Case report

Room saturation with acetylene: a new and lethal manner of theft. A medico-legal case

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Abstract

In pathological-forensic literature blast injuries are usually studied in relation to suicides, homicides during terrorist attacks and accidental events on the workplace, while the finding of these kinds of fatalities during misdoing is a recent occurrence. The Authors describe the peculiar case of the accidental death of the member of a criminal mob specialized in thefts to ATMs using acetylene tanks.

The victim, having poured out the acetylene with the intent of triggering an explosion, was involved in the blast of the tank, deceasing immediately.

This unusual manner of death highlights the danger of room saturation with acetylene, a criminal technique becoming more and more popular in the last years. Clin Ter 2018; 169(6):e261-264. doi: 10.7417/CT.2018.2088

Key words: Blast injuries, Acetylene, Forensic pathology

Introduction

In the pathological-forensic field, blast injuries are characterized by a particularly destructive pattern in which multiple lesions can result from the explosion (blast injuries), from blunt forces due to the impact with the components of the exploding device (splits or missiles injuries as seen in collapsing buildings with glass splinters and beams) and from the excessive heat produced by high temperature gases -heat injuries- (1). All these effects demonstrate the extreme variability of the same phenomenon (2) and can represent quite an issue for the forensic practitioner in terms of victim identification, reenactment of the crime scene, cause of death (3), differential diagnosis between suicide, homicide and accidental event (4).

Nowadays, blast injuries are usually correlated with terrorist events (5-6) associated with religious fanaticism (4) whereas suicide attempts following this modality (7-8) are considered rare events (4) described only in scientific literature due to the peculiarity of the detrimental means (3,9-13). Quite more common are fatalities taking place in a work environment (14-16) in which these accidents are caused by poor or faulty safety measures or by transgressions of the workers (17). Other cases described in literature are accidental explosions of fireworks (18-19) or medical devices (20). As far as we know, there are no reports on the use of an exploding mean during theft or any other illicit event with victims, exception made for one case (21) in which a thief was harmed during an aggravated bank theft.

The Authors, taking as a starting point the accidental death of the member of a criminal mob due to the explosion of a tank of acetylene used to rob an ATM, are presenting the peculiarities of the case, the unusual destructive pattern and the pathological-forensic characteristics.

The case

In a small town close to the city of Milan (Italy) a previous offender, 49 years old, was found dead nearby the ATM he was trying to rob. Short time before this finding the thief, inserted a pipe through the automatic dispenser to distribute the gas, with the intention of applying an electric ignition (electric plug and batteries) that would have caused the blast, but was involved in the explosion of the acetylene tank. The victim was hit by a barrage of steel and glass splinters coming from the entrance of the bank and some parked cars, deceasing immediately. From Police investigations, it was discovered that the victim had a known criminal background for criminal conspiracy, theft, illicit detention of explosive materials and attempted robberies to various ATMs (more than a hundred infractions from 2009 all around Italy, with a total amount of 2 mln of euros stolen). Moreover, he was usually working with other family members on isolated ATMs, usually during Friday nights when these devices were loaded with more money to face the weekend. The day following these facts, the Juridicial Authority ordered the autopsic examination of the corpse.
**Autopsy Findings**

**External Examination:** the cadaver (weight 120 kg, height 170 cm) was placed on the dissection table still wearing a balaclava, a fisherman vest containing break-in instruments, and black trousers. The head, stained with partially dried blood, was showing periorbital, bilateral, spectacles-like ecchymosis. Various areas of epidermal loss were found on the left side of the face, left thigh and left leg. Multiple contused lacerated wounds were visible on the left side of the face (with several dermal flaps and detachment of the dermis from the muscle-fascial layers) (Fig. 1A). A 4 cm long wound, with infiltrated edges, was found at the root of the neck, left supraclavicular region. The left hand was traumatologically disintegrated (Fig. 1B). The anterior surface of the right leg and left foot showed the exposure of osseous stumps (Fig. 1C). All the edges of the wounds were irregular and infiltrated with hemorrhage.

**Internal Examination:** there were no relevant findings about head, brain, heart (except for a mild concentric hypertrophy of the left section of the heart) and abdominal organs. Once detached the soft tissues of the chest, various infiltrated fractures were found in the left clavicle and at the I, II and III left rib. 700cc of fluid blood were found in the left pleural cavity and the corresponding lung, at the superior lobe, was presenting a 4 cm wide and 3 cm deep wound in the pulmonary parenchyma. In this lesion, an irregular metallic splinter of 3x2 cm was found (Fig. 1D).

No other relevant findings were discovered and the cause of death was identified in hemothorax due to left pulmonary lacerative wound on a subject with an extensive contused lacerated complex to the left side of the face, to the left foot and with a double osseous fracture to the inferior left limb.

**Materials and Methods**

During the autopsy, biological fluids, specimens of inner organs, epidermal adnexa, psoas muscle and sub-epidermal fat tissue were collected for further toxicological and histochemical analysis. Moreover, organ fragments were sampled for forensic histopathological investigations.

