Original Research Article

Journal of College of Medical Sciences-Nepal, Vol-20, No.1, Jan-Mar 2024
ISSN: 2091-0657 (Print); 2091-0673 (Online) Open Access
DOI:10.3126/jcmsn.v20i1.59077

Comparative Analysis of Extracted Human Teeth Sterilization by Using Distinctive Sterilizing Agents

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ABSTRACT

Background

Regular use for practice and educational purposes of Extracted human teeth in dental institutions at undergraduate and postgraduate levels is a necessity. Individuals who collect extracted teeth must decontaminate and then handle teeth. Different materials and methods are used for sterilizing extracted teeth to avoid infection from them.

Methods

Total of 50 freshly extracted human teeth that were intact, non-carious and extracted due to periodontal disease or orthodontic purpose were divided randomly into 5 groups consisting of 10 teeth in each group.These were stored in sterile saline till tested and will randomly be divided into one of the following 5 groups of sterilizing agents consisting of 5.25% sodium hypochlorite, 10% formalin, 2% glutaraldehyde, Microwave Radiation and a control group with normal saline. All teeth will be immersed in separate bottles. Samples were collected with the help of inoculating loop and then streaked over the surface of Mc-conkey agar medium. The media was incubated at 37 degree C for 24 h. Sterilization was determined based on the growth of micro-organisms on culture medium. Evidence of growth was observed after 24 hour of inoculation. Absence of any visible growth in the media was the indicator of an effective sterilization.

Results

This research showed that, 10% formalin, 5.25% sodium hypochlorite could be efficiently used for sterilization and disinfectionof extracted human teeth.

Conclusions

Extracted teeth are potential source of infection hence should be disinfected before any use in the laboratories.

Keywords: extracted human teeth; sodium hypochlorite; formalin; culture media.

INTRODUCTION

Intact extracted human teeth are used by undergraduate and postgraduate dental students to develop their mechanical and clinical skills for treating patients. Extracted human teeth are used for in vitro laboratory dentin bonding research, before clinical trials ultimately decide their clinical effectiveness.[1] Extracted teeth serve a low budget substitute to typodont. There are instances where even typodont cannot replace extracted teeth. These include preparing the ground sections and in vitro dentin bonding research.[1] Ground sections of teeth or bone are considered best solutions for the study of any hard tissues in the study of histopathology. Various studies have been performed like progression of dental caries, enamel studies, dentin studies, cementum annulation studies, bone morphologies, age determination studies, etc.[2] Freshly extracted teeth are by their nature a potential source of cross contamination to laboratory equipments, therefore newly extracted teeth must be decontaminated.[3]

METHODS

A total 50 permanent extracted human teeth collected

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from the department of oral and maxillofacial surgery of Universal College of Medical and Dental Sciences, Bhairahawa, Nepal and dental clinics in peripheral regions in Bhairahawa. The teeth were stored in sterile saline till tested and were randomly divided into one of the following 5 groups consisting of 10 teeth in each group. Group 1: Teeth were immersed in 20 ml of 5.25% sodium hypochlorite at 37 degree C for 7 days. Group 2: Teeth were immersed in 20 ml of 10% formalin at 37 degree C for 7 days. Group 3: Teeth were immersed in 20 ml of 2% glutaraldehyde at 37 degree C for 7 days Group4: A total of 10 teeth were treated with microwave irradiation at 650 W for 3 min. Group 5: This included a control group, in which teeth were immersed in normal saline. All teeth were immersed in separate bottles. Following the assigned treatment procedures, teeth from each group were placed individually in separate test tubes.

Collection of sample:

In order to obtain samples metal transfer loop was first flamed till it turned red-hot then allowed to cool. The loop was dipped in a tube containing teeth. The samples were then streaked over the surface of Mc-conkey agar medium. The media was incubated at 37 degree C for 24 h.

Determination of Sterilization

Sterilization was determined based on the growth of micro-organisms on culture medium. Evidence of growth was observed after 24 h of inoculation. Absence of any visible growth in the media was the indicator of an effective sterilization. This prospective cross-sectional study was approved by the institutional review committee (IRC). Ethical approval letter no. UCMS/IRC/016/23. Period of study was from 19th July 2023 to 23rd August 2023.

