Endobiz v3 - free endodontic clinical record and practice management software

Richard Kahan tells you why you should download EndoBiz Remote Version 3 from www.endobiz.co.uk

On November 19 2012, after programming work spanning 17 years, I announced at the British Endodontic Society annual regional meeting that my endodontic clinical record and practice management software, EndoBiz, would be available free of charge for unrestricted and unlimited use.

What led to this surprising decision?

The dental software industry in the UK is mostly divided between two mega-corporations who bought up all the competition during the nineties and noughties. Their unassailable domination allows them to dictate their terms to users, and when it comes to requesting additional functionality and software specific to the needs of niche users, their business model will not provide.

This was my position in 1995, setting up a specialist endodontic practice with specific software requirements to enable a higher level of clinical note taking that truly reflected superior clinical expertise, with the ability to save time and money in efficiency, and to allow secure access to the record system from anywhere and at any time.

Do it yourself

With no software package coming close to my requirements and the big players turning a deaf ear to my requests, I decided to write it myself.

EndoBiz version 5 was completed and then tested throughout 2011. It was written as a corporate level cloud-based, fully customisable internet solution for specialist endodontic referral practices from the ground up, using the latest web programming protocols. This is in stark contrast to most other dental software programs, which have been written many years ago for single practices legacy platform. Improvement has been through modules bolted on to maintain some ‘newness’ to keep the punters happy and revenues streaming in.

The EndoBiz development process was long and complex (much longer than anticipated), and subsequently very expensive. However, the result impressed fellow specialist endodontists, referring practitioners and patients, as well as being described in PC Pro magazine (June 2012) by resident network specialist Steve Cassidy as “a superbly constructed, beautifully designed solution that no-one has heard about”.

Clarity of vision

The “no-one has heard about” is what I have to work on at present. I am unwilling to lose the clarity of vision and dedication to specialist endodontics by selling out to a larger corporation software house. Yet, as I have found, competing with these giants is unrealistic for anyone without the deepest of pockets.

So how does a small (but impressive!) independent software developer survive in this corporate world? I hope and believe it can be through grass-roots level support!

‘So how does a small (but impressive!) independent software developer survive in this corporate world? I hope and believe it can be through grass-roots level support’
Irrigation for the root canal and nothing but the root canal

Dr Phillipe Sleiman discusses chemical preparation of the canals

Irrigation is a major step in endodontic treatment. A variety of chemicals are used to achieve what I like to consider the chemical preparation of the root canal system.

Sodium hypochlorite (NaOCl) is a major component of the chemical preparation, mainly owing to its ability to attack the collagen component of the pulp tissue, and it is very cost-effective. However, one of the problems of using NaOCl is its safety, especially during its delivery inside the root canal space and the ability to limit its delivery strictly to root canal system and the ability to limit its safety, especially during its delivery inside the root canal space and nothing but the root canal space.

Going beyond the limit of the root canal space causes serious problems, the gravity of which depends on the amount of NaOCl passing to the margins of the periodontal ligament or even attacking the periodontal ligament. A small amount can result in pain or discomfort after treatment, whereas a larger amount, especially in cases of large and/or open apices, can accidentally be delivered inside the maxillary bone, travel via veins and arteries to primary anatomical organs and cause extensive, serious and very dangerous reactions. It is possible that the majority of such incidents are treatable with steroids and antibiotics, as they are limited to muscle and bone inflammation and slight reversible necrosis.

Sometimes we are not that lucky, irrigating the last few millimetres in the root canal space is an important key to treatment success, and a certain amount of NaOCl may be delivered into the maxillary sinus especially in the area of the maxillary second premolar and first molar. The case discussed below was the result of accidental NaOCl delivery into the maxillary sinus.

Case report
The patient was referred to my office for a complaint regarding the maxillary molar. After examining the patient and looking at her preoperative X-ray, I saw nothing wrong with the existing root canal treatment, at least concerning the roots, but found a vague image in the sinus that I thought could be related to the maxillary molar and could be the cause of the problem. I asked my assistant to take a panoramic X-ray, which demonstrated a much larger problem inside the sinus but at that point I did not realize the scale of the issue.

