Excellence in endodontics
Daniel Flynn discusses endodontic microsurgery

The dental profession who erroneously believe success rates to be around 60 per cent when the actual figure for endodontic microsurgery is over 91 per cent after five to seven years (1).

Modern techniques and equipment have transformed the procedure. Using CBCT scans from the outset we can plan surgery exactly; three dimensional picture of bone loss is clear as is the position of anatomically sensitive structures; lengths can be accurately measured and existing treatment such as posts and MB2s assessed.

Radiographic examination (Fig 1) revealed a large radiolucency associated with the UL5. There was an initial root canal treatment and subsequent retreatment provided by a competent GDP using rubber dam and sodium hypochlorite irrigation. There was a well-fitting new crown placed and no associated periodontal pocketing greater than 5mm.

A provisional diagnosis of acute exacerbation of chronic apical periodontitis was made and treatment options discussed with the patient (who had just paid for and was satisfied with a new crown.)

1 Root canal retreatment through the crown

2 Endodontic microsurgery

3 Extraction +/- prosthetic replacement

produce neat, precise incisions as they cut in multiple directions. Once the flap was raised, the perforation in the buccal plate was identified and root tip located. The granulation tissue was curettaged and haemostasis achieved.

At the four-month review the buccal swelling had completely resolved and radiographically there was significant healing present.

Following resection of 5mm of the root tip perpendicular to the long axis of the tooth a retropreparation was completed with ultrasonics, then sealed with MTA. The tissues were compressed and the flap closed with 5/0 monofilament sutures that were removed painlessly after 72 hours as reattachment had taken place.

The effect of ultrasonic irrigation
James Prichard provides an in-vitro study

Rubber dam hazards
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Treating Patients
Dr Sander Loos provides a case report

Flexibility and strength
Dr Philippe Sleiman discusses root canals

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One are the days of the clumsy apicectomy and amalgam retrograde fillings. Endodontic surgery has evolved to become a technically accurate, highly predictable procedure with remarkable success rates.

Implant technology has meant many teeth of questionable prognosis are extracted in the name of future predictability. While implants have been a wonderful adjunct in the dental armature, our primary role as dentists is to try and conserve the existing dentition that have good long term prognosis.

Classically an apicectomy was a treatment of last resort, using large bulky instruments, rough approximations and excess amounts of amalgam. The biological ramifications of additional canals, cracks, apical deltas and poor initial root canal treatments may have been overlooked resulting in poor success rates. This has understandably resulted in a negative perception of apical surgery amongst the dental profession who erroneously believe success rates to be around 60 per cent when the actual figure for endodontic microsurgery is over 91 per cent after five to seven years (1).

Modern techniques and equipment have transformed the procedure. Using CBCT scans from the outset we can plan surgery exactly; three dimensional picture of bone loss is clear as is the position of anatomically sensitive structures; lengths can be accurately measured and existing treatment such as posts and MB2s assessed.

The following case is an example of the techniques which we now use. The patient presented following multiple episodes of pain and swelling from the UL5. There was an initial root canal treatment and subsequent retreatment provided by a competent GDP using rubber dam and sodium hypochlorite irrigation. There was a well-fitting new crown placed and no associated periodontal pocketing greater than 5mm.

Radiographic examination (Fig 1) revealed a large radiolucency associated with the UL5. There was an overextended root canal filling. On CBCT (Fig 2) a clearer picture of the size of the apical radiolucency emerged and its relationship to adjacent anatomical structures was visualised. There was one canal present with an overfill of gutta percha and sealer. The CBCT scan provided very useful information at this point. Although the treated canal appeared centered in the root there was a question whether there was a second canal present in the tooth. Also there appeared to be an apical bulbosity present which could mean multiple paths of exits present.

A provisional diagnosis of acute exacerbation of chronic apical periodontitis was made and treatment options discussed with the patient (who had just paid for and was satisfied with a new crown.)

1 Root canal retreatment through the crown

2 Endodontic microsurgery

3 Extraction +/- prosthetic replacement

‘Endodontic surgery has evolved to become a technically accurate, highly predictable procedure with remarkable success rates’
There are significant differences between the above microsurgical techniques and traditional surgery approaches.

