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Disinfection of Extracted Teeth for Dental Researches

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الخلاصة

الهدف: ان الهدف من هذه ا لدراسة هو لتحديد كفاءة لطرق المختلفة ا لمستخدمة لتعقيم الاسنان المخلوعة. **المواد والطرق:** تم تقسيم الاسنان لمستخدمة في البحث الى خمس مجموعات حسب نوع الجرثوم ا لمستخدم ، وستخدمت الطرق الستة لتالية في التعقيم ولكل المجاميع (2,5 % و 1% هيبوكلورت الصوديوم لمدة اسبوع، التعقيم في جهاز المعقام لمدة ربع ساعة، التعقيم بالموجات الدقيقة لمدة 3 و 6 دقائق والمجموعة السادسة غمرت في محلول ملحي لمدة اسبوع في درجة حرارة الغرفة.
النتائج: اظهرت النتائج ان التعقيم في جهاز المعقام لمدة ربع ساعة، التعقيم بالموجات الدقيقة لمدة 3 و 6 دقائق او في هيبوكلورات الصوديوم 2,5 % اعطى افضل النتائج .

ABSTRACT

Aims: To determine the effectiveness of different disinfection methods on extracted human teeth using five types of bacteria *Proteus* species, *Escherichia coli*, *Kelebsiella* species, *Staphylococcus aureus*, *Streptococcus mutans*. **Materials and Methods**: In this study extracted non-carious teeth were divided into five groups according to the type of bacteria that were inoculated inside the pulp chambers. Each group of the teeth were subdivided into six groups; group A: teeth were immersed in 2.5% NaOCl for 1week, group B: teeth were immersed in 1% NaOCl for 1week. Group C: teeth were autoclaved at 121C for at 15 Ibs psi for 15 minutes, group D: teeth disinfected using microwave for 3 minutes, group E: teeth disinfected using microwave for 6 minutes, group F: control group in which the teeth immersed in normal saline for seven days at room temperature. Each tooth aseptically placed in individual test tube with growth media. Simples were examined after 24h. **Results**: showed that autoclave, microwave (when used at sex and three minutes), sodium hypochlorite at 2.5% prevented the growth completely in all types of the bacteria that were used to infect the teeth involved in this study.
Key words: Disinfection, microwave, extracted teeth

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INTRODUCTION

Natural teeth are invaluable teaching tool for preclinical instruction in operative dentistry and endodontic techniques [(1)]. Also development and testing the restorative materials requires large numbers of extracted teeth. Freshly extracted teeth are by their nature a potential source of cross contamination to laboratory equipments and personal, therefore newly extracted teeth must be decontaminated. The American Dental Association (ADD 1988) and the Centers for Disease Control (CDC 1986) call for the killing or complete removal of any organisms that might cause disease. The CDC (1992) has recommended only the decontamination of extracted teeth for use in dental educational setting, to minimize the risk of transmission of blood-borne pathogens [(2)].

Control of microbial growth is equated with killing microorganisms or creating conditions under which they cannot grow. Exposure to high temperatures, ionizing radiation, and various chemicals, are routinely employed to kill microorganisms[(3)].

The center for disease control (CDC), USA recommends storing extracted teeth in 1:10 household bleach. However some study showed house bleach at this concentration to be a poor disinfectant for this purpose [4]. Autoclave is widely used in medical institutions, laboratories, and industries where the quality of reusable items is maintained with respect to infection control [5].

Microwave is one of the alternative energy sources for sterilization; the efficiency of microwave sterilization is essentially a function of both of electromagnetic field strength and the exposure time [6].

The aim of this study is to evaluate the effectiveness of various disinfection methods (Sodium Hypochlorite in two concentration 2.5%, 1%, autoclave, and microwave) for disinfection of extracted teeth.

MATERIALS AND METHODS

Noncarious, unrestored teeth were collected and stored in saline until the start of the study (n = 300). An endodontic access was prepared according to Dominici *et al.,* [7] and then the teeth were divided into five groups according to the type of microorganisms that inoculated inside the pulp chamber as follows:

Group 1 = 60 teeth inoculated with *Proteus* species.

Group 2 = 60 teeth inoculated with *Escherichia coli.*

Group 3 = 60 teeth inoculated with *Kelebsiella* species.

Group 4 = 60 teeth inoculated with *Staphylococcus aureus.*

Group 5 = 60 teeth inoculated with *Streptococcus mutans*

The cultures of the used bacteria were isolated and identified at Dept. of Dental Basic sciences laboratories [8-10].

The teeth were placed in a sterile saline for 24 hour ,the groups were subdivided into five groups (10 teeth in each) according to the type of disinfection that used to kill the microorganisms used in this study .

Group A: Teeth were immersed in 2.5% NaOCl for 1week. (Household bleach, Clorox, Turkey).

Group B: Teeth were immersed in 1% NaOCl for 1week. (Household bleach, Clorox, Turkey).

