|| Print ISSN: 2589-7837 || Online ISSN: 2581-3935 ||
International Journal of Medical Science and Diagnosis Research (IJMSDR)
Available Online at www.ijmsdr.com
NLM (National Library of Medicine ID: 101738824)
Review Article
Volume 6, Issue 3; March: 2022; Page No. 01-04

# Ameloglyphics – A New Thought to Forensic Odontology, A Review

**Subhajit Jana[1], Abhishek Banerjee[2], Abhinandan[3], Ipsita Bhakta[1], Chatterjee Abhishek [4]**

**[1]PGT, Oral and Maxillofacial Pathology, Awadh Dental College and Hospital, Jamshedpur**

**[2]Associate Professor, Oral and Maxillofacial Pathology, Awadh Dental College and Hospital, Jamshedpur**

**[3]Professor, Oral and Maxillofacial Pathology, Awadh Dental College and Hospital, Jamshedpur**

**[4]Clinical Tutor cum demonstrator, Oral and Maxillofacial Surgery, Bardhaman Dental College Hospital, Bardhaman.**

**Conflicts of Interest: Nil**
**Corresponding author: Dr Abhishek Banerjee**
**DOI: https://doi.org/10.32553/ijmsdr.v6i3.924**

**Abstract:**
Soft tissues are unable to provide reliable information of human identification in mass disasters, it is largely feasible with skeletal remains especially teeth. There is a crucial need for new and dependable methods for recognition and confirmation of victims in mass disasters. Forensic Odontology employs various methods like rugoscopy, dental labelling, DNA analysis from dental pulp, bite marks analysis, etc. Currently it embraces the study of enamel rods end patterns. Ameloglyphics is an analysis of the end patterns of the enamel rod. These patterns have been found to be unique to the individual teeth of the same individual, as well as to different individuals. A potential association between the type of enamel rod end pattern and the incidence of dental caries can help to predict the individual's susceptibility to caries and to implement preventive measures. Individual identification is becoming more important than ever in today's world. Numerous techniques have been used for victim recognition in forensic dentistry, including rugoscopy, cheiloscopy, bite marks, dental impressions (ameloglyphics), radiographs, photographic samples, and biochemical approaches .The use of enamel rod end patterns may be used to identify the susceptibility of an individual to common dental conditions that are acquired during one's lifetime.
**Keywords:** Biometric analyses; Forensic science; Acid etching, Peel technique ;Automated biometric technique.

## Introduction:

Advances in forensics have raised a need for the development of more susceptible Tools and techniques in victim or convict identification in disasters Condication Human enamel resists degradation more the any other tissue in the body therefore it has immense potential to serve as identification tool in forensic odontology. Ameloglyphics is the science of recording and analysing the tooth print, an external manifestation of enamel rood ends with a distinct patterns. The term forensic means ‘court of law’. Forensic odontology has been defined as that branch of dentistry that is in the interest of justice, deals with the proper handling and examination of dental evidence and with proper evaluation, and presentation of dental findings[1].Forensic odontology has

played a key role in identification of people in mass disasters, in crime investigation, in ethnic studies, and also identification of decomposed and disfigured bodies like that of drowned persons, also fire victims, and victims of motor vehicle accidents.

ROLE OF TEETH IN FORENSIC ODONTOLOGY in such situations, dental hard tissues gain importance for identification based on the condition of the deceased. Teeth can withstand extreme temperatures and are resistant to Postmortem decomposition. Therefore, the use of dental evidence is the method of choice in establishing an identity from badly burned, traumatised, decomposed and skeletonized remains[2]. The various methods employed in forensic odontology include rugoscopy, cheiloscopy, bite marks, tooth prints for teeth, radiographs, photographic study, and also molecular methods [3,4].

ENAMEL:

Enamel is the hardest and essential substance in our body. Enamel is a product of ectoderm that is the derived cells called ameloblasts [5]. The basic structural unit of enamel is the enamel rods which are also called enamel prisms. The development of enamel is a complex process, where the ameloblasts lay down in the enamel rods in an undulating and inter- twining pathwan such situations, dental hard tissues gain importance for identification based on the condition of the deceased. Teeth can withstand extreme temperatures and are resistant to postmortem decomposition. Therefore, the use of dental evidence is the method of choice in establishing an identity from badly burned, traumatised, decomposed and skeletonized remains [2]. The various methods employed in forensic odontology include rugoscopy, cheiloscopy, bite marks, tooth prints for teeth, radiographs, photographic study, and also molecular methods [3,4].

