

CASE REPORT

Death from Penetrating Trauma to the Chest and Abdomen

Asan Petrus^{1*}

Department of Forensic and Medicolegal, Faculty of Medicine, Universitas Sumatera Utara,
Jalan Dokter Mansyur Medan, Sumatera Utara

Corresponding email: asanpetrus95@gmail.com

Abstract: Deaths from penetrating trauma are less common than blunt trauma, gunshot wounds, asphyxia and drug intoxication. The most common mode of death is homicide. Penetrating trauma to the chest and abdomen causes severe bleeding and damage to internal organs, leading to instability of vital signs. Hypovolemic shock due to loss of circulating volume causes tissue hypoperfusion and hypoxia, if not treated promptly will cause multi-organ failure and death. The objectives of this case are to review cases of penetrating trauma to the chest and abdomen in forensic and medicolegal aspects. This case reports a victim of penetrating trauma by a sharp wound who was found dead in the direction of a palm oil plantation not far from his house. In this case, the stab wound to the abdomen was the most harmful to the victim as it caused severe bleeding (1400 mL) and was aggravated by bleeding from the stab wound to the chest (750 mL). The bleeding resulted in a loss of blood volume of more than 40% of the total blood in the victim's body. The victim experienced hypovolemic shock with decreased systolic blood pressure, tachycardia, and oliguria. As a result, oxygen delivery to vital organs cannot meet oxygen demand, causing a drop in blood pressure, refractory acidosis, and a further drop in cardiac output, leading to multiorgan failure (MOF) and, finally, death. The victim's death was unnatural and the cause of death was due to sharp trauma in the form of a stab wound to the abdomen that penetrated the abdominal cavity aggravated by a stab wound to the left chest resulting in severe bleeding. As per the Indonesian Criminal Code, Article number 338 or 340, the offender of this murder can be sentenced.

Keywords: Crime, death, hypovolemic shock, penetrating trauma

INTRODUCTION

Violence against homicide victims and abuse of living victims can occur in the form of sharp trauma, blunt trauma, or other forms of trauma, either together or individually. According to Butchart et al., violence is also one of the most common causes of death in the world. The medicolegal aspect of trauma can be the result of an accident, abuse or self-inflicted. The knowledge associated with injury/trauma in forensic science is called Traumatology.¹

Every year, 1.4 million people worldwide lose their lives to violence. Violence is the fifth leading cause of death in the world, and in people under the age of

40, it is the leading cause of death. In addition, the number of crime cases in Indonesia is also still relatively high, namely, there were 1,150 cases in 2017 and 1,024 cases in 2018. Whereas in North Sumatra according to data reported by the police, the incidence of crimes against life in 2018 occupies the number 2 position, namely there are 107 cases, and for the incidence of the number of crimes against physical in 2018 reported North Sumatra province occupies the first position with the incidence of 5,240 cases.²

Deaths from sharp violence are less common than deaths from blunt violence, gunshot wounds, asphyxia and drug intoxication. The most common mode of death associated with sharp violence is

homicide, followed by suicide. A report by the Centre for Disease Control in the United States evaluated violent deaths that occurred in 16 states during 2006. Sharp violence accounted for 1.7% of all suicides, compared to the top 3 suicides, which were: firearms (51.3%), hanging/strangulation/suffocation (22.1%), and poisoning (18.4%). Sharp violence cases accounted for 12.1% of all homicides compared to 65.8% for firearm deaths and 4.6% for blunt violence.^[1] Bleeding deaths are a substantial global problem, with over 60,000 deaths per year in the United States and an estimated 1.9 million deaths per year worldwide, 1.5 million of which are from physical trauma.²

Bleeding is the acute loss of blood due to damage to blood vessels. Bleeding can be superficial (not deep) and most often occurs when superficial vessels are damaged. On the other hand, it can be deep and penetrate the skin tissue and internal organs of the body, leading to a series of symptoms and complications, as well as instability of vital signs (heart rate and blood pressure). There are two types of Bleeding; external and internal. External bleeding occurs from external body parts, or traumatic injuries, while internal bleeding requires a high level of clinical examination, laboratory tests, Mayo Clinic, and careful observation of vital signs. Bleeding is a major cause of potentially preventable death, especially in acute/early trauma.³