Turning back to the patient, I went into some questions related to the issue, such as “Do you have problems breathing through your nose on this side?”, “Can you describe to me the pain or discomfort you are having?”, “Can you tell me if anything unusual happened during your previous root canal treatment?” and “What were the indications for this treatment several months before?”. The patient, quite unexpectedly, told me she had an chlorine taste in her throat arising from her nose as if a liquid was dripping internally. Also, after the treatment was over and she was on her way home, a strange liquid with the same chlorine smell began dripping from her nose.

Upon hearing that, I asked the patient to have a CBCT scan of the maxilla because it was necessary to establish the situation in the sinus. The patient was nervous and anxious, so I asked the radiology centre if they could capture the CBCT scan for her on the same day as a favour.

A couple of hours later, the patient returned to my office and I took the time to examine the images. In the panoramic view, it was clear that half of the sinus was filled with inflammatory tissue (Fig. 2), in the sectional views, I noticed that the posterior wall of the sinus was non-existent in some places (Figs. 3–5). Potentially, it could be the position of the patient during the root canal procedure that made NaOCl stagnate on the posterior wall.

The case discussed below was the result of accidental NaOCl delivery into the maxillary sinus (Figs. 3–5). Potentially, it could be the position of the patient during the root canal procedure that made NaOCl stagnate on the posterior wall.
and aggravate the damage. The patient was informed of my opinion and recommended to see her otorhinolaryngologist, who took over the case, since it was already beyond the specialty of the dental profession and so she did.

Conclusion
As we have seen, what seems to be a normal root canal treatment can hold serious implications for human health. Although it is very true that we need irrigation to clean the root canal system, those chemicals need to be limited to the root canal system only, as even a few drops of NaOCl approaching the periodontal ligament may create an inflammatory region and area of tissue damage as a result of an aggressive chemical reaction.

Sometimes this process is limited and may only cause minor discomfort for a couple of days, but when the amount of chemical is larger more severe problems may occur, for which the use of steroids and antibiotics is recommended. A major accident can still happen at any time when an amount of chemical travels outside the oral cavity and causes a more serious complication.

One of the safest options that we currently have at our disposal is the EndoVac system (SybronEndo), which is designed specifically to deliver fresh irrigant all along the root canal system and, most importantly, to clean the last 5mm of the root canal system using the MicroCannula. It allows us to be certain that no chemicals can go beyond the limits of the root canal space, nor cause any serious or even minor damage.

I would like to thank Yulia Vorobyeva, interpreter and translator, for her help with this article.

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Iatrogenic errors before and after non-surgical root canal treatment

Dr Rafaël Michiels

Several reports in the literature describe iatrogenic errors during root canal treatment. The most common errors include perforations, ledge- ing, transportation, zipping, over- extension, file separation and underfilling. Little emphasis is placed on the preparation of a tooth before starting root canal treatment, or on the finishing of the tooth after obturation of the root canal system. On various online forums and in several clinical articles, beautifully executed root canal treatments are shown with coronal restorations that are less than ideal. This is a serious problem, since it has been demonstrated that a successful outcome depends not only on adequate root canal treatment, but also on adequate coronal restoration. In this article, I will elaborate on these aspects and present a case as an example.

Before starting root canal treatment

As endodontists, we are specialised in the treatment of root canal systems. However sometimes we focus on this only, forgetting that there is more to a tooth than a root. When a patient comes into our office, often he will have (a) symptomatic apical periodonti- tis, Whether the tooth has been treated before is somewhat irrelevant in the scope of this article. The first thing that we, as practitioners, should try to determine is the cause of the problem. The most cited causes are previous inadequate root canal treatment, primary decay, recurring decay, worn restorations and poor restorations overall. If the tooth has not undergone root canal treatment previously, then the cause of the problem is most likely one of the coronal factors. It is important to address this. After all, what is the point of performing a beautiful root canal treatment if the primary cause of the problem is not treated?