Group C: Teeth were autoclaved at 121C for at 15 Ibs for 15 minutes.

Group D: teeth disinfected by using microwave for 3 minutes.

Group E: Teeth disinfected by using microwave for 6 minutes.

Group F: control group in which the teeth immersed in normal saline for seven days at room temperature.

The teeth in treatment groups(C, D .E and F) were placed in a glass beaker with 100ml of saline (10 teeth/group) to prevent teeth from dehydration when some of saline solution evaporated during autoclave and microwave cycle [11].

Following the assigned treatment procedure and time period, teeth from each group were aseptically split with sterile dental tweezers and placed into separated test tubes containing Brain heart infusion broth (Oxoid). The test tubes containing individual teeth were placed for 48 hours at 37C in an incubator. Evidence of growth was observed using the McFarland turbidity indicator. Data was collected, and statistical analysis was performed.

Results

The results are shown in Tables (1-5).

Table (1): Effect of Disinfectants on *Proteus spp.*

Type of Disinfection Method	Number of the Teeth	Percentage of No growth
A(2.5% NaOCl for 1week)	10	100%
B(1% NaOCl for 1week)	10	20%
C(autoclaved at 121C for at 15 Ibs for 15 minutes)	10	100 %
D(microwave for 3 minutes)	10	100%
E(microwave for 6 minutes)	10	100%
F(Normal saline for seven days at room temperature)	10	0%

Table (2): Effect of Disinfectants on *Escherichia coli.*

Type of Disinfection Method	Number of the Teeth	Percentage of No growth
A(2.5% NaOCl for 1week)	10	100%
B(1% NaOCl for 1week)	10	20%
C(autoclaved at 121C for at 15 Ibs for 15 minutes)	10	100 %
D(microwave for 3 minutes)	10	100%
E(microwave for 6 minutes)	10	100%
F(Normal saline for seven days at room temperature	10	0%

Table (3): Effect of Disinfectants on *Kelebsiella* species

Type of Disinfection Method	Number of the Teeth	Percentage of No growth
A(2.5% NaOCl for 1week)	10	100%
B(1% NaOCl for 1week)	10	20%
C(autoclaved at 121C for at 15 Ibs for 15 minutes)	10	100 %
D(microwave for 3 minutes)	10	100%
E(microwave for 6 minutes)	10	100%
F(Normal saline for seven days at room temperature	10	0%

Table (4): Effect of Disinfectants on *Staphylococcus aureus*

Type of Disinfection Method	Number of the Teeth	Percentage of No growth
A(2.5% NaOCl for 1week)	10	100%
B(1% NaOCl for 1week)	10	10%
C(autoclaved at 121C for at 15 Ibs for 15 minutes)	10	100 %
D(microwave for 3 minutes)	10	100%
E(microwave for 6 minutes)	10	100%
F(Normal saline for seven days at room temperature	10	0%

Table (5): Effect of Disinfectants on *Streptococcus mutans*

Type of Disinfection Method	Number of the Teeth	Percentage of No growth
A(2.5% NaOCl for 1week)	10	100%
B(1% NaOCl for 1week)	10	0%
C(autoclaved at 121C for at 15 Ibs for 15 minutes)	10	100 %
D(microwave for 3 minutes)	10	100%
E(microwave for 6 minutes)	10	100%
F(Normal saline for seven days at room temperature	10	0%

All results showed that autoclave, microwave (when used at six and three minutes), sodium hypochlorite at 2.5% completely prevented the growth of all types of the bacteria used to infect the teeth.
When sodium hypochlorite used at 1% concentration it showed only 20% bacterial reduction in group 1, 2, 3 and 10 % bacterial reduction in group 4 and 0% bacterial reduction in group 5. While the group of the teeth that immersed in normal saline showed 100% bacterial growth.

DISCUSSION

Before the use of the teeth in dental educational exercises, the teeth first should be cleaned of adherent patient materials and disinfected because they were contaminated with different microorganisms as the blood is the major cause of cross infection with different disease like hepatitis B. The result of present study showed that the immersion of the extracted teeth for seven days in 2.5% sodium hypochlorite, autoclaving at 121C, 15 Ibs for 15minutes and the use of the microwave six or three minutes were effective in disinfecting the extracted human teeth. While, the use of 1% sodium hypochlorite is less effective than other methods. This may be may due to penetration of the agent into pulp space at this concentration [11]

Therefore 1% sodium hypochlorite should not be used to disinfect teeth for laboratory/ research use.

With regard to autoclaving, there is a concern about using it for sterilization of extracted teeth with amalgam restorations as it may release mercury vapors in the air through exhaust residual mercury contamination of autoclave [1, 11].

The disinfection procedure should not affect the characteristics of the tooth structure; therefore farther study needs to evaluate the effect of the use of microwave, autoclave and sodium hypochlorite for disinfection of the teeth on the physical property of the teeth.

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