Microscopically, groups of enamel rods run in a unique direction, which differs from an adjacent group of enamel rods and results in forming various and different patterns of enamel rod endings on the tooth surface .It has been estimated that each and unique tooth has millions of enamel rods and that the number varies in all the teeth. The length of the rods in the enamel rod is greater than the thickness of the enamel as a result of the oblique direction and wavy arrangement of the rods. It varies in different portions of the crown of the tooth, being long in the thicker portions like in the cusps (cusp area) and short in the thinner portions in the cervical area. The size and diameter of the enamel rods become more as they reach the outer surfaces .Although it is observed that the average diameter of the enamel rod is 4-5 μm, there is considerable variation with its course. It has been suggested that the diameter of the enamel rods is more in the ratio of 1:2 while passing from the dentin enamel junction to the outer surface [5,6,7].

TYPE OF ENAMEL RODS:

The shape of the enamel prisms approximates to one of three patterns

Pattern I: Prisms are circular.

Pattern II: Prisms are aligned in parallel rows.

Pattern III: Prisms are arranged in staggered rows such that the tail of prism lies between two heads in the next row, giving a keyhole appearance.

RECORDING OF ENAMEL RODS AND PATTERNS:

In ameloglyphics, recording of enamel rod endings on the tooth surfaces are proceeded using acid etchant, acetate peel technique [9,10], and automated biometrics as sequential steps for reproducing complete and accurate enamel rod end patterns for personal identifications.

ACID ETCHING:

The acid etching on the surfaces of enamel results in the removal of the surface mineral

component in the rod and rod sheath. As the rods and rod sheaths have a different and various mineral density, the etching results in an uneven dissolution of the surface enamel along with the removal of the smear layer. The effect of acid etching on enamel depends on the following:

1. Kind of acid used.

2. Acid concentration.

3. Etching time.

4. Form of etchant.

5. Rinse time.

6. Whether enamel is instrumented before etching.

7. Chemical composition and condition of enamel .About 10% of orthophosphoric acid in gel form is the most commonly used acid to condition the enamel in viva studies.

Three types of etching patterns can also be obtained:

1. Predominant dissolution of the prism cores.

2. Predominant dissolution of the prism peripheries.

3. No prism structure is evident.

ACETATE PEEL TECHNIQUE:

A peel is a replica of an acid-etched mineral surface, made upon acetate film. Peeling is a simple, inexpensive, and rapid way of making replicas of dental hard tissue surfaces. The peel-making technique was first developed by the palaeobotanist to study Cellular structures of the fossil plants and later taken upon by the palaeobotanist, carbonate petrologists, and paleontologists to study both the texture and structures of carbonate rocks and fossils. Further modifications were done to study dental hard structures due to its unique mineralogical compositions . The peel can be examined under a microscope with the incident or transmitted light or with combinations of both and can be stored for future[8,9,10].

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The term “biometrics” refers to identification techniques that are based on specific physical

AUTOMATED BIOMETRIC TECHNIQUE:

The term “biometrics” refers to identification techniques that are based on specific physical characteristics. It is a technology of identification or authentication of a person that transforms a biological, morphological, or behavioral characteristic in digital value. When the patterns studied are consistently recognized and provide greater confidence, they are referred to as “positive identification”[8,9]. Biometric-based identification and verification methodologies such as fingerprint verification, iris scanning, and facial recognition have also been steadily improved and refined in automated systems and software, which can distinguish individuals reliably[10,11].

**Discussion:**

Enamel rod end patterns are unique for each tooth in an individual and may be used as an adjunct with other methods for personal identification. This technique is a simple, inexpensive, and rapid method which can be performed by even a dental auxiliary staff. Our institution is passionate about high quality evidence based research and has excelled in various fields[12,13]. Usually, this method of personal identification can be included as adjunct antemortem dental records of firefighters, soldiers, jet pilots, divers, and people who live or travel to politically unstable areas and this record can be used for the predilection of dental caries and gender prediliction[14,15].

**Conclusion:**

Ameloglyphics can play a significant role in the personal identification of individuals particularly working in dangerous occupations such as soldiers, divers, jet pilots, and people who live and travel to potentially unstable environments. Ameloglyphics is a simple

inexpensive technique that is used as an adjunct method in personal identification. Ameloglyphics is a science with sound scientific basis. Currently, the science is in an evolving stage. The development of exclusive software would lead to the establishment of more authentic and reproducible datebase for personal identification in the field of forensic odontology.

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