

## An Unusual Case of Postmortem Burning Following Suicide

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### Abstract

In this case study, a 63-year-old male, holding with his right hand a 12 gauge, double trigger shotgun, loaded with one cartridge, was found completely carbonized inside a burnt out car. The body showed a degree of destruction by fire, consisting of a level 3 of the Crow-Glassman Scale (CGS). Toxicological analyses were performed on still available soft tissues and body fluids. Based on X-ray examination and autopsy findings, the victim was not still alive at the time of fire. The death was determined by a cranio-facial trauma due to a shotgun. The fusion of the lower right limb with the accelerator pedal suggested to the investigators an uncommon way to ignite the car. In fact, not only there was not found accelerant, but it was determined that the fire started from the engine.

**Keywords:** Shotgun; Burnt body; Post-mortem burning

### Introduction

A burned body has always been a hard task for forensic investigations. Identifying the victim, time, cause, and manner of death [1-4] is complicated due to the condition of the body. It is a duty of the forensic pathologist to establish whether an accident, suicide or homicide occurred [5]. The majority of fire-related deaths are accidental, taking place in house fires, automobile or aircraft accidents. In a case series analysis of burned bodies Gerling reported that [6], accidental events represent 60.8% of the cases and 18.5% suicides, the same incidence described by Yeoh (18%) [7]. Bohnert [8] reported that accidental events occur in 66% of the cases and suicide in 23%. Suicides, mainly, occur from self-immolation although some peculiar cases have also been described [9]. Suicide by self-immolation is rare in developed countries with variable incidences between 0.06% to 1%, while in developing countries the incidence of self-immolation reaches at 40.3% [10,11]. An accurate estimate remains difficult to ascertain due to certain studies that consider self-inflicted deaths. Concerning to murder, this form of death accounts for 6% according to Gerling [6]. Tumer et al. [12], recently described 13 cases of burned bodies after a homicidal event (15.6% of burned bodies recorded). Post-mortem burning following homicide (with the cause of death most often by strangulation or firearm) usually occurs to cover evidences of criminal actions and to prevent victim identification. The biggest problem is to establish the death manner of burned bodies in forensic assessment and if victims were exposed to fire before or after death [5] and if the injuries contributed to the cause of death [13]. In fact, evidences obtained even under the most accurate investigation did not always permit the reconstruction of some events, leading to a clear interpretation of the cause of death [6]. The authors present a case of a burned body discovered in his car where a shotgun was present, offering various interpretive hypotheses about the cause and manner of death.

### Case

In September, in the countryside near Florence (Tuscany, Central Italy), some fire brigades and forensic pathologists were alerted at 11:00 because of the presence of a burning car, with a body inside, on the side of a road crossing a wood. When forensic pathologists arrived on the death scene at 12:30, the fire was not extinguished yet. The car engine was still running, its doors and windows closed but not locked and there were noises of gunfire from the car cockpit. Soon firefighters extinguished the fire and found inside the car the cadaver, extensively carbonized, of a subject that, later, was identified as a 63-year-old man,

living in the area. The vehicle was ascertained to belong to the victim.

In the first analysis, the body, located in the driver's seat, showed a totally burned surface and the pugilistic attitude with the skullcap free from any soft tissue, but not calcinated, visible body cavities with the internal organs exposed and multiple fractures of the limbs with burned bones. The head was present but the identification was not so evident, since the flesh was largely devoid due to the soft tissues of the face burnt away or partially charred. The lower third of the right leg was found completely fused to the front compartment of the car, attached to the accelerator pedal (Figure 1). Fragments of skull bones were found in the back-seat section of the car. The Crow-Glassman Scale (CGS) was used for describing the extent of burns to remains. At the external exa-



**Figure 1:** The lower third of the right leg was found completely fused to the front compartment of the car, attached to the accelerator pedal.

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mination, the body showed a degree of destruction by fire consisting to a level 3 of the CGS (Figure 2) [14].

