Review Article

Forensic pediatric dentistry

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Abstract

Forensic dentistry is the legal field of dentistry which analyses dental evidence in the interest of justice. Pediatric dentistry is that dental specialty concerned with the treatment of dental diseases in children. This specialty is utilized for identification of individuals through visual, clinical, and radiographic interpretation of sound and caries involved teeth, eruption sequence of teeth, shedding sequence of teeth, tooth calcification and maturation, fracture of teeth, root canal therapy, type of restorations and dental crowns and bridges, pit and fissure sealants, appliances, oral and maxillofacial pathologies and associated syndromes and injuries of teeth and tooth mark examination. This specialty is also utilized for age estimation studies which include eruption sequence, Schour and Massler chart, Demirjian's method using dental maturation chart, and Nolla's stages of calcification. This specialty also plays an important role in recognizing child abuse. This paper aims to discuss the forensic aspect of pediatric dentistry from the Indian context.

Key words: Age estimation, child abuse, forensic aspect, forensic dentistry, identification, pediatric dentistry

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Introduction

Forensic dentistry is the legal field of dentistry which analyzes dental evidence in the interest of justice. Dental evidence has been gathered for the identification of victims and suspects in mass disasters, abuse, and organized crimes.[1] The dental evidence is displayed in the following sequence in the court of law, i.e., proper handling, thorough examination, perfect evaluation, and true presentation.[1] A working categorization for forensic dentistry was formulated based on the relationship of various dental specialties with forensic dentistry.[2] A detailed evaluation about the utility of nine dental specialties with forensic dentistry was ascertained to know the forensic implications of each individual dental specialty and to do research in the parent dental specialty.[3] A simplified Indian coding was proposed for forensic dental identification.[4]

Pediatric dentistry is utilized for identification of individuals and age estimation studies and for recognizing child abuse. This paper aims to discuss the forensic aspect of pediatric dentistry from the Indian context.

A review of the literature was done using PubMed from 2010 to 2017 to evaluate the forensic aspect of pediatric dentistry from the Indian context. The following keywords were searched in PubMed: identification, sound teeth, caries involved teeth, eruption sequence of teeth, shedding sequence of deciduous teeth, tooth calcification and maturation, fractures of teeth, root canal therapy, type of dental restorations, dental crowns and bridges, pit and fissure sealants, appliances, oral and maxillofacial pathologies with associated syndromes, age estimation and child abuse. The Indian authors study was selected from PubMed.

Access this article online	
Website: www.jfds.org	Quick Response Code
DOI: 10.4103/jfo.jfds_79_17	

How to cite this article: Shamim T. Forensic pediatric dentistry. J Forensic Dent Sci 2018;10:128-31.

Identification

Pediatric dentistry is that dental specialty concerned with the treatment of dental diseases in children.[3] This specialty is utilized for identification of individuals through visual, clinical, and radiographic interpretation of sound and caries involved teeth, eruption sequence of teeth, shedding sequence of teeth, tooth calcification and maturation, fracture of teeth, root canal therapy, type of restorations and dental restorations, pit and fissure sealants, appliances, oral and maxillofacial pathologies and associated syndromes and injuries of teeth and tooth mark examination [Table 1].

Sound teeth and caries involved teeth

Sound teeth and caries involved teeth may be interpreted clinically, visually, and radiographically and this may aid in individual identification from dental records procured from the dentist.

Table 1: Forensic aspect of pediatric dentistry

Forensic aspect of pediatric dentistry
A) Identification
Sound teeth and caries involved teeth
Eruption sequence of teeth
a) Deciduous dentition
b) Mixed dentition
c) Permanent dentition
Shedding sequence of deciduous teeth
Tooth calcification and maturation
Fractures of teeth
Root canal therapy
a) Pulpectomy
b) Pulpotomy
c) Apexification
Type of dental restorations
a) Amalgam
b) Esthetic (glass ionomer, composite)
c) Interim restoration
Dental crowns and bridges
a) Metallic
i) Full coverage (stainless steel)
ii) Nonfull coverage
b) Nonmetallic
i) Full coverage
ii) Nonfull coverage
iii) Laminates/veneers
Pit and fissure sealants
Appliances
a) Orthodontic appliances
b) Space maintainers
Oral and maxillofacial pathologies and associated syndromes
Injuries of teeth and tooth mark examination
B) Age estimation
Eruption sequence
Schour and Massler chart
Demirjian's method using dental maturation chart
Cameriere's method
Moorrees method
Nolla's stages of calcification
C) Recognizing child abuse
Injuries of teeth and tooth mark examination

Eruption sequence of teeth

Eruption sequence of teeth is usually calibrated from deciduous dentition, mixed dentition, and permanent dentition. The eruption sequence of teeth will vary among various ethnic groups, and it was evident from a study done in school children.[5] In the oral cavity, the eruption disturbances of teeth will manifest as premature eruption (natal teeth and neonatal teeth) and delayed eruption due to certain systemic conditions.[6] Eruption disorders of teeth may present as a primary failure of eruption, ectopically erupted teeth and impacted teeth.[7]

Shedding sequence of deciduous teeth

The shedding sequence of deciduous teeth will be clinically manifested as delayed and premature variants due to certain systemic conditions.[6] More recently, a case of cleidocranial dysplasia presenting with retained deciduous teeth in a 15-year-old girl was reported.[8]

Tooth calcification and maturation

Tooth calcification and dental maturity are assessed using radiographs of developing dentition. The assessment of dental development from radiographs was carried out by Demirjian (mineralization of teeth in 8 stages), Nolla (mineralization of teeth in 10 stages) and Moorrees (mineralization of teeth in 14 stages) with comprehensive drawings.[9] There is paucity of information related to Moorrees method in dental maturation in Indian population.

