IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

Mouthful of Evidence: How teeth tells tales in forensic cases - An In Vitro study

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Abstract : This study investigates the efficacy of impregnated Porcelain-Fused-to-Metal (PFM) and Metal crowns in retaining surface details and identification marks when exposed to varying temperatures and time intervals, simulating the conditions of charred bodies. Six extracted teeth, prepared with identification marks, were subjected to different temperatures (400-1200°C) for 5 minutes, followed by gradual cooling. Results show that the indentations on both PFM and Metal crowns remained intact, even at extreme temperatures, demonstrating their potential as a reliable means of identification in forensic cases. This research contributes to the field of forensic odontology, highlighting the significance of dental evidence in identifying human remains.

Index Terms – Dental materials, Dental records, Forensic science, Victim identification, Radiographs .

INTRODUCTION

Forensic dentistry, a specialized field of dental medicine, plays a vital role in the pursuit of justice and truth. By applying dental expertise to legal issues, forensic dentists help solve crimes, identify human remains, and resolve disputes. With their unique blend of dental knowledge and investigative skills, forensic dentists analyse dental evidence to[(1).]

- Identify victims of mass disasters, homicides, and accidents.
- Verify identities in cases of missing persons or suspected fraud.
- Analyse bite marks and dental impressions to link suspects to crime scenes.
- Estimate age, sex, and ancestry from dental remains.
- Reconstruct dental profiles to aid in facial reconstruction.

This article will delve into the fascinating world of forensic dentistry, exploring its applications, techniques, and impact on criminal investigations and legal proceedings. By examining real-life cases and expert insights, we'll uncover the significance of forensic dentistry in uncovering the truth and bringing justice to victims and their families.

MATERIALS AND METHODS:

The armamentarium used in this study consisted of:

- Porcelain-fused-to-metal (PFM) and metal crowns.
- An incinerator (Touch & Press DENTSPLY).
- A digital operating microscope.

The methodology employed in this study involved:

- Collecting six extracted teeth that had undergone root canal treatment,
- Preparing the teeth for crown placement and creating a unique identification mark on each tooth,
- Fabricating three PFM and three metal crowns, for 400 ℃, 800℃ and 1200℃ $respectively$ which were

then divided into two groups ,experimental and control group(teeth were not subjected to any temperature).

- Subjecting the crowns to varying temperatures and time intervals to assess their durability and resistance to heat,

The teeth were exposed to a controlled thermal environment, where they were:

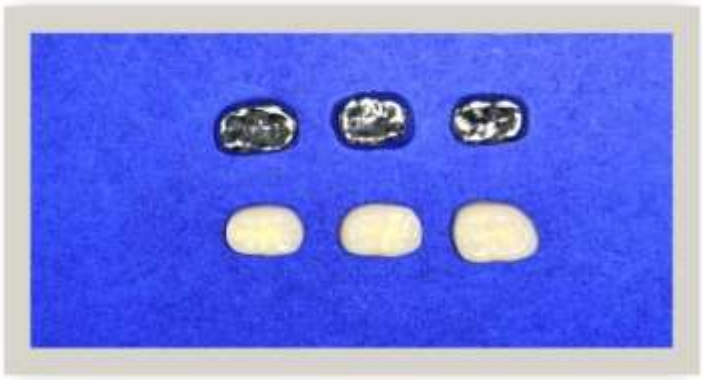
- Heated gradually to a predetermined temperature
- Maintained at that temperature for a duration of 5 minutes
- Allowed to cool gradually to ambient temperature

This thermal cycling process was designed to simulate the effects of extreme temperatures on the teeth and crowns, enabling an assessment of their thermal resistance and durability.

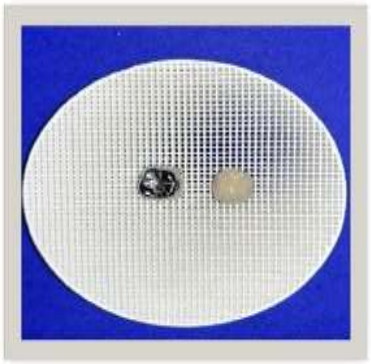
- Teeth were then examined for any physical changes that occurred. These changes included:

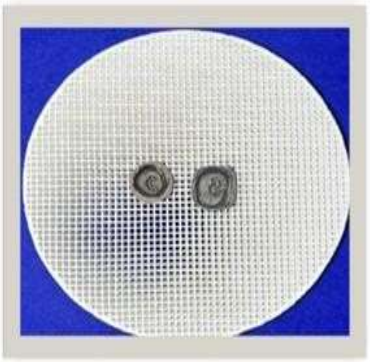
1.Cracks,2.Melting,3.Blistering,4.Effect on indentation,5.charring.

