

Quality Assessment of the Pulp Chamber Floor Refining by Different Ultrasound Devices

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Abstract — Access surgery is an important procedure performed during endodontic treatment as it allows the dental surgeon to access the pulp chamber and locate the root canals. During this procedure, spherical and conical stem diamond tips with inactive end are used to remove caries, establish a contour shape and refine the walls of the pulp chamber. Inserts coupled to dental ultrasound are constantly used to help refine the floor of the pulp chamber. However, depending on the vibration provided by the ultrasound device and incorrect handling of the insert, it will cause depressions and perforations in the floor of the pulp chamber. Given the context, this research aims to assess the quality of pulp chamber floor refinement by different ultrasound devices. This is a research with the principle of applied investigation, qualitative and quantitative approach, with an exploratory character, where 100 upper and lower human molars will be selected distributed in 4 groups, where the floor refinement will be carried out with TRA 24 ultrasound insert (Trinks, São Paulo, Brazil) however, coupled to different ultrasonic devices: G1 (No. 25) CvDentus, G2 (No. 25) Sonic Plus Ecel, G3 (No. 25) Sonic Air Scaler and G4 (No. 25) Denshine . After completion of the access surgery, a visual inspection will be performed to assess the presence of excessive wear, depressions and identification of root canals. The results were tabulated, analyzed and it was found that there was no significant difference between the groups regarding the presence of excessive wear, depressions and identification of root canals. Thus, it is possible to conclude that all ultrasonic devices showed satisfactory results in the refinement of the floor of the analyzed teeth.

I. INTRODUCTION

“The main threat to the health of dental pulp is dental caries” (TORABINEJAD and WALTON, 2010, p. 21). There are other threats like trauma and fracture. Faced with the injury, the pulp organ may develop an inflammatory process. Consequently, necrosis and emergence of periradicular pathology may be installed. While this situation does not cause discomfort and is generally ignored, this type of injury can result in damage or loss of dental components. That's why endodontic treatment is important.

Valdivia et al. (2015), states that "A fundamental prerequisite for the success of endodontic treatment is the adequate preparation of the access surgery, the location and identification of the entrance of the root canals". As mentioned above, it is important that all stages of the endodontic treatment are carried out properly.

Access surgery performed improperly makes endodontic treatment difficult. The size and shape of the cavity performed should follow the group and internal anatomy of the pulp chamber. Thus, the quality of the

mechanical chemical preparation of the root canal is associated with root access (MIRANZI et al. 2011).

According to the author Miranzi et al. (2011), the objectives of access surgery are: to be straight, preserve the tooth structure and remove the roof of the pulp chamber. The intention is to allow direct access to the apical region, and not just the entrance of the conduits. The purpose of access surgery is to make the instruments pass through the pulp chamber and enter the root canal without blocking, as well as to reduce the damage caused to the instruments, allowing the operator to act on the walls without modifying the internal anatomy.

It must also remove the material from the pulp chamber and its final shape must allow the endodontic instruments to come into contact with the root canal surface and reach the apical region without interfering with the tooth wall. (MIRANZI et al., 2011)

Sometimes, access surgery may be unsuccessful, where the operator is unable to remove the roof of the pulp chamber completely, causing the root canals not to be visualized and located, thus the cutting instrument will not correctly enter the root canal.

For years, ways to facilitate and improve mechanical chemical preparation to access the pulp chamber in an effective and minimally invasive way have been tested. The use of ultrasound is one of them. It facilitates procedures at different stages of the endodontic treatment, such as cleaning the canals, eliminating pulp residues and refining the pulp chamber. Acting in little space and have good cutting precision. As a way to reduce errors during access surgery, ultrasound provides benefits to obtain an optimal area of visualization of the root canals, a good refinement of the pulp chamber and adequate space to use cutting instruments (RAMOS; NETO, 2019).

Found in the endodontics field, there are a variety of inserts that differ in the shape, length, size and construction that they are used. It is important that the ultrasound source is specifically dedicated to endodontics, or at least that it is a multidirectional unit offering an "endo" application (an operative mode, in which the amplitude of vibrations is limited) (IANDOLO, et al. 2015).

The aim of this study is to compare the efficiency of three ultrasound devices in the refinement of the pulp chamber floor.

II. MATERIALS AND METHOD

It is a research with the principle of applied investigation, qualitative and quantitative approach, with an exploratory character. One hundred maxillary and mandibular molars with similar sizes and diameters in the

coronary and radicular region, donated by patients in need of extraction for reasons of orthodontic treatment or periodontal involvement, were selected.

