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Case Series

Tracing the Tracks: a Case Series on Patterned Injuries

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Abstract

BACKGROUND: Patterned injuries are those that bear the shape, size, and contour of the impacting object. Identification and interpretation of patterned injuries while conducting medico-legal examinations of victims of assault, rape, torture, etc. or of the deceased during autopsy are of great importance because these injuries give us an idea about the causative weapon/object and manner of death. **MATERIALS and METHOD:** The authors have presented a case series of three cases that came for postmortem examination in the department of forensic medicine and toxicology. **OBSERVATION:** The cases in our study show patterned injuries caused by blunt force trauma in accidental, homicidal, and suicidal deaths. **CONCLUSION:** These cases will be helpful in understanding the type of injuries, the object involved, and the resulting patterns, which will further aid in identifying the weapon or object of offense and thus providing justice to the deceased and their family.

1. Introduction

Forensic Patterned injuries over victims are frequently observed in all manners of death like accidental, homicidal or suicidal and they also provide insight on the type of weapon or object utilized and the mechanism behind it.¹

The patterned injuries may be caused by either the impact of a weapon/object on the body or by impact of the body on a patterned surface/object. Patterned injuries can be seen in any case, irrespective of it being a suicidal, homicidal, or accidental case.

Patterned injuries can be classified or subdivided on the basis of forces involved: i) Blunt force injuries are the most common type of patterned injuries involving patterned abrasion, patterned contusion, patterned or signature

fracture over the skull, etc. seen in cases of RTA, burn, hanging, assault. ii) Sharp force injuries involving stab wounds with different shapes on the basis of different weapons involved like single edged or double edged knives, screw drivers, scissors, etc. iii) Firearm injuries involving contact entry wounds, shotgun entry wounds by wads and pellets, etc. causing muzzle imprints, abrasion collars and tattooing effects. iv) Other miscellaneous patterns like filigree burn in lightning, crocodile burn in electrocution etc.²⁻⁵

2. Case Findings

In recent study we have shown the importance of different types of patterned injuries caused by blunt force trauma.

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Case 1:

A case of a 32 year old male was brought for autopsy with an alleged history of a road traffic accident during the celebration of the Holi festival. As per history, the victim was under the influence of alcohol and suddenly fell down and came under the truck tyre. On external examination, reddish patterned contusion in form of 04 zigzag-shaped linear contusions present over the right side of chest and abdomen, horizontally placed and parallel to each other with an equal gap in between, appears to be the pattern of a tyre mark.

Figure 1: Tyre mark (Patterned contusion).



On internal examination, underlying 2nd to 9th ribs of the right side were found fractured in the mid axillary line with ecchymosis of surrounding muscles and tissue. Multiple contusions were present over the posterolateral aspect of the right lung. The diaphragm was found ruptured over right side. The liver was found ruptured, separated and moved up in to the right side of the chest cavity through ruptured diaphragm with effusion of blood in the surrounding region. The right kidney was also found lacerated and separated from all its attachments with effusion of blood in the surrounding region. All the internal organs were found pale. Opinion regarding the cause of death is given as shock and haemorrhage as a result of multiple injuries present over the body. Injuries present over the body are found consistent with the alleged history.

Case 2:

A case of a 28 year old male was brought for autopsy with an alleged history of assault. As per history, the deceased came home under the influence of alcohol and had an argument with his wife and left the home again; after a few hours, he returned back and became unconscious. His family members then brought him to casualty department, where he was

declared brought dead and the body was sent for post mortem examination.

On external examination, the left eye was found blackened; multiple rail-patterned bluish contusions were present over upper and lower back region of various lengths and positions and over posterior aspect of right arm region. Multiple diffuse deep-seated contusions were present over posterior aspect of right arm and forearm region, right upper and lower back region and both buttocks region. 03 Lacerated wounds present lower limbs 02 over left leg region and 01 over right leg region. All the internal organs were found pale. Final opinion regarding cause of death will be given after getting histopathology reports and chemical analysis reports of preserved material. Injuries present over body were caused by hard and blunt object and homicidal in nature.

Figure 2: Multiple rail-patterned bluish contusions.



Figure 3: Ligature mark on Neck & Ligature material.

**Case 3:**

A case of a 38 year old male was brought for autopsy with alleged history of hanging. As per history, the deceased hanged himself in his own home by using the rope after having some argument with his family members. On external examination, ligature material was present insitu around neck as a

nylon rope; cyanosis was present over the nails of both hands and both ear lobules. The ligature mark over the neck was well pronounced and had an imprint of the ligature material. All the internal organs were congested, petechial hemorrhages were present over inner aspect of scalp.

