

Differential Decomposition: A Case Report

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Received on 24.05.2019, Accepted on 11.06.2019

Abstract

Estimation of Postmortem Interval (PI) or Time since Death (TSD) is an important objective of post-mortem examination which connects an accused to the particular moment of time to prove his guilt or innocence. This plays an essential role in investigation of medico legal cases. In India, the PI/TSD is estimated on the basis of naked eye changes after death and it is always mentioned in every post-mortem report done by the Forensic Pathologist. This estimation is always a challenge for Forensic pathologists due to various variable factors. The authors present a case of a person who died in unknown time duration and the external changes observed were differential in different parts of the body, a phenomenon rarely cited in standard literature. The authors recommend intensive studies to be initiated in Indian settings to determine a scientific data for the actual time taken for the process of decomposition.

Keywords: Time since Death; Differential decomposition; Forensic Pathologist; External and internal factors; Taphonomy.

How to cite this article:

Arijit Dey, Hemant K. Kanwar, Varun Chandran et al. Differential Decomposition : A Case Report. J Forensic Chemistry Toxicol. 2019;5(1):67-71.

Introduction

Determination of Postmortem interval is an integral part of Postmortem examination. Estimation of Postmortem Interval (PI) connects an accused to that particular moment of time of an incident to prove his guilt or innocence and plays an important role in investigation in medicolegal cases. Its estimation continues to be a major challenge for Forensic pathologist particularly in tropical countries. In India, the autopsy surgeon usually considers the gross external changes in a dead body after death to opine about the time passed since death. The various gross changes in the body after death used for giving opinion

about PI are the loss of corneal reflex and changes in eye, cooling of the body, post mortem hypostasis, rigor mortis, decomposition and other putrefactive changes [1-8]. The Forensic Medicine textbooks mentions a range of time duration in which each of these changes appear in a dead body [1-8]. The entire body is exposed to similar environmental conditions and the decomposition changes observed in one human body is expected to be similar throughout. However, there can be instances where different parts of the body show different grades of decomposition changes. The authors present one such instance involving differential decomposition changes at different parts of the same body, which is quite rare as per the standard literature.

Case Details

History

A 40 year old male Cab driver was reported to be missing since 22nd November, 2017. Two days prior to this, he had last contacted his family by his mobile phone. He remained missing and his body was not recovered for more than a month. On 2nd January, 2018, police was informed about a partly decomposed body found hanging from a tree near a jungle (Images 1 and 2). The police removed the body and from the personal belongings confirmed the dead body to be that of the missing cab driver. The dead body was brought to AIIMS and postmortem examination was conducted on the next day. The body was preserved in cold chamber overnight till autopsy.



Image 1: Scene of recovery



Image 2: Corpse hanging from tree

Autopsy Findings

The deceased was a male of moderate nutrition and average built. The deceased was wearing light blue coloured half sleeve shirt, a dark blue coloured trousers, black leather belt, blue underwear, but did not have any socks or shoes. The following significant external findings were observed (Figures 3-8).

Rigor mortis had passed off. There was blackish discoloration over upper limbs, entire abdomen & legs. Peeling of skin was present over forearms, hands, legs & abdomen at places. There were multiple maggots of varying length around head, neck and chest. A blue colored nylon rope with a single running knot was present in front of the neck encircling the neck in two loops. The neck was elongated and third and fourth cervical vertebrae were detached from each other and the head area was joined with the rest part of the body only by the posterior muscles of the neck. The soft tissues over face & forehead was missing, thus exposing underlying bones. Soft tissue of anterior aspect of neck was lost due to extensive maggot activity and decomposition. Phalanges of both lower limbs were absent and evidence of nibbling was present. However, the back muscles were mostly normal and spared from any decomposition changes. No external ante-mortem injury could be appreciated over the body.



Image 3: Head with Nylon rope in situ



Image 4: Blackened lower limbs**Image 5:** Skin peeling and blackening**Image 6:** Nibbling of toes**Image 7:** Minimal decomposition of back muscle**Image 8:** Partial skeletonization of face

All internal thoracic organs were blackened and shrunk into black mass and contained maggots (Images 9–11). The brain matter was softened, liquefied and found to be grey in color. The peritoneal cavity contained about 500 ml of orange-yellow colored paste like greasy material at places. All the intestinal organs including liver, spleen and kidneys were soft, flabby and pulpy. Small intestine, large intestine, mesentery and pancreas showed decomposition changes. The samples preserved in this case were: a portion of thigh muscle (for toxicological analysis), molar teeth (for DNA profiling). The opinion about time since death and the cause of death was kept pending, until the receipt of toxicological analysis reports.

