Forensic Perinatal and Paediatric Pathology as a Special Interest Area in Forensic Medicine in Sri Lanka: The Way Forward

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Abstract

The perinatal and paediatric death investigations involve different medico-legal, clinical, parental, and social issues which need thorough medico-legal investigations. The familiarity with common causes of perinatal and paediatric death and skill in special paediatric dissection procedures are important factors. In addition, the pathologist is required to have the knowledge and the skill of interpreting macroscopic and microscopic findings of the placenta and the cord. In 2018 the perinatal and paediatric pathology has been identified as a subspecialty in Forensic Medicine by the Postgraduate Institute of Medicine, Sri Lanka, and introduced into the post-MD special interest area curriculum. There are different areas to be improved in the field of perinatal and paediatric autopsy investigations in Sri Lanka such as establishing standard measurement charts and routinely use of different ancillary investigations including the use of molecular pathology.

Keywords: Perinatal and paediatric pathology, autopsy, subspecialty in Forensic Medicine

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Introduction

The perinatal and paediatric death investigations involve different medico-legal, clinical, parental, and social issues. The parents may want to know the cause of death of their child and its possible effect on future pregnancies. The statistics of perinatal and paediatric deaths are an indicator of the health status of the country and also help to design future health development. Therefore, the perinatal deaths are investigated at the institutional/national level and utilized for statistics and audit purposes.

Globally, 7.6 million children died before the age of 5 years in 2010 with 64% of the above deaths being due to infections.[1] According to the WHO, 2 million stillbirths and 2.9 million neonatal deaths were reported globally in the year 2016.[2] Perinatal mortality is 5 times higher in developing countries than in developed nations.[3] In Sri Lanka, the neonatal death rate was 6.3, and the mortality rate under 5 years was 10.9 for 1000 live births in 2027.[4]

The medical terms included in the range of forensic perinatal and paediatric autopsy (PPA) include foetus, early neonates, neonates, infants and children. The PPA may be a pathological autopsy where the autopsy is performed due to a natural illness by a clinical pathologist after obtaining consent from the parents. However, in deaths which are unusual, unnatural, suspicious, homicides and deaths where the cause of death is not known, a medico-legal investigation is needed to determine the medical cause of death as well as the manner of death.[5]

From a Forensic Pathologist`s perspective, there are several particularly important objectives of the perinatal post-mortem examinations. These include the age of the foetus, maturity, viability, degree of maceration, whether the baby was born alive or dead, period of survival, congenital abnormalities, significant placental abnormalities, and the possible cause and manner of death with the reconstruction of events to confirm or exclude given allegation.[6]

Medico-legal importance of specialized Perinatal and Paediatric Autopsy (PPA)

The autopsy examination remains the gold standard for identifying the cause of perinatal and paediatric deaths. A review of 27 studies found that perinatal autopsy revealed a change in diagnosis or additional findings in 22% to 76% of the cases.[7]

Although child autopsies are not more difficult than adult autopsies, it requires additional investigations (sometimes high cost), a number of extra techniques, additional time, and specialized procedures which need to be performed routinely. The post-mortem examination of children older than 2 years of age does not greatly differ from adult autopsies.[5] But there is a significant difference in foetal anatomy, especially in the cardiovascular system, and also due to abnormal embryological development of other systems. Therefore, the autopsy procedures are significantly different and time-consuming, and the presence of congenital anomalies demands a more meticulous autopsy.

There is a great difference between the patterns of causes of death in childhood and adults. During the neonatal period, the deaths most commonly occur due to prematurity and related conditions, chromosomal abnormalities, or congenital malformations but in older children, the deaths due to natural illnesses decline substantially with the trauma being the major cause of death.[1] The causes of trauma in infants are mostly due to non-accidental and when the child becomes older and active the injuries are mostly inflicted following accidents. Therefore, the familiarity with common causes of perinatal and paediatric death is important to focus on the post-mortem with special autopsy techniques and the necessary ancillary investigations. The special autopsy techniques are required routinely in perinatal and paediatric autopsies. The middle ear dissection, spinal cord dissection, and dissection of the eye are performed routinely on neonatal deaths compared to the adult autopsies where these dissections are performed only on indications.

In cases of perinatal and neonatal deaths, the examination of the placenta and umbilical cord provides the answers to the cause of death in one-third of cases. [8,10] Therefore, the pathologist is required to have the knowledge and the skill of interpreting macroscopic and microscopic findings of the placenta and the cord. Furthermore, at all possible times, he should be provided with the above organs in addition to the body of the foetus or the neonate.