In the front section, between the gearstick and the lever used to drop the backrest, there was, near to the right arm of the body, a side by side, 12 gauge, and double trigger shotgun, loaded with one cartridge. The gun was later determined as belonging to the victim. The shotgun was incompletely burned: in particular, the wooden parts were totally burnt out, but a part of the stock. A piece of metal, hemispherical in shape (about 8 mm, gr 3.5), probably the lead loading of a hunting cartridge, was found in the boot of the car but none of the ammunitions was inside the car. Over the driver's seat, on the inner roof, two concave depressions in the metal sheet were observed (Figure 3). The body was transferred to the local morgue and stored at 4°C. Before autopsy, total body radiographs were performed and identified small fragments of metal in the skull (Figure 4). The autopsy was performed about 42 h after the discovery of the body and toxicological analysis took place to determine the vitality of the victim at the time of the fire, based on CO levels in haemoglobin (COHb).

At the autopsy, the head was still articulated and extended as the result of the contraction of massive muscle mass at the back of the neck but was destroyed upon exposition of the brain, that had been reduced to

a shapeless pulp, so it was impossible to establish the exit and entrance wounds. The fracture lines were radiated from front to back. Three metal fragments were found in the parenchyma of the brain (Figure 5) (two 1 gr. of weight and one 3 gr. of weight). Hemorrhagic infiltration at the skull base was found. Portions of the chest wall were burnt away exposing the viscera. The abdomen wall was completely destroyed with exposure of the intestine. The arms and legs were skeletonized with the extremities fractured by the heat thus resembling the posture of a boxer. There was no evidence of soot found at the larynx level, tracheal or bronchial tubes nor any other sort of injury to the upper airway or digestive system, providing evidence that the man was not alive when the fire began. Personal identification was later made using dental comparison of ante-mortem and post-mortem teeth features [15-17]. In fact, although most of the anterior teeth had burst apart, some posterior teeth were still present and partially damaged by the fire. Furthermore, DNA analysis showed no incongruities between the missing individual and the DNA collected from burnt body confirming the previous suspect. Histological examination, as far as possible in burnt body, confirmed a blood infiltration at the skull base, and blood infiltration of brain where metallic particles were found. No other signs



Figure 2: The body showed a degree of destruction by fire consisting to a level 3 of the CGS.



Figure 4: Small fragments of metal in the skull



Figure 3: Two concave depressions in the metal sheet.

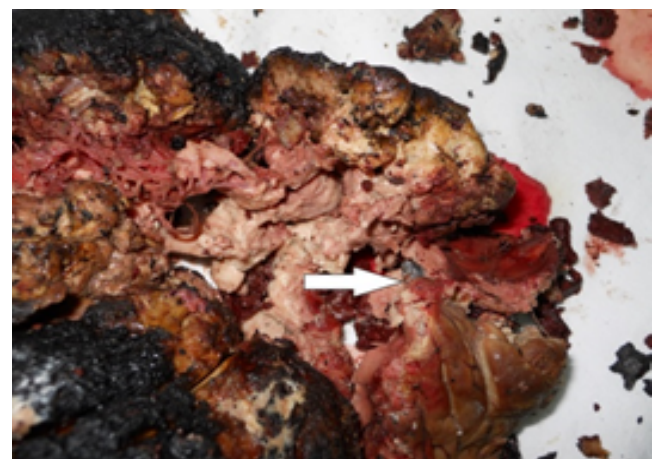


Figure 5: Three metal fragments were found in the parenchyma of the brain.



suggestive of vitality were discovered (edema, blood infiltration, etc) in other organs.

The COHb analysis performed on blood samples by a spectrophotometric method revealed low levels of carbon monoxide (below 10%) consistent with the absence of inhalation in life (as suggested by the absence of soot lining the airways). Screening test and toxicological analysis of all other tissue samples (kidney, liver and urine) were totally negative. No presence of any accelerant was detected at the location of the event by investigators. Subsequent investigations carried out inquiring his family members confirmed the suicidal hypothesis since he was experiencing a period of severe depression due to a family bereavement and at his home there were found hand written letters with suicidal intents. Finally, a research was carried out on the victim's car, highlighting that there had been a fire caused by a short circuit due to engine overheating.

