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## **Identification of the murder weapon by the analysis of an atypical pattern of sharp force injury.**

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### **ABSTRACT**

This paper presents a peculiar case of homicide committed with a sharp instrument. Since at the crime scene two different knives were found, one near the victim’s body and the other far from the place where the homicide was committed, it was necessary to determine which of these weapons could have caused the bodily injuries sustained by the victim. During post-mortem investigation an unusual damage was found in the vicinity of the fatal wound to the neck, suggesting that the wound was inflicted with a great force, using a sharp object with a peculiar shape. A comparative study between the two weapons was performed in order to determine the compatibility with the abovementioned damage. Consequently, these analyses led us to the identification of the murder weapon and the author of the crime.

Parole Chiave: arma bianca, omicidio, lesioni secondarie

### **RIASSUNTO**

#### **Identificazione dell'arma del delitto attraverso lo studio di lesioni figurate atipiche.**

In questo lavoro viene presentato un caso particolare di omicidio conseguente all’azione di arma bianca. Sulla scena del crimine sono stati rinvenuti due coltelli differenti, uno in vicinanza del cadavere e l’altro lontano dal luogo del delitto. Durante l’esame necroscopico è stata rilevata una particolare lesione circostante la ferita mortale localizzata al collo, la quale indicava una particolare forza viva che ha animato il colpo inferto alla vittima. È stata eseguita una comparazione tra le due armi allo scopo di determinare la compatibilità di una di esse con la inusuale lesione precedentemente descritta. Questa analisi ci ha permesso di identificare la corretta arma del delitto e, tramite essa, l’autore del crimine.

## 1. INTRODUCTION

Murders committed by sharp force represent one of the most common causes of violent death in several countries [1-5]. Pointed and/or sharp-edged instruments may produce different types of damages which are usually characterized by clean division of the skin with sharp, straight, and cutlike edges that normally do not show any abrasions or contusions. However sometimes it is possible to detect unusual damages of the tissues surrounding the typical wounds suggesting the shape of the instrument used. For this purpose a careful examination of bodily injuries and the weapons found at the scene should be performed. We report a peculiar case of homicide committed with a flick knife, identified after a careful analysis of characteristic secondary lesions inflicted by projections of the knife's handle.

## 2. CASE REPORT

An homicide was committed in an apartment in the suburbs of Rome while four male individuals were having dinner and two of them started a fight. The body of a twenty years old man was found in the kitchen in a sitting position with the head turned to the left (Fig. 1). At the crime scene several blood stains were found disseminated outside the building and on the kitchen floor, where a pool of blood was situated (Fig. 2). During the investigations the following items were found: one typical kitchen knife on the table near the body (Fig. 3), a flick blade knife in the lobby of the building, outside of the apartment (Fig. 4), and numerous empty wine and spirits bottles. The victim's body was diffusely stained by hematic material especially located on the face and the neck.



Fig. 1 – The victim



Fig. 2 – Pool of blood in the kitchen



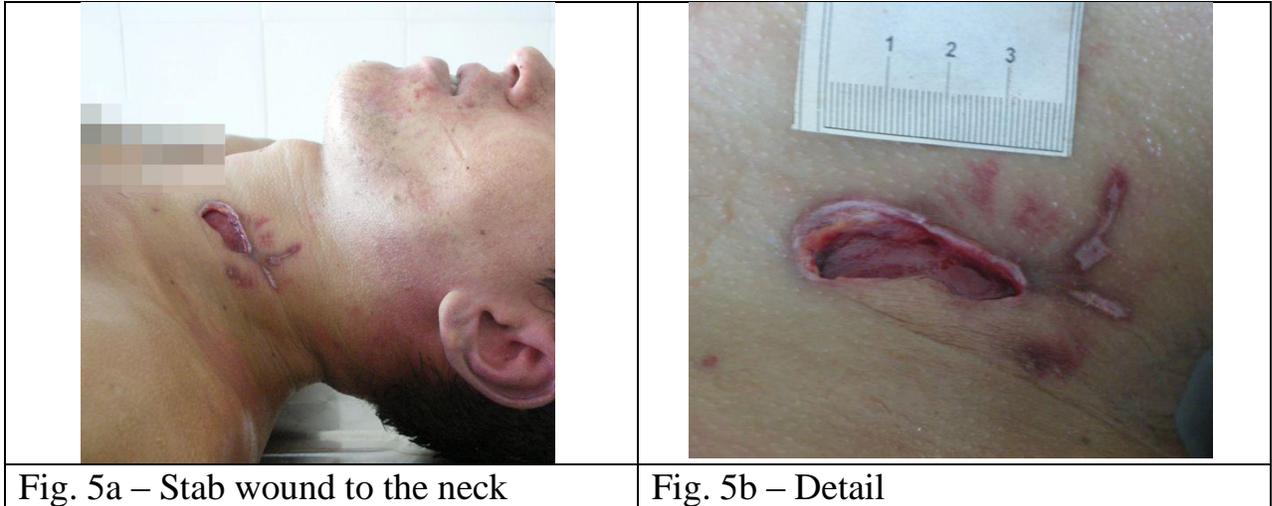
Fig. 3 – “Classic” kitchen knife found on the table near the body



