Homicidal Ligature Strangulation without Ligature Mark by the Door Curtain Presenting as Natural Death

Duangta Dulabutr

Abstract

Homicidal ligature strangulation almost always presents with ligature marks. However, the author reported a case of ligature strangulation without detectable ligature mark. A 35-years-old woman was found dead at the crime scene which first appeared like natural death. No external wounds and no signs of violence were observed. Autopsy findings presented no ligature mark at neck region and the lack of injuries in the deep neck structures. Only petechial hemorrhages at conjunctiva, epicardium and visceral pleura had been found. The additional information from her mother about the wrong position of the door curtain was helpful for the police and forensic pathologist. After an investigation, it was found that the door curtain was used in ligature strangulation. The highlight of this case is the difficulties in interpretation of pathological findings in asphyxial death in case of using soft materials in ligature strangulation. In addition, body decomposition and minimal signs of struggle in the crime scene can make post-mortem examination more complicated.

Key words: ligature strangulation, ligature mark, sign of asphyxia, homicide, decomposition
Introduction

Ligature strangulation is the most common method of homicidal asphyxia.\textsuperscript{1, 2} Victims of ligature strangulation are predominantly females.\textsuperscript{2, 3} The neck compression results from applying ligature material around the neck. The ligature material used can range from hard materials, for example, wires and strings, to soft clothing. The mechanism of death is the occlusion of the neck vessels supplying blood and oxygen to the brain. The face and neck above the ligature mask frequently appear markedly congested, with confluent scleral hemorrhage and conjunctival petechial hemorrhage because of venous occlusion.\textsuperscript{1, 4}

In general, the complete occlusion of both arterial and venous sides rarely occur and the compression of venous system is more likely to happen because the compression force making venous occlusion is much less than that making arterial occlusion.\textsuperscript{4} This venous compression produces increased intravascular pressure, congestion, and rupture of the vessels. The ligature mark usually encircles the neck in horizontal plane overlying the larynx or upper trachea, and fractures of the hyoid bone or thyroid cartilage may be presented.\textsuperscript{1, 4, 5}

Most of the ligature strangulation cases have classic signs of asphyxia: facial congestion, conjunctival petechial hemorrhage and cyanosis and the ligature mark is obviously detected around the neck.\textsuperscript{1, 4} However, there are some circumstances that ligature mark can be difficult to identify. For example, soft clothing used as ligature material can produce obscure ligature mark and this finding can be missed in post-mortem examination.\textsuperscript{1} In this article, the author reported the medico-legal case which was presented in the unsuspected circumstance and ligature mark was not detected even in the medico-legal autopsy. However, after DNA analysis was performed on victim’s nails and the police investigation was conducted based on the results of DNA profiles, homicidal asphyxia was revealed in this case and the offender was arrested and charged with murder. According to the police record, ligature strangulation was the method used by the offender and ligature material used in this case was soft clothing.

Case report

A 35-years-old healthy woman was found death in her house in the morning. The scene investigation showed a decomposed body lying on back position on the floor of the living room in a tidy house and no sign of struggle was observed. The door was closed in the unlocked position. A fan was still working near her feet. There was remaining food on the table and unwashed clothing in the bathroom. No signs of injuries were detected on her body at the initial examination of the scene. No suspicion of homicide was raised from the police investigation. Because the cause of death could not be pronounced, the corpse was sent to autopsy at the Department of forensic medicine, Phrachomklao hospital, Phetchaburi province.
The autopsy findings revealed the decomposed female body with discoloration of the face, neck, and trunk and marbling at upper torso (Figure 1). Obvious assault wounds or defense wounds were not found on her body in the external examination. No evidence of neck injuries or ligature marks was detected (Figure 2). There was no evidence of injuries of external and internal genital organ and acid phosphatase determination on vaginal swabs and microscopic examination for spermatozoa were negative. Minimal petechial hemorrhages at the conjunctiva of her left eye were detected. The internal examination revealed no evidence of chest and abdominal injuries (Figure 3A). The lack of injuries to the neck muscles, neck bony structures and neck vessels were noted (Figure 3B). Some petechial hemorrhages at the epicardium and visceral pleura were detected (Figure 3C). There was no evidence of injuries or diseases at internal organs including brain, heart, lungs, liver, spleen, pancreas, and kidneys and bony structures of both arms and legs. The toxicological screening for drugs of abuse was performed on urine sample using immunoassay and the results were negative for methamphetamine, opiates, and benzodiazepine groups. Analysis of blood ethanol was performed by head space gas chromatography-flame ionization detector (HS-GC-FID) and the result was negative for ethanol. Because petechial hemorrhages were found at conjunctiva, epicardium and visceral pleura and the body were decomposed, these signs could be considered as asphyxia signs and homicidal asphyxial death was still in the differential diagnosis. Thus, blood, hair, and nail samples were collected to send to the police for further DNA analysis. If mixture profiles were detected in this analysis, DNA profiles from the suspect were analyzed and compared if possible.
One day later, her mother came from another province to bring her daughter’s body back for the funeral. The useful information about her habit was provided by her mother. Her daughter was usually prudent because she lived alone in her house. Thus, it was less likely possible that she closed the door with unlocked position. In addition, the police record stated that the door was closed without closing the door curtain and the curtain was not in the proper position on the curtain rail. These findings were not consistent with her daughter’s habit. Before the victim died, she communicated with her mother via “Line” application on the Smartphone two days ago and everything in her life was fine. However, her mother found that her daughter’s Smartphone was missing from her house. All of this information convinced the author that this case tended to be unnatural death. Homicidal asphyxia was suspected and ligature strangulation using door curtain might be possible because some of the scene markers were not consistent with the victim’s habit and door curtain was the soft clothing which could leave minimal injuries.

