Sequence of Irrigation in Endodontics

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Oral Health, May 2005

ABSTRACT

Irrigation has an important role during endodontic treatment. We are proposing a sequence for the different irrigating agents in order to achieve the best chemical preparation possible.

During the last several years endodontics has progressed to the point for treatment to be less traumatic for the patient and less stressful for the dentist.

However, if the use of nickel titanium rotary instruments has allowed us to gain time during endodontic treatment, it can also tempt us to neglect one of the main objectives of endodontics, that being the "cleaning" on which Dr. Herbert Schilder has emphasized since he insisted on "cleaning and shaping". It may be more appropriate to say, "shaping for cleaning".

The main goal of the root canal treatment is to completely eliminate the different components of the pulpal tissue, calcification and bacteria, the placement of a hermetic seal to prevent infection or re-infection and to promote healing of the surrounding tissues if needed.

There are many techniques available to accomplish the root canal preparation. There are also many techniques for filling the root canal system (ie. vertical compaction of warm gutta-percha, System B, lateral condensation).

We must ask ourselves the question, "Why do we irrigate and what irrigation protocol will provide the cleanest canal?" In this context, let us remember that the shaping is the result of endodontic instruments while the cleaning results from irrigation. Therefore, we have two types of preparation. The first one is chemical and the second one is mechanical. It is the chemical preparation that will be discussed in the scope of this article. Moreover, it has been proven that there is a close correlation between these two types of preparation. In fact, with greater tapered preparations, the quantity and the concentration of the irrigating solution will be greater and will therefore better eliminate the smear layer.[6] The files can clean only parts of the root canal system. They create a reservoir that can hold the different irrigating solutions, which will access and clean portions of the root canal system that the instruments cannot reach.

In endodontics the most commonly used irrigating solution is sodium hypochlorite (NaOCl). It has many desirable qualities and properties. It performs bactericidal cytotoxicity, dissolution of organic material, and minor lubrification.[9] But sodium hypochlorite by itself is not sufficient for total cleaning of

the endodontic system.[10] It has no effect on the smear layer and its high surface tension does not allow for its cleaning and disinfection of the root canal system's totality. For this reason, and according to the different clinical situations, we will have to use other irrigants in combination with sodium hypochlorite.

In this presentation, re-treatments and dissolving the obturation material will be excluded. We will limit our discussions to vital and necrotic teeth, and those teeth that have internal resorptions. The various irrigants that will be used consecutively and according to the clinical situations are:

- EDTA (17%) (Ethylene diaminetetraacetic acid) (Smear Clear) (Sybron Endo, Orange, CA)

- Chlorhexidine 0.2%

- Sodium hypochloride 5.25%

- Citric acid 50%

- distilled water.

In general, the most common act after accomplishing the access cavity is the introduction of an endodontic file in the root canal. But this act of becoming a natural reflex has to be rejected for many reasons. Among these we have:

a) The spread of bacterial toxins in all of the endodontic system and in the periapical area and this will affect a successful prognosis for the endodontic treatment due to the post-operative " flare-up" that may occur.

b) The breakdown and the accumulation of the pulp tissue with its collagen may create from the beginning an organic plug within the root canal.

At the end, let us remember that the access cavity, having four walls will create a "reservoir" for the irrigation solutions to be frequently and continuously refreshed (Figs. 1-3).

VITAL TEETH

In this clinical case1 we have to face the challenge of treating the complexity of the different components of the pulp, and eventually the presence of bacteria.

We suggest beginning the treatment by:

1) An application of sodium hypochlorite and/or an application of urea peroxide.

The purpose of this mixture:

a-The collagenic anti-aggregation effect due to the proteolytic and lipidic affinity of urea peroxide.[11]

b-To destroy the biggest amount of pulp tissue inside the access cavity and provide a better view of the canal orifices by controlling bleeding and preventing any collagenic plugs from forming.

c-At this stage the effect of EDTA is only important for its antibacterial effect in combination with other antibacterial agents.[11]

2) The second step consists of irrigating with 2ml of sodium hypochlorite 5.25 percent (60°C). The warm NaOCl is more efficient in destroying the collagen and this will reduce the time needed for the elimination of the organic part. This irrigation will create an effervescent effect between the sodium hypochlorite and urea peroxide. This "elevator effect" will evacuate the organic debris outside the access cavity, disorganize the coronal pulp tissue and help to better detect the canal orifices.[7,12]

3) A second application and its activation is obtained by using a K file (08-10). This will disorganize the pulpal tissue in both the cervical and middle thirds of the endodontic system. This step has to be preceded by an abundant irrigation with distilled water in order to eliminate the first mixture present in the access cavity.

4) Once the preparation of the canal has begun, Smear Clear (Sybron Endo, Orange, CA) (17 percent EDTA cetrimide, and surfactants) must be used. The EDTA is an organic acid which eliminates the mineral part of pulp tissue,[5,17] the surface tension inhibitor will allow a better contact with the dentin for a higher efficiency of the product.

It is advised to alternate the use of EDTA from the beginning of the preparation in order to eliminate the mineral layer before its thickening and condensing it inside the canal systems which will close the entrances of lateral and accessory canals and dentinal tubules.

