ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at: www.ijdsir.com

Volume – 6, Issue – 2, March - 2023, Page No. : 298 - 301

Envisioning Forensic Paediatric Odontology Under New Light- A Review Article

[1]Dr.Saloni Kanodia, 2nd Year PG Student, Department of Pedodontics and Preventive Dentistry, Jaipur Dental College, Jaipur

[2]Dr.Abhishek Khairwa, Professor, Department of Pedodontics and Preventive Dentistry, Jaipur Dental College, Jaipur

[3]Dr.Manohar Bhat, Professor & HOD, Department of Pedodontics and Preventive Dentistry, Jaipur Dental College, Jaipur

[4]Dr.Diksha Shekhawat, Senior Lecturer, Department of Pedodontics and Preventive Dentistry, Jaipur Dental College, Jaipur

Corresponding Author: Dr. Saloni Kanodia, 2nd Year PG Student, Department of Pedodontics and Preventive Dentistry, Jaipur Dental College, Jaipur

Citation of this Article: Dr. Saloni Kanodia, Dr. Abhishek Khairwa, Dr. Manohar Bhatt, "Envisioning Forensic Paediatric Odontology Under New Light- A Review Article", IJDSIR- March - 2023, Volume – 6, Issue - 2, P. No. 298 – 301.

Type of Publication: Review Article

Conflicts of Interest: Nil

Abstract

Forensic Odontology is the legal application of dentistry which analyse dental evidence in interest of law and justice. Pedo dontists plays an important role in Forensic Odontology through their expertise in various fields such as accidental or non- accidental oral trauma, child abuse, age determination etc by examination of teeth and jaws. These dental finding/records may be helpful in forensic identifications. Extending this vision to social cause like Female Foeticide, where it can be used for investigation of cause of female neonatal death. Neonatal line is an accentuated incremental line of retzius demarcating prenatal and postnatal Enamel, visible in primary teeth and permanent first molar. It is a marked striae formed at the time of birth. It reflects the metabolic changes at the time of birth. Presence of Neonatal line provides evidence of live births. In case of still births it is absent. Various methods like light microscopy, SEM, polarized micro scopy could be used for its identification. It provides vital evidence about the period of independent existence and number of days, the infant had survived before the brutal act, hence it can be used as stand- alone evidence in case of absence of other soft tissues and hard tissues. Thus, awareness must be spread among Dental fraternity regarding potential role in bringing justice to infants sacrificed to brutal act. It must be included in post-mortem protocol in cases of suspicious infant death.

Keywords: Female Foeticide, Forensic Odontology, Live birth, Still birth, Neonatal line.

Introduction

Female infanticide is one of the evils that plagues our society to this day. It has led to an imbalance in the male

to female ratio in our country. Infanticide is defined as the killing of a child under the age of 1 year and the term neonaticide is used when the child is killed within 24 h of birth.[1]Brutal acts, such as gender selection followed by termination of a female foetus, female neonaticide, and female infanticide, have resulted in a condition called “Female Deficit Syndrome” in India, which in turn leads to adverse social, political, and economic problems.[2]

Most of these cases are never brought to court, and even those that are brought to light remain unproven because of the state in which the body is usually discovered, mostly putrefied.

Although skeletal parameters are a valuable asset in determining the age of the infant, no particularly relevant method provides conclusive evidence of the separate existence of the infant and helps in distinguishing live birth from a still born child.[3]

The examination of developing tooth germs may provide a reliable answer pertaining to the fetal age, the possibility of a separate existence, and even the period of survival after birth.[4]

The high endurance of teeth to adverse physical conditions, such as heat, cold, fire, and chemicals, make the assessment of the developing teeth a viable tool for forensic investigation. They can also be acquired from fossilized remains and render a vast amount of metric and mor phologic data relating to hominid evolution.[5]

Formation of neonatal line

The various stages of growth, during the development of the dentition, follow a very precise pattern, particularly before and after birth. Embryonal tooth enamel develop ment starts in about the 10th week of pregnancy. In a circadian rhythm, appositional layers of organic enamel matrix are formed.