The best way to do this is by removing the old restoration completely, followed by full caries removal. This may sound logical, but it is not. There are certain disadvantages with this approach, and it is these disadvantages that guide many practitioners in their decision-making. Removing an existing restoration might result in the sacrifice of healthy tissue and it might make it more difficult to obtain proper isolation with a rubber dam. Another factor is time; removing an old restoration is time-consuming and even more so if a build-up is required before endodontic treatment.

These are some reasons that many practitioners choose to leave the old restoration in place. This can compromise the treatment outcome and is a risk that can be avoided. Fortunately, there are advantages too. By removing the old restoration and subsequently all the caries, the practitioner eliminates one of the major causes of failure and can assess immediately whether the tooth is restorable and thus avoid unnecessary treatment. Another advantage is that it is necessary to fabricate a completely new restoration afterwards, which avoids patching up of old restorations. Overall, the advantages are greater than the disadvantages and the only thing it requires from the practitioner is a change in behaviour and some perseverance.

After root canal treatment

Once root canal treatment has been completed, often we need to send the patient back to the referring dentist. In this case, an adequate temporary restoration must be placed. Typically, a temporary filling material like Cavit (3M ESPE) or a glass ionomer cement is used. A cotton pellet or some other form of space maintainer is generally placed underneath this temporary filling. This is done because the referring dentist then has easier access to the pulp chamber so that he can gain better retention when placing the permanent restoration.

There are several disadvantages to this approach. Leaving space between the temporary restoration and the canal orifices puts the patient at risk of contamination. As practitioners we cannot guarantee that the patient will show up for the permanent restoration, sometimes the appointment is cancelled for a variety of reasons. Another risk is fracture of the restoration and/or tooth. If that happens the gutta percha can be exposed to saliva, which too might lead to contamination. Ideally, however, the tooth should be restored immediately after the root canal treatment has been carried out. This means that the endodontist places the permanent restoration.

Advantages with this approach are:
• It saves the patient a visit to his regular dentist
• The tooth is already isolated, creating the ideal environment for a restoration
• It saves the referring dentist time, which he can spend on other treatments
• It offers the endodontist some variety in the treatments he performs, enabling him to broaden his skill set

Again, this only requires a change in behaviour of the practitioner and some perseverance. It will also require that the referring dentist allow the endodontist to place the restoration. The endodontist will have to upgrade his skills, so that he can also create beautiful coronal restorations.

Following, is a case that illustrates the advantages and disadvantages of the above-mentioned

Fig 1. Diagnostic radiograph, showing the separated instrument in the mesiodistal canal.

Fig 2. Size 15 Flexile file passing through the perforation.

Fig 3. Perforation repair with grey MTA-Baplas.

Fig 4. Post-op radiograph.

Fig 5. Follow-up radiograph after nine months, showing coronal restoration that was less than ideal.

Fig 6. Diagnostic radiograph of another referred tooth (tooth #16).

Fig 7. Working length, together with complete removal of the old restoration.
approaches.

When I had just graduated as an endodontist, a 56-year-old male patient was referred because he was experiencing some mild pain in his left mandibular second molar. I was acting as a third-line practitioner in this case. Another endodontist did not wish to begin treatment and finally referred the patient to me.

The tooth was diagnosed as having symptomatic apical periodontitis and was previously treated inadequately, including a separated instrument in one of the mesial canals (Fig. 1).

In the first visit, I removed the gutta percha from the mesiolingual canal, and cleaned and shaped it completely. The separated instrument was located in the mesioangular canal, but I could not remove it completely. I left the distal canal untouched. Calcium hydroxide was used as an interappointment dressing, and the tooth was restored with a cotton pellet and glass ionomer cement. An initial error was made by not removing the old restoration and caries completely.

