

Case Report

Hyoid bone fracture and an elucidation of circumstances in a case of ligature strangulation by garroting

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Ligature strangulation is an important aspect of forensic practice and unless proven otherwise is considered to be a homicide. We report a case of a traveler, who was attending a political procession, but was later robbed and strangled with a scarf by some anti-social elements. His body was subsequently abandoned in the wilderness to get decomposed leading to the diminution of valuable traumatic signatures over the neck, thereby presumably raising difficulties in diagnosis of cause and manner of death. After the body was recovered, a careful autopsy was conducted on it with fruitful results. The cause of death was opined to be homicidal ligature strangulation. Therefore, thorough assessment and proper documentation of strangulation injuries, even in highly decomposed corpses, may lead to smooth execution of justice.

Key words: Decomposition, ligature strangulation, hyoid bone fracture, garroting.

INTRODUCTION

In ligature strangulation, pressure on the neck is applied by a constricting band that is tightened by a force other than the body weight, with virtually all cases of ligature strangulation being homicides (Dimaio and Dimaio, 2001). The ligature (material) may consist of a wide variety of objects such as cords, wires, ropes, scarves, ties, towels, stockings, etc (Demirci et al., 2009). Fracture(s) of the larynx or hyoid bone is a classical sign of the 'pressure to the neck' (Dunsby and Davison, 2011). In ligature strangulation, a broad ligature may cause fracture of the hyoid bone (Kennedy, 2005). If the ligature material is soft and wide, external visible lesions may be

absent or discreet and may escape undetected (Pollanen and Chiasson, 1996). Furthermore, if the decomposition has stepped in, external as well as internal findings may be largely obscured (Maxiener, 1987).

Decomposition, if concocted with ligature strangulation, can become a deceptive ingredient in concealment of homicide and can render the escape of an assailant to be very easy. So a detailed post-mortem examination and crime scene investigation must be conducted to rule out a manner of death other than homicide. In this case, ligature strangulation in a decomposed body is discussed in the light of hyoid bone fracture as an important finding

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Figure 1. Body at the crime scene. Ligature (parna) lying loosely beside the head.

in drawing of opinion.

CASE DETAILS

Case history

The case belongs to a 40-year old male individual whose dead body was referred for autopsy from a local village hospital (Community Health Centre/CHC) on the grounds of decomposition. Purportedly, the dead body was recovered by the police from the wilderness along the highway. As stated by the local police, the deceased and one of his friends came to attend a political procession in the vicinity. After that they consumed alcohol and at around midnight they were heading back to their homes in a car, when suddenly they were stopped and robbed by some people, who then eloped the scene with the deceased and his car. During the scuffle, his friend was beaten and became unconscious few meters away from the scene. When he regained consciousness, he went straight to the police station to lodge a complaint. After some time, the police traced back the car and the body of the deceased, thereby establishing the chain of events.

Crime scene details

The crime scene details (Figure 1) were largely conjectured by careful inspection of the photographs provided by the investigating official. The photographs were snapped from a mid-range view and appeared to be taken in or around noon. The body was lying on the

ground in open with surrounding area covered in wild grass turf and dry strands. The body was established in a supine posture with right side of the face discolored darker in comparison to the left. The difference was deduced from the fact of change in posture by the police authorities who were the first arrivals at the scene and turned it from a (original) right lateral to supine position for examination purpose and further proceedings at the scene.

The body observably had a slight tilt to the left in its upper half. Further visual inspection of photographs indicated that the clothes were smudged with putrefied secretions and grass straws. The body grossly showed signs of putrefaction. Right side of the face was blackened and trails of red tinged fluid from nostrils and mouth rolled down towards the left side. The eyes were closed and anterior teeth visible through pursed lips. After deduced reasoning based on the facts recovered from crime scene photographs, it was established that the recovery site was just a dump site; the recovered scarf could be used as an instrument in action.

The decomposition was established while the frame could not show any struggle signs. Minimal to no trace evidences were present and a few garbage pieces were present around body.

AUTOPSY FINDINGS

The deceased wore a blue t shirt, white vest, black trousers and black underwear. The body was bloated and emitted foul odour of putrefaction (Figure 2). Cluster of



Figure 2. General condition of the body. Bloating stage of putrefaction with markedly effaced and darkened soft tissues and facial features.



Figure 3. Horizontal stripe like reddish congested/hyperemic zone over front skin of the neck, at the level of thyroid cartilage; depictive of ante-mortem nature of the ligature injury.

eggs of flies were present. Skin showed post-mortem bullae and epidermal slippage. The facial features were deformed, bloated, discolored and non identifiable. Purge fluid was found oozing out of natural orifices and hairs were pluckable with mild traction. The chest was tense, abdomen distended and marbling was present. External genitalia were distended, anus was lax and coils of rectum were protruding out.

On dissection of the major cavities, that is, cranial, thoracic and abdominal, most of the internal organs showed diffused putrefactive changes with emphysema and crepitaney, albeit with preserved anatomic outline. Portions of all the routine viscera were collected for toxicological analysis, especially for detection of any stupefying agent.

