

Role Of Oral Pathology In Forensic Investigations- A Review

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ABSTRACT-

Forensic odontology is considered to be the subdiscipline of dentistry which analyses dental evidence in the interest of justice. Oral pathology is the sub group of dentistry that deals with the pathology affecting the oral and maxillofacial regions. This field is used for identification through oral and maxillofacial pathologies along with associated syndromes, different patterns like in enamel rods, determining sex using exfoliative cytology, even from occlusal morphology, and deoxyribonucleic acid profiling from teeth. This subdiscipline can also be utilized for estimating age with methods like Gustafson's method, incremental lines of Retzius, perikymata, natal line formation in teeth, neonatal line, racemization of collagen in dentin, incremental lines and thickness of cementum, even by translucency of dentin. Even though the expertise of an oral pathologist till now is not used in forensic investigations, this paper thus aims to discuss the role of oral pathology in forensic investigation.

Key Words: *Oral pathology, Forensic odontology, Perikymata, Incremental lines of Retzius.*

INTRODUCTION:

Oral pathology is the subdiscipline of dentistry that deals with the pathology affecting the oral and maxillofacial regions^[1] This field is now being widely utilized for identification and age estimation studies of individuals in forensic, i.e., in forensic odontology^[2] The role of oral pathology in forensic investigation is considered in the scientific literature^[3,5] and this evaluation solely depends upon the current working classification proposed for forensic odontology^[6] A simplified Indian coding was proposed for forensic dental identification based on the interrelationship of dental specialties including oral pathology with forensic odontology^[7] Forensic odontology is an investigative aspect of dentistry that helps in proper evaluation of the dental evidences and eventually present those collected evidences in the interest of justice^[2,8] Post death time estimation can be histologically assessed by cellular changes in postmortem gingival specimens^[9,11]

IDENTIFICATION OF VICTIMS BY ORAL AND MAXILLOFACIAL PATHOLOGIES WITH ASSOCIATED SYNDROMES:

Dental variations among people are noted to be unique, and this knowledge can eventually guide us in achieving positive identifications of people involved in disasters .The individuals can be identified from oral & dental pathologies with associated syndromes which are narrated in this following review^[1,11] the following surface developmental anomalies like enamel hypoplasia, dentinogenesis and amelogenesis imperfecta, typical shape abnormalities like teeth with talon cusp, cusp of carabelli, peg shaped laterals, teeth showing fusion, germination, all can contribute in the identification of a person lost in disaster if they are being carefully recorded in ante mortem reports. Pre recorded Teeth anomalies associated with number of teeth in dental arch like individuals having supernumerary teeth, mesiodens, dental agenesis or submerged tooth can also contribute to make recognition easier during disaster victim identification. The victims may also be identified from dental traits of congenital syphilis (Hutchinson teeth) and bilaterally impacted canines^[12,13].

ENAMEL ROD PATTERNS:

Biometrically, the undulated groups of enamel rods extending from the dentinoenamel junction to the external tooth surface forms specific patterns on tooth surface^[14] These patterns of enamel rods are unique for each and every tooth in an individual, and the biometric study of enamel rod patterns from individual tooth for identification purpose is called amelogyphics^[15] It can be recorded from a tooth using cellulose acetate film, cellophane tape, or light body dental impression material^[16]

SEX DETERMINATION USING EXFOLIATIVE CYTOLOGY:

Human dentition is influenced by genetic and environmental factors that determine the position of teeth in the arch^[17,18] The characteristic features of the teeth such as morphology, crown size, and root length will help to determine the sex of the individuals^[19]. Confocal microscope in exfoliative cytology from scrapings of buccal mucosa of barr body positive cells can be used to identify sex of a particular individual^[20]. Exfoliative cytology can be done using acridine orange, aceto orcein, or Papanicolaou stains^[20, 23] There is a significant decrease in the cell size ranging from 0.002 to 0.017 mm/sq with aging, evident with exfoliative study using Papanicolaou stain^[22] .The sex of a male individual is determined from the pulp tissue stained with quinacrine mustard for fluorescent Y chromosome^[24].The amelogenin gene in enamel may present as identical genes in females and different genes in males^[24,25]