Hypovolemic shock is a potentially life-threatening condition. Early recognition and appropriate management are essential. Hypovolemic shock is circulatory failure due to loss of effective intravascular volume (fluid or blood). This loss of effective circulating volume leads to tissue hypoperfusion and tissue hypoxia. If left untreated, hypovolemic shock can

cause ischemic injury to vital organs, leading to multiorgan failure (MOF).⁴

According to data from the Central Statistics Agency (BPS), the proportion of victims of violence who reported to the police reached 52.43% in 2020. Reports of violence to the police in the first year of the COVID-19 pandemic were the highest since 2016, as shown in the graph. When viewed by gender, victims of violence who reported in 2020 were more likely to come from the male group with a percentage of 58.67%, while female victims reported only 44.58%.²

CASE

We reported a case of sharp trauma to the chest and abdomen based on the body delivered by the investigator to Bhayangkara Hospital TK.II Medan on Tuesday, September 20, 2022. According to the investigator, the body was found dead not far from his house on September 19, 2022, at 10:50 p.m. Previously the victim was involved in an argument with a man who disturbed the victim's residence, then the victim chased the suspect towards a palm oil plantation not far from his house. Not long after, the victim's worried wife came to the location where the victim was, it turned out that the victim's wife had found the victim lying bleeding and lifeless. Seeing the incident, the victim's wife reported it to residents and the police. The body was examined inside and out because it was suspected of having a criminal offence on September 20, 2022, at 11.20 a.m. (west of Indonesia time's) at the Forensic Medicine and Corpse Recovery Installation of Bhayangkara Hospital TK.II Medan.



Figure 1. Body received at Bhayangkara Hospital Medan.

The general identity of the corpse is a 41-year-old man. Body weight 51 Kg, with a body length of 150 cm, skin colour tan, black-brown eyeball colour, black hair mixed with grey hair and curls, nutritional condition is sufficient. The special identity of the corpse, there are two tattoos on the right chest the right back and the left upper arm. The first tattoo on the right upper arm has an abstract drawing with a size of 62 cm long and 15 cm wide, with a distance of 0.5 cm from the centre line of the front of the body and in line with the top of the right shoulder in black. The second tattoo on the left upper arm is an abstract drawing measuring 25 cm long and eight cm wide, at a distance of 5 cm from the top of the left shoulder and 5 cm above the left elbow.

On external examination of the corpse, the head was symmetrical, and no signs of violence were found. On the forehead, there was a reddish abrasion on the right forehead, with a size of 0.5 x 0.2 cm, at a distance of 3 cm from the centre line of the front body, and 7 cm from the top of the right eyebrow (Figure 2A). The eyelid membranes were pale (Figure 2B). Pale-coloured lips were observed (Figure 2C).



Figure 2. (A) Abrasions on the forehead, (B) Pale eyelids, and (C) Pale lips.

On the chest, there was a reddish open wound on the left upper chest, oval. Before the wound was closed, the wound size was 2 cm x 0.8 cm, and the wound depth was 9.5 cm, after the wound was closed, there was a line-shaped wound with a length of 2.4 cm. The wound is characterized by flat edges, one corner of the wound is sharp, and the other corner is blunt, the direction of the wound is from left to right, at a distance of 10 cm from the centre line of the front body and 2.5 cm from the top of the left nipple (Figure 3).



Figure 3. Open Wound on Chest.

On the abdomen, a reddish open wound was found on the right upper abdomen, oval-shaped with a size of 3.8 cm x 2 cm, wound depth of 10 cm, with the characteristics of flat wound edges, one corner of the wound is sharp, the other corner of the wound is blunt, the direction of the wound is perpendicular, with a distance of 3 cm from the centreline of the front body and 5 cm from the top of the navel. There was an intestine hanging from the wound (Figure 4). The upper and lower limbs were pale (Figure 5). Other findings were unremarkable.



Figure 4. Open Wound on Abdomen.



Figure 5. Pale Fingertips.

On internal examination of the corpse, there was a blood stain on the left

pectoral muscle, measuring 4 cm x 2 cm (Figure 6). There was a penetrating wound between the 4th & 5th ribs with a size of 3.2 cm x 0.5 cm in line with the open wound. Blood and blood clots totalling 750 ml were found in the left chest cavity (Figure 7 A & B). There was a penetrating wound in the lower upper lobe of the left lung measuring 3.4 cm x 0.5 cm (Figure 8).

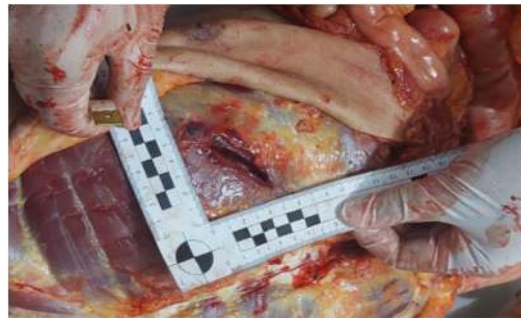


Figure 6. Blood Infiltration and Penetrating Wounds on Chest Muscles.



