: Istanbul, Turkey
Date: 23–25 September 2010
E-mail: www.endoistanbul2010.com

8th IFEA World Congress

Where: Athens, Greece
Date: 6–9 October 2010
E-mail: IFEAsecretary@aol.com
Website: www.ifea2010-athens.com

Trans-Tasman Endodontic Conference

Where: Christchurch, New Zealand
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DGEndo Annual Meeting

Where: Berlin, Germany
Date: 4–6 November 2010
E-mail: sekretariat@dgendo.de
Website: www.dg-endo.de

BES Regional Meeting

Where: Leeds, UK
Date: 19–20 November 2010
Website: www.britishendodonticsociety.org.uk

2011

34th International Dental Show

Where: Cologne, Germany
Date: 22–26 March 2011
E-mail: ids@koelnmesse.de
Website: www.ids-cologne.de

ESE Congress

Where: Rome, Italy
Date: 14–17 September 2011
Website: www.eserome2011.com

DGEndo Annual Meeting

Where: Bonn, Germany
Date: 3–5 November 2011
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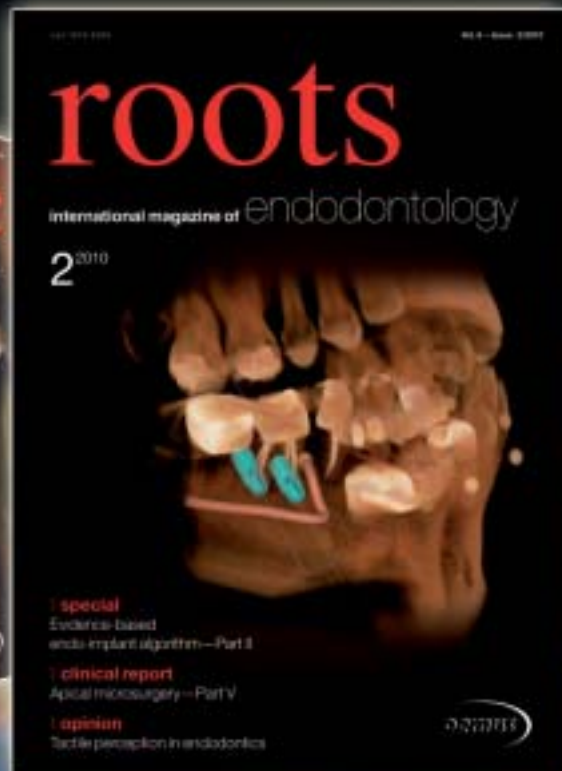
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