Fig. 4 – Flick knife found in the hall

The external examination of the washed body showed the presence of several wounds in different somatic districts:

- A stab wound on the left anterolateral side of the neck which main axis was oblique, of the maximum length of 3.8 cm (Fig. 5a). This lesion was located 4 cm from the median line of the body and 166 cm from the left heel. The upper edge of the wound was slightly infiltrated and the inferior edge showed an appearance similar to an inverted “V” (Fig. 5b).



- An excoriated patterned area was close to the described wound to the neck. It was characterized by a squared off area of de-epithelialization from which originated a linear area from supero-medial corner of the complex, directed upward and medially. Another linear excoriation with a transverse direction was situated in direct continuation of the main axis of the stab wound to the neck, separated from the latter by a bridge of intact skin (Fig.6).



Fig. 6 – Details of the excoriations.

- A pinpoint lesion of the anterior side of the left shoulder with a longitudinal axis of the maximum length of 0.6 cm. was located 154 cm from the left calcaneal plate (Fig. 7-a).
- A stab wound of the lateral side of the left arm with a longitudinal axis of the maximum length of 1.5 cm. was located 149 cm from the left heel (Fig. 7-b).

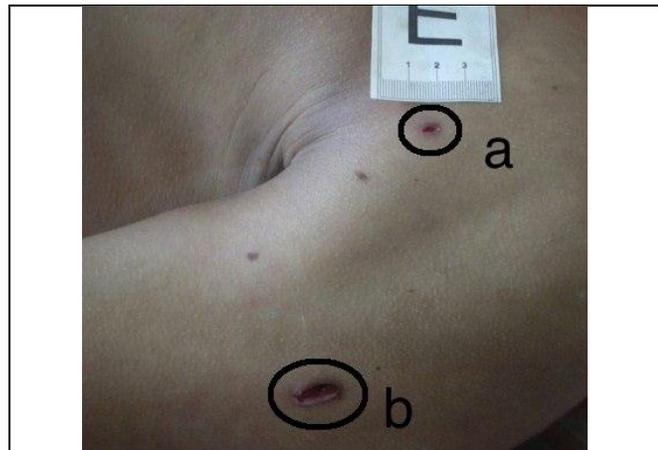


Fig. 7-a: Pinpoint wound at the left shoulder; 7-b: Stab wound at the left arm.

At the autopsy two different wound channels were found, both originated from the stab injury to the neck.

The first wound channel had an oblique axis oriented from left to right with about 45° inclination compared to the body's sagittal plane. Its course involved trachea and penetrated in the right hemitorax cavity where the right pleura and lung upper lobe were perforated. This channel was 10 cm. in length.

The second wound channel was perpendicular to the body's transversal plane. Its course involved the left platysma and sternocleidomastoid muscles, severed the left subclavian artery and penetrated in the left hemitorax cavity where the left parietal pleura was perforated. This channel was 6 cm. in length.

As a result of these wounds, a massive bilateral hemohorax of 1.8 liters (left) and 1.5 liters (right) was found.

Toxicological analyses demonstrated a severe alcohol intoxication.

### 3. DISCUSSION

In sharp force injures, somatic tissues have a different level of resistance in opposition to the penetration of the blade. Scientific evidence shows that skin and muscle tissues have greater resistance compared to the subcutaneous components [6]. However, once the blade gets over the skin resistance, its penetration in the body becomes easier [7]. The atypical patterns of sharp force injuries are generally caused by irregular features of different blades, but it is also possible that two knives with equal blades produce totally different penetration force and wounds [8] The weapons found at the crime scene were:

- 1) a typical kitchen knife, found on the kitchen table, with a smooth blade with a single cutting edge and sharp extremity, of the length of 11.5 cm, the maximum width of 2 cm and the maximum thickness of 1 mm; (Fig. 8)
  
- 2) a flick-knife found in the building lobby, with a smooth blade with a single cutting edge and sharp extremity, of the length of 12,5 cm, the maximum width of 1,5 cm and the maximum thickness of 3,5 mm, with a brown wooden handle. (Fig. 9).



