CONTRIBUTIONS ON THE ULTRASOUND USE IN FAST FINDING AND CREATING THE ACCES TO THE CALCIFIED CANNALS AND ABLATION OF THE PULPOLITES

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Abstract. *In the treatment with ultrasounds, two categories of devices are used, which work on the principle of the magnetostriction phenomenon or the principle of pieso-electrictricity. The most important part of an endodontic ultrasound device is the ultra-acoustic system which must be calculated, projected and made in such way so th exercise a certain type of ultrasound (asked by that application) which together with the endodontic instrument acoustically activated to work together in resonance regime. In order to find the hidden canals calcified and for an easier making of the acces to the root canals is suggested an endodontic instrument with an active specific part and with a central canal which allows the penetration of a cooling fluid in the work area and in order to create the phenomenon of ultrasound cavity.*

Keywords: ultrasounds, magnetostriction, canals calcified, ultrasonic endodontic device, root canal treatments

1. INTRODUCTION

Considering the properties and effects of the ultrasound wawes propagation through the dental system tissues, along over 60 years, more different possible applications have been tried, taking into consideration the modifications which might appear into the tissues or the endodontic instruments evolution and the knowledges on endodoncy in continuous development.

The use of ultrasounds or the instruments with ultrasounds were introduced for the first time (1953) in stomatology in preparing the cavity using an abrassive paste by Balamuth I. but it had not efficiency as compared to a great speed piece hand piece [1, 2].

In 1955, a researcher, Zinner, uses for the first time ultraswounds in order to eliminate the strong deposits on the tooth surface, a method improved later by Johanson and Wilson and thus plaque tartar ultrasound device becomes a base intrument in eliminating the plaque and tartar.

The concept of using ultrasounds in endodoncy was introduced for the first time by Richman in 1957, but the root canals preparation before obturation is made only when Martin and his collaborators use an instruemnt which can cut through dentine [3].

The so-called hand pieces activated with ultrasounds of lower frequency (1..8 kHz) were developed later, which produce lower friction tensions and allow a preparation of the root cannal with a lesser modification at the tooth surface [4].

Due to the explossive development of certain sciences sucha s physics, chemistry and mathematics, of some industrial branches as electronics, automatics and computer science, materials science and technology, at the same time with the development of knowledges in endodoncy, decades of fantastic leaps in the research field on the application of ultrasounds in endodoncy follow in almost all important domains of it [5, 6].

Although the diagnostication and ultrasound therapy, as well as cleaning the instruments before sterilization with ultrasounds become usual operations, the concept of minimum invasive stomatology and the wish to prepare the cavity of the root cannal as closest to the theoretical prescriptions as possible lead to many studies and research concerning the use of ultrasounds also in a series of operations leading to an endodontic treatment of great efficiency and performance. The most frequent ultrasound applications in endodoncy, which have been under thorough research, having coresponding accomplishments are the following: the rapid finding and creating the access to the calcified cannals and the pulpolites; removing the intercannals obstacles (broken instruments,hard pastes, silver cones, broken metallic remains, etc., and the repreparation of the root cannal; activating the irrigations ollutions and increasing the efficiency of their action; ultrasound condensation of the gutta-percha in the root canal; placing and activating different medicine substances (pastes, tri-oxides mineral aggregates, etc.) inside the root canal; endodontic surgery (preparing the root cavity and placing the root canal material at the root peak); preparing the root canals [7, 8].

2. ACTUAL RESEARCH STATE

One of the important challenges of the endodoncy is locating the canals, especially in the cases when the hole is covered by secondary dentine as well as placing restauration material or pulpotomes.

A lack of rectiline access is undoubtedly the main cause for the root perforation, or the incapacity to verify the radiographic indications, that is why, the microscopic visualising and the ultrasound activated instruments are a sure and effective combination in order to obtain optimum results in preparing the access, not only to find the canals but also to reduce the time and increase the possibilities of treatment.

There are many variants of rotative milling device for access available, but they are difficult to use without risks especially at the teeth difficult to treat as the molars (Figure 1, a).For instance, locating canals V2 for the superior molars (Figure 1, b) is much more effective and safer if an instrument like that presented in Figure 2, a,b,c is used and it is ultrasound activated.

As a aconsequence of the ultrasound activity, the peak of the intruemnt performs vibrating movements of to-and-fro with ultrasound frequency (45…60 kHz) and microns order amplitudes (2…15μm) and allows cleaning the access to the canal, locating calcified canals in any tooth and removing dental calcified pulpwith great efficiency.