However, in Sri Lanka majority of the perinatal autopsies which have medico-legal implications are presently conducted by forensic pathologists who have postgraduate training in general forensic pathology.

Perinatal and paediatric autopsies as a subspecialty in Forensic Medicine

In 2018 the Perinatal and Paediatric Pathology had been identified as a subspecialty in Forensic Medicine by the Post Graduate Institute of Medicine, Sri Lanka and introduced into the post-MD special interest area curriculum. The postgraduate trainees who have successfully completed the MD in Forensic Medicine with a special interest in Forensic Paediatric and Perinatal Pathology would receive 6 months of training in General Forensic Medicine and a further 6 months in Forensic Perinatal and Paediatric Pathology in Sri Lanka as a Senior Registrar and a minimum of 6 months of overseas training in Forensic Perinatal and Paediatric Pathology within the one year of overseas training. At present two teaching hospitals; Peradeniya and Karapitiya have been recognized as training centers for Forensic Paediatric and Perinatal Pathology and two specialists in Forensic Medicine have shown their special interest in the subspecialty.

The way forward

There is a necessity to develop different areas to improve the quality of perinatal and paediatric autopsy investigations. The preliminary investigations such as CT and MRI scan, in addition to routine investigations and special ancillary investigation procedures, toxicological screening, molecular and genetic studies, metabolic screening, biochemical studies, and microbiology has immense value in determining the cause of death.

It is mandatory to develop standard measurement charts for physical profile comparisons, stranded organ weights, placental anthropometric measurements, and heart measurements for Sri Lankan neonates and children which require additional meticulous research studies. When the mortuary facilities are concerned, special instruments which suit neonatal and paediatric dissections, specially trained technicians and several other aspects of the death investigations need to be improved.

The placenta is a foeto-maternal organ and is composed of foetal DNA. Both maternal and fetal disorders may affect placental components and placental abnormalities may prejudice both maternal and fetal wellbeing.[12] Therefore, the placenta may provide important information regarding events in

the antenatal period and its examination plays a major role in stillbirths[13] and early neonatal deaths. The examination of the placenta, membranes, and cord should be done in all perinatal deaths as it is an integral part of the postmortem examination. The investigations such as cytogenetics, microbiology, and histopathology can be performed on the placenta.[14] According to the guidelines in some countries, all placentae should be retained for a few days after birth to allow for subsequent retrieval of an infant who deteriorated after birth which is a good practice to be adopted in Sri Lanka for better outcome of foetal/ neonatal death investigation.

A Full Skeletal Radiology should be a part of paediatric and perinatal autopsy examination ideally interpreted by a Forensic or Paediatric Radiologist with experience in foetal and paediatric imaging. Post mortem Magnetic Resonance Imaging (PMRI) is a potential tool in perinatal autopsy and detects Central Nervous System malformations.[15,16] In the absence of putrefaction, the presence of air in the lungs, stomach, and intestine assessed with MRI or CT is a sign of live birth [6]. The value of post-mortem MRI as an adjunct to or substitute for autopsy is increasingly studied[11], especially in pathological autopsies where the parents object for the dissection on a cultural and religious basis although MRI alone does not provide accurate discretion.

Routine microscopic examination is an important part of the perinatal post-mortem examination, particularly in live-born and well-preserved fetuses. Even in severely macerated fetuses, microscopic examination of tissue may help in estimating the time since death. It is also necessary to acquire special knowledge and skills in Paediatric and Perinatal histopathology for accurate interpretation of findings to decide on the cause of death and address other medico-legal issues.

Molecular Pathology is an emerging discipline within pathology which involves the testing of nucleic acid within a clinical context to make a diagnosis of a disease, malignancy, or a congenital abnormality. Molecular pathology is helpful to understand the involvement of genetic factors in the sudden unexpected death of infants, unexpected death in childhood, different type of arrhythmias, and seizure disorders that may not have been recognized.[10,18] It also helps for counselling parents to plan future pregnancies and also the termination of current pregnancies where the law of the land permits gross congenital anomalies as a reason for therapeutic abortion which is not an indication in Sri Lanka.[19] In contrast to traditional beliefs, this law should be revised to delight the full benefit of the development of Paediatric and Perinatal Pathology in Sri Lanka.