Mineralization of the matrix, where hydroxyapatite units form alongside, wavily running enamel prisms is initiated soon after matrix secretion giving mature enamel an onion like appearance. At birth a well discernible layer called neonatal line [NNL] is formed (FIG. 1). NNL was first named in 1936 by Schour who described it as a distinctive incremental line in the enamel and a corresponding incremental line in the dentin [6]. The timing of birth is preserved in the enamel and corresponds the neonatal line. It is a predictable consequence of the birth process and occupies a characteristic position. It marks the event of birth. It is found in all deciduous teeth as they start to form enamel matrix in utero, and usually but not always found in earliest enamel formed of first permanent molar [7] sometimes in a mesiobuccal cusp of the first permanent molar[8]. The neonatal line is said to be caused due to decreased plasma calcium in first 48 hours after birth or could be due to trauma associated with birth. It extends obliquely from surface to dentino-enamel junction. It is less densely mineralized and is said to be at a constant level within the tooth and shifts cervically as gestation is prolonged[9]. NNL separates pre and postnatal enamel and dentin and varies in location in different tooth types[10]. The thickness of prenatal enamel gradually grows from preterm to post term and consequently the location of NNL changes. NNL makes up one measure of prenatal and postnatal development of a child.

The presence and characteristics of NNL are particularly important in forensic medicine, in alleged infanticide with de composed human remains because NNL is evide nce of live birth.

Various Factors affecting Neonatal Line

Neonatal lines are formed by metabolic changes that infant undergoes at birth and during its neonatal life[10].

1. In a study conducted by Eli et al., the width of the neonatal line was found to be higher in infants born by an operative (difficult delivery) when compared to infants born by normal delivery[11]

2. The thickness was the least in infants born by elective caesarean section, where there was no active birth pro cess[11].

3. Zanolli et al. have suggested that, more than the mode of delivery, the factors related to gestational length had an impact on the width of the neonatal line[12]

4. In the study conducted by Hurnanen et al., the width of the neonatal line was found to be inversely pro portional to the duration of the delivery; and prolonged delivery process was suggested to inhibit the develop ment of the neonatal line[8].

5. Noren observed that infants born to diabetic mothers were found to be prone to hypocalcaemia, showing thicker and less mineralized neonatal line[13].

Methods of identification of neonatal line[4]

1.Decalcified sections- NNL cannot be identified.

2. Light Microscope- NNL is seen as a distinct dark line closer to the outer surface of enamel and parallel to the outer surface.

3. Polarized Microscope- NNL appears as a distinct positive birefringent band. (FIG.2)

4. Scanning Electron Microscope- NNL appears as an indistinct scalloped or non-scalloped white line

Limitations

Neonatal line can be visualized, only if the baby had survived for at least 2 days, however predominantly, a majority of the infanticide occur immediately after birth; thus, this is the major limitation in using the neonatal line as evidence for infanticide[4].

The light microscope can demonstrate neonatal line only after a significant amount of postnatal enamel has developed; hence, it might be essential for the child to survive for 3 weeks for the neonatal line to be visible. However, in a study conducted by Janardhan an et al., they were able to demonstrate the neonatal line in a baby who had survived for just 6 days, also the six incre mental lines correlated with the 6 days of survival of the baby before death.

Thus, according to Janardhan an et al., numerous factors such as the axis of the tooth section, thickness of the section, and the light source used, might influence the detection of neonatal line.

Whittaker and MacDonald have stated that SEM can distinguish postnatal enamel from prenatal enamel within a day or two after birth[4.14].

In a study conducted by Srinivasan et al., the neonatal line was best visualized under the polarized microscope, in a baby which had died 10 days later[15].

Conclusion

Neonatal line can be used as an important tool in the investigation of neonaticide cases which claim to be still births, as NNL being the live birth indicator.

However, the main limitation of using neonatal line for the assessment of postnatal survival of infants is that most of the infanticides occur immediately after birth, but a couple of days of survival are necessary before the neonatal lines could be detected.