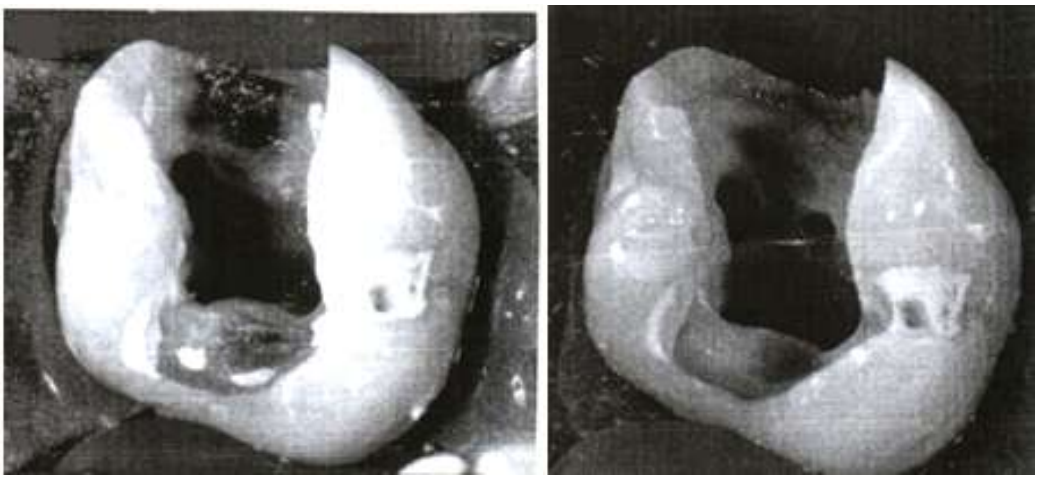

Figure 1. Finding the access at the oriffice of the root canal mesiovestibulary MV2 into a superior molar: a – performing the access by classic methods; b – performing the access with endodontic intruments ultrasounds activated

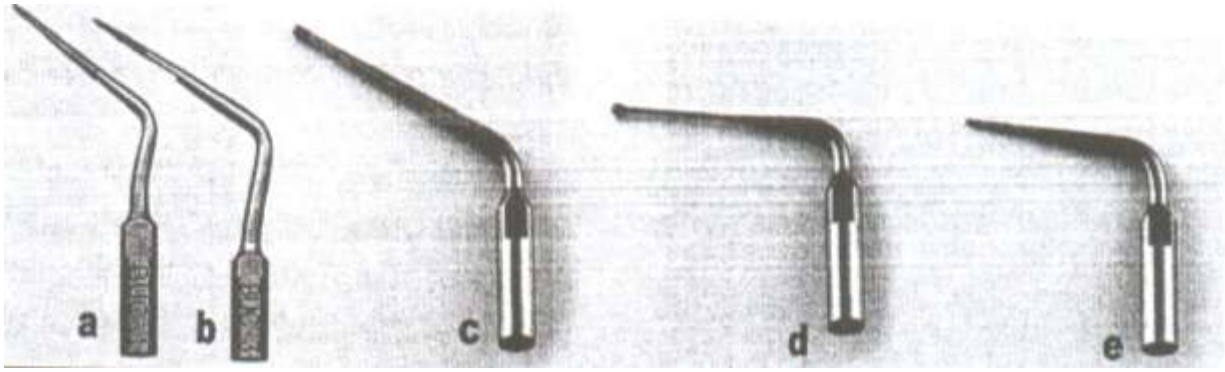

Figure 2. Types of endodontic instruments ultrasound activated:
a – for removing the calcified pulp and the infected dentine; b – similary to the previous, but with sharper peak and with water canal ; c – for finding canals, restauration material, temporary cements or broken instruments remains; d – ball point peak covered with diamant used to prepare the root canal ; e – a clasic spreader covered by diamant particles used for the preparation of the root canal

The visual access and the superior control which the ulterasound activated instruments offer, presented in Figure 2, during the access procedures, makes them very useful especially treating the most difficult accessed molars in locating the canals MV2 and removing the secondary dentine from the mesial wall Figure 3 of the superior molars.

These diamond covered instruments are more efficient than those made of stainless steel but they have the tendency to break easier, that is why it is necessary to continue the researches in order to find the most effective solution

3. EXPERIMENTAL OBTAINED RESULTS

When we are looking for hidden and calcified canals we must consider that in the majority of cases the secondary dentine is whitish or opaque while the pulp rooms is darker and grey. Experiemntaly it was noted that the ultrasounds have an increased efficiency when the calcifications covering the holes/oriffices of these canals are broken. In order to remove the disadvantages which the different varaints of rotative milling devices used in present have, we used in our experiments, an endodontic instrument in the form presented in Figure 3.

