Troughing: Detection of three canals in the mesial root of an upper molars

By Dr. Carlos Vidal Tadele

Summary
The complex anatomy of the root canal system is a determining factor in the success of Endodontic therapy. The localization and permeability can become a very complex task even for the most experienced dentists. The combination of the use of the microscope together with the arrival of the ultrasound to the area of the root canal means that manoeuvres such as “troughing” make it easier and more effective to locate the entrance to the conduct. In this article we present some guidelines which will help the dentist to understand and carry out such work together with the illustrations of a clinical case study, in which as a result three main conductus in the buccal root of an upper molar were cleaned, shaped and filled.

Key words
Troughing, Surgical microscope, Ultrasonic, Three canal Mesiobuccal root.

Introduction
The sealing of endodontic pathology is conditioned by the capacity of controlling the infection within the complex system of the root canals (1).

The upper first molar is a tooth that presents a complex anatomy in its mesiobuccal root. Pineda (2), Weine (3), Vertucci (4), and Brown Herbsman (5) describe the anatomical complexities a practitioner should confront.

With the arrival of the Surgical Microscope (7) and the use of ultrasound in endodontic therapy, the “troughing” manoeuvre is being carried out, which means to create a depression or open a path at the floor of the pulp chamber for better access to the orifices of the pulp canals.

The aim of this article is to describe the Troughing manoeuvre and to illustrate a clinical case in which three conductus in the mesiobuccal root of a upper first molar are present.

Classification of veine for the conductus of the mesiobuccal root
Weine proposes four types to describe the configuration of the main conductus in the mesiobuccal root (3), of the upper molars (Fig. 1):
• Type I: one conductus from the entrance orifice to the apex.
• Type II: two orifices that converge into one at the apical foramen.
• Type III: two orifices of entrance at the pulp chamber and two seamed conductus from origin to the apex.
• Type IV: one orifice of entrance at the pulp chamber to then diverge into two separate conductus with independent apical foramen.

The configurations of Type II and III represent almost 95% of the cases (Fig. 1).

Classification of verticuci for the mesiobuccal root
Type I: one conductus, one foramen.
Type II: two conductus that fuse at the apical third.
Type III: two conductus that divide in two and re-join into one.
Type IV: two separate conductus till the apex.
Type V: one conductus dividing near the apex.
Type VI: two conductus that fuse along the root and divide once again at the apex.
Type VII: one conductus that divides into two and finally has 2 furcations.
Type VIII: three separate canals in exit.

Description of the troughing manoeuvre path opening at the angle line of the orifices of entrance to the mesial root of a upper molar.

The technique of access to the pulp chamber is a key procedure for good practice in Endodontic treatment. The opening should be direct at the possible site of entrance orifice to the apex. The technique of pulp chamber and instrument the root chamber with the use of a microscope and the help of a microscope, it is possible to master the mesiobuccal conductus, to avoid the screw and blockage effect, which would lead to fracture.

Once opened, the mesiobuccal conductus 2 and 3 are permeabilised with the apical files size 10 and 15, and we can determine our conductometry with the use of apex locators and continue the instrumentation till the obturation (Figs. 8 and 9).

Discussion
With the Niti rotary files, the new optical illumination, magnifying methods and with the contribution of the ultrasound, the “troughing” manoeuvres are necessary for the opening access of the teeth, both in RCT and retreat, where a high percentage of the refractory chronic periodontitis towards an endodontic therapy is due to the non-localisation of more than one conductus in a root (8).

According to Wolcott and cols, while endodontic literature allows numerous articles related to the prevalence of two conductus in the mesiobuccal root of an upper molar, there are not so many articles describing the presence of a third conductus in the mesiobuccal root of an upper molar.

Although the literature already indicates the existence of a third canal in the mesiobuccal root is not common, there are authors that refer to the percentage of a molar with a type 8 configuration in root as 6%. (9). The lack of knowledge thereof can lead to treatment failure (10). It is important to full understand the anatomy of the upper first molar, and with the help of a microscope and ultrasound will be able to master the mesiobuccal root of the upper molars.

In our day to day practice it is normal to find more than two conductus, as it can be observed in the following clinical examples. We need to understand that the mesiobuccal root is oval-shape root and not round root. In most cases if there is more than one canal we will find isthmus we will need to prepare.

Fig. 1
Fig. 2
Fig. 3
Fig. 4
Fig. 5
Fig. 6
Fig. 7
Fig. 8
Fig. 9
Fig. 10
Fig. 11
Fig. 12
Fig. 13
Fig. 14
Innovations in Maxillofacial Surgery: Guided Maxillofacial Surgery

By Dr. B. Philippe (MD) Maxillofacial Surgeon

The precise realisation of osteotomies and exact positioning of skeletal parts released by osteotomy maneuverers can be concerns for maxillofacial surgeons. Guided maxillofacial surgery represents one of the latest innovations in maxillofacial surgery and consists of simulating a computer osteotomy to ensure accurate three-dimensional positioning of intraoperative bone cutting and precise drill guides created through the use of miniplates that have been manufactured before surgery with commercially pure porous titanium (CPFTi) under direct metal laser sintering (DMLS).