More accurate and earliest detection of this line parti cularly within hours after death by means of advanced techniques could rewrite this supplementary evidence of possible infanticide into substantial evidence and more studies need to be done in this direction.

References

1. Mittal P, Khanna K, Khanagwal VP, Paliwal PK. Female infanticide: The innocence murdered again. J Indian Acad Forensic Med 2013; 35:181-3.

2. Park K. Textbook of Preventive and Social Medicine. India: Banarsidas Bhanot Publishers; 2015.

3. Smith P, Avishai G. The use of dental criteria for Esti mating postnatal survival in skeletal remains of infants. J Archaeol Sci 2005; 32:83-9.

4. Janardhan an M, Umadethan B, Bini raj KR, Kumar RBV, Rakesh S (2011) Neonatal line as linear evidence of live birth: Estimation of postnatal survival of a new born from primary tooth germs. J Forensic Dent Sci 3(1): 8-13

5. Nambiar P, Paul G, Swaminathan D, Nadesan K. Medico-legal implications of dental prenatal age estimation with reference to a case report. Ann Dent Univ Malaya 2000; 7:46-50.

6. Ham AW, Cormack DH, Histology JB (1979) Lippincott Company, USA.

7. Chandrashekar C, Takahashi M, Miyakawa G (2010) Enamel and Forensic Odontology-Revealing the identity. J Hard Tissue Biology 19(1): 1-4.

8. Hurnanen J et al. (2017) Deciduous neonatal line: width is associated with duration of delivery. Forensic Sci Int 271: 87-91.

9. Skinner M, Dupras T (1993) Variation in Birth timing and location of the neonatal line in human enamel. J Forensic Sci 38(6): 1383-1390.

10. Schour I (1936) The neonatal line in the enamel and dentin of the human deciduous teeth and first permanent molar. J Am Dent Assoc 23(10): 1946-1955.

11. Eli I, Sarnat H, Talmi E. Effect of the birth process on the neonatal line in primary tooth enamel. J Pediatr Dent 1989; 11:220-3.

12. Zanolli C, Bondioli L, Manni F, Rossi P, Macchiarelli R. Gestation length, mode of delivery, neonatal line-thickness variation. Hum Biol 2011; 83:695-713.

13. Noren JG. Microscopic study of enamel defects in deciduous teeth of infants of diabetic mothers. Acta Odontol Scand1984; 42:153-6.

14. Whittaker DK, MacDonald DG. A colour atlas of forensic dentistry. England: Wolfe Publishing Ltd; 1989.

15. Srinivasan S, Murthy PS, Deshmukh S, Sham Sundar NM. A comparative study to associate the prese nce of neo natal line in deciduous teeth of infants with the occurrence of live birth. J Indian Soc Pedod Prev Dent 2017; 35:249-53.

Figure 1:

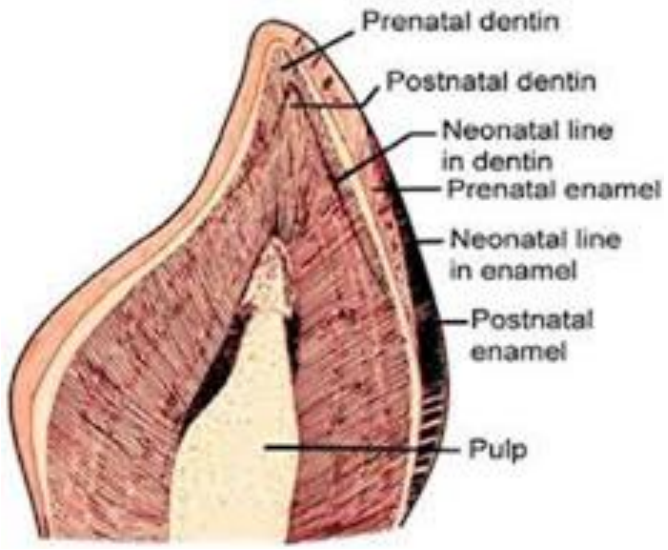

Figure 2: