ISSN:0975-1459
Journal of Pharmaceutical Sciences and Research
www.jpsr.pharmainfo.in
Radhika MI et al /J. Pharm. Sci. & Res. Vol. 12(1), 2020, 100-102

Morphohistological changes observed in human teeth following Incineration – An observational study.

Radhika MI[1], Nithya J [2], Mahesh Ramakrishnan [3]

1. Graduate student,Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences,Saveetha University, Chennai, India

2.Senior Lecturer , Department of Dental Anatomy, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India

3. Reader, Department of Pedodontics,Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India

Abstract

Background : Teeth are amongst the most resilient elements of the human skeleton and are often utilized in routine forensic investigation involving the identification of unknown remains. Teeth exposed to thermal stress have the potential not only to aid in identification but also in understanding circumstances surrounding the fire. Thus it can indicate the history of exposure to thermal conditions.

Aim: To understand the effect of extreme temperatures on human teeth and to determine the morphological and histological changes in teeth when subjected to various ranges of high temperatures.

Materials and methods: Freshly extracted 30 teeth will be collected and divided into 6 groups. Each group will be subjected to different temperature ranges starting from 200 degrees to 400 degrees each. The histological and morphological changes will be observed at various intervals of time.

Key words: Forensic Identification, Healthy teeth, morphology and histology

INTRODUCTION

Human Identification is one of the main fields of study in forensic science as it deals with the human body and targets establishment of human identity. Dental identification is one of the most reliable and most frequently used techniques for identification, and forensic odontology is a specialty itself.

Various events can lead to burned skeletal remains; these may include transport accidents, terrorist attacks, suicides, etc. Among many investigating procedures, fire investigation poses a challenge because it not only involves investigations concerning the origin of fire but also its cause and the identification of the victims affected. In some accidents, it is possible that victim identification becomes nearly impossible owing to complete loss of soft tissues. In such a circumstance, dental evidence can provide a clue to solve the mystery of victim identification, because the dental structures are the last to get destroyed under extreme conditions, whether it is temperature, acid or putrefaction. This is because they are extremely hard and are encases in both hard and soft tissue casing.

A clear understanding if the physical and histological changes observed in teeth after they are subjected to high temperatures can provide clues in fire and crime investigations, when dental evidence remains. Therefore the present study was undertaken to observe the structural damage in freshly extracted teeth when subjected at high temperatures for a certain period of time, and to correlate the physical and microscopic observations with the temperature.

This study aimed to determine the relation of color changes that occur post heating with fragility to aid in proper handling of samples in a forensic scenario will play a major role in mass disasters where there is extensive loss of other tissue components. Hence assessment of tooth Morphohistology following incineration will play a major role in forensic dentistry.

MATERIALS AND METHODS

Freshly extracted 30 teeth were collected and fixed in Formalin. After extraction, the individual teeth were collected and debrided with a solution of hydrogen peroxide rinsed well with tap water and then fixed in formalin. The teeth were categorized into 6 groups, based on the temperatures they were exposed to and the time for which they were kept. Group A consisted of teeth subjected to 200 degrees C for 10 minutes; Group B consisted of teeth subjected to 200 degree C for 30 minutes. Group C comprised of teeth subjected to 300 degrees C for 10 minutes and group D consisted of teeth subjected to 300 degrees C for 30 minutes. Group E consisted of teeth subjected to 400 degrees C for 10 minutes and group F consisted of teeth subjected to 400 degrees C for 30 minutes. Special Trays were used to expose the teeth at specific temperatures, and these were placed in the furnace. These were exposed to the temperatures ranging from 200 to 400. Teeth were then examined for any physical changes that could have occurred. These changes include change in color, texture, morphology etc.

Thin sections of each tooth were made and observed under the microscope for any histological changes.

RESULTS:

Physical Changes in *Group A*

a) Colour: The color of the crown and root changed from yellowish white to dark yellow

b) Texture: Small micro fractures on the surface of the root

c) Morphology: No significant change in the morphology of the tooth

Group B

a) Colour: the colour of the root changes to a yellowish brown

b) Texture: Micro fractures can be seen on the surface of the root

c) Morphology: Root tips are broken

Group C

a) Colour: The colour of the root changes to a light steel gray

b) Texture: Surface of root becomes hard and flak

c) Morphology: root tips may tend to break

Group D

a) Colour: the colour of the crown becomes a light yellow, roots turn into light gray

b) Texture: Surface of root becomes hard and flaky

c) Morphology: Root tips tend to break

Group E

a) Colour: Root colour changes to brown colour, enamel colour changes from white to yellowish white.

b) Texture: Surface of the root is rough

c) Morphology: Crown is broken into pieces whereas the root remains intact

Group F

a) Color: Root colour changes to dark brown colour, enamel colour changes from white to yellowish white.