1. Osteotomy size
The use of smaller instruments, magnification and illumination allows access to the root tip, often without removing any additional buccal bone should the plate be already perforated. Staining the PDL makes it easier to differentiate between bone and root tip. The smaller the size of the osteotomy, the quicker the healing (2).

2. Bevel Angle
Traditionally the root was resected at 45 degrees for access, visualisation and sealing purposes. But, this method results in the exposure of a greater amount of dentinal tubules and may not remove enough of the apical anatomy lingually. Modern techniques using a cut perpendicular to the long axis of the tooth result in exposure of far fewer tubules, enables a smaller osteotomy, retention of more buccal bone and no periodontal communication. There is less chance of a lingual perforation in the retro-preparation and it is easier to identify the apices of

Fig 4 Soft tissue removed
Fig 5 Haemostasis achieved, parallel resection of root tip and retro-preparation sealed with MTA
Fig 6 Soft tissue sent for histological investigation

‘The use of smaller instruments, magnification and illumination allows access to the root tip, often without removing any additional buccal bone should the plate be already perforated’
the roots.

3. Root end resection
It is recommended to remove 3mm of the root tip. At this level 88 per cent of apical ramification and 95 per cent of lateral canals are removed (5). Following resection it is critical that the root end is inspected under high power visualisation, stained and viewed with micro-mirrors. Identification of isthmuses, cracks and lateral canals may be treated at this stage.

4. Retro-preparation
Micro-hand pieces and burs are no longer the ideal treatment for retro-preparation. Instead, diamond coated ultra-sonic tips are excellent for allowing the operator to clean along the original canal, the isthmus and minimise microcrack formation.

The use of MTA as a root end filling material is another improvement. Superior to amalgam in terms of sealability and biocompatibility, it is more difficult to place and doesn't give an aesthetically pleasing result when viewed on a radiograph post-operatively. Critically MTA results in regeneration of periodontal ligament and cementum cells and appears to have inductive effects on bone and tissue cells. Super-EBA has also shown favourable results using microsurgical techniques.

Endodontic microsurgery is a great option to keep in mind when planning treatment and has an added bonus for patients being the least expensive intervention when compared to endodontic re-treatment and crown, extraction and fixed partial denture, or extraction.

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Dr Daniel Flynn
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qualiﬁed from the Dublin Dental Hospital, Trinity College, Dublin in 2002. Daniel has recently joined the EndoCare team headed by Dr Michael Sultan. Daniel lectures and provides hands-on courses for general practitioners. He also teaches Endodontics at the Eastman Dental Institute for Oral Healthcare Sciences.

Fig 1 Examining a rewound root tip with a mirror and implant (4)
Fig 2 Post-operative radiograph
Fig 3 Four-month review (Almost complete healing and asymptomatic)

Fig 7 Examining a resected root tip with a micro-mirror and implant (4)
Fig 8 Post-operative radiograph
Fig 9 Four-month review (Almost complete healing and asymptomatic)
Do we treat patients based on radiolucency?

Dr Sander Loos provides a case report

Just after Christmas, on 26 December 2010, a 76-year-old male patient, who was in great pain, consulted the emergency dentist. The patient indicated that he felt a throbbing pain in his lower left jaw. The pain was unbearable and had kept him awake all night. The dentist took radiographs of teeth #36 and 57 and an orthopantomogram (OPG; Figs 1 & 2).

Although the radiograph did not show the full anatomy of tooth #57 and its surrounding structures, the dentist diagnosed apical periodontitis (AP) and advised an endodontic retreatment or extraction and an implant. To make the patient comfortable for the time being, he prescribed 500 mg Amoxicillin and Ibuprofen.

After another sleepless night, the patient consulted a different emergency dentist on 27 December. The analgesics did not give him pain relief and he was starting to become desperate. The second dentist confirmed the original diagnosis and referred the patient to an oral surgeon because an endodontist was not available at short notice. He requested apical surgery on tooth #57.

The following day, the oral surgeon took another OPG and concluded that surgery was not the best treatment option in this case because the apex was located too close to the nerves alveolaris inferior and access to the apices of tooth #57 was difficult.

He also confirmed the diagnosis of an AP and suggested extraction or endodontic retreatment.