Fractures of teeth

The fractures of teeth include crown fractures, root fractures, and combination of crown and root fractures which are assessed by radiographs. In a study done about fracture incidence in 4–6-year-old school children in Gulbarga city in India, it was found that the prevalence of traumatic dental injuries in the 5-year-old children was higher than that in the 4- and 6-year-olds.[10] In a recent study about prevalence and etiology of traumatic injuries to the anterior teeth among 5–8-year-old school children in Mathura City in India, it was found that males experienced more traumatic injuries than the females with male to female ratio of 1.8:1.[11]

Root canal therapy

In the pediatric population, root canal therapy includes apexification, pulpotomy, and pulpectomy. The morphology of the root canal and pulp chamber and root canal (size, shape, and number) of an endodontic treated teeth can be assessed radiographically, and it will differ individually.[12] The evaluation of pulp chamber dimensions of primary molars such as the distance between cusp tip to pulp chamber ceiling (4 mm), the distance between pulpal floor to furcation (1.7 mm) and the average height of the pulp

chamber (2–3 mm) are studied from bitewing radiographs.[13] Anomalous anatomic variants such as single-rooted primary first mandibular molar, radix entomolaris, and radix paramolaris may also exist in primary dentition.[14,15]

Type of dental restorations

The type of dental restorations in pediatric population includes conventional amalgam restoration, esthetic restorations, and interim restorations. Radiographic interpretation of individual restorations will help in identification.[16] Undoubtedly, individuals with numerous and complex restorations are often easier to identify using electrical conductance measurement, fiber-optic transillumination, quantitative laser-induced fluorescence device, and DIAGNOdent than those individuals with little or no restoration.[17] Restorations play an important role to aid in the identification process, as various restorative materials have varying resistance to high temperatures.[18]

Dental crowns and bridges

The individuals are identified from dental crowns and bridges fabricated on the teeth by radiographic visualization. Dental crowns include metallic (full coverage, stainless steel, nonfull coverage), nonmetallic (full coverage, nonfull coverage), and laminates or veneers.

Pit and fissure sealants

The individuals are identified from pit and fissure sealants applied on caries prone teeth. Pit and fissure sealant materials are categorized as glass-ionomer and resin-based materials. The resin-based materials with recent additions include pit and fissure sealant placed following sixth-generation bonding agent (ADPER PROMT), pit and fissure sealant placed following seventh-generation bonding agent (OPTIBOND), and pit and fissure sealant placed following eighth-generation bonding agent (FUTURA BOND DUAL CURE).[19]

Appliances

The individuals are identified from appliances fabricated on the teeth. The appliances include orthodontic appliances (fixed orthodontic appliances, removable orthodontic appliances, habit breaking appliances (palatal crib and oral screen), myofunctional appliances, and space maintainers (conventional band and loop, prefabricated band with custom-made loop, and glass fiber reinforced composite resins such as Ribbond and Everstick).[20]

Oral and maxillofacial pathologies with associated syndromes

The individuals are identified from oral and maxillofacial pathologies with associated syndromes. The oral and maxillofacial pathologies include (a) developmental disturbances of teeth and jaws, (b) regressive alterations of teeth, (c) tumors and cysts of oral cavity, (d) mucosal lesions of oral cavity, (e) salivary gland pathology, (f) reactive lesions of oral cavity, and (g) oral manifestations of systemic diseases and common oral diseases such as acute herpetic gingivostomatitis and acute necrotizing ulcerative gingivostomatitis.

Injuries of teeth and tooth mark examination

Individuals may be identified from traumatic injuries of teeth based on Ellis classification and tooth mark examination in suspected child abuse cases.

Age estimation

Pediatric dentistry is also utilized for age estimation studies which include eruption sequence, Schour and Massler chart, Cameriere's method, Moorrees method, Demirjian's method using dental maturation chart, and Nolla's stages of calcification.[2]

Recognizing child abuse

Pediatric dentistry also plays an important role in recognizing child abuse which will present clinically as physical abuse, neglect, sexual abuse, and emotional abuse.[3,21] The dentist should acquire adequate knowledge about the clinical examination of suspected cases of child abuse presented clinically as sexual abuse.[21] In a recent study done on dentist's role in detecting child abuse in India, it was found that dentists were hesitant and unaware of the appropriate authority to report the case and increased awareness in this aspect should be emphasized.[22] Hard tissue categorization (traumatic injuries of teeth based on Ellis classification) and detailed tooth mark examination are carried out in suspected child abuse cases. Tooth marks may appear on the skin as hemorrhage, contusion, laceration, incision, and avulsion.[23]

Conclusion

This article hopes to sensitize all dental fraternities and pediatric dentistry specialists around the globe to know about the forensic aspect of pediatric dentistry. With the emergence of legal measures such as The Juvenile Justice Act (Care and Protection of Children), 2000, Protection of Children Against Sexual Offences Bill, 2011, CHILDLINE (a 24 hour free emergency phone service for children in need of care and protection), National Commission for Protection of Child Rights for the rights and protection of children, dental professionals working in public and private sector in India are obliged to safeguard the rights and protection of children by acting as an expert in forensic investigation pertaining to identification, age estimation, and abuse detection pertaining to dental specialty.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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