One month later the patient returned in agony. When I re-opened the tooth, a great deal of pus and blood came out of the tooth. I then tried to bypass the remainder of the fragment in the mesioangular canal, but perforated the root with a 15.04 ProFile (DENTSPLY Maillefer; Fig. 2). I also retreated the distal canal in this session and fractured a small piece of a 25.06 ProFile in the apical part, but could bypass it. I then filled the canals again with calcium hydroxide and sealed the tooth with a glass ionomer filling.

One month later, I saw the patient again for the completion of the treatment. He no longer had any symptoms. I restored the perforation with grey MTAEngels (Fig. 3). I obturated the canals with gutta percha and Topseal (DENTSPLY Maillefer) using warm vertical condensation, I sealed the cavity with Fuji IX A1 (GC) immediately on top of the gutta percha (Fig. 4). I then referred the patient back to the dentist for a permanent restoration, with the explicit advice to have the distal restoration replaced too.

Nine months later the patient returned to my office for another tooth. I decided to take a follow-up radiograph of the left mandibular second molar to see if healing was favourable. The patient had not experienced any complaints since I completed the treatment and the radiograph showed a favourable apical outcome. However, the permanent restoration was less than ideal (Fig. 5). I had to refer the patient back to the dentist for a new restoration.

Conclusion
Looking back upon this case, I can conclude that I should have removed the old restoration and the caries at the start of the treatment. Positively, it was good that the glass ionomer filling was placed immediately above the canal orifices, preventing contamination via a leaky restoration. Ideally, I should have finished the restoration myself. It required a change in my behaviour and some perseverance to begin to perform cases in accordance with the aforementioned approaches, as can be seen in Figures 6, 7 and 8.

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In endodontic treatments, Nickel-Titanium instruments in continuous rotation optimise root canal shaping. Generally, rectilinear and barely curved root canals with a round or oval section do not cause difficulties and can be prepared by using all standard techniques. However, particularly thin and moderately or strongly curved canals with a laminar section are more difficult to shape and involve a considerable risk of failure.

Despite its super elastic qualities, Nickel-Titanium alloy has one important inconvenience, namely its low resistance in case of repeated use which results in instrument separation.

Instrument fracture can occur either through material fatigue caused by a significant number of compression-tension cycles or through torsion due to obstruction of the instrument’s tip in the canal.

A certain number of factors such as the pressure exercised on the contra-angle head, the speed of rotation and the number of clinical applications favour the occurrence of instrument separation.

In addition to these procedural mistakes, instrument diameter, taper, profile and machining as well as canal curvature are crucial for the occurrence (or not) of instrument fracture.

Continuous rotation versus reciprocating technique

In recent years, we have seen several alternating movement systems (clockwise – counter-clockwise rotation) come forward, destined to limit instrument separation, for example M4® (Sybron Endo), Endo-Eze AET® (Ultra Trade), EndoExpress® (Essential Dental System), WaveOne® (Dentsply) and Reciproc® (VDW).

The alternative movement technique varies between 30° and 90°, being thus either symmetric or asymmetric, depending on the manufacturer. The kinetics of reciprocation reproduces the manual movement of the intra-canal file, restricts the risk of instrument fracture and facilitates the penetration into calcified canals.

The systems with a 90° alternating and symmetric movement require a large instrumental sequence whereas the systems limited to a 50° movement have a restricted cutting capacity and a tendency to extrude dentine and pulp debris towards the periapex.

The latest generation systems with an asymmetric range do not require any pressure being exercised on the contra-angle head.

Although an evolution of the GIROMATIC® technology seemed to be possible, the new One Shape® instrument is used in continuous rotation. The acknowledged benefits of this rotational dynamic are an excellent tactile sensation and a remarkable cutting efficiency.

The difficulty in the instrument’s development lies in its...
profile which is specifically dedicated to root canal shaping with only one single instrument in continuous rotation.

