The Use of the Antiseptic Solution "Octenisept" in Endodontic Practice: The Systematic Review

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Abstract

Octenidine hydrochloride - OCT (Octenisept) has the potential to be used as root canal irrigant due to its efficacy against Candida albicans and E. faecalis. OCT is good alternative to NaOCl and CHX.

The purpose of this review article is to assess systematically the available scientific evidence about the effectiveness of using antiseptic solution "Octenisept" during endodontic treatment.

The study of publications was produced in the electronic databases such as Google Scholar, PubMed during a systematic review of the literature. Included articles contain information about using Octenisept in endodontic practice and its properties. The publication date criterion was selected from January 2007 to August 2021. 52 articles were viewed during the review. After analyzing the literature for inclusion criteria, the total number of publications has become 10.

According to literature data, the using of Octenisept for endodontic treatment is good alternative to other irrigants due to the antibacterial effects and clinical results.

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Introduction

Endodontic procedures aim for the total elimination of all microorganisms, or, at least, for reducing the bacterial population to a level at which the host resistance can overcome it[1-3]. canal irrigation is one of the most important parts of endodontic therapy, and it contributes through root canal system disinfection [4-7]. For this procedure. There are most common irrigants like solutions of sodium hypochlorite (NaOCl) and chlorhexidine gluconate (CHX) and a new one which is called Octenisept (OCT). Octenidine dihydrochloride (OCT; N,N′-[1,10 decanediyldi-1[4H]-pyridinyl-4ylidene]bis[1 octanamine]dihydrochloride) is a bispyridine antimicrobial compound that carries 2 cationic active centers per molecule and demonstrates broad-spectrum antimicrobial effects, covering both gram-positive and gram-negative bacteria, fungi, and several viral species[8,21]. The purpose of this review article is to analyze the properties of Octenisept as root canal irrigant during endodontic treatment.

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Materials and methods

Eligibility Criteria

Publications that met the following selection criteria were included:

1) Publication year isn't earlier than 2007
2) Availability of studies proving the properties of antiseptic solution "Octenisept" during endodontic treatment.
3) Figuring the topic of the effectiveness of Octenisept as root canal irrigant and its properties.

The review didn't include publications, the title and abstract of which did not meet at least one of the presented inclusion criteria.

Information Sources

Up-to-date information in Russian and English from Google Scholar, PubMed electronic databases has been studied.

Search and Selection of Studies

A search in Russian and English with no time limit was performed by one person. Search terms included "Octenisept", "Octenidine

hydrochloride", "endodontic practice", "Октенисепт", "антисептический раствор", "эндодонтическое лечение". The studies were filtered and selected in several stages. Firstly, they were evaluated by titles. Secondly, individual documents at the first stage were additionally assessed by reading the abstracts and full-text articles. The first selection criterion was the selection of publications whose titles included at least one search term. Further, publications which are dated earlier than 2007 were excluded. At the last stage, the content of the full-text versions of the selected articles was examined (Figure 1).

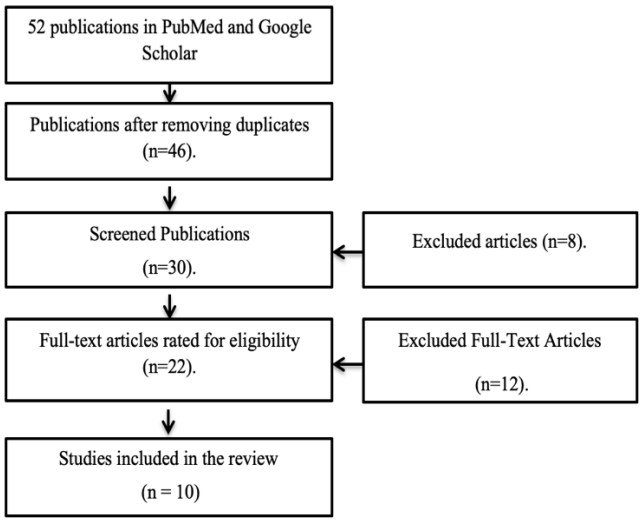

Figure 1. Article selection process.