Conclusion

There is a difference in anatomy, embryonic development, physiology, the prevalence of causes of death, autopsy techniques, ancillary investigations, and routine dissection techniques in children when compared to adults. Therefore, the Forensic Pathologist needs to acquire the training and skills during the postgraduate training. The different areas of the medico-legal investigation of perinatal and paediatric deaths must be improved for a more accurate investigation of perinatal and paediatric deaths. Sri Lanka is one of the developing countries which may not be in the position to accommodate all these high-cost investigations, where these investigations can be modified to suit the purpose of investigation and local demand to overcome the financial burden. Suitable guidelines should be developed to overcome lapses with the collaboration of other professional colleges.

Disclosure statement

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References

1. Burton EC, Singer NA. Pediatric Natural Deaths. Chapter: Forensic Pathology of Infancy and Childhood. Springer, New York, NY: 2014:855 - 98. doi:10.1007/ 978 -1-61779-403-2_36
2. Allason E, Tuncalp O, Gardosi J, Pattinson RC, Erwich JJHM et al. Classifying the causes of perinatal death. Bulletin of the World Health Organization. 2016; 94(2):79-79A. doi: http://dx.doi.org/10.2471/BLT.15.168047
3. Bayou G, Berhan Y. Perinatal mortality and Associated Risk Factors. A case Control Study. Ethiop J Health Sci. 2012;22(3):153- 62
4. National Statistics. Family Health Bureau.health.gov.lk
5. Sharma L. Postmortem studies. Chapter: Autopsy in Foetal Infant Deaths. 2020. DOI: 10.5772/intechopen.92673
6. Cohen MC, Scheimberg I. Forensic Aspects of Perinatal Deaths. Acdemic Forensic Path, 2018;8(3):452-91
7. Perinatal Society of Australia and New Zealand Clinical Practice Guidelines for Care around Stillbirth and Neonatal Death. 3rd Edition. 2018.
8. Hooper JE, Williamson AK. Autopsy in the 21st Centaury, Best Practices and Future Directions.

Springer Nature Switzerland AG 2019. Pp. 85-88. ISBN 978- 3- 319- 98372-1

9. Bass T, Bergevin MA, Werner AL, Liuzzi FJ, Scott DE. In situ fixation of the neonatal brain and spinal cord. Pediatr Pathol. 1993 Sep-Oct;13(5):699-705. doi: 10.3109/15513819309048255. PMID: 8247965.
10. Collins Kim A, Byard Roger W. Forensic Pathology of Infancy and Childhood. 1st Ed. U.S.A: Springer-Verlag New York Publishers Ltd. 2014; Print ISBN 978-1-61779-402-5
11. Shubha Poorani S E, Brundha M T. Preservative and Fixative Methods of Brain Biopsy- Review. Journal of Pharmaceutical Sciences and Research 2015; 7(6):336-8. https://www.researchgate.net/publication /282209112_ Preservative_and_fixative_methods_of_brain_biopsy-_Review
12. Baergen RN. Indications for submission and macroscopic examination of the placenta. APMIS. 2018;126(7):544-50. doi: 10.1111/apm.12830. PMID: 30129124.
13. Nijkamp JW, Sebire NJ, Bouman K, Korteweg EJ, Erwich JJHM et al. Perinatal death investigations: What is current practice? Seminars in Fatal & Neonatal Medicine. 2017;22(3):167- 75
14. Pekko Saukko, Bernard Knight. Forensic Pathology. 4th Edition. CRC press. ISBN 9780340972533.
15. Sevaux JLH, Nikkel PGJ, Lequin MH, Groenendaal F. the Value of Autopsy in Neonates in the 21st Century. Neonatology. 2019;115(1):89-93. DOI: 10.1159/000493003
16. Griffiths PD, Variend D, Evans M, Jones A, Wilkinson ID, Paley MN, Whitby E. Postmortem MR imaging of the fetal and stillborn central nervous system. AJNR Am J Neuroradiol. 2003 Jan;24(1):22-7. PMID: 12533322.
17. Wainwright HC. My approach to performing a perinatal or neonatal autopsy. J Clin Pathol.2006;59(7):673-680
18. Cunningham KS. The promise of Molecular Autopsy in Forensic Pathology Practice. Academic Forensic Pathology. 2017;7(4):551-66. https://doi.org/10.23907/2017.047
19. Proposals of the Law Commission to provide for the medical termination of pregnancy in cases of rape and serious foetal impairment- Explanatory note; Feb 2013. Available at: https://lawcom.gov.lk/web/images/stories/reports/medical_termination_of_pregnancy_ proposals_of_the_law_commission_of_sri_lanka (cited on 01.06.2022)