Each time a rotary file is working inside the canal, irrigating solution must be present. Ultrasonic activation of the irrigating solution, using a small diameter file, is advised for a more efficient chemical preparation.

The early use of EDTA facilitates the flow of the different irrigants in the lateral canals permitting a chemical preparation of all the endodontic system.[14] EDTA also plays an important role in the reduction of inflammatory reaction by inhibiting the affinity of macrophages to the vaso-active peptides of the pulpal tissue.[3] A time frame between four and five minutes must not be exceeded for the presence of the EDTA inside the canal.

Chlorehexidine can be used for a total elimination of the bacteria inside the canal. Distilled water is used between each irrigating solution in order to prevent an acid/ base reaction, between sodium hypochlorite and EDTA, for a more efficient action of the chemicals on the tissues. A copious neutralization

of all the chemical agents must be done by the end of the preparation and before the fitting of the gutta percha cones so that the master cone does not push any of the chemicals outside the canal that might cause an inflammation of the surrounding tissues.

NECROTIC TEETH

The main difference between vital teeth and necrotic ones is the absence, not in total, of the pulpal parenchyme and the abundance of bacteria present in the latter. For this reason, the irrigation sequence will be different. Irrigation will be initiated with either sodium hypochlorite (5.25%, 60%C) for its bacterial effect or with chlorohexidine (0.2%) (10 minutes)[15] for the elimination of various bacterial types present in the root canals and dentinal tubuli.[8] We will use distilled water to neutralize the effect of these irrigants. Then we can repeat the same irrigation sequence described previously for vital teeth.

The EDTA, by eliminating the smear layer and opening the dentinal tubuli will permit an easy flow of NaOCl or chlorhexidine for a better disinfection of the endodontic system. In both clinical situations (vital and necrotic teeth) it is necessary[2,11,13] to end our sequence by using distilled water in order to eliminate the chemical agents or to neutralize their effects. This will inhibit:

- Their flow towards the periodontal tissues

- The alteration of the filling material

- The formation of a precipitating layer due to the crystallization of sodium hypochlorite after drying the canal walls.

PRESENCE OF RESORPTIONS

When we suspect an internal resorption, the irrigation sequence is the same that was described for vital teeth. But this sequence will be followed by the use of citric acid 50 percent (10 minutes) in order to eliminate the granulation tissue and to obtain smooth dentinal walls. This will ameliorate the adaptation of the filling material. The citric acid is eliminated by NaOCl and distilled water. The same sequence is adopted for external apical resorptions but with an activation of the patency.[18]

DISCUSSION

Many types of irrigants can be used such as H2O2[16], anesthetic solutions, physiological serum, and de-ionized water. What is proposed is a sequence of irrigation, which may become more complex in order to deal with different clinical situations.

The alternate us of urea peroxide, sodium hypochlorite, chlorhexidine, citric acid, distilled water and EDTA is essential for the cleaning of the endodontic system.

The time we gain by using rotary Niti instruments is compensated by an abundant irrigation for a better cleaning of the endodontic system and this will contribute to the increase success rate of endodontic treatment.

Chemical preparation is a double-edged sword; it will help us succeed in the adequate cleaning of the main canal its systems. But it must be followed by a three dimensional obturation to fill all of what has been cleansed and prepared.

Perfect absorption of the fluid is essential from the main canal and all of its systems. If this is not accomplished then the adherence between the sealer and the dentin will be compromised. In addition, the presence of the fluid inside the systems can have a negative hydraulic pressure preventing the obturation material from entering the complexity of the root canal systems for accomplishing a three dimensional obturation.

With the introduction of new materials for root canal obturation and going towards adhesive endodontics, the root canal irrigation or chemical preparation is comparable to the dentine and enamel conditioning prior to the use of adhesive restorative materials with some small modifications.

CONCLUSION

The irrigation act often dismissed during endodontic treatment and must not be overlooked. It is one of the major keys of success for endodontic treatment. The irrigation usually reduced to a needle on the tray has to be systematically evaluated in order to become an endodontic entity having a precise chronology and codification.

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Figures for this article.

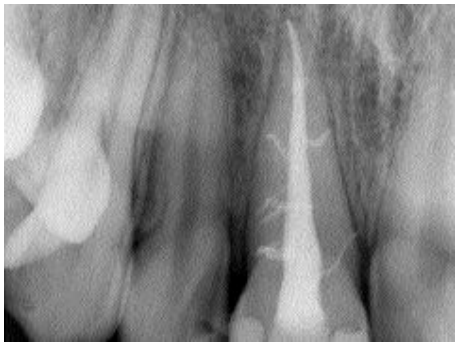

FIGURE 1--A central incisor treated in two sessions, the pulp was necrotic and some swelling was noticed.

FIGURE 2--An upper canine treated in one session, after a crown fracture of the composite filling.

3A 3B

FIGURES 3A & B--Showing several anterior teeth treated in single session using the K3 rotary files, and the nice thing is that...

FIGURE 4--A re-treatment of two lower premolars.

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