Original Article

Efficacy of Endox Endodontic System in eradication of Enterococcus faecalis from Infected Pulp in Duhok, Kurdistan, Iraq

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ABSTRACT

Objective

To evaluate the efficacy of the newly available endox endodontic system on isolated Enterococcus faecalis from single rooted canals.

Methods

Two hundred and fifty extracted single rooted teeth were selected for this study. The root canals were prepared and shaped with sterile reamers (#15-35) and endox needle was introduced into the canal and microbiological samples were collected from each tooth using sterile paper points before and after the treatment for the isolation and identification of Enterococcus faecalis.

Results

Eighteen (7.2%) isolated strains of Enterococcus faecalis from 250 single rooted canals were treated with endox. In 10 (55.6%) cases, Enterococcus faecalis was eradicated, while in 8 (44.4%) cases it was resistant to endox.

Conclusion

Endox method was reasonably effective in the elimination of Enterococcus faecalis from infected single rooted canals. (Rawal Med J 2010;35: ).

Key words

Endox, Enterococcus faecalis, infected pulp, endodontic.
INTRODUCTION

Once established, a root canal infection is difficult to be eliminated by the host defence mechanisms or by systemic antibiotic therapy, as absence of blood supply in a necrotic pulp impedes the transport of defence cells and molecules as well as systemically administered antibiotics to the infected site. The principle of complete debridement of vital and necrotic pulp tissue, removal of microorganisms and affected dentin, and cleansing of the root canal are the cornerstone in successful endodontic therapy. Recently, there have been significant technological advancements to facilitate root canal cleaning and shaping.

Endox is an innovative method for the treatment of bacterial infections of the root canal. It is a device that helps improve the quality of root canal treatment and to simplify the scheme of work, allowing initially locate the apex of the root canal system (endometrial) and subsequently the pulp tissue vaporization with reduction of bacterial content of the canal system, by increasing temperature, after high frequency current (600 kHz) for one tenth of a second. Endox endodontic system has a fine surgical steel needle that is used as an active electrode, introduced into the open root canal and a neutral electrode that is held in the patient's hand. Then a discharge of high frequency alternating current (HFAC) is applied. The passage of this electromagnetic field, when carried out under specific conditions of impedance, produces a sterilization of the root canal similar to that observed with standard methods using chemicals, with beneficial effects for inside and outside the tooth. The use for endodontic treatment causes the death of microorganism exposed by promoting damages in the envelope of the cell, and survivors require a long period of time to recover the normal growth rate that improves the beneficial effects of this
One of the resistant bacteria found in persistent periapical lesions is *Enterococcus faecalis*, which is capable of invading the tubular dentin even after adequate chemomechanical preparation has been performed. This has received much attention as the *Enterococcus faecalis* bacteria have been found to adapt best to the root canal system and eradication is extremely difficult. Moreover, clinical isolates of *Enterococcus faecalis* recovered from root canal infections can express antimicrobial resistance to conventional treatment regimens recommended for dental procedures. The aim of this study was to evaluate the efficacy of endox endodontic system on isolated *Enterococcus faecalis* from single rooted canals.

**MATERIAL AND METHODS**

Two hundred and fifty extracted single rooted teeth were selected for this study from Azadi teaching hospital, Duhok city, Kurdistan province, Iraq. The study was carried out in the Department of Microbiology, College of Medicine, University of Duhok, Kurdistan province, Iraq. A reamer of suitable size (#15-35) was used to enlarge the canal and remove the pulp tissues. Instrumentation was followed by irrigation with normal saline. The initial microbiological sample was obtained by inserting sterile paper point into the prepared canal.

![Fig 1. API 20 strep showing a very good identification of Enterococcus faecalis in the endox treatment for sample number 211B.](image)

The endox needle was introduced into the canal, and one to two impulses were emitted and then the second sample was taken by inserting sterile paper point into the canal. Following the manufacturer recommendation, the frequency applied was 600
kHz in 1/10 of the second. The sterile paper points were cultured into brain heart infusion broth. After incubation at 37°C for 24 hours, each sample was sub-cultured on brain heart infusion agar, blood agar, MacConkey agar and thioglycolate broth. After incubation at 37°C for 24 hours, colony morphology were noted and diagnosed by catalase test and gram stain. The suspected colonies were sub-cultured onto bile esculin agar and incubated at 37°C for 24 hours and identified further by biochemical methods API 20 Strep (Biomerieux - France).

RESULTS

Out of a total of 250 samples, 18 (7.2%) cases of *Enterococcus faecalis* were isolated and 232 (92%) showed negative cultures.

<table>
<thead>
<tr>
<th>Table 1. Effect of endox system on 18 strains of <em>Enterococcus faecalis.</em></th>
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<tbody>
<tr>
<td><strong>Endox endodontic system</strong></td>
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<tr>
<td>Eradicated after treatment</td>
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<tr>
<td>Resistant (Not eradicated)</td>
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<tr>
<td>Total</td>
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Endox eradicated 10 (55.6%) cases of *Enterococcus faecalis*, while 8 (44.4%) were resistant (Table 1).

DISCUSSION

This is a pioneering study from Iraq, using endox endodontic system for the elimination of *Enterococcus faecalis* in root canal (infected pulp). We chose *Enterococcus faecalis* because, amongst all the bacterial species associated with persistent endodontic infections, it is one of the most frequently isolated species. In the present study, only 7.2% cases of *Enterococcus faecalis* were isolated and 92% were negative for *Enterococcus faecalis*. This is similar to a study from Jordan.
Turkish studies have shown that Enterococcus faecalis from patients with endodontic infections varies from 9.6% \(^{12}\) to 75%. \(^{13}\) A recent study from USA reported Enterococcus faecalis in 11% of 100 oral rinse samples of patients receiving endodontic treatment. \(^{14}\) These differences are probably due to different identification techniques, geographic differences or sample size, although they may also be due to differences in coronal leakage or dietary intake in the different populations. \(^{15}\)

Our study showed that endox endodontic system eliminated Enterococcus faecalis in 55.6% isolates. A recent study showed that endox was not able to eliminate pulp tissue from the root canal system without mechanical cleaning and authors could not recommend high-frequency electric pulses as the sole endodontic treatment but felt that endox may be utilized as supplement to traditional cleaning and shaping. \(^{4}\) However, other studies reported that endox system was of great benefit in elimination of the pulp tissues and microorganisms and less post operative pain. \(^{5,16}\) The study also showed that it was able to obtain a more compact obturation of the root canals as the fulguration leaves a smooth intraradicular surface and there is reduction of biomechanical instrumentation as it not necessary to enlarge the root canal, just enough to allow a correct obturation. \(^{5}\)

The advantages of endox endodontic system is that, the treatment normally does not last more than a few seconds. This means a significant reduction of the time in the chair with a considerable reduction of cost. There is also a reduction of risk of breaking or swallowing instrument, reduction of the possibility of damage from sodium hypochlorite both swallowed as well as inoculated over the apex.

**CONCLUSION**

The endox endodontic system showed relatively effective response in eradicating Enterococcus faecalis from single rooted canals. We recommend endox endodontic
system to be used with the classical method used in the dental clinics for treating single rooted canals with sodium hypochlorite for the complete eradication of Enterococcus faecalis.

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REFERENCE