Toxicological analysis were run as a generic screening in order to investigate any eventual substance capable of pharmacological effects and also with specific targets in order to find the most common substances of abuse, using standard protocols of the Laboratory of Forensic Toxicology of the University of Milan. The research of substances of abuse was run using immunoassay techniques EMIT on urine samples, and ELISA on blood samples. For the Blood Alcohol Concentration (BAC) and volatile substances evaluation, a chromatographic analysis was assessed with Headspace Technology (HPLC-MS) while the research of non-volatile substances was estimated with immunoassay techniques and GC-MS.
在内的物质被评估，使用气相色谱-质谱技术（GC-MS）联合评估。

为了进行病理解剖学检查，所有标本均在10%缓冲福尔马林中固定，经酒精脱水后，用微切片机切片成2μm切片。切片用Hematoxylin-Eosin溶液染色和Masson三色染色法染色，以评估病变的活力。切片在Leica DME光学显微镜下检查，并使用Leica DC300F数码相机拍照。同样，这些切片也在偏光显微镜下检查，以评估外部材料在外伤中的偏振能力。

**结果**

毒理学检查未在任何方面发现异常，除了血液酒精含量为1.4 g/L。

病理学检查，使用光学显微镜，显示出肺泡出血的浸润，表明受害者在受伤时是活着的。在Masson的三色染色和偏光显微镜（Fig. 2）下，观察到这些碎片被注入肺泡组织，由爆炸力传送。

**讨论**

乙炔（C₂H₂），根据IUPAC分类为不饱和烃中，以三重键的形式存在，具有高内部能量和随后的不稳定性、易燃性和爆炸性，即使是最小的触发器也是如此（22）。这种物质因其高化学活性而在工业过程中的重要性，使其成为各种合成反应中的“中间体”。

这种无色物质，可以很容易从每个五金店、化学产品店、体育用品店或农业合作社购买（23），最近被作为工具用来打开取款机，通过饱和房间的乙炔气体来实现。在意大利，这种类型的ATM抢劫最初发生在皮埃蒙特，90年代末，由一群年轻罪犯首次使用这种方法，他们通过开发这种技术，可以在105秒内打开取款机。这些罪犯会将乙炔罐放在ATM的漏洞附近，打开阀门以允许气体制成的房间，最后，用电动点火器触发气体制成的爆炸。

在本案例中，然而，在点火器点燃之前，突然发生了爆炸，受害者手中仍握着乙炔罐。由于犯罪发生的空间被限制在犯罪者左半身的空间范围内，因此，比在开放空间中爆炸时，可以造成更严重的伤口（24），并遭受典型的次级损伤，包括伤口中穿刺玻璃和金属碎片，导致从罐中和从附近的物体碎片中通过爆炸产生的冲击波。

病理形态学特征表明在面部（烧伤的毛发和皮脂腺，伤口边缘的燃烧痕迹）由于乙炔的极高温度。证明了大部分有害发现的左偏移性，与乙炔罐放置在犯罪者左半身的事实一致，而且，爆炸可能是由于身体的上部产生的。特别是，次级损伤位于多个区域：左肺尖部、左侧面部、左侧颈部、右下肢和左脚。病理学形态学特征表明面部（烧伤的毛发和皮脂腺，伤口边缘的燃烧痕迹）由于乙炔的极高温度。证明了大部分有害发现的左偏移性，与乙炔罐放置在犯罪者左半身的事实一致，而且，爆炸可能是由于身体的上部产生的。特别是，次级损伤位于多个区域：左肺尖部、左侧面部、左侧颈部、右下肢和左脚。病理学形态学特征表明面部（烧伤的毛发和皮脂腺，伤口边缘的燃烧痕迹）由于乙炔的极高温度。证明了大部分有害发现的左偏移性，与乙炔罐放置在犯罪者左半身的事实一致，而且，爆炸可能是由于身体的上部产生的。特别是，次级损伤位于多个区域：左肺尖部、左侧面部、左侧颈部、右下肢和左脚。病理学形态学特征表明面部（烧伤的毛发和皮脂腺，伤口边缘的燃烧痕迹）由于乙炔的极高温度。证明了大部分有害发现的左偏移性，与乙炔罐放置在犯罪者左半身的事实一致，而且，爆炸可能是由于身体的上部产生的。特别是，次级损伤位于多个区域：左肺尖部、左侧面部、左侧颈部、右下肢和左脚。病理学形态学特征表明面部（烧伤的毛发和皮脂腺，伤口边缘的燃烧痕迹）由于乙炔的极高温度。证明了大部分有害发现的左偏移性，与乙炔罐放置在犯罪者左半身的事实一致，而且，爆炸可能是由于身体的上部产生的。特别是，次级损伤位于多个区域：左肺尖部、左侧面部、左侧颈部、右下肢和左脚。
This peculiar case, thanks to its impressive detrimental features, reveals the social dangerousness of the use of this saturation technique in ATM robberies with acetylene; this substance, due to its high flammability and explosiveness, should not be so easily purchasable by common people and should be regulated by a strict legislation.

References