Upon external examination of the neck, two parallel faintly visible horizontal marks were observed at left antero-lateral aspect of neck, mandating the need to

differentiate between the true from pseudo-ligature mark. The mark (ligature) situated on lower middle aspect of the neck could be traced medially where it was found to be merging with the linear reddish congested to ecchymosed band like an area at the level of thyroid cartilage mandating a closer scrutiny and dissection (Figure 3). In addition, the transverse mark (higher) situated near the left ramus of mandible was darkly discolored, parch-like and taken in a grooved course. After layer by layer dissection of the neck with a prior Y shaped incision, the subcutaneous tissues beneath these marks depicted corresponding pattern and band like ecchymosis transversely along their course(s), with adjacent pale and greasy tissues (Figure 4). Neck muscles were softened and greasy on account of putrefaction. On palpation, thyroid and cricoid cartilages was intact while left greater cornu of the hyoid bone was hypermobile. On further dissection, the left greater cornu of hyoid was deformed



Figure 4. Fine soft tissue ecchymoses beneath the mark, differentiated from the surrounding paler unaffected tissues. Another transverse dark abraded groove can be seen near left ramus of mandible.



Figure 5. Complete fracture of left cornua majora hyoidae just distal to body-cornual fusion.

inwards and showed complete and displaced fracture just distal to fusion with body (Figure 5). The fractured ends and surrounding tissues showed heavy infiltration of blood (Figure 6). The complete laryngeal-hyoid complex was x-rayed (Figure 7) and subsequently macerated. The post-maceration details of the hyoid bone fracture were showing on first impression (Figure 8) while the thyroid cartilage with its ala and horns, processes of arytenoid cartilages as well as ring and arch of cricoid cartilages

were unremarkable and intact. Ossification and fusion of the hyoid bone along with incipient ossifications of laryngeal cartilages were appreciated. The laryngeal joints (cricothyroid and cricoarytenoids) were unremarkable although synovium depicted hemolytic staining of tissues. No additional trauma was present over the body. After considering the history given by the police, crime scene details and autopsy findings, a step by step reconstruction of events was done and the cause



Figure 6. Hyoid bone ex situ, showing definite hemorrhage in surrounding soft tissues.

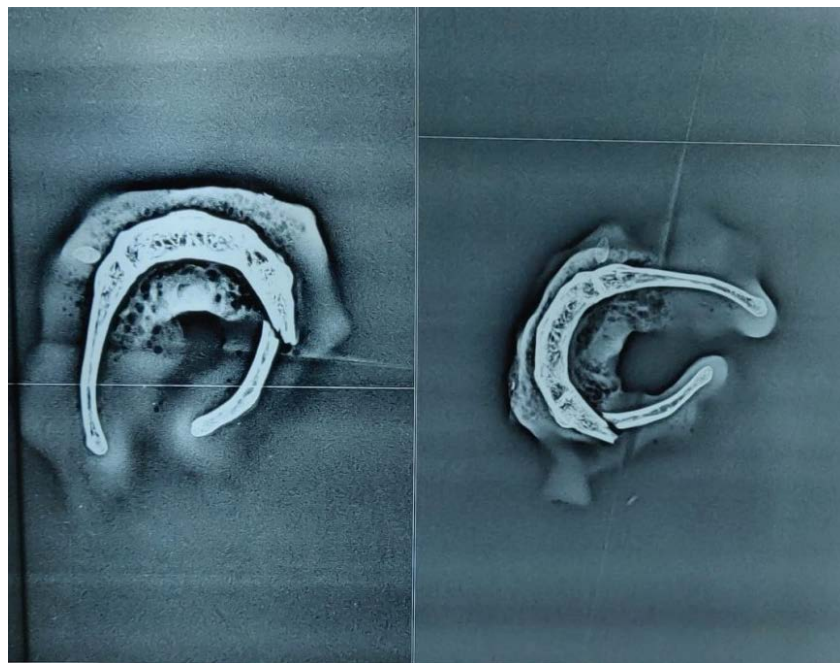


Figure 7. Digital X-ray image of laryngeal-hyoid complex showing details of hyoid fracture. A complete separation with displacement of the fracture fragments is visible. The bone is completely ossified.

of death was opined to be homicidal ligature strangulation. After a few days, police arrested the assailants and they revealed that they applied pressure on neck with a white cotton male parna/scarf (Figure 9) from behind and

strangled the victim. The scarf was brought for weapon examination and a subsequent opinion was given that “the injuries (that is, ligature strangulation) described in post-mortem report can be caused by such



Figure 8. Hyoid bone after maceration. The complete detail of the fracture suggestive of a bending compression mechanism is easily discernable.



Figure 9. Ligature (parna/male scarf) found at crime scene brought for further examination.

type of material (e.g cotton scarf).”

DISCUSSION

It should be noted that usually, cases of ligature strangulation involve victims who are asleep, defenseless or significantly inferior in terms of physical strength (Madea, 2020). In this case, there was a history of alcohol consumption by the deceased before the incident, which would have possibly weakened his physical strength.