PRE-OPERATIVE PHOTOGRAPHS

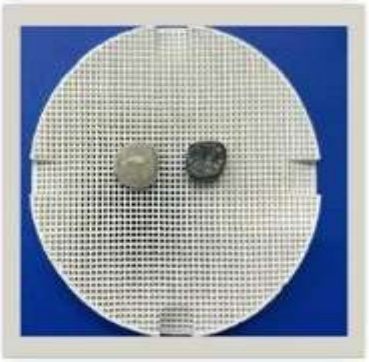


BURNING AT 400°C





BURNING AT 1200℃


DISCUSSION:

The quest for reliable methods of human identification has long been a pressing concern, with forensic odontology emerging as a vital tool in this pursuit [(1).] The unique characteristics of dental evidence have led some to propose forensic odontology as the sole means of positive identification in certain cases [(2).]

The exposure of human remains to extreme temperatures during fires poses significant challenges for identification purposes. Temperatures can vary widely depending on factors such as the location of the fire, duration of combustion, type of oxidant, and firefighting agents employed [(3)] . For instance, petrol combustion can reach temperatures of 800-1100°C, while cremation and house fires can reach 871-983°C and 649°C, respectively [(4).]

In light of these factors, this study investigated the effects of temperatures ranging from 400 to 1200°C on dental crowns, with an alphabet indented on each crown for identification purposes.[(5)] This temperature range was selected to simulate the varying conditions encountered in fire accidents. The results of this study contribute to the growing body of research on the application of forensic odontology in human identification, particularly in cases where extreme temperatures have compromised traditional identification methods.[(9).]

CONCLUSION:

The significance of dentistry in identifying victims of large-scale disasters cannot be overstated. As such, it is imperative for dental team members to maintain accurate, comprehensive, and accessible patient records [(1)]. This study's findings underscore the importance of dental evidence in identification processes, particularly in cases where traditional methods are compromised.

Notably, the results of this study demonstrate that indentations on both PFM and metal crowns remain unaffected even after exposure to extreme temperatures of up to 1200°C. This suggests that indentations can serve as a unique identifying factor for victims with charred bodies, where other identification methods may be unavailable or require extended periods [(2).]

The implications of this study are profound, as it highlights the potential for dental evidence to play a critical role in disaster victim identification. Furthermore, the durability of indentations on dental crowns under extreme temperatures reinforces the importance of meticulous record-keeping and documentation in dentistry [(3).]

In conclusion, this study contributes to the growing body of research on forensic odontology, emphasizing the significance of dental evidence in identification processes.[(7)] The findings of this study have far-reaching implications for disaster response and victim identification, underscoring the critical role of dental professionals in these efforts.

REFERENCES :

1. Patel A, Parekh V, Kinariwala N, Johnson A, Gupta MS. Forensic Identification of Endodontically Treated Teeth after Heat- Induced Alterations: An In Vitro Study. Eur Endod J 2020; 3: 271-6Patel A, Parekh V, Kinariwala N, Johnson A, Gupta MS. Forensic Identification of Endodontically Treated Teeth after Heat-Induced Alterations: An In Vitro Study. Eur Endod J 2020; 3: 271-6V.
2. Gupta KK, Johnson A. A morphological and radiological assessment of teeth in variable incinerated temperature-An experimental study. Journal of Punjab Academy of Forensic Medicine & Toxicology 2020; 20(1).
3. Vishwanath V, Rao HM. Gutta-percha in endodontics - A comprehensive review of material science. J Conserv Dent 2019; 22(3):216–22.
4. Ranganath, A., & Nasim, I. (2017). Effect of high temperatures on root canal obturation–an aid in forensic identifications. Journal of Advanced Pharmacy Education & Research, 7(3):256-258.
5. Reesu, G. V., Augustine, J., & Urs, A. B. (2015). Forensic considerations when dealing with incinerated human dental remains. Journal of forensic and legal medicine, 29, 13-17.
6. Pinchi, V., Pradella, F., Buti, J., Baldinotti, C., Focardi, M., & Norelli, G. A. (2015). A new age estimation procedure based on the 3D CBCT study of the pulp cavity and hard tissues of the teeth for forensic purposes: A pilot study. Journal of forensic and legal medicine, 36, 150-157.
7. Silva, R. F., Franco, A., Picoli, F. F., Nunes, F. G., & Estrela, C. (2014). Dental identification through endodontic radiographic records: A case report. Acta stomatologica Croatica, 48(2), 147- 150.
8. Star, H., Thevissen, P., Jacobs, R., Fieuws, S., Solheim, T., & Willems, G. (2011). Human dental age estimation by calculation of pulp–tooth volume ratios yielded on clinically acquired cone beam computed tomography images of monoradicular teeth. Journal of forensic sciences, 56, S77-S82.
9. Bonavilla, J. D., Bush, M. A., Bush, P. J., & Pantera, E. A. (2008). Identification of incinerated root canal filling materials after exposure to high heat incineration. Journal of forensic sciences, 53(2), 412-418.
10. Edson, S. M., Ross, J. P., Coble, M. D., Parson, T. J., & Barritt, S. M. (2004). Naming the deadconfronting the realities of the rapid identification of degraded skeletal remains. Forensic Science Review, 16(1), 63-88.M.