Fig. 8 – Kitchen knife

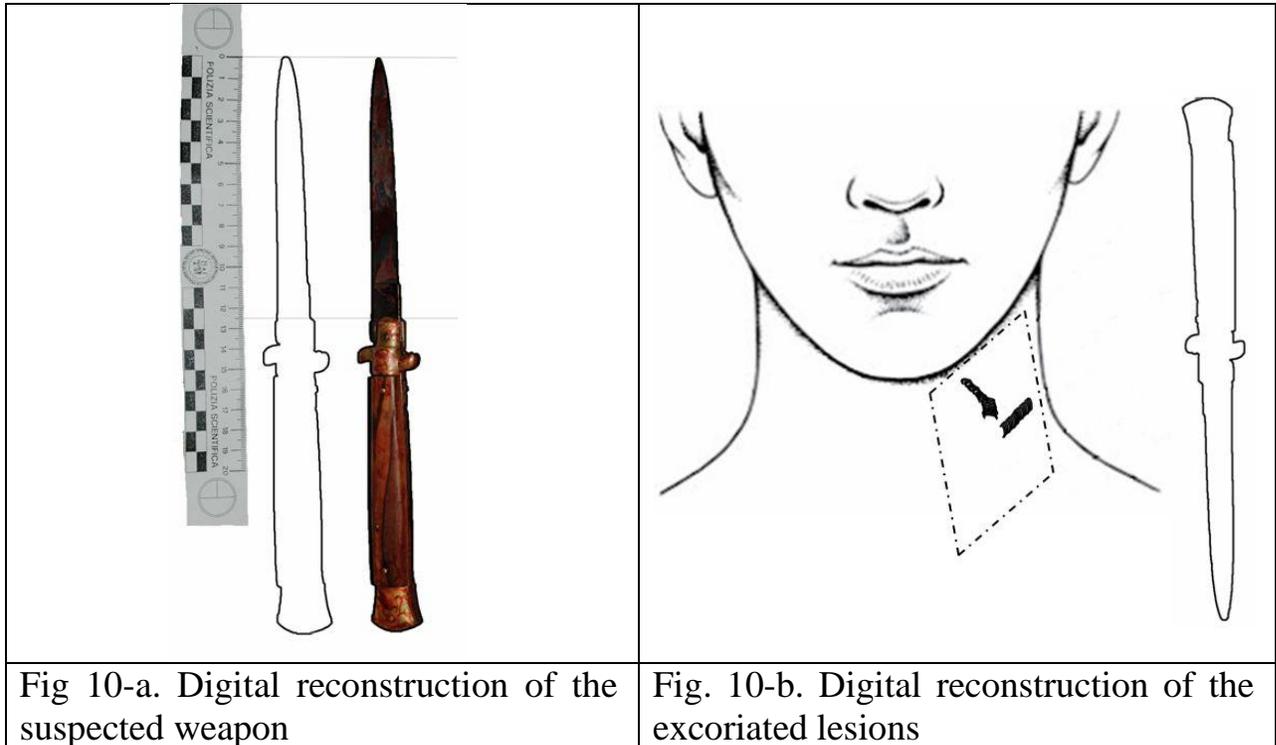


Fig. 9 – Flick-knife

The detailed study of unusual wounds can be useful to find more information about the murder weapon and therefore the author of the crime [9]. In this case was impossible to identify the murder weapon between the two knives found at the scene studying the penetrating wounds, because both knives had blades of similar size. Moreover, scientific evidence shows that the deepness of a stab wound can be greater, less or equal compared to the length of the blade, depending on the flexibility of the tissues, the force applied and the level of penetration of the blade [10].