Decomposition of body is one of the most common and significant artefacts (Abdullah, 1973). Neck skin fold

appearing as pseudo-strangulation marks in a putrefied and bloated corpse may be confused with antemortem injuries (Thejaswi et al., 2013).

Injuries to the hyoid bone are not commonly observed because the level of ligature is below the bone and the traction on the thyrohyoid ligament is not much. However, if some broad ligature such as a clothesline is tightly and forcibly applied, the hyoid bone may be snapped and get fractured (Vij, 2011). The possibility of fracture, however, is largely dependent upon the degree of ossification and fusion of the cornuae majora-body joint. The wide-spread use of clothesline is further attributed to the fact that it is easily available (Demirci et al., 2009).

In the present case, the possibility of suicidal or

accidental mode of strangulation was ruled out on the basis of scene finding characterizing absence of ligature (in situ) around the neck as well as the posture of the body, autopsy findings primarily comprising presence of hyoid bone fracture, haemorrhage within and beneath the ligature mark and also the case circumstances (Bux et al., 2006; Cordner et al., 2020; Madea, 2015; Mathiharan and Patnaik, 2006; Maxeiner and Bockholdt, 2003). The ecchymoses beneath the ligature impression with the use of a broad and soft ligature signifies formation of certain narrow folds that form the ligature base, thereby causing more local pressure and injury over these points; as well as an indicator of the struggle that ensues (Dimaio and Dimaio, 2001; Mathiharan and Patnaik, 2006).

Fracture of the hyoid bone or larynx has been well studied, and has great appeal as a diagnostic criterion for two main reasons: (1) it is an objective and impressive gross autopsy finding; and (2) it can be clearly related to mechanical injury to the neck (Pollanen, 2001). On this basis, as a criterion for strangulation, hyoid or laryngeal fracture is probably the least controversial. Hyoid fractures occur in approximately one-third of strangulation cases (Dimaio, 2000; Pollanen and Chiasson, 1996), but the incidence of laryngeal fractures has exceeded 50% in some studies (Dimaio, 2000).

Fractures of the hyoid bone are usually found in the posterior third of the greater cornuae, and may be unilateral or bilateral, while local haemorrhage is found at the site) of discontinuity (Pollanen, 2001). Investigations into the skeletal factors that determine hyoid fracture in neck compression have focused on a correlation between shape of the hyoid and fracture (Miller et al., 1998; O'Halloran and Lundy, 1987; Pollanen and Ubelaker, 1997). Furthermore, the fracture axis in this case was suggestive of bending-compression type force mechanism.

The main biological factor that correlates with fracture of the hyoid bone is rigidity (Pollanen, 2001). An ossification centre is found at the point where the greater cornuae meets the body of the hyoid bone and this is often fused in cases with hyoid fracture (Pollanen and Chiasson, 1996).

Macroscopic laryngeal fracture is most commonly observed at the base of the superior cornuae of the thyroid cartilage whereas fractures of the lamina, cricoid, and inter-laminal separations are relatively rare (Camps and Hunt, 1959; Maxeiner, 1998). It has been claimed that blunt impact to the neck is more likely to fracture the lamina of the thyroid cartilage, however, it is uncertain if the converse is true (Camps and Hunt, 1959).

The concealment of the body following a homicide is a phenomenon rarely encountered in forensic pathology, and it may lead to several challenges. In order to destroy crucial evidence of a murder and/or to delay or avoid the discovery of the corpse, perpetrators may hide or waste the body of their victim, or part of it, after the homicide (De Matteis et al., 2020). Even in cases in which the corpse is retrieved just shortly after the homicide, forensic

pathologists have often to face with badly altered bodies, skeletal remains, and putrefied corpses (Konopka et al., 2007).

The present case further reminds us of garroting, a modified method of strangulation which was used by the robbers around 1862 in India. The method chiefly consisted of suddenly throwing of a rope or loincloth over the head and quickly tightening it around the neck. Due to sudden loss of consciousness, there is no struggle. The assailant is then able to tie the ligature (Mathiharan and Patnaik, 2006).

It is possible to overpower silently, and kill a healthy strong person by garroting single-handedly. Such cases have been reported in a classical book of Medical Jurisprudence (Beck, 1825).

In the present case, the presence of strangulation injuries in conjunction with a lack of additional injuries over the body is consistent with garroting as possible mechanism, which was further revealed on interrogation of the culprits.

Conclusion

In bodies where decomposition process have begun, a conscientious autopsy must be conducted, in which there is careful inspection of the body, complete exploration of all the body cavities and a keen observation given to post-mortem artifacts. Presence of hyoid bone fracture must always call an attention to rule out homicidal asphyxiation. Though the process of decomposition has its own limitation, it should not become a tool for a fleeing accused in its escapement. Thus, the cause and manner of death can get noticed in a decomposed body after a systematic post-mortem examination along with certain additional investigations and efforts, and the present case is an example of it.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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