On 5 January 2011, the patient visited my office for the first time. The pain had diminished but not disappeared. Intra-oral examination showed a well-restored dentition with a cantilever bridge on teeth #35 to #37, with #36 and 37 functioning as abutments.

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Tooth #37 showed an occlusal filling in the crown. Palpation of the buccal fold was not painful and there was no mobility of teeth #36 and 37. The pockets of #36 were within normal limits. However, periodontal probing distal of #37 provoked strong pain and extreme bleeding. The distal pocket measured approximately 6mm.

As the previously taken radiographs were not available and the OPT was considered unsuitable for proper diagnosis, a peri-apical radiograph (Fig. 5) was taken. The radiograph showed that tooth #37 had previously been treated endodontically. The mesial canals were filled with silver cones rather too short of the apex. There also appeared to be some gutta-percha and a large metal post in the distal canal. Additionally, radiolucency was noticeable around the apex of the mesial root. According to the patient, he had received endodontic treatment about 15 years ago owing to pain following bridge cementation. The tooth had been without symptoms since then.

Considering the history and my clinical and radiographic findings, my differential diagnosis was:

1. Painful AP owing to reinfection or leakage
2. Painful marginal periodontitis distal of tooth #37 owing to poor oral hygiene
3. Vertical root fracture (VRF) of the distal root of tooth #37

As diagnosis 1 and 3 would have required rather invasive therapies (re-treatment or extraction), we opted to rule out the local marginal periodontitis first. Under local anaesthesia, the distal pocket was thoroughly cleaned and the patient was instructed to use dental floss distal of tooth #37 on a daily basis.

On 31 January, three weeks after initial treatment, the patient returned for evaluation and appeared free of complaints. There was no bleeding on probing and pain could not be provoked.

It should be noted that by selecting this strategy, neither an AP nor a VRF was definitively excluded as a cause of pain. It should be taken into account that owing to the patient being on antibiotics, the symptoms of the AP may have temporarily disappeared and returned at a later stage. Nevertheless, at that point we treated the patient based on history, a radiograph and patient complaints rather than merely on the basis of the radiolucency evident on the radiograph.

In May 2011, the patient returned to our office once again. He was free of complaints, pockets were within normal limits and there was no bleeding on probing.

“The radiographic picture is only one means of diagnosis... the picture may show a lot of rarefaction, but to use it as the sole means of diagnosis is unwise.” Thomas Philip Hinman, 1921
Root-canal retreatment is a very common procedure that endodontists and general practitioners are faced with on almost a daily basis. The biggest challenge here is to re-establish the initial pathway of the canal and its original exit or apex. During the past decade, several techniques required that gutta-percha be used to fill the root canals. Sometimes and for many reasons, such as leakage or short preparation and/or obturation, the gutta-percha needs to be removed and the canal re-negotiated.

Generally, NiTi rotary files were used in such cases in order to facilitate and expedite our task. However, the files used to accomplish this task faced additional challenges, that is, the debris coming from the previous obturation and the density of the obturation material. The first difficulty is piercing the mass of the obturation material. Here, our choice of file should focus on a strong tip that can take the pressure and engage the mass of the gutta-percha, break it down and push it back into the access cavity. The second challenge is to select an instrument that can enter the root-canal structure and engage the obturation material, pushing it out coronally, while offering enough flexibility to go around curves and shape the root-canal surface safely.

Today, thanks to heat treatment that has changed the world of rotary NiTi files, allowing us to modify the crystalline structure of the metal, we have been able to obtain several types of the alloy to give us different files, from the Twisted File to the latest modification of the K5 system, the K3XF (SybronEndo; Fig. 1). The K5 system files are known to be robust yet very safe.

The slight modification in their structure gives these files much-needed flexibility, while preserving their very high safety levels. The clinical applications are very simple. My favourite sequence of the K5 system is the G-pack, which allows me to do crown-down using the taper of the files and keeping the tip stable at ISO 0.25. This sequence allows for a very nice start, removing the obturation material from the coronal third with relatively short files, such as orifice openers, and doing so in a relatively short time. The deeper we go, the more we need to decrease the taper, especially when curves are present inside the canals and smaller taper files are needed.