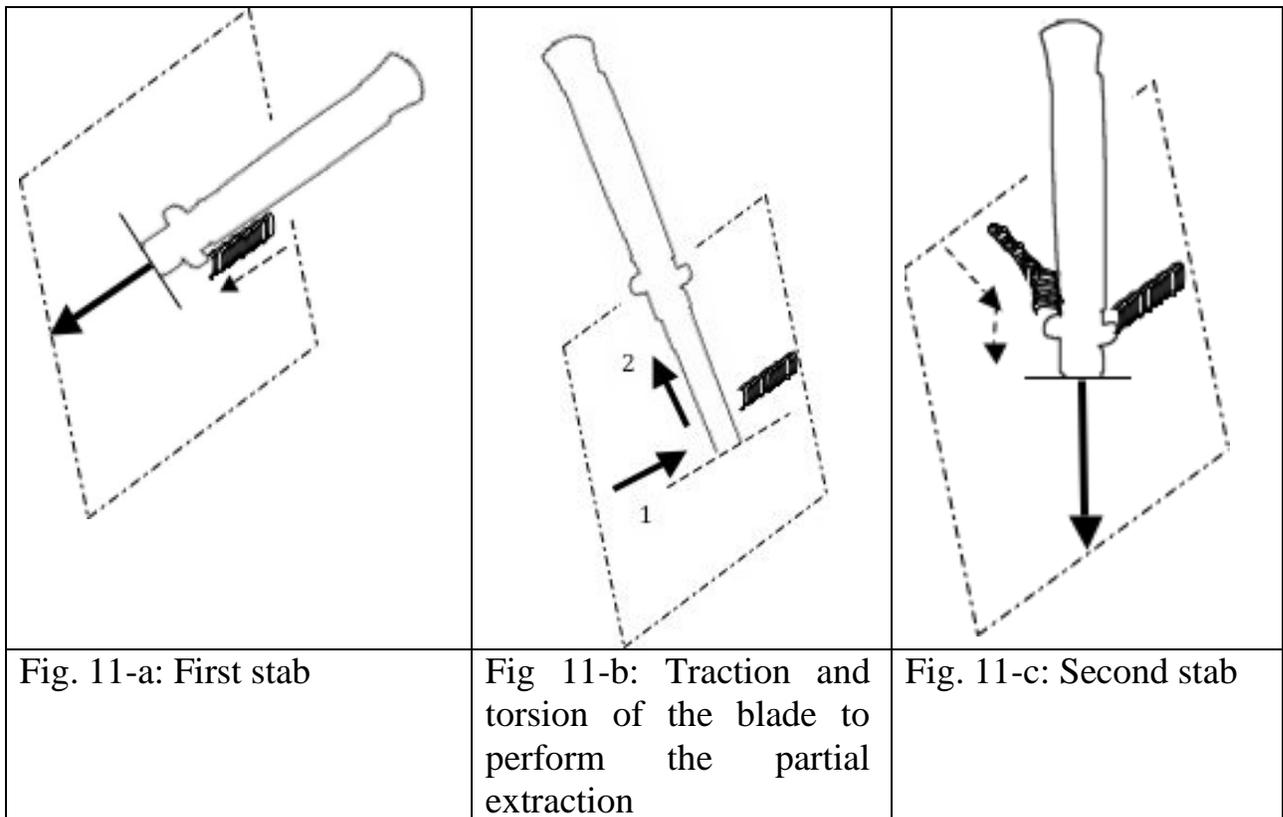
The correct identification of the murder weapon and the reconstruction of the event were possible due to the detailed analysis of both primary and secondary lesions. The atypical excoriated complex close to the main wounds was consistent with the peculiar conformation of the handle of the flick-knife. (Fig. 10a – 10b). The fatal injury was localized to the left side of the neck. Its lower margin showed an

appearance similar to an inverted "V" (fig. 5), compatible with a double introduction of the blade inside the body or with blade torsion inside the wound before its extraction [11].



Most probably these unusual injuries were caused by the flick-knife's handle while the blade was penetrating inside the body. The presence of two different wound channels indicated that the victim was hit by two stabs to the neck, probably without complete extraction of the blade from the body between the first and the second stab. A detailed analysis of the lesions led us to confirm that the excoriated complex was the result of violent movement of penetration, torsion and retraction of the blade inside the body. According to our reconstruction of the event, the first stab (fig. 11-a) was inflicted with an oblique direction from top to bottom and from left to right; during the penetration of the blade, the handle of the knife hit and

crawled against the skin surface, producing an excoriated lesion with an axis orientated in virtual continuity with the axis of the fatal wound. Subsequently the blade was partially extracted by traction and torsion movements directed upwards and outwards (fig 11-b). At last the trajectory was modified while the blade was inside the body, describing an arc with medial concavity, before performing the second stab (fig. 11-c) with a longitudinal direction.



Our reconstruction was confirmed by the presence, in the context of the excoriated wound, of little areas of skin exfoliation, whose layer were raised and oriented in the centripetal direction, evidence of sliding during the penetration of the blade and not during its extraction. The pattern of excoriated wounds was indicative of a particular violence which animated the stab. (Fig. 12)



Fig. 12: Compatibility between knife's handle and excoriated complex to the neck

The absence of defense wounds or other lesions related to fight, grasping or immobilization of the victim was peculiar and indicated a sudden attack. These aspects are often suggestive of suicide, while in homicides multiple depth wounds are often inflicted to different somatic districts [12]. Therefore, the absence of this typical signs in this case show that the victim was hit suddenly, although the drunkenness could have caused a lack of reaction of the victim. Plausibly, due to the confusion caused by alcohol, the author of the crime may have acted in the absence of any defensive reaction by the victim.

After the recognition of the murder weapon, the killer was identified through fingerprints on the knife handle.

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