Cochrane Collaboration data were used to assess the risk of bias, with tests performed at each of the selection stages, according to Higgins et al [30]. The levels of bias were classified as follows: low risk, if all the criteria were met; moderate risk, when only one criterion was missing; high risk, if two or more criteria were missing; and unclear risk, if there were very few details to make a judgement about a certain risk assessment.

Results

52 articles were reviewed, of which 40 were from the PubMed database, 12 were from Google Scholar. After the selection according to the exclusion criteria, the total number of articles was 10. In the selected articles, the relevant data on the effectiveness, properties of using the antiseptic solution "Octenisept" in endodontic practice were analyzed (Table 1).

Author	Publication year	Study	Number	The material
Hernán C-L. et al [2]	2019	third molars	N	OCT, NaOCl, CHX
Tandjung L, et al [3]	2007	roots	56	OCT
Eldeniz A.U. et al [4]	2015	teeth	70	OCT, NaOCl, CHX
Guneser M.B. et al [5]	2016	teeth	70	OCT, NaOCl, CHX
Makbule B.A. et al [7]	2019	Mandibular incisors	105	OCT, NaOCl, CHX
Resmiye E.T. et al [9]	2012	teeth	80	OCT, NaOCl, CHX
Gušić I. et al [12]	2016	teeth	60	OCT
Decker E.M. et al [17]	2013	roots	40	OCT, CHX
Jia Da C. et al [21]	2019	mandibular premolars	40	OCT, NaOCl, CHX
Aravind V. et al [24]	2018	teeth	40	OCT, NaOCl, EDTA

Table 1. Characteristics of the studies included in the review.

Discussion

Bacteria are the primary cause of the development of necrotic pulps, periapical pathosis and post-treatment disease following root canal treatment. Many studies have revealed that Enterococcus faecalis, Actinomyces, Staphylococcus epidermidis and Candida albicans are the most prevalent microorganisms associated with failed endodontic treatment[24]. There are some different irrigants like solutions of sodium hypochlorite (NaOCl) and chlorhexidine gluconate (CHX) which are commonly used in the endodontic practice. Another potential irrigant is octenidine hydrochloride (OCT), which is an antiseptic agent, also can be used during endodontic treatment.

Octenisept - octenidine hydrochloride (OCT, N,N′-[1,10 decanediyldi-1[4H]-pyridinyl-4ylidene]bis[1-octanamine]dihydrochloride) (Schülke & Mayr, Norderstedt, Germany) is a bispyridine antimicrobial compound that carries 2 cationic active centers per molecule, containing 0.1% octenidine hydrochloride (an antimicrobial agent) and 2% phenoxyethanol, a derivative of ethanol, which serves as a preservative, is a bispyridine antimicrobial compound that carries 2 cationic active centers per molecule [2,21].

Octenidine hydrochloride differs from quaternary ammonium compounds (QACs), such as benzalkonium chloride, and other guanidines,

such as chlorhexidine gluconate (CHX), by the lack of an amide- and ester structure in its molecule, which results in lower toxicity due to possible metabolites. Octenisept is stable and remains antimicrobially active at an extremely broad pH range (1.6–12.2). Octenidine hydrochloride binds readily to negatively charged surfaces, such as microbial cell walls and eukaryotic cell membranes. In - vitro experiments demonstrated a strong adherence to bacterial cell membrane components (for example, cardiolipins). Octenisept has a high affinity towards cardiolipin, a prominent lipid in bacterial cell membranes, making it selectively lethal to bacterial cells without adversely affecting eukaryotic cells. Also Octenidine effectively prevents bacterial co-aggregation, which is critical for biofilm formation[27]. So, Octenidine hydrochloride has a broad antimicrobial spectrum, including Gram-positive and Gram-negative bacteria, chlamydiae, mycoplasma and fungi [11].