Then, the author called the police to explain the autopsy findings and the assumption that her death might be caused by homicidal ligature strangulation by the door curtain. After he received this information, he interviewed all possible people who were closed to the victim and all 8 neighbors. Their DNA was collected from buccal mucosa after interviewing. Eventually, DNA profiles from one of the neighbors were matched with DNA mixture profiles from the victim’s nails and there was a fingernail scratch detected at his forearm. Then, the alleged offender confessed because he succumbed to the forensic evidence.

According to the police investigation record, he committed a crime for the purpose of victim’s properties. On the day of alleged crime, He noticed that the victim’s front door was opened and the light was turned on because he lived in the next house. He heard some sound from the kitchen and he thought that the victim was there. Thus, he climbed up the wall between their houses and he pushed the steel grill door to walk into her house to avoid seeing her.
However, he saw the victim lying on the couch in this living room and she screamed for help. Then, he decided to snatch the door curtain to strangle her neck from behind and compress her body on the floor until she was unconscious and dead. Then, he attempted to position her body in sleeping posture and kept the falling curtain rail up. Then he turned off the light and took her Smartphone and money away. He left the door curtain beside the victim’s car and returned to his house. On the next day, he threw the SIM card into the river and brought her Smartphone to sell. Finally, this alleged offender was charged with an offence of robbery that causes grievous bodily harm to the other person and causing death.

Discussion

In general, homicidal ligature strangulation usually presents obvious ligature marks, defense wounds and deep neck structure injuries. External findings frequently reveal the signs of asphyxia: facial congestion and conjunctival petechial hemorrhage. The signs of struggle at the crime scene were usually noted. However, neither external wounds nor signs of struggles in the victim’s house were initially observed in this case. Therefore, the police and the doctor who first came to the crime scene did not consider as the suspected homicidal case. The indication of sending her body for medico-legal autopsy was an unknown cause of death because she was in the young age group and did not have known the underlying disease.

Crime scene investigation is crucial in post-mortem examination to obtain useful information for the declaration of a manner of death. History taking from close relatives and intimate friends is also important to obtain victim’s habit, lifestyle and personal matter and this information can assist the police investigation particularly in suspicious cases. According to this case, when victim’s history was obtained from her mother, some suspicious issues were raised because crime scene findings including door position, door curtain left outside the door and the position of door curtain rail were not consistent with her daughter’s habit even though other findings in the crime scene were fine. In addition, the victim had made the last conversation with her mother on the Smartphone before her death, but her Smartphone was missing from the crime scene. For this reason, this case should be considered as the suspected case and the police and forensic pathologist should find the evidence to prove this assumption.

The absence of ligature mark in homicidal ligature strangulation was an interesting issue in this case and it has not been reported in Thailand before. There were only a few cases that were reported in published papers. Ligature materials in previous studies were the victim’s own hair and the artificial hair extension. Both of these materials left poorly defined ligature mark but these cases still presented marked congestion and petechial hemorrhages on their faces different from this case. The absence of the ligature mark can be described by this following formula.

\[
\text{Pressure} = \frac{\text{force}}{\text{area}}
\]

This equation shows that the pressure is the force applied to the surface area of an object in perpendicular direction to the surface. Therefore, the pressure caused by the ligature mark is inversely proportional to the surface area of a ligature material on a neck. If there is the same compressive force applying to the different surface areas on any rope points, the pressure on the neck will be more distributed on the surface area of the ligature mark and the pressure on each point of the larger surface area of the ligature object will be less than that of the smaller surface area. According to this case, the murderer used the door curtain which was the soft broad ligature and removed it immediately after her
death. As a result, the ligature mark was absent and even the injuries of the neck structures were not detected. In conclusion, the appearance of the neck injuries depends on three factors, including the nature of the ligature materials (material texture and surface area of the material), amount of force used and the duration which force is applied on materials.\textsuperscript{6, 7}