## Discussion

This case presented many challenges for forensic pathologists. The most critical forensic issues to answer were: the cause of death and the manner in which it occurred – with particular attention if the fire had taken place before or after death. The evidence that emerged from the autopsy supported a post-mortem fire exposure. In fact, the macroscopic findings were not compatible with vital fire/heat exposure: the absence of soot in the airways (present in 80% of cases reported by Gerling [6], and the absence of lesions in the digestive system [12]. Other indicative signs of ante-mortem burning, such as edematous swelling and vesicular or patchy detachment of the pharynges-laryngeal mucosa, were not found and histological examination revealed no indication of *in vivo* exposure to fire/heat [8,10,18,19]. Moreover, the carboxyhemoglobin test was negative, so, based on the literature which indicates the vitality of the lesions, this result is typical of non-vital burning. Indeed, literature states that in non-vital burning, the HbCO rate remains nearly constant at below 10% [8]. Thus, to note that in closed environments, such as inside an automobile, the concentration of HbCO is usually higher in cases of ante-mortem burning victims [10].

During the autopsy and X-ray examinations, metal residues in the brain were highlighted with fractures of the skull and its base with blood infiltration of both, in accordance with a gunshot at close range with a direction from the bottom of the car to the roof where there were found two concave depressions showed in Figure 2. While dissecting the skull, a haemorrhagic infiltration at its base was found which, although only indicative, suggested a trauma occurred while alive, whereas the fractures of the limbs did not show any sign of vitality. [20] In this case, the presence of blood infiltration of the skull base suggested a vitality of the lesion which was confirmed by a histological examination. The skull fracture with radiation lines from the front to the back, metal fragments found inside the base of the skull and blood infiltration of the brain where metallic fragment were found suggested that the cause of death could be ascribed to a gunshot with skull-facial disruption [21,22].

The presence of a gunshot wound to the head and apparent post mortem burning, raised the possibility of someone else involved in the death. Tumer [12] described cases of burnings following homicides pointing to some important features for differentiating the diagnosis of suicidal or accidental events: the discovery of the body in a lonely place, violent cause of death with post-mortem burning and the presence of an accelerant, are all elements strongly indicative of homicide. In two cases he described bodies being found in cars parked in an isolated place and in another case a partially burned firearm was found.

In the present case, evidence such as the firearm belonging to the victim, the absence of any accelerant, the place where the firearm was found (near the victim's right arm), the post-mortem examination findings such as the metal fragments found in the parenchyma of the brain with the hemorrhagic infiltration at the skull base.

The head is the most common site of a single self-inflected gunshot wound, while the most common site of multiple suicidal gunshot wounds is the chest [23,24]. Worth of mentioning, the victim's mood change (basically depressed) as reported by relatives, led the investigators to conclude this was a suicidal event.

Suicide by firearm is, a relatively common method, especially among men, [25,26] with an injury framework of the skull due to a single shot fired almost in contact [27,28]. The weight, morphology and "hardness" of the metal fragments found in the parenchyma of the brain and in the boot of the car, as well as the two concave depressions in the sheet metal, were compatible with a cartridge of 9 buck shot 11/0-8.40 mm-3,7 gr. The nine pellets fired simultaneously, caused the fracture of the skull with brain disruption and immediate death of the individual and then ricocheting onto the bonnet (as evidenced by the two depressions identified in the survey). The pellets ended up, at least in part, in the rear of the vehicle where the remains of the discharged-cartridge were found. Even if the isolated place of the event supports the suicidal hypothesis however the post-mortem burning was incongruent with a suicidal event. Actually, the fusion of the lower right limb with the accelerator pedal suggested to the investigators an unusual way to ignite the car. In fact, not only there was not found accelerant, but it was determined that the fire started in the engine. A hypothesis of the dynamics was that: the victim, located in the driver's seat while the car was parked, but still running with the gears in neutral (as it was found), shot himself in the face with a shotgun. According to the reconstruction carried out by the investigators, the forceful backwards movement of the body in the car seat and the pressure of the lower right limb on the accelerator pedal led to the overheating of the engine with the subsequent involvement of combustible materials and the blaze of the car itself fusing the foot to the foot pedal [29].

## Conclusions

This case study illustrates the difficulties faced by medico-legal investigators when burned bodies are recovered from vehicle fires, where there are apparently fatal gunshot wounds to the head and autopsy suggests of post-mortem burning of bodies. It highlights the need for a careful multi-disciplinary investigation of the scene, consideration of background circumstances including the medico-legal history of the deceased, and post-mortem radiography. Correlation of all of these sources of evidence ensures the most effective means by which the incident can be reconstructed, allowing a hypothesis of the dynamic and reliable conclusions to be drawn regarding the medico-legal issues raised by death.

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