The size and shape of these prefabricated miniplates will match exactly to the anatomy of the skeletal parts released by osteotomy maneuverers and the spaces created by the respective movement of skeletal fragments. The surgeon can dispense with these custom miniplates immediately. The joining of these miniplates also eliminates any intraoperative bending that can occur in miniplates and promote precise positioning of the skeletal parts.

After creating the computer simulation of the planned osteotomy by the surgeon, the DICOM data of the simulation is sent to the biomedical engineer who then draws the prototype of the osteotomy guide based on the recommendations of the surgeon. The stability of the osteotomy guide on the maxilla is determined by its close contact with the underlying skeleton and this can be augmented by the placement of mini-screws. The design of the osteotomy guide must ascertain the precise execution of the Lefort I osteotomy. Once the design of the osteotomy guide is validated by the surgeon, it is produced using sterilisable polyamide by stereolithography. (Fig.1)

The design of the custom-made titanium miniplate system completed by the biomedical engineer takes into consideration multiple factors, in particular, the size and form of the system. The miniplate system must lie on the maxilla in a completely passive fashion, without transmitting any tension or trauma to the underlying skeleton. These custom-made miniplates are created as a single unit, initially joined together to allow for their use as a positioning guide. The use of this guide permits maximal congruent contact between the bony segments and the miniplates themselves and thus enables the precise positioning of the skeletal segments freed by the osteotomy. The miniplates are joined together either in 4 by 4 configuration (Lefort 1 osteotomy) or in 2 by 2 configuration (sagittal split, genioplasty). The positioning and depth of the miniplates for ostesynthesis are also simulated. (Fig. 2)

This new system of custom-made titanium miniplates (either 4x4 or the 2x2) functions intrinsically as a positioning guide and allows for precise positioning and rapid fixation of the maxillary or mandibulary segments in Lefort I osteotomies or maxillofacial reconstructions. This new miniplate system also has several other advantages:

- It decreases any associated trauma to the underlying skeletal structure as it is made in accordance with the individual anatomy of the patient and the desired skeletal displacement of the bony segments.
- It makes the operation much easier for the surgeon and decreases the time spent in the operating room.
- It decreases any associated deformities, the final result of the surgical bone reduction and fixation can be based on the contralateral normal skeleton.
- In this situation, the miniplate system can be designed based upon a contralateral face by symmetrising digitally from the midline.
- All cranio-maxillofacial osteotomies or maxillofacial reconstructions may benefit from this new type of custom-fit miniplate osteosynthesis.

During virtual surgery planning, the length of the screws and their best position of placement can be ascertained in function to the thickness and density of the underlying bone.

- It decreases the length of time needed for the surgical procedure.
- It decreases any associated trauma to the underlying skeletal structure as it is made in accordance with the individual anatomy of the patient and the desired skeletal displacement of the bony segments.
- It makes the operation much easier for the surgeon and decreases the time spent in the operating room.

Guided maxillofacial surgery is mainly discussed in orthognathic surgery and implant surgery (Lefort 1 indicated for maxillary acquired atrophy) but other applications can also benefit from guided surgery:

- In patients who have unilaterial deformities, the final result of the surgical bone reduction and fixation can be based on the contralateral normal skeleton.
- In this situation, the miniplate system can be designed based upon a contralateral face by symmetrising digitally from the midline.
- All cranio-maxillofacial osteotomies or maxillofacial reconstructions may benefit from this new type of custom-fit miniplate osteosynthesis.

References

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Always a perfect healing with P.R.F. (platelet-rich fibrin)

By Dr. Dominique Caron

AFTER any weird wisdom tooth extraction here is a first quick introduction to a smart technique.

You are happy, your bony complicated 59, looking like a plug for hollow brick, is out.

You performed the removal nicely but you are now preparing the second step, which is not nicely but you are now preparing.

As a practitioner, however you are facing:

- Guns: Out and set apart
- Bone: Naked, scratched and wounded
- Empty socket welcoming food collection
- Dental nerve often naked at the bottom of the socket.

Of course, you hope for a quick healing with no infection, no swelling nor pain.

There is a very efficient way of helping nature, to give the times and the means to recover. You can bring massively in the socket the natural angiogenic, regenerative building materials that the body naturally brings too slowly.

You need fibrin, platelets, leukocytes, cytokines and growth factors.

All of these components are available in patient’s blood, all you have to do is to extract it and concentrate it in the socket.

The process

Just before starting the surgery, a nurse draws blood from the patient into plain tubes, about 10 ml.

The clotting cascade starts immediately so try to be quick with the blood collection and immediate centrifugation: around 2800 rpm 10 mm.

What does it change?

- Hemostasis: You get a quick clot filling the socket (that allows much less food collection)
- The dental nerve is immediately protected
- The clot filling the socket (that allows much less food collection)
- Bone resorption is much less significant

In short P.R.F. is:
- SAFE: No biochemical handling, strictly autologous.
- EFFICIENT: Enhances the body’s natural healing.

To conclude, this smart French technique can render your patient’s life and yours much happier!

Stay tuned for further articles with all other applications.

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