0.1% octenidine hydrochloride showed comparable antimicrobial effect with 2% chlorhexidine gluconate (CHX) and 3% NaOCl. Enhanced antimicrobial efficacy of Octenisept attributed to its cation-active structure that readily binds to negatively charged bacterial cell wall and thereby affects vital functions of cell membrane that leads to cell death. OCT at a lower concentration could be a potential antimicrobial irrigant against *Staphylococcus epidermidis.* Octenidine hydrochloride cannot replace NaOCl as root canal irrigant because it does not possess the ability to dissolve pulp tissue[21]. Excellent antimicrobial properties of Octenisept indicate it could be a useful substitute in patients who are allergic to sodium hypochlorite (NaOCl)[8].

Octenidine was particularly effective after incubation periods of 10 min and 7 days. After 7 days, only one of 10 samples showed positive culture. The studies showed the effectiveness of octenidine against Enterococcus faecalis in dentine disinfection[3]. Octenisept acts as a cation active substance on the cell membrane; thus, it destroys bacterial cells by interacting with their cell walls and intracellular components. Some studies demonstrated that the antimicrobial efficacy of various concentrations of different concentrations of Octenidine hydrochloride was more effective than 5.25% NaOCl against selected endodontic microorganisms[5]. Moreover, all Candida cells were totally eliminated in root canals irrigated with antiseptic solution "Octenisept"[4].

The toxicity parameters of octenidine hydrochloride are well within compliant limits. No carcinogenic or mutagenic effects have been registered[24]. There is no study in the literature about allergic reactions of Octenisept on gingiva and oral tissues, and the allergenic potential is classified as low[15].

Octenidine hydrochloride (OCT) is an antiseptic agent that has broad-spectrum antimicrobial activity and until recent years, this molecule has been used in medicine. Due to its favorable properties, such as noncarcinogenicity, nonmutagenicity, and bactericidicity, Octenisept has been suggested as a root canal irrigant[7]. There is no study in the literature about allergic reactions of antiseptic solution "Octenisept" on gingiva and oral tissues, and the allergenic potential is classified as low[15].

Conclusions

A new wound antiseptic, octenidine hydrochloride (OCT), demonstrated better potential in elimination of Candida albicans cells and may be a promising alternative to NaOCl and chlorhexidine solutions. Also Octenisept was as effective as NaOCl and CHX in removing from Enterococcus faecalis infected root canals and hence OCT may have potential as an endodontic irrigant. OCT at lower concentrations effectively inhibited antimicrobial growth of Staphylococcus *epidermidis* in compared to CHX and NaOCl. Octenidine hydrochloride (OCT) is a better choice in root canal irrigation because of its faster ability to produce intratubular disinfection.
The good clinical results of Octenisept were not because the antimicrobial activity was the only requirement of an endodontic irrigant of choice. Octenidine hydrochloride is more effective than sodium hypochlorite and is relatively nontoxic.

Octenisept is not currently popular as an endodontic irrigant because insufficient information is available about its properties *in vivo.* However, Octenidine hydrochloride is unique due to its relative non-cytotoxicity at the site of action and good antimicrobial activity. These characteristics make antiseptic solution "Octenisept" attractive as a potential alternative antimicrobial agent in the field of endodontics.

The summary: Antiseptic solution "Octenisept" showed good results in elimination

of Candida albicans, Enterococcus faecalis and Staphylococcus *epidermidis. Due to the excellent antibacterial effect,* non-cytotoxicity and low allergenic potential, Octenidine hydrochloride can be suggested as a root canal irrigant in the endodontic practice. The antimicrobial activity was not the only requirement of an endodontic irrigant of choice. It ismore effective than sodium hypochlorite and is rela-tively nontoxic.

Declaration of Interest

The authors report no conflict of interest.

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