3. Discussion

In case no. 1 of the road traffic accident, a patterned contusion injury was present over the right side of the chest and abdomen, which resembled the shape of the vehicle tyre present in the picture provided by the investigating officer (Figure 1). External patterned injury and underlying internal injuries were found consistent with the alleged history of a road traffic accident and were also helpful in determining the type and nature of the causative object as a tyre of a heavy vehicle. Similarly, there are other patterned injuries occurring during vehicular accidents that help in determining the causative object that impacted the deceased, like patterned contusions by the seatbelt with underlying intrathoracic and intra-abdominal injury and patterned injuries by the headlight rim, grill, bumper, etc.⁶ Patterned injuries are also helpful in determining the mechanism and possible chain of events in injury causing and their manners, which will aid in recreating the crime scene.

A similar case study done by Xiao N. et al., showing how tyre marks imprint injury present over the body, helped them in reconstructing the crime scene and also identifying the vehicle that caused it.⁷ Also, a case study done by K.V. Satish et al. shows that patterned abrasions present over the chest and abdomen help in confirming the causative object which is a washing machine in this case.⁸

In Case no. 2 of assault, multiple rail-patterned bluish contusions were noted over the back region and right arm region during autopsy, whose dimensions were found consistent with the dimensions of the cylindrical rod provided by the investigating officer at the time of the weapon query. So, in this case, also with the help of patterned injury, we are able to identify the weapon of offense (Figure 2). The injury due to a pliable weapon appears as two parallel lines of bruising with an undamaged zone in the center like a railway track.⁹ Injuries caused by hard, blunt, and heavy objects like wooden planks, cricket bats etc. show more diffused and deep-seated contusions. The hard, blunt, and flexible object like a belt will also produce patterned contusion injuries, even a buckle of a belt can cause imprint contusions

over the victim's body. Six penny bruises over the neck region in cases of throttling can be helpful in determining the manner of death, as they're an impression of the fingers of the assailant. So the objects with different properties will produce different kinds of patterned injuries. Even a photograph of the injury can be helpful in identifying the object/weapon of offense by superimposition.¹⁰

In homicidal cases, these kinds of patterned injuries will also be helpful in preventing the misleading of cases by changing the weapon of offense. A case report by Zugibe FT. et al. also showed the importance of patterned injuries and their meticulous study in identifying and correlating the weapon of offense.¹¹

In Case no. 3 of hanging, the depression of skin over neck region was caused by the plies of nylon rope, forming the imprint abrasion, which helped in identifying the ligature material used for hanging. (Figure 3). Similarly, different ligature material will have different types of impressions, like a dark indented ligature mark in cases of cable wires; ligature mark in the case of belt will be broad and resemble its shape; a hard designed border of a cloth will form an imprint of the border, etc. Many times ligature material does not come with the body in an insitu state and later on it will be sent for medico-legal examination to determine whether the ligature mark present over the neck region could be caused by the given ligature material or not. So, in such a situation, the patterned ligature mark will be extremely helpful in identifying the ligature material used during hanging. The study done by Karmakar SN et al., also depicts the importance of patterned abrasion marks in hanging cases when it comes to correlating them with the provided ligature material.¹² The most common ligature material used for the hanging is nylon rope as per study by Khan et al in their study.¹³ There were cases with mechanical asphyxia presented and discussed at Forensic conferences.^{14,15} The study done by Maheshwari et al., shown the antemortem histopathological changes in addition to morphological findings.¹⁶

Similar to the term 'res ipsa loquitur', a Latin phrase meaning "the thing speaks for itself", patterned injuries also often speak for themselves by revealing the identity of the causative weapon or object through their distinctive shape and characteristics. From the faint impression of a shoe sole on skin to the precise outline of a cylindrical rod, patterned injuries hold within them the potential to

unravel the enigma of a crime scene. They are the silent witness, the unspoken testimony that can link a victim to a perpetrator, a weapon to a wound, and a sequence of events to a narrative of trauma.

4. Conclusion

Patterned injuries are important postmortem findings that help in determining the weapon/object of offense and help in understanding the mechanism behind it, as seen in **case no. 1**. Many hit-and-run cases or planned accident cases can be solved if patterned injuries are present over the body by correlating them with the causative object or vehicle in this case.

The significance of patterned injuries extends beyond the area of forensic medicine, touching a broader aspect of social and legal implications of a violent crime, as seen in **case no. 2**. The autopsy surgeon should be more careful and focused when homicidal patterned injuries are present over the victim's body because sometimes the postmortem examination report is the only evidence that reflects the intention of the accused, links the injuries with the weapon recovered from the accused and determines the manner of death.

The autopsy surgeon should identify and describe in detail about the patterned ligature mark injury over the neck region in case of hanging because it's helpful in linking with ligature material, especially when crime scene or ligature material is altered, as seen in **case no. 3**.

The autopsy surgeon should not neglect such findings, and a thorough and detailed examination of such injuries must be performed during medico-legal examination of injuries and autopsy. The location, direction, and dimensions of these injuries should be noted properly and accurately, as sometimes it is the mere crucial link between the injuries on the victim and the causative agent, which will aid in reconstruction of the crime scene, identification of the object, and determination of the manner and cause of death.

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