It is at this particular moment that the flexibility of the heat-treated alloy gives the files the ability to negotiate the curves without any distortion of the canal or macro-damage to the file structure (as has been demonstrated in research and clinically).

Clinical cases

The first clinical case could be described as a very bad day in a dental office. Two files had been trapped and separated in the mesial canals and the patient was referred to the clinic but had to drive for more than two hours to...
get to our clinic. When I first saw
the X-rays (Fig. 2), I remembered
a very similar case from several
years ago with practically the
same location of file separation.
The separated files in the mesial
canals were clearly visible. It was
also noticeable that the distal ca-
nal had not been treated to full
length. Ultrasonic tips and the
use of an operating microscope
allowed me to retrieve the sepa-
rated files and it was then time
to reshape the canals and retreat
the distal canal (Fig. 5). Owing to
the combination of requirements
for the treatment of this case—
shaping and retreatment in one
tooth—my instruments of choice
were K3XF files. I started with
25.08, followed by 28.06 and con-
cluded crown-down with 25.04.

This gave access to the api-
cal part, which was enlarged to
53.04 in the mesial and distal
canals in order to prepare the
apical portion of the root-canal
system. The speed of the micro-
motor for the shaping procedure
was 500rpm and a sequence of
push-and-pull movements—four
to five strokes per canal—with
each file was used in order to
reach full working length. Figure
4 shows the obturation of the ca-
als, which was performed with
RealSeal (SybronEndo) after
both separated files had been re-
moved and the root-canal system
reshaped.

The second case came as
another referral. The patient
was suffering from pain in her
lower molar and was sent to
the office in order to check the
case and give the necessary
treatment. The preoperative
X-ray (Fig. 5) showed an api-
cal lesion with an incomplete
root-canal treatment. Because
diagnostics found no sign of a
root-canal crack, retreatment
was my choice. However, we
had to overcome two obstacles:
the crown placed on the tooth
and the fibre post inside the dis-
tal canal. I decided to go through
the crown without removing it in
order not to place any tension on
the distal canal. When analysing
the anatomy, it appeared that the
roots were fused. In such cases,
without any tension is recom-

I would like to thank Yulia Vo-
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Conclusion
In the two clinical cases present-
ed here – both rather a challenge
for root-canal retreatments – the
final results were an endodon-
tic success. This lends support
to the fact that each challenge
needs to be treated separately
without fear or tremor from the
initial pre-operative X-rays. Our
fear shall control neither our
judgment nor our choices!

Fig 4

Fig 5

Fig 6

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See page 18 for full list of features.
Rubber dam hazards?

Dr Kenneth Serota gives his opinion

The September issue of Oral Health included an article by Dr Ellis Neiburger entitled Rubber dam hazards. The contextual inaccuracy, skewed perspective and postulatory bias is striking. The endodontic journal, but it did. Before I comment on the text, I’d like to share a scientific article with you published by Smith and Pell in the British Medical Journal in 2003 entitled Parachute use to prevent death and major trauma related to gravitational challenge.

Design systematic: Review of randomised controlled trials. Data sources: Medline, Web of Science, Embase, and the Cochrane Library databases; appropriate Internet sites and citation lists.

Study selection: Studies showing the effects of using a parachute during free fall.

Main outcome measure: Death or major trauma, defined as an injury severity score > 15.

Results: We were unable to identify any randomised controlled trials. Advocates of evidence-based medicine have criticised the adoption of interventions evaluated by using only observational data. We think that everyone might benefit if the most radical protagonists of evidence-based medicine organised

Not wishing to misjudge nor malign the author, I searched the many publications attributed to Dr Neiburger in the literature using Google Scholar. My personal favourite was Similar enulbiusar osseous lesions in Tyrannosaurus Rex and man, followed closely by Voodoo Barbie and the dental office? not to be undone by Water line biobfilm dangers… A Tempest in a teapot. Of note, none of the references pertaining to the hazards were dated beyond 1990.