Figure 7. Blood and Blood Clots. (A) In the Left Chest Cavity & (B) In the Collection Container.



Figure 8. Penetrating Wound of the Left Lung in the Lower Upper Lobe.

At the opening of the abdominal skin, a blood seep was found in the right upper abdominal muscle with a size of 4 cm x 3 cm. On the right upper abdominal muscle, a penetrating wound measuring 3.5 cm x 0.6 cm was found in line with the open wound (Figure 9). Blood and blood clots were found in the abdominal cavity totalling 1400 ml (Figure 10 A & B). A penetrating wound was found on the large abdominal blood vessel (abdominal aorta) measuring 1.5 cm x 0.2 cm (Figure 11). A penetrating wound was found in the lower stomach, measuring 5 cm x 3 cm. (Figure 12). Food residue was found to be solid, with no pungent odour. Blood infiltration was observed in the hanging intestine, measuring 5 cm x 4 cm. A penetrating wound was found in the intestinal tube measuring 3.4 cm x 2.5 cm (Figure 13).



Figure 9. Infiltration of Blood in the Deep Abdominal Muscles.



Figure 10. Blood and Blood Clots. (A) In the Abdominal Cavity & (B) In the Collection Container.



Figure 11. Penetrating Wounds of the Great Vessels of the Abdomen.



Figure 12. Open Wounds on the Lower Stomach.



Figure 13. Infiltration of Blood and Penetrating Wounds in the Intestinal Loops.

DISCUSSION

Estimated Time of Death

Examination of the corpse revealed purplish-red corpse bruises that did not disappear with pressure on the back of the neck, back, waist, and upper and lower limbs that did not disappear with pressure. The bruising started between 30 minutes and 2 hours post-mortem. The corpse bruise begins to gradually settle between 6 to 12 hours. Before the cadaveric bruise settles, the cadaveric bruise can still move around if the corpse is moved. A cadaveric bruise settles when there is no more blood movement or flow or when blood seeps out of blood vessels into surrounding tissues due to haemolysis and rupture of blood vessels.

Settled cadaveric contusions can occur 6 to 12 hours before decomposition occurs or between 24-36 hours at cold temperatures. Cadaveric bruising begins to settle for 8-12 hours with a faint picture, where the bruise can be precisely demonstrated by pressing the discoloured and unpressured parts.⁵

The stiffness of the corpse is found to be difficult to move in all joints. Rigor mortis, or stiffness of the corpse after death, is due to the loss of adenosine triphosphate (ATP) in the muscles. ATP is the basic energy for muscle contraction. Muscles require a continuous supply of ATP to contract, as the lack of large amounts of ATP only causes muscle contraction for a few seconds. Three metabolic systems are responsible for maintaining the supply of ATP in the muscle, namely the phosphagen system, the glycogen-lactic acid system, and the aerobic system. Under optimal conditions, the phosphagen system can provide maximal muscle strength for 10-15 seconds, the glycogen-lactic acid system for 30-40 seconds and the aerobic system for an unlimited time. After exercise, all three systems need time to replenish. After death, ATP ceases. In the absence of ATP, actin and myosin filaments become permanently complex and stiffen the corpse. This complex will occur until decomposition occurs.⁵

Rigor mortis disappears with decomposition. Cold or freezing temperatures/air will slow the onset of rigour mortis as long as the temperature remains constant. Rigour mortis will disappear with secondary relaxation. Once rigour mortis disappears, it will not return. Rigor mortis usually occurs 2-4 hours post mortem and persists at 6-12 hours post mortem.⁵ The onset of rigour mortis is in small muscles, such as the jaw, and then gradually in large muscle groups. Classic rigour mortis occurs in the jaw and upper and lower extremities. Rigor mortis will

disappear upon decomposition. At ambient temperatures, rigour mortis will disappear by 36 hours but may remain for up to 6 days. In hot climates such as Texas, the decomposition phase will occur within 24 hours. Hyperthermia and loss of temperature regulation due to cerebral haemorrhage and infection can accelerate the onset of rigour mortis.⁵ Since there were no signs of decomposition in this corpse, the estimated time of death was approximately 12 to 24 hours at the time of post-mortem examination.⁵