METHODS OF AGE ESTIMATION:

Oral pathology plays an important role in age estimation studies, which are mainly carried out using ground sections of teeth^[1] Ground sections are generally done maintaining the proper integrity of the tooth since no chemicals are added. The techniques that are followed to estimate age that too using teeth include Gustafson's technique, incremental lines of Retzius, perikymata, natal line formation in teeth, neonatal line, incremental lines of cementum, thickness of the cementum, and translucency of dentin^[6]

1.Incremental lines of Retzius: Incremental lines of Retzius represent the discrepancy in the rhythmic mineralization of enamel prisms^[26] This rhythmic mineralization appearing in enamel may be influenced by metabolic disturbances so that the lines may appear closer or the rest periods may be prolonged^[1] .In forensic odontology, incremental lines of Retzius act as a tool in the chronological mapping of dental development as evident from scanning electron microscopy^[27]

2.Perikymata: Perikymata can be described as imbrication lines or in other words “the number and spacing of incremental markings at the enamel surface.”^[1] They are important indicators of the growth patterns of the teeth since they provide information on time of crown development and the underlying developmental processes^[28]

3.Natal line formation in teeth: The natal line formations (either pre or post) in teeth are considered as birth indicator^[29] These natal lines are more common in both enamel and dentin of deciduous teeth and permanent first molars which indicate the development during the transitional period between intra- and extra-uterine environments^[1]

4.Neonatal line: The neonatal line is a hypomineralized structure in the enamel matrix which is believed due to disturbances in the enamel secretion stage^[30] .The presence of neonatal line indicates live birth by measuring the amount of postnatal hard tissue formation^[31,32] . In a populace study reported from north focal Poland, an away from in the width of the neonatal line was seen alongside an abatement in the youngster's age at death^[33] Late proof recommends that neonatal lines are created because of change in the measurement, heading, and level of mineralization of the veneer crystals and is considered as generous proof in child murder cases brought under the steady gaze of the law in India^[34]

5.Cemental incremental lines: The incremental lines of cementum will guide to determine the age of adults^[35] A major disadvantage of this method is that the tooth cannot be salvaged (the tooth may either be extracted or sectioned) so mostly it is not practical among living individuals^[1]

6.Thickness of the cementum: The thickness of the cementum will aid in age estimation^[36] .It was observed that the thickness of cementum is more statistically evident at the apex compared to the one-third of the root length from the apex^[37]

7.Translucency of dentin: The dentinal translucency is used frequently to estimate age because of its accuracy and simplicity^[38]. The estimation of dentinal translucency in elderly individuals is not feasible because the junction at translucent and nontranslucent zones is irregular^[1] Age estimation using the dentinal translucency is more accurate in the methods by Singhal et al. and by Prince and Ubelaker, with respect to that of Lamendin^[38]

DNA MATCHING IN FORENSIC ODONTOLOGY:

Following the failure of conventional dental methods, identification with the help of DNA (deoxyribonucleic acid) material from teeth can provide the necessary link to prove identity. Teeth provide an excellent source of DNA and they are found within distinct locations of the tooth. DNA can be extracted from the internal dental sites like coronal pulp, odontoblastic processes, accessory canals, cellular cementum, radicular canals. Following which it can be processed and matched with an pre recorded ante mortem report or with parent or sibling ^[39].The principal laboratory techniques used to compare and evaluate fragments of DNA material from a suspect or victim are restriction fragment length polymorphism (RFLP) and polymerase chain reaction (PCR) analyses.

CONCLUSION:

This article aims at sensitizing the dental fraternities around the globe to make them well aware about the actual relationship of oral pathology with forensic odontology. Perhaps this review helped to clear out the necessity of oral pathologists in mass disaster scenarios and the benefit out of it.

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