

Elementary Elimination of Extracted Tooth

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Abstract: Human tissues such as biopsy specimens, extracted teeth, body organs despite considered as a low to negligible risk to the handlers and the community, aesthetic factors and community expectations need to be considered when managing and disposing of these wastes. Biomedical waste (BMW) can be any solid, liquid or fluid waste including its container and any intermediate products. Though considerably less amount of waste generated by dental practitioners, environmental safe disposing of extracted teeth is still a difficult task faced by every dentist across the world. However usually in dental hospitals the general wastes and BMWs are allowed to mix due to lack of negligence and awareness that gives a green signal for easy transmission of HIV, HBV, Hepatitis C to health care and sanitation workers. This study is an attempt by using acid treatment as an alternate method to dispose extracted teeth in order to combat the issue of improper disposal that may lower the burden on waste disposal work, a more efficacious waste disposal system and cost saving.

Keywords: Acid treatment, Biomedical waste, Disinfection, Elementary method, Infection control

1. Introduction

Dental practices produce large amounts of waste such as plastic, latex, cotton, glass and other materials, most of them are contaminated with infected body fluids. They also produce other type of wastes like teeth extracted, fillings and various chemical solvents. Biomedical waste describes both the non-anatomic and anatomic wastes produced by practitioners¹. It has been specified in the notification of government of India 1998 that hospital waste management is a responsibility of hospital hygiene and care. The appropriate knowledge and regular practice of proper disposal by colour coded disposing bags among the dentists, attenders and auxiliaries is still in question due to lack of negligence². Dental students practice their preclinical skills on artificial teeth models and extracted teeth to learn numerous dental procedures. The occupational safety and health administration (OSHA) blood borne pathogens standard considers the human teeth used for research and teaching purposes as a potential source of blood borne pathogens³. The only acceptable method of disposal of human waste is incineration that requires skill and knowledge when managing and disposing of these wastes from other waste streams that do not require incineration⁴.

2. Aim of the Study

The aim of the present study is to efficiently and effectively use acids as a method of disposing the extracted teeth, the most frequently generated waste by the dental practitioners.

3. Methodology

Thirty extracted human natural teeth were used for the study. All teeth were non-carious and had been extracted because of periodontal reasons or orthodontic purposes that were discarded. The teeth were kept in optimum disinfectant 5% sodium hypochloride solution at room temperature before the start of the experimental procedure (Fig-1). Aqueous solution of hydrochloric acid (HCl): 25 ml (14.6 ml of 37% HCl + 10.4 ml of water) was used for the acid treatment of

the teeth to be disposed. The teeth were observed for morphological changes at various intervals from the time of immersion. The specimens were under observation until they had completely dissolved or completely precipitated. The resultant solution is neutralized with 10% sodium hydroxide to obtain disinfected water and salt which can be easily disposed domestically.

4. Results

In the present study four stages of morphological changes was observed. The effervescence was observed in the solution after 15 minutes of immersion (Fig-2)

Stage 1:- stage of transparency: -Following the effervescence this transparency was witnessed at the incisal edge at 1 hour (Fig-3).

Stage 2:- stage of progressive dissolution: - transparency was progressively increased up to 8 hours (Fig-4, 5).

Stage 3:- stage of disintegration: -After 8-20 hours of immersion, disintegration of the crown and root was noticed. (Fig-6)

Stage 4:- stage of established dissolution: - After 24-26 hours of immersion in HCl, there was complete dissolution of the tooth (Fig-7).

Neutralization: -The acid free of teeth remnants obtained after 26 hours is treated with 10% sodium hydroxide acting as a base for neutralizing the above solution results in formation of salt and water (Fig-8, 9). The obtained water and salt are of simple form which can be disposed as routine domestic waste since the salt and water obtained are disinfected and also neutralized hence harmless and safe.

5. Figures



Figure 1: The teeth were kept in optimum disinfectant at 5% sodium hypochloride.



Figure 2: The effervescence was observed in the solution after 15 minutes



Figure 3: Transparency was witnessed at the incisal edge at 1 hour



Figure 4, 5: Transparency was progressively increased up to 8 hours



Figure 6: After 8-20 hours of immersion, disintegration of the crown and root



Figure 7: Complete dissolution of the tooth



Figure 8: The acid free of teeth remnants treated with 10% sodium hypochloride results in formation of salt and water



Figure 9: The acid free of teeth remnants treated with 10% sodium hydroxide results in formation of salt and water.