As to the inaccuracies, rather than repeating the text, I’ll answer the “factoids”: rubber dam is routinely used in the vast majority of endodontic and restorative procedures by contemporary dentists; sterilisation of the rubber dam can be done readily; reuse is the most scurrilous of the factoids proposed; colour is not an issue, in fact it can be used to enhance photographic documentation; the physical and chemical properties of the dam enable it to be used with most if not all dental materials and its strength cannot be in dispute, as the average endodontic procedure does not require multiple replacement; damage from clamps occurs because of improper placement; the sheer enormity of clamp sizes and design allows for literally any clinical situation with tissue injury essentially non-existent; there are a raft of alternatives to clamp placement (Fig 1); the issues pertaining to time for placement, phobias, material residue in pockets anon … even providing a rebuttal to the text gives it an undeserved credibility.

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I’m not certain how it managed to secret itself into our beloved centenarian journal, but it did. Before I comment on the text, I’d like to share a scientific article with you published by Smith and Pell in the British Medical Journal in 2003 entitled Parachute use to prevent death and major trauma related to gravitational challenge. The abstract reads:

Objectives: To determine whether parachutes are effective in preventing major trauma related to gravitational challenge.

Design systematic: Review of randomised controlled trials. Data sources: Medline, Web of Science, Embase, and the Cochrane Library databases; appropriate Internet sites and citation lists.

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Dentistry is perched on a slippery slope. In North America alone, it represents a silo of approximately $60 billion. Evidence-based science has been replaced by market forces and the concept of “nondiagnostic advocacy” has been lost in the ether. I wish I possessed Randy Lang’s erudition and Will Rogers’ wit. His recent editorial on a specific orthodontic band of dubious value beyond the strength of its marketing showed the fact that even amongst those whose focus is narrowed by specialty, a segment can be catalysed through market forces to recognise something as the holy grail, when another faction sees the same product as the holy grail.

In my own area of interest, a recent article by one of the better-known clinicians questioned the value of the wealth of new endodontic products coming to market, especially the latest NiTi iteration that reintroduced reciprocation. The essence of the article was, “if it ain’t broke, don’t fix it”, which then included the takeaway message that the product long associated with the reputation of the author had served the discipline well and it too required only a paucity of instruments to achieve 100 per cent predictable clinical success.

To bring this to a purposeful conclusion, I would encourage you to Google Bayes’ theorem. It is in essence an equation and demonstrating its value to clinicians questioned the number of a priori probabilities and then compute a posteriori probabilities, the degree of confidence one can have that must never be overlooked is the need to maintain biological fundamentalism through assiduously conceived experiments and authorship that follows the Cochrane Collaborative principles. We are about to enter a decade wherein it is manifestly conceivable that teeth can be regenerated or replicat- ed and achieve morphological and functional integration into the gnatostomatic apparatus. While it may not impact on the $4 billion a year whitening arena of oral services, it will impact on many others. The number of rubber dam hazard articles may well breach the leves and floodgates and overwhelm the profession, decimating the landscape and relocating the populace. It is Oral Health’s job to stand on guard:

“Oh Canada, to stand on guard for thee”.

**Key for Excellence in Prosthodontics**

Graduated from the University of Toronto in 1975 and was awarded the George W. Switzer Memorial Key for Excellence in Prosthodontics. He received his Certificate in Endodontics and Master of Medical Sciences degree from the Harvard-Forsyth Dental Center in Boston. A recipient of the American Association of Endodontists’ Memorial Research Award for his work in nuclear medicine, and the lews and rich media, Dr Serota presented the inaugural endodontic programme for the Ontario Dental Association from 1983 to 1987 and was awarded the ADA Award of Merit for his efforts in the promotion of continuing education. The author of more than 40 publications, Dr Serota is on the editorial board of Endodontic Practice, Endo Tribune and Implant Tribune. He founded R4TRENDS, an on-line educational forum for dentists from around the world who wish to learn cutting-edge endodontic therapy, and recently launched INPLANTS (www.inplantanium.com) and www.id-salutaire.org in order to provide den- tists with a clear understanding of the endodontic-implant algorithm in foundational dentistry.

**References**

3. Neuburger EJ. Water line is a rubber dam hazard articles may well breach the levees and floodgates and overwhelm the profession.
**An in-vitro study**

James Prichard discusses the effect of ultrasonic irrigation variables on the dimensions of artificial root canals

**Aim:** To investigate the effects of power setting, type of irrigant and duration of ultrasonic irrigant agitation with Irrisafe™ on the mean percentage change in the cross-sectional area and diameter of artificial root canals in an in-vitro model.