**Image 9:** Thoracic cavity with maggots



Image 10: Blackened & softened internal organs

Discussion

After death, the corpse undergoes putrefaction or decomposition, wherein the complex organic tissues get dissolved into gases, liquids and salts. Knight mentions that decomposition changes are initiated at a variable time after death and is expected to begin in an average temperate climate at about 3 days in unrefrigerated corpse [1]. Rigor mortis starts disappearing at the onset of decomposition [2]. The earliest sign of decomposition is greenish discoloration of the lower quadrants of the abdomen, visible in the first 24-36 hrs and this may appear in 12-18 hours in summer and in 1-2 days in winter [3]. The marbling of skin begins in 24 hours and is visible in 36-48 hours while slippage of skin is seen in about 60-72 hrs [4]. In the present case, there was evidence of skin peeling over the upper limbs, while there was blackening of skin in both lower limbs. In a hanging body, the postmortem lividity appears in a 'glove and stocking' pattern and the lower limbs being the most dependent portion leads to maximal pooling of peripheral blood [1-8]. This may have led to blackening of skin only of the lower limbs, while the other portions of the body were relatively spared from this decomposition change. There was presence of gnawing activity on the toes, as the body was discovered in a forest area, where there could be presence of scavenger activity on the corpse. The environment temperature and moisture, particularly in Tropical Countries, influence the onset of putrefaction. Decomposition is hastened by obesity, heavy clothing, and sepsis, all of which keep the body warm [2]. The deceased was wearing a half sleeved shirt and a trouser and the back area was fully covered by the wearing apparel. This may be the probable reason behind the presence of

lesser decomposition changes in the back muscles of the body, which remained covered from external environment due to the presence of clothes.

As is evident from the autopsy findings in this case, the decomposition changes were variable in different areas of the body. While the back muscles were completely spared from any putrefactive changes, the limbs showed blackening and peeling of skin, which can be seen in a cadaver 3–6 days after death. Also, the internal organs were mostly converted into a blackish softened pulpy material along with presence of maggots, both mature and immature, in different phases of their life cycles. There was also partial skeletonization of face and neck areas. These changes are evident usually 3–4 weeks after death in tropical climates. As per the circumstantial evidence, the person was last seen alive 42 days before his corpse was discovered by the police. The authors could not specify the postmortem interval in this case in the presence of differential decomposition changes in different areas of the cadaver. In this present case, the report of chemical analysis of the viscera for the common toxicants was negative, thereby ruling out the possibility of poisoning. The body was discovered in a hanging state from the branch of a tree, with a nylon rope present in situ encircling the neck. However, most of the soft tissues of the neck region were missing and the thyro-hyoid complex had completely disappeared due to extensive maggot activity. Thus, the authors could not comment, whether the person committed suicide by hanging himself or whether he was killed, and then postmortem suspension of the corpse was done, using the nylon rope as a ligature material. The final opinion as to cause of death and time since death were both opined as "undetermined", in the presence of such varied decomposition changes, and lack of any definite autopsy finding of specific asphyxia death.

Even after exhaustive searches about decomposition changes, the authors realized that no studies has been done in India in recent times related to estimation of PI/TSD from naked eye changes like rigor mortis and decomposition changes in the body after death. In India, the PI/TSD is mentioned almost in every postmortem report done by the Forensic Pathologist and this is given entirely on the basis of naked eye changes after death. In court proceedings, the Honorable Judges relies heavily on the Time since death given in the autopsy report to decide the culpability of an accused. This is a matter of concern, as there are no studies in Indian scenario to substantiate or refute the claims of International literature related to the

rate of decomposition changes in the cadaver. There are a few studies which have been done in the past in other countries [9-13]. According to Knight [1] and Dimaio [2] all the methods used to determine PI/TSD are unreliable and inaccurate and have a wide range of variability, making them of dubious scientific value. The circumstantial evidences are more accurate than the scientific methods as seen in most cases. Yadav et al. describes a case report, where the rate of decomposition changes observed in a cadaver were far too advanced, as compared to the probable time since death, which was obtained based on circumstantial evidence [14]. A single body may show different grades of decomposition changes, depending on posture, wearing apparel, external environment, etc. Thus a wrong interpretation may lead to a gross miscarriage of justice with an accused being exonerated or an innocent man being punished for criminality.

Conclusion

The authors describe a case with differential rates of decomposition changes in the same body, thereby questioning the prevailing theories about decomposition findings. The Investigating authorities and Judiciary should be made aware of the existing fallacies about estimation of time elapsed since death and the fact that it cannot be fixed by any method, and only an approximation can be made, that too with several considerable biological variations in individual cases. "Body Farms" should be developed in Indian settings for detailed Taphonomical studies so as to generate scientific data about the actual time taken for the process of decomposition to begin and get completed in tropical climate with seasonal variations. To conclude, in situations like these, circumstantial evidence is very important and often more precise in estimating time since death.

Funding: None

Conflict of Interest: None declared

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