Instrument profile
The instrument’s variable cross-section with a diameter of 25/100 mm and a .06 taper constitutes the innovation of One Shape® (fig.1).

The resistance of a NiTi instrument to separation as a result of torsion and bending depends on its diameter and cross-section. Two cutting edges provide an outstanding resistance to bending whereas a triple helical pitch better withstands torsion.

One Shape® presents three different cross-section zones along its length to ensure greater flexibility and limit aspiration.

The 16 mm cutting zone consists of:
• A first zone with a length of 2 mm presenting a variable three-cutting-edge design to ensure a centered progression of the file towards the apex. At the same time the file respects the initial canal path and curvatures, due to the guidance of its non-working tip (fig.2).
• A second transitional zone with a length of 7.5 mm which progressively changes from three to two cutting edges.
• A third coronal zone with a length of 6.5 mm provided with two symmetric and positive cutting edges for an efficient upward debris removal.

The innovative concept of an instrument with variable cross-sections (fig.3) facilitates the downward movement in the root canal, guarantees greater flexibility and respects the original canal path, thanks to a centered progression and the continuous rotation technique.

A single use instrument
One Shape® is a single use instrument. However, it can be used for the endodontic treatment of teeth with one or more roots. Above all, the single instrument concept implies a considerable simplification of the application protocol and thus ensures safe and efficient root canal shaping, whereas the single use concept avoids a systematic control of the tip or the file for unwinding signs.

The single use concept – One Shape® is supplied in sterile blister packaging – which also prevents cross-contamination as a consequence of insufficient instrument decontamination.

Finally, the single use concept evades the weakening of NiTi instruments due to their contact with sodium hypochlorite irrigating solution and autoclaving.

Instrumental dynamic
The use of One Shape® requires an endodontic contra-angle connected to a “traditional” motor with a rotational speed of 400 rpm. The instrument gradually descends into the root canal by simultaneously brushing the canal walls in a range of 1 to 2 mm without pressure on the contra-angle head. This brushing process eliminates dentine overhangs and constraints.

One Shape® shapes the root canal and limits obstructions towards the apex. Once the working length is reached, a wide range brushing movement with pressure exercised on the canal walls is recommended in order to verify the free space of the One Shape® instrument in the canal and eliminate the pulp parenchyma.

This mechanical preparation process with a wide taper ensures extensive irrigation and efficient cleaning of the root canal system.

Respecting the anatomy and the constriction of the apical...
zone is essential for the success of each endodontic treatment. An over instrumentation beyond the apical limit with wide tapered NiTi files always results in apical tipping, over obturation with apical transgression and a defect in the three-dimensional sealing.

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The working length actually evolves during the root canal preparation due to the instrument's linear action.

Protocol

The One Shape® method helps to carry out a safe root canal preparation provided that the simple protocol is applied. As for all the root canal preparation methods the pulp chamber opening has to be sufficient for a direct access to the canal system. Dentin overhangs have to be eliminated. The real challenge in endodontics is to locate the canal path, make it permeable and secure it down to the working length.

The exploration of the root canal is accomplished by using either a MMC 15 type manual file or mechanized instruments such as G-Files® 12/100mm or/and 17/100mm. In the case of a strongly curved canal path, the coronal part of the canal has to be widened and straightened by using EndoFlare®. This procedure also restricts the bending stress on the instrument during the preparation of the canal's most apical portion.

After validation of the exploration process, the pulp chamber has to be thoroughly irrigated using sodium hypochlorite (three per cent to 5.25 per cent).

The working length varies significantly during root canal shaping.

The use of an electronic apex locator is highly recommended, especially regarding their current precision after elimination of constraints in the coronal third.

Conclusion

One Shape® – the single file system for root canal shaping – is a solution destined to practitioners who face the following difficulties:

• reluctance to adopt new techniques
• aseptic chain organisation
• insufficient and inadequate root canal preparation
• appearance of overhangs and constraints
• mechanised instrument separation
• complex instrumental protocol
• long and difficult shaping.