Mechanism and Cause of Death

The external and internal examinations revealed: (1) The first stab wound penetrated the chest wall, pectoral muscle and lung resulting in bleeding in the left chest cavity totalling 750 ml. (2) The second stab wound penetrated the abdominal wall, stomach, hanging intestines, and cut through the large abdominal blood vessels resulting in bleeding in the abdominal cavity totalling 1400 ml. In this case, the second stab wound was the most dangerous stab wound for the victim, as it cut through the large abdominal blood vessels and caused profuse bleeding (1400 ml), aggravated by the stab wound to the chest (750 ml) which was the most likely mechanism of death.^{6,7}

The mechanism of haemorrhage was also characterized by the presence of pallor of the eyelids, the surface of the lips, and the tips of the fingernails and toenails, and the results of the internal examination showed that the left lung and liver were pale. The haemorrhage resulted in a loss of blood volume of more than 40% of the total blood in the victim's body, the haemorrhage caused the blood volume status to continue to decline, especially when 25 to 30% of the effective blood volume, the victim experienced a state of shock with decreased systolic blood pressure, tachycardia, and oliguria. As a result, oxygen delivery to vital

organs cannot meet oxygen demand, causing a drop in blood pressure, refractory acidosis, and a further drop in cardiac output, leading to multiorgan failure (MOF) and, ultimately, death.¹⁰⁻¹³

CONCLUSION

Trauma is the most common cause of death in both children and adults (mostly young adults) and can be caused by homicide and traffic accidents. A thorough and careful examination by an expert doctor can help if there is a suspicion of criminal activity in a homicide case. From the results of the external and internal examinations, as well as having been discussed, it was concluded that the victim's duration of death was 12-24 hours, the nature of the victim's death was unnatural and the cause of death was due to sharp trauma in the form of a stab wound to the abdomen that penetrated the abdominal cavity, stomach, hanging intestines and cut the large abdominal blood vessel (*aorta abdominalis*) aggravated by a stab wound to the left chest that penetrated the chest muscle, between the 4th and 5th ribs and the lower left lung resulting in severe bleeding. The perpetrator in the murder case can be charged with Article 338 of the Criminal Code and or 340 of the Criminal Code.

REFERENCES

1. Wiranto D. Korban Pembunuhan Yang Disebabkan Oleh Trauma Tajam Yang Diperiksa Di Bagian Forensik Rs Bhayangkara Palembang Berdasarkan Visum Et Repertum 2016-2018. *Fak Kedokt Univ Sriwij.* 2019.
2. Statistik badan pusat. *Statistik Kriminal 2019.*; 2019.
3. Johnson, A. B., & Burns, B. (2020). Hemorrhage. *StatPearls Publishing.* <https://www.ncbi.nlm.nih.gov/books/NBK542273/>
4. Taghavi S, Nassar Ak, Askari R. Hypovolemic Shock https://www.ncbi.nlm.nih.gov/books/NBK513297/#_NBK513297_pubdet_
5. DiMaio V, DiMaio D. *Forensic Pathology* 3rd edition. London: CRC Press LLC. 2022.
6. Saukko, P., Knight, B. 2016. *Knight's Forensic Pathology*, 2nd Ed. London: CRS Press.
7. Prahlow, Joseph A. 2016. *Forensic Autopsy of Sharp Force Injuries.* Tersedia http://emedicine.medscape.com/public/vp_track_iframe.html. Diakses tanggal 10 Oktober 2022.
8. Bardale, R. 2011. *Principles of Forensic Medicine and Toxicology.* First Edition. New Delhi: Jaypee Medical Publishers.
9. Tsokos, M. 2008. *Forensic Pathology Reviews.* Vol 4. Berlin, Germany. Humana Press:139-149.
10. Zeiler, J., Idell, S., Norwood, S., & Cook, A. (2020). Hemothorax: A Review of the Literature. *Clin Pulm Med.*, 27(1), 1–12. <https://doi.org/10.1097/CPM.00000000000000343>
11. Suhas S. Bilchod, Nawaz M. Dakhani, Deepak Arkalgud, Yamanur P. Lamani (2020) *Near-transection of abdominal aorta due to stab injury: a case report* <https://www.ijurgery.com/index.php/isj/article/download/6681/4307>
12. Stefan Potente, Frank Ramsthaler, Mattias Kettner, Patrick Sauer, Peter Schmid (2020) *Relative blood loss in forensic medicine—do we need a change in doctrine?* <https://link.springer.com/article/10.1007/s00414-020-02260-w>

13. Taghavi S, Nassar Ak, Askari R. (2022)
Hypovolemic Shock.
<https://www.ncbi.nlm.nih.gov/books/NBK513297/>