Root scaling was performed with periodontal curettes (Duflex – SS White – Rio de Janeiro – Brazil), removing any dirt on the external surface. The specimens were submitted to prophylaxis with pumice stone (SS White – Rio de Janeiro – Brazil) and water, using Robinson brushes (KG Sorensen – Rio de Janeiro – Brazil) coupled to a contra-angle micromotor (Kavo, Joinville – SC, Brazil). Subsequently, they were placed in 0.1% Timol (Manipulation Pharmacy – Formula and Action – São Paulo – SP) and preserved for a maximum period of three months (Silva et al., 2006; Marending et al. 2007).

Access surgery was performed on all dental elements with the 1014 diamond tip (coupled at high rotation (Kavo, Joinville - SC, Brazil)) (to remove caries or permanent restorations), along the tooth axis, until reaching the pulp chamber. Soon after, a 3082 diamond tip (coupled at high speed (Kavo, Joinville – SC, Brazil)) was used to refine the pulp chamber walls. After completing these steps, a visual inspection was carried out in order to locate the root canals and a photographic record will be taken of the pulp chamber. Afterwards, the teeth were randomly distributed into 4 groups so that the floor could be refined using a TRA 24 ultrasound insert (inserting lateral movements) coupled to the ultrasound device:

G₁ (n=25) CvDentus calibrated at power 2

G₂ (N=25) Sonic Plus Ecel calibrated at power 2

G₃ (N=25) Sônico Air Scaler calibrated at power 2

G₄ (N=25) Denshine calibrated at power 2

Subsequently, a visual inspection was carried out in order to locate the root canals and a photographic record will be taken from the pulp chamber.

III. RESULTS

Among the four ultrasounds used in this study, the findings obtained showed that there was no difference between them. In the refinement of the pulp chamber, a pattern was observed between them (Figure 01, 02, 03 and 04).

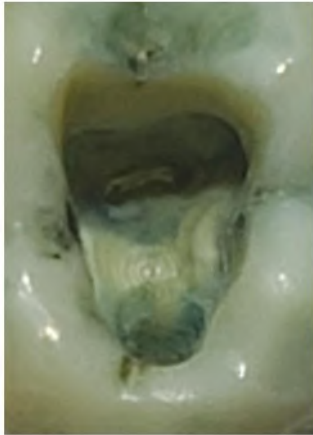


Fig.1: G₁ CvDentus
Source: Own Authorship



Fig.4: G₄ Denshine
Source: Own Authorship



Fig.2: G₂ Sonic Plus Ecel
Source: Own Authorship



Fig.3: G₃ Sônico Air Scaler
Source: Own Authorship

IV. DISCUSSION

There are two methods for producing ultrasound. The first is magnetostriction, which converts electromagnetic energy into mechanical energy. The second is based on the piezoelectric principle, in which a crystal is used that changes dimension when an electrical charge is applied. The deformation of this crystal is converted into mechanical oscillation without producing heat. This method of ultrasound production is used in Endodontics, as it works in a linear fashion, with reciprocating movements, being ideal in this area (Plotino et al., 2007). The ultrasounds used in this study are all piezoelectric.

While obtaining the results, all the difficulties faced by dental surgeons in accessing and refining the pulp chamber floor were taken into account. Thus, the use of ultrasound in the research facilitated access and inspection of root canals in molar teeth analyzed.

The preparation of access cavities is often complicated by the presence of pulp chambers that over time, calcify and cause deposition of secondary dentin formed that obstructs the canal, totally or partially, altering its anatomy. These situations become complex because it is difficult to make a correct cavity access, respecting the original anatomy, not altering the chamber floor and allowing the location of all the entrances to the canal. The control provided by ultrasonic tips is preferable as it has a slower and more controllable cutting power than rotary instruments (Iandolo et al. 2015). While obtaining the results, all the difficulties faced by dental surgeons in accessing and refining the pulp chamber floor were taken into account. Thus, the use of ultrasound in the research facilitated access and inspection of root canals in molar teeth analyzed. However, there is no difference between the ultrasounds used to refine the floor.

The results of this study demonstrated that the choice of ultrasonic devices for the refinement of the pulp chamber floor is valid, as they perform the same function, providing a smoothness of the pulp chamber floor at the same level and enabling a better visualization of the entrances to the root canals.

V. CONCLUSION

Thus, it is possible to conclude that all ultrasonic devices showed satisfactory results in the refinement of the floor of the analyzed teeth.

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