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IRRIGATION OF ROOT CANALS DURING ENDODONTIC TREATMENT

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Resume. *Irrigation has a central role in endodontic treatment. An optimal irrigant should have all or most of the positive characteristics, but none of the negative or harmful properties. None of the available irrigating solutions can be regarded as optimal. Using a combination of products in the correct irrigation sequence contributes to a successful treatment outcome.*

Keywords: *irrigation, sodium hypochlorite, chlorhexidine digluconate. ethylenediaminetetraacetic acid.*

Relevance. The major causes of pulpal and periapical diseases are living and nonliving irritants. The latter group includes mechanical, thermal and chemical irritants. The living irritants include various microorganisms including bacteria, yeasts and viruses. When pathological changes occur in the dental pulp, the root canal space acquires the ability to harbor various irritants including several species of bacteria, along with their toxins and byproducts. Investigations in animals and patients have shown that pulpal and/or periradicular diseases do not develop without the presence of bacteria. The main goal of successful endodontics is the elimination of infection and the protection of the decontaminated tooth from future microbial invasion. The only proper irrigation procedure might help to clean root canal system thoroughly [4].

Aim of study: investigation of all the possible variants of irrigation protocols in endodontics which are present and being used at current period.

Research tasks:

1. Based on current literature data to establish the basic role of irrigation in endodontic treatment.

2. Based on current literature data to establish the features of the commonly used materials for the irrigation.

Material and methods of research: in the study all available sources of literature on irrigation protocols in dentistry have been analyzed. such as sodium hypochlorite, chlorhexidine, EDTA, citric acid and etc. have been discussed.

Results and its discussion. Irrigation has a central role in endodontic treatment. During and after instrumentation, the irrigants facilitate removal of microorganisms, tissue remnants, and dentin chips from the root canal through a flushing mechanism. Irrigants can also help prevent packing of the hard and soft tissue in the apical root canal and extrusion of infected material into the periapical area. Some irrigating solutions dissolve either organic or inorganic tissue in the root canal. In addition, several irrigating solutions have antimicrobial activity and actively kill bacteria and yeasts when introduced in direct contact with the microorganisms. However, several irrigating solutions also have cytotoxic potential, and they may cause severe pain if they gain access into the periapical tissues [4].

An optimal irrigant should have all or most of the positive characteristics, but none of the negative or harmful properties. None of the available irrigating solutions can be regarded as optimal. Using a combination of products in the correct irrigation sequence contributes to a successful treatment outcome [4].

Sodium hypochlorite (NaOCl) is the most popular irrigating solution. NaOCl ionizes in water into Na1 and the hypochlorite ion, OCl, establishing an equilibrium with hypochlorous acid (HOCl). Hypochloric acid disrupts several vital functions of the microbial cell, resulting in cell death. NaOCl is commonly used in concentrations between 0.5% and 6%. It is a potent antimicrobial agent, killing most bacteria instantly on direct contact. It also effectively dissolves pulpal remnants and collagen, the main organic components of dentin. Hypochlorite is the only root-canal irrigant of those in general use that dissolves necrotic and vital organic tissue. It is difficult to imagine successful irrigation of the root canal without hypochlorite [2,4].

Complete cleaning of the root-canal system requires the use of irrigants that dissolve organic and inorganic material. As hypochlorite is active only against the former, other substances must be used to complete the removal of the smear layer and dentin debris. Smear layer removal is an important part of the treatment because it contains microorganisms and microbial antigens embedded in the amorphous mixture of inorganic and organic dentin and necrotic tissue. Smear layer has traditionally been removed by EDTA (ethylenediaminetetraacetic acid), and citric acid (CA) has also been used for this purpose. EDTA and CA effectively dissolve inorganic material, including hydroxyapatite. They have little or no effect on organic tissue and alone they do not have antibacterial activity. EDTA is most commonly used as a 17% neutralized solution (disodium EDTA, pH 7). CA is also marketed and used in various concentrations, ranging from 1% to 50%, with a 10% solution being the most common. EDTA and CA are used for 2 to 3 minutes at the end of instrumentation and after NaOCl irrigation. Removal of the smear layer by EDTA or CA improves the antibacterial effect of locally used disinfecting agents in deeper layers of dentin. EDTA and CA are manufactured as liquids and gels [3].

QMix 2in1 is a new root canal irrigant built on the effectiveness of EDTA that removes smear layer at least as effectively as 17% EDTA, and has proven to be a highly effective antimicrobial agent (≥99.99% disinfection per independent studies). It kills planktonic (free-floating) bacteria, including Enterococci, within seconds, and research shows it is capable of penetrating biofilms due to its unique blend of antibacterial substances and their combined synergistic effect. QMix™ 2in1 is a premixed, ready-to-use, colorless and odorless solution that is free of antibiotics. No evidence of tooth staining has been observed in laboratory conditions following use of this solution [4].

Chlorhexidine digluconate (CHX) is widely used in disinfection in dentistry because of its good antimicrobial activity. It has gained considerable popularity in endodontics as an irrigating solution and as an intracanal medicament. CHX does not possess some of the undesired characteristics of sodium hypochlorite (ie, bad smell and strong irritation to periapical tissues). However, CHX has no tissue-dissolving capability and therefore it cannot replace sodium hypochlorite [4].

CHX permeates the microbial cell wall or outer membrane and attacks the bacterial cytoplasmic or inner membrane or the yeast plasma membrane. In high concentrations, CHX causes coagulation of intracellular components.3 One of the reasons for the popularity of CHX is its substantivity (continued antimicrobial effect), because CHX binds to hard tissue and remains antimicrobial. However, similar to other endodontic disinfecting agents, the activity of CHX depends on the pH and is also greatly reduced in the presence of organic matter.

Other irrigating solutions used in endodontics have included sterile water, physiologic saline, hydrogen peroxide, urea peroxide, and iodine compounds. All of these except iodine compounds lack antibacterial activity when used alone, and they do not dissolve tissue either. Therefore there is no good reason for their use in canal irrigation in routine cases. In addition, water and saline solutions bear the risk of contamination if used from containers that have been opened more than once. Iodine potassium iodide (eg, 2% and 4%, respectively) has considerable antimicrobial activity but no tissuedissolving capability and it could be used at the end of the chemomechanical preparation like CHX. However, some patients are allergic to iodine, which must be taken into consideration [4].

Conclusions:

1. The use of root canal irrigating solutions exerting antimicrobial activity and prolonged residual activity is desirable in order to control dentin infection and delay reinfection of the root canal.

2. Sodium hypochlorite is the most important irrigating solution and the only one capable of dissolving organic tissue, including biofilm and the organic part of the smear layer. It should be used throughout the instrumentation phase. However, use of hypochlorite as the final rinse following EDTA or CA rapidly produces severe erosion of the canal-wall dentin and should probably be avoided.

3. The total removal of the smear layer is preferred in order to improve the adaptation of the obturation materials in the root canal dentin, decrease apical, and coronal microleakage and facilitate the diffusion of the irrigant solutions and intracanal medications into the root canal system. 17% EDTA is the solution most commonly used to remove the smear layer.

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