The other factor that affected the detection of external and internal neck injuries was body decomposition. Although an autopsy was carefully conducted in this case because the body was transformed into decomposition state, the detection of external wounds related to strangulation including fingertip contusions and fingernail abrasions at the victim’s neck was still difficult due to skin discoloration. In addition, putrefaction of the soft tissue produced area of discoloration and tissue swelling due to gas production and the combination of tissue swelling and skin discoloration may be mistaken for a ligature.\textsuperscript{9} Therefore, it was difficult to interpret the ligature mark at the neck. However, there was no obvious injury in deep neck structures including soft tissue, neck muscle and bony structures in this case after a thorough examination. In previous studies, it was suggested that when some of the body areas were discolored after decomposition began, injuries particularly contusions would be modified and may be difficult to evaluate.\textsuperscript{10, 11} The abnormal signs found in this case were only some petechial hemorrhage at the conjunctiva, epicardium and visceral pleura. Although petechial findings were non-specific, over 70\% of strangulation victims have such hemorrhage.\textsuperscript{9} When the questionable history from the victim’s mother was considered, homicidal asphyxia was suspected. Thus, cutting fingernails for DNA analysis with the accused was useful.

Although interrogation with all suspected people had not been helpful, DNA profiles of one of these suspects matched with DNA mixture profiles from the fingernails of the victim. The accused had made confession and this criminal case was finally resolved. In the author’s opinion, DNA sampling should be performed in every suspected homicidal case not only in the strangulation case. It is helpful not only for detecting murderer’s DNA profiles from the deceased but also comparing with DNA from bloodstain at the weapon and the scene though in the other case. The collection of DNA evidence from the corpse and the scene should be performed as early as possible before the evidence is lost, washed away, or degraded.

Nowadays, the post-mortem CT with 3D documentation to reveal injuries in the neck structures was introduced in the strangulation-related death which no specific signs and injuries was detected by both external and internal examinations and this procedure was recommended to be the standard procedure before performing the autopsy.\textsuperscript{12} However, the availability of this instrument in the forensic department in Thailand is the major limitation of this procedure due to high initial and maintenance costs. In addition, the interpretation of post-mortem CT findings may be limited especially in decomposed bodies.

**Conclusion**

In case of no obvious external injuries and no suspected findings in the crime scene, if there are suspicious signs in autopsy findings and cause of death is still questionable, homicidal death should be in a differential diagnosis. The thorough crime scene investigation and complete history talking are crucial. In case of using a soft material in ligature strangulation, ligature mark may not present and only non-specific petechial hemorrhages at the conjunctiva and visceral organs can be found in autopsy findings. In addition, wound examination can be difficult to be evaluated especially in decomposed bodies. Thus, forensic pathologists should be aware of all of these issues before making the conclusion.
Acknowledgement

The author would like to express the sincere gratitude to Dr. Peerayuht Phuangphung from Department of Forensic Medicine, Siriraj Hospital, Mahidol University for his kindness in guidance to prepare the article. In addition, the author was considerably thankful to Phrachomklao Hospital, Phetchaburi Province for supporting the author in performing this case report in the hospital. Finally, the author was deeply grateful to all involved people including the police from Muang Phetchaburi Police Station and victim’s mother for valuable information in this article.

References

บทคัดย่อ
รายงานผู้ป่วย: การฆ่ารัดคอโดยไม่พบรอยกดรัดที่ดูคล้ายการตายตามธรรมชาติ รายงานการชันสูตรพลิกศพ
ดวงตา ดุลบุตร
กลุ่มงานนิติเวช โรงพยาบาลพระจอมเกล้า จังหวัดเพชรบุรี

โดยทั่วไปการฆ่ารัดคอมักจะพบรอยกดรัดบริเวณลำคอ อย่างไรก็ตามบทความนี้ได้นำเสนอรายงานกรณีการฆ่ารัดคอที่ตรวจไม่พบรอยกดรัดบริเวณลำคอ โดยศพที่พบเป็นหญิงอายุ 34 ปีที่พบเสียชีวิตในสภาพแวดล้อมล่าสุดจากการตายตามธรรมชาติ จากการตรวจไม่พบบาดแผลจากเหตุการณ์ใด ๆ ที่เกิดเหตุขึ้นนอกจากการฆ่ารัดคอโดยการใช้ผ้าม่านประตู ที่มีร่องรอยการต่อสู้เล็กน้อย

ผลการผ่าพิสูจน์ศพไม่พบบาดแผลบริเวณลำคอด้านนอก และไม่พบการบาดเจ็บของเนื้อเยื่อภายในลำคอ พยายามสืบหาสาเหตุการตายจากอาการขาดอากาศไม่พบ

ข้อมูลเพิ่มเติมจากผู้ต่อสู้กับผู้ตายที่มีการต่อสู้ที่ผ่านมาในพื้นที่ผ่านการชันสูตร พบลักษณะการขาดอากาศไม่ชัดเจน จากการสืบสวนหลักฐานพบว่าผู้ต้องสัมพันธ์กับเหตุการณ์ที่เกิดขึ้น

คำาสำาคัญ: การรัดคอ, รอยกดรัด, ลำคอ, การฆ่ารัดคอ, ผ้าม่าน, การสืบสวน, การชันสูตร