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

By Dr. Carlos Vidal Tadeo

Summary

The complex anatomy of the root canal system is a determining factor in the success of Endodontic therapy. The classification and permeability can become a very complex task even for the most experienced dentists. The consideration of the use of the microscope together with the arrival of the ultrasonic 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 result three main conducts 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 Herbramsson (5) describe the anatomical complexities a practitioner should confront.

With the arrival of the Surgical Microscope (7) and the use of ultrasonic 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 conducts in the mesiobuccal root of a upper first molar are present.

Classification of weine for the conducts of the mesiobuccal root

Weine proposes four types to describe the configuration of the main conducts in the mesiobuccal root (5), of the upper molars (Fig. 1):

- Type I: one conduct 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 separated conducts from origin to the apex.
- Type IV: one orifice of entrance at the pulp chamber to then diverge into two separate conducts with independent apical foramen.

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

Classification of vertucci for the mesiobuccal root

- Type I: one conduct, one orifice.
- Type II: two conduct that fuse at the apical third.
- Type III: two conducts that divide in two and re-join into one.
- Type IV: two separate conduct till the apex.
- Type V: one conduct dividing near the apex.
- Type VI: two conducts that fuse along the root and divide once again at the apex.
- Type VII: one conduct that divides in two and finally has 2 main exits.
- Type VIII: three separate canals in exits.

Description of the troughing maneuver

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 of the pulp chamber with refined walls. Over-expansions of the root of the pulp chamber should be avoided and perfect visualisation should be permitted at all entrances of the conduct, which should be situated at the angle lines between the walls of the pulp chambers and the floor.

The use of the surgical microscope allows a better vision of the dentin we will need to remove in order to locate the conducts.

At first, by using the probe DG16 we locate the three orifices of entry of mesiobuccal, distobuccal and palatal conducts, probably in its traditional triangular disposition.

At this point, we should refine the access to the pulp chamber by using ultrasound, in this case directly connected to the equipment house. We use a Kavo scaler (Fig. 5), with flat head and diamond tip (Komet), which will avoid steps on the pulp chamber floor. Thus, the ultrasound will allows us to eliminate small calcifications and delimit the angle lines connecting the three main conducts. Finally the use of the ultrasound permits a direct access for the observation with the Surgical Microscope and the instrumentation of the conduct without permeabilization (Fig. 4, 5 and 6).

Among the different options to permeabilization the mesiobuccal conducts 2 and 3, if there were any, we propose the Pro- Taper file F1 or Reciproc R25 in order to open these extra canals without permeabilization. No matter how risky this manoeuvre may seem, it is efficient as long as we keep its use to the coronal millimetres and refrain the temptation of continuing to the apical zone of the mesiobuccal conduct, to avoid the screw and blockage effect, which would lead to fracture.

Once opened, the mesiobuccal conducts 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 with the instrumentation till the obtura- tion (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 endo- ddontic therapy is due to the non-localisation of more than one conduct in a root (8).

According to Wolcott and cols, while endodontic literature shows numerous articles related to the prevalence of two conducts in the mesiobuccal root of an upper molar, there are not so many articles describing the presence of a third conduct 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 micro- scope 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 conducts, 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.
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 maneuvers 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 (CPPTi) under direct metal laser sintering (DMLS).

The size and shape of these pre-fabricated miniplates will match exactly to the anatomy of the skeletal parts released by osteotomy maneuvers and the spaces created by the respective movement of skeletal fragments. The surgeon can dispose good model 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 1 osteotomy. Once the design of the osteotomy guide is validated by the surgeon, it is produced using RNL silicate 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 osteosynthesis 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 communications. (Fig. 4) R. Seeberger, D. Rolf, K. Wolfang, D.C. Thiele. Use of Stereolithographic Drilling and Cutting guides in bilateral distraction. The Journal of Craniofacial Surgery & Volume November 2011:22: 6 1-5

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 unilateral deformities, the final result of the facial bone reduction and fix 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.

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2) B. Philippe. Custom-made titanium miniplates. Conflict of Interest: No

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

By Dr. Dominique Caron

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

You are happy, your bony complications &8, 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 fully in your hands: the healing. You are a good dentist, your patient expects nothing less than perfection.

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, cicatrization rebuilding 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

While the nurse is taking care of the blood, you extract the wisdom tooth in a smart way, as I am sure you know. You begin to set the stitches as usual but before doing the knots, fill the socket with P.R.F.

PRF set inside

PRF already set

What does it change?

- Accelerated tissue remodeling:
  - Inflammation is lower during the following days
  - Pain is reduced
  - Even lower risk of infection
  - Fast neovascularization.
  - Even lower risk of infection
  - Accelerated tissue remodeling:

In short P.R.F. is:

- QUICK: Very simple preparation, 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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