6. Discussion

Biomedical waste management (management and handling) rules 1998 was assessed by the ministry of development and forests to halt the incorrect practices of BMW management. These rules were proposed to safeguard the society, patients and health care workers from the harmful effect of infectious waste^{1, 2}. According to awareness and evaluation study conducted by Bangennavar et al showed only 47% dentist were aware about use of yellow bags for discard human anatomical waste which includes extracted teeth, 19% dentists were aware of 10 categories of BMW disposal. In a study carried out by Sanjeev et al, Ingle et al, Sudhir et al respectively opined that any plastic bags can be used for waste segregation. The plastic bags that are used for waste disposal are particular bags that are non-chlorinated and thus can be incinerated. Normal plastic bags if used can release toxins, dioxins and furans resulting in environmental pollution². The Center for disease control and prevention(CDC) has adopted guidelines for infection control of the extracted teeth used for research and teaching, imposing their sterilization before use to minimize the risk of transmission of blood borne pathogens. Various new methods of sterilization have been introduced with negligible effect on tooth structure such as gamma radiation, high pressure, chemicals or gases^{3, 4}. The current practice of disposing of extracted teeth is as follows:-

- 1) All extracted teeth should be stored in a well-constructed container with secure lid and labelled with biohazard symbol.
- 2) Common house hold bleach (1:10) dilute with water or formalin, used as a fixative.
- 3) Teeth must be placed in a sealable, clear yellow plastic bag secondary to placing in the container in the event of possible leak.
- 4) Transported to a certified waste carrier for disposal by incineration⁵.

Incineration is a high temperature dry oxidation process that reduces organic and combustible waste to inorganic incombustible matter and results in a very significant reduction of waste- volume and weight. The process is usually selected to treat wastes that cannot be recycled, reused or disposed off in a land fill site. In the process of incineration; incinerators reduce the waste by burning it after the incinerator is initially fired up with gas or other combustible material. The process is then sustained by the waste itself. Complete waste combustion requires a temperature of 850° C for at least two seconds but most plants raise it to higher temperatures to reduce organic substances containing chlorine. Flue gases are then sent to scrubbers which remove all dangerous chemicals from them. To reduce dioxin in the chimneys where they are normally formed, cooling systems are introduced in the chimneys. Chimneys are required to be at least 9 meters above existing structures

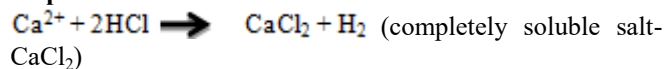
The high cost of incineration plant has been a turnoff for municipal authorities and is only now being addressed with the introduction of waste to energy(WTE) plants. The need for huge waste to incinerate has led to abandonment of other plans for recycling and reuse of waste. Dioxins are produced in the treatment and is a cancer forming chemical. These are produced in the smoke stack. The plants require skilled personnel for operation and continuous maintenance⁵.

Kiran Jadhav et al in his study on post-mortem identification in forensic identification revealed that there are very few studies that have actually focused on the issue of destruction of the human body by chemical means and the issue of positive identification after acid dissolution⁶. There is brief mention in the Italian journal Archivio di Medicina Legale of an experimental animal destruction in an acidic environment⁷. The availability of the different acids showed that hydrochloric acid and sulfuric acid are more easily available commercially than is nitric acid. As far as the cost factor is concerned, hydrochloric acid is cheaper than sulfuric acid and nitric acid. Hydrochloric acid is a colorless, highly pungent solution of hydrogen chloride (HCl) in water. It is a corrosive, strong mineral acid with many industrial uses. Hydrochloric acid is found naturally in gastric acid. When it reacts with an organic base it forms a hydrochloride salt. It has numerous smaller-scale applications, including household cleaning, production of gelatin, descaling, and leatherprocessing^{7,8}.

In the present study the tooth is first disinfected to avoid contamination or cross infection. Following the acid treatment after 26 hours the solution obtained was found to be free of teeth remnants suggestive of completion of the

process. The obtained solution was treated with an alkali so as to neutralize for effective disposal. After neutralization by acid base reaction the by-product obtained was uncontaminated, disinfected water accompanied by a salt.

Step 1:- Acid Treatment



Step 2:- Neutralization



The obtained water and salt are of simple form which can be disposed as routine domestic waste^{8, 9}. The observed morphological changes may vary when the concentration of the acid used is different from that used in the present study; however, it must be noted that the concentrations that used are the ones that are most commonly available commercially and safe.

7. Conclusion

With the advent of diseases like AIDS, Hepatitis B and their increasing prevalence in health care workers and other personnel working in health care institutes it become important to have proper waste management. This method of acid treatment of an extracted tooth may pave way as an elementary method of biomedical waste disposal.

8. Future Perspectives

Most dentists were aware of the hazardous effect of improper disposal of dental waste; majority of them still practiced improper waste disposal. There is need to retrain the practitioners on the importance and new technologies of proper waste disposal.

9. Conflict of Interest

Nil

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