b) Texture: Surface of the root is rough

c) Morphology: Root shows fracture

Fig. 1: Group A after incineration

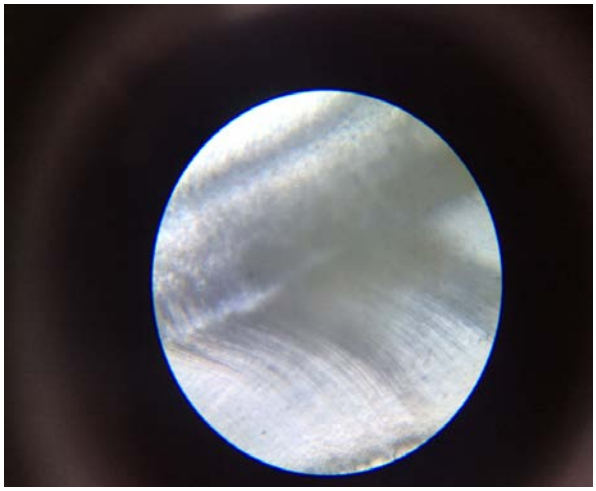

Fig. 2: Group B – Stain ability of the cells decreases, dentinal tubules show uniform widening

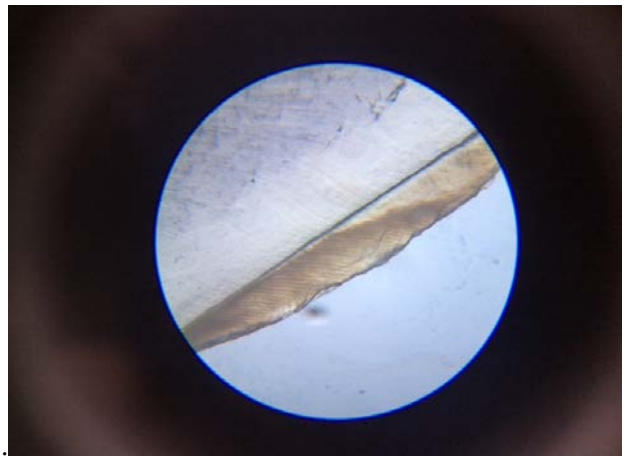

Fig. 3: Group D: Dentin demonstrates irregular dilation of tunules, browning of dentin

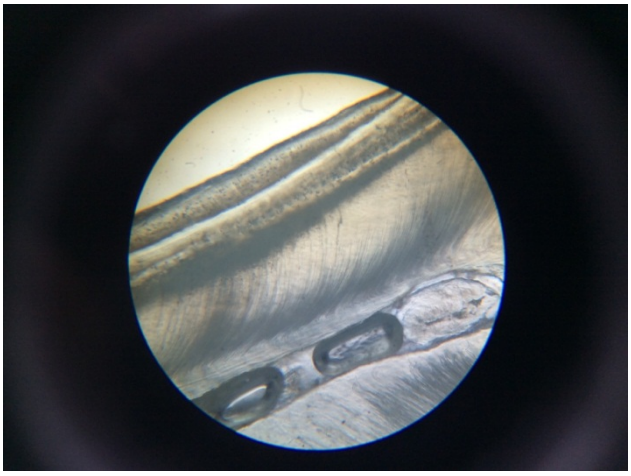

Fig. 4: Group D: uniform widening of dentinal tubules, wicker basket pattern of arrangement of tubules, inability to differentiate between enamel and dentin

DISCUSSIONS

The establishment of forensic odontology is a unique discipline that has been attributed to Dr, Oscar Amoedo, the father of Forensic Odontology. [3] Identification of victims after disasters may become difficult because of the complete loss of soft tissues. In such instances, the dental remains can prove to be of some value because they are extremely hard and can resist temperatures to a certain extent. The knowledge of the morphology of incinerated teeth, including their histology is an important part of forensic fire investigation where the investigators can use this unique nature of teeth to identify victims. Morphological changes can provide useful information about the temperature and duration of exposure to fire. [1]

CONCLUSION

Evaluation of dental remains can provide additional and more accurate forensic information in victim identification because of the accuracy of morphological changes, the histological patterns at temperatures that are encountered in accidents such as bomb blasts, house fires, suicide attacks, etc. A larger sample size, more temperatures and variations in the teeth will provide more reliable data for practical implications.

REFERENCES:

1. Prakash AP, Reddy SDP, Rao MT, Ramanand OV. Scorching effects of heat on extracted teeth - A forensic view. Journal of Forensic Dental Sciences. 2014;6(3):186-190.
2. Bagdey SP, Moharil RB, Dive AM, Thakur S, Bodhade A, Dhobley AA. Effect of various temperatures on restored and unrestored teeth: A forensic study. J Forensic Dent Sci 2014;6:62-6
3. Pol CA, Gosavi SR. Scanning electron microscopic analysis of incinerated teeth: An aid to forensic identification. Journal of Oral and Maxillofacial Pathology : JOMFP. 2014;18(1):32-35. 4. Patidar KA, Parwani R, Wanjari S. Effects of high temperature on different restorations in forensic identification: Dental samples and mandible. J Forensic Dent Sci. 2010;2:37–43.
5. Bose RS, Mohan B, Lakshminarayanan L. Effects of elevated temperatures on various restorative materials: An in vitro study. Indian J Dent Res. 2005;16:56–60.
6. Uma Maheswari T N. Dental biometrics. Int J Forensic Odontol 2017;2:45
7. Merlati G, Danesino P, Savio C, Fassina G, Osculati A, Menghini P. Observations on dental prostheses and restorations subjected to high temperatures: Experimental studies to aid identification processes. J Forensic Odontostomatol 2002;20:17-24.