**Methodology:** Twenty-five extracted anterior human teeth were collected and split into two halves, each of which was embedded in epoxy resin. The external root surfaces were polished to produce flat, smooth dentine surfaces. A pilot score was used as a guide to prepare an artificial canal using rotary instruments to a size 30/.06. The root canals were randomly assigned to five groups. Group 1: irrigation with 2.5 per cent NaOCl, ultrasonic agitation at power setting 7 (n=5); Group 2: irrigation with 17 per cent EDTA, ultrasonic agitation at power setting 7 (n=5); Groups 3, 4, and 5 were irrigated with 2.5 per cent NaOCl, 17 per cent EDTA, 2.5 per cent NaOCl, with ultrasonic agitation at power setting 4 (n=5), 7 (n=5) and 10 (n=5) respectively. Irrigant was delivered with a syringe and ultrasonically agitated with a P5 Satelec® and Irrisafe™ tips. Canal area and depth were measured at 17, 16 and 9mm from the canal orifice at baseline and after one, two and five minutes of ultrasonic agitation.

This study came about as a result of a presentation that Chris Stock, Godfrey Cutts and I made to Prof Kish Gulabivala. We showed him a protocol for shaping and then cleaning root canals using Irrisafe. He announced that all steel instruments and tips remove dentine and cut root canals, so I set out to prove him wrong!

I would like to express my thanks to Prof Gulabivala for the idea behind this project and the incredible opportunity he afforded me.

Contemporary endodontics falls into three distinct categories:

1. Preparation (mechanical shaping)
2. Irrigation (syringe flushing and adjunctive cleaning)
3. Obturation (sealing the root canals in three dimensions)

The existence of several morphologically different microorganisms was shown to be associated with necrotic pulps as early as 1984 by W.D. Millar. Bacteria in the root canal system has been shown to cause apical periodontitis in gnotobiotic rats (Kakehashi et al. 1965). Sundqvist demonstrated that 18 out of 19 traumatised but intact teeth associated with periapical radiolucencies gave positive bacterial cultures (Sundqvist 1975).

Schilder (1967) suggested that the root canal be cleaned and then shaped to allow for three-dimensional obturation. However, at least 58 per cent of the root canal surface could remain uninstrumented during root canal treatment (Peters et al. 2001) and 70 per cent more debris remained following instrumentation when compared with instrumentation and irrigation (Baker et al. 1975).

Furthermore the landmark studies of Byström and Sundqvist (1981, 1983) demonstrated a 100-1000 fold decrease in bacterial counts when 0.5 per cent Sodium Hypochlorite (NaOCl) was introduced instead of saline. Therefore it has generally been accepted that a chemo-mechanical approach to root canal debridement is required to significantly reduce the bacterial load that may encourage more...
predictable healing.

The role of root canal preparation has therefore undergone a shift from one primarily fulfilling a debriding function to one regarded more as establishing radicular access to the complex root canal system, for irrigation and obturation (Gulabivala et al. 2005).

Root canal irrigants should be biologically compatible, chemically able to remove both organic and inorganic substrates, he antibacterial, demonstrate good surface wetting , have no adverse effects on remaining tooth structure and be easy to use and effective within clinical parameters (Gulabivala et. al 2005).

Penetration of irrigants in to the root canal is a function of irrigating needle diameter in relation to preparation size (Ram 1977), and placement of the needle closer to the working length increased the efficiency of irrigation (Abou-Rass & Piccinino 1982, Sedgeley et al. 2005).

Improvement of the efficiency of irrigation especially in the apical third of the root canal system has been attempted by agitating the irrigant. The use of hand-files, pumping of well adapted GP cones (manual dynamic), continuous irrigation during rotary instrumentation and sonic and passive ultrasonic devices have all been described (Gu et al. 2009).