RESULTS

It was observed that no growth on culture media after sterilization was seen with teeth immersed in 10% formalin for 7 days, 5.25% sodium hypochlorite for 7 days thus indicating complete sterilization. These agents showed 100% efficacy in sterilizing extracted teeth as compared to other methods. The least successful method among various chemicals used were, normal saline and teeth with microwave radiation for sterilization, while 2% glutaraldehyde showed 60% efficacy. (Table 1).

DISCUSSION

In our study as shown in table no.1, 10% formalin is 100% efficient to sterilize human extracted teeth, this is in accordance with the finding of Tijare, et al.[4] and Tabrizizadeh M. et al.[5] In their study they found that only 10% formalin was effective in sterilizing/ disinfecting all the extracted teeth. Our results are in accordance with observations made by Kumar et al,[6]Lolayekar et al[7] and Dominici et al,[8] who also observed 10% formalin, 5.25% sodium hypochlorite and autoclaving were the best methods of sterilization. A study by Abdul-Rahman et al[9] showed that the immersion of the extracted teeth for 7 days in 2.5% sodium hypochlorite, autoclaving at 121 degree C, 15 lbs for 15 minutes were effective in disinfecting the extracted human teeth, which is also our finding in this study. In our study we found that 2% glutaral-

Table 1. Comparison of efficacy of different methods used and teeth disinfected/sterilized.

Type of sterilizer/ disinfectant used	Duration (days)	No. of teeth studied	No. of teeth disinfected/ sterilized	% Age efficacy of different disinfectant solutions
5.25% Sodium hypochlorite	7	10	10	100
10% Formalin	7	10	10	100
2% glutaraldehyde	7	10	6	60
Micro Wave Radiation	160 W 3 min	10	0	0
Normal saline	7	10	0	0

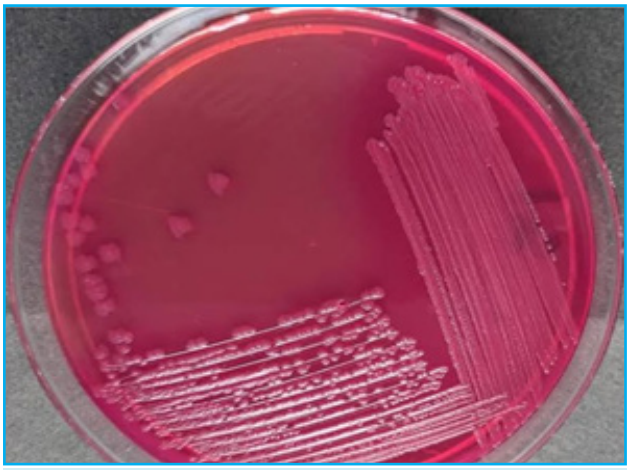

Figure 1. Growth of micro-organisms on Mc-conkey Agar.

dehyde was 60% effective in sterilizing the extracted teeth this is in accordance to study done by Sandhu et al. in which they found that 2% glutaraldehyde was 73% effective in sterilization.[1] In our study, the main drawback was while dealing with formalin as, formalin is dangerous, irritant and a probable carcinogen. Proper care and appropriate armamentarium were used while handling it.[10] Our outcomes are also in accordance with Nishant et al.[12] They have come to the conclusion in their study that 10% formalin, 5.25% sodium hypochlorite were 100% effective in disinfecting/sterilizing all the extracted teeth when immersed for a period of 7 days[12]

CONCLUSIONS

This study concluded that, 10% formalin ,5.25% sodium hypochlorite could be efficiently used for sterilization and disinfection of extracted human teeth. hence could be efficiently used for sterilization and disinfection of extracted human teeth.

Conflict of interest: None

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Citation: Nishant, Sharma BS, Chandel SS, Rajput N. Comparative Analysis of Extracted Human Teeth Sterilization by Using Distinctive Sterilizing Agents. JCMS Nepal. 2024; 20(1): 84-6.