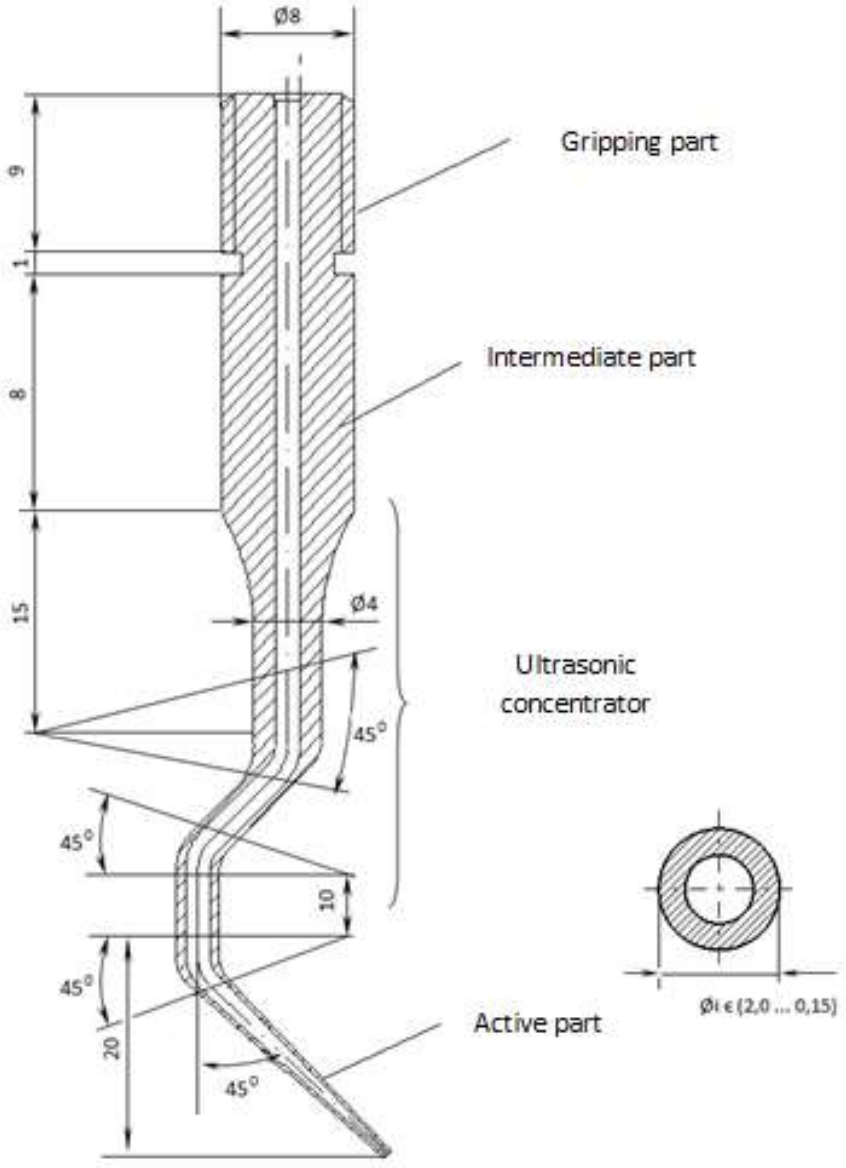

Figure 3. Endodontic instrument

The instrument is endowed with a central canal allowing the introduction of fluids (oxygenated water, different sollutions) at the intervention place in order to create the cavity phenomena which essentially contributes to the removing of hard strata. The active part ends with a peak of a certain ray of recording which allows working in deeper areas of the canal to remove the secondary dentine and the existing calcifications.

This instrument is made of staineless steel thermically reated in order to have a good resistance at demands but also a slight flexibility in order to avoid breaking in the processed area. It has the advantage that it makes a less aggressive cut in the area and it has a greater resistance that the instruments used in present which have the diamond peak and present an aggressive cut having the tendency towards breaking.

The experiments showed that the ultrasound method presents the following advantages as compared to the classic methods: increased efficiency as the necessary time is reduced to half; the thermic tenssions introduced are lower; the quality of the procersses surfaces is better; there are no solicitations by fire and neither the possibility of breaking the instrument and the phonic pollution is absent.

4. CONCLUSIONS

Following the theoretic and experimental researches, we can take the following conclusions:

1^o The ultrasound applications in endodoncy and the spectacular leap of their use were possible with the evolution of the theoretical research in the endodontic studies and the present innovations in technology and the endodontic intruments;

2^o Generally, an ultrasound equipment used for different applciations in the dental medicine and respectively in endodoncy is made of an electronic generator with variable frequency and authomatic tuning of the resonance frequency, an ultra-acoustic system which transforms the electric oscilations in mechanic oscilations with ultrasonic frequency, the set of endodontic instruments which lead, concentrates and focus the ultrasonic energy in the tissue which are to be treated and the auxiliary elements which allow the introduction of irrigating substances, of cleaning, washing or medicating by aspiration of substances which must be removed from the action place of the endodontic instruemnt which is ultrasound activated;

3^o In the treatment with ultrasounds, two categories of devices are used, which work on the principle of the magnetostriction phenomenon or the principle of pieso-electrictricity ;

4^o The most important part of an endodontic ultrasound device is the ultra-acoustic system which must be calculated, projected and made in such way so th exercise a certain type of ultrasound (asked by that application) which together with the endodontic instrument acoustically activated to work together in resonance regime;

5^o in order to find the hidden canals calcified and for an easier making of the acces to the root canals is suggested an endodontic instrument with an active specific part and with a central canal which allows the penetration of a cooling fluid in the work area and in order to create the phenomenon of ultrasound cavity;

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