Richman first described the use of ultrasonics in endodontics in 1957. Endosonics was a term first described by Martin and Cunningham (1984) and referred to the simultaneous preparation and irrigation of root canals. Passive ultrasonic irrigation (PUI) was first described by Weller et al. (1980) and relates to the non-cutting action of the ultrasonically activated file. The free movement of the file or wire allowed irrigant to penetrate more easily into the apical part of the root canal (Krell et al. 1988)

However significant problems were encountered with k-fil es as they produce irregular shapes and apical perforations (Stock 1991, Lamley et al. 1983), straightened canals (Chenail & Teplitsky 1985, 1988) and ledged simulated root canals (Al Jadaa et al. 2009).

IrrisafeTM (from Acteon UK) is a stainless steel instrument that is non-cutting, parallel sided and available in two lengths (21 and 25 mm) and two tip sizes (ISO 20 and 25) and designed to be used after root canal shaping is complete to agitate freshly delivered irrigants.

It can be pre-bent in curved canals and introduced to 1mm short of the working length. It should fit loosely within the prepared canal shape so that the movement of the irrigant around the tip is uninhibited and the tip can vibrate freely. Once inserted, the power is activated and the violent movement of the irrigant “scrubs” the walls of the canal thereby implying the effective removal of dentine debris, micro-organisms (biofilm and planktonic bacteria) and organic tissue from the root canal (van der Sluis 2007).

The technique requires that the NaOCl irrigant is delivered in
Key features of IrriSafe

- Driven by the Newton® range of piezoelectric generators, IrriSafeTM generates micro-cavitation and micro-currents that spread through the canal system. It is the best instrument for the passive ultrasonic irrigation currently available.
- The irrigant effect is amplified not only by the mechanical activation provided by the vibration, but also by the heating effect of the ultrasonics, that intensifies the sodium hypochlorite dissolution and debridement properties.
- Non-cutting edges to prevent any damage to the root canal anatomy.
- IrriSafe is more efficient than smooth wires, because its loops generate turbulences and optimize the irrigant activation.
- The blunt-end prevents any perforation to the apex or to the canal walls.
- The special steel benefits from a specific surface treatment that provides the instrument with a better resistance and transmission of the ultrasonic vibrations and a complete compatibility with sodium hypochlorite, versus nickel-titanium ultrasonic wires.

Godfrey Cutts and I run an annual two-day endodontic re-treatment course, throughout which we also use Acteon’s Endo Success Kit. This ultrasonic tips kit has been designed as a solution for the problems most often encountered during non-surgical endodontic treatments. The new titanium-niobium alloy allows optimum use of ultrasound in the trickiest situations.

The current trend in surgical techniques is to offer minimally - or even non-invasive protocols. By using an operating microscope, together with high-tech micro-instruments, it is now possible to treat the entire root canal.

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About the author

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RCS, MFFDS, IFFDS, FDS

5ml bolus via a syringe fitted with a side vented needle and then IrriSafe™ is inserted and activated for 20 seconds. This is repeated three times. In oval canals the tip can be moved towards the walls (avoiding contact dampening) to encourage fluid movement into these areas.

Ideally EDTA liquid is then inserted and agitated for a further 20 seconds before a final flush of NaOCl is performed.

The canal(s) can then be dried and obturation carried out according to preference.

The results of the study

The mean percentage change in cross-sectional area and diameter in descending order were:

- Group 2 - 52.7 per cent and 26.2 per cent
- Group 5 - 42.6 per cent and 25.8 per cent
- Group 4 - 25.2 per cent and 9.4 per cent
- Group 3 - 14.6 per cent and 5.1 per cent
- Group 1 - 6.5 per cent and 3.8 per cent

Linear regression analysis of the data from Groups 1, 2 and 4 revealed that canal dimensions were significantly affected by irrigant regime (p<0.0001), coronal-apical level (p=0.009) and duration of irrigant agitation (p=0.0001). Analysis of the data from Groups 5, 4 and 5 revealed that both coronal-apical level (p=0.009) and duration of agitation of the irrigant (p<0.0001) significantly affected the increase in canal dimensions.

Conclusions: The test model established that there is a clinically insignificant change in root canal dimensions when manufacturer’s instructions were followed (Group 4). Irrigation choice and combination, duration of agitation and coronal-apical level all had a significant effect on the dimensions of the artificial root canal.