



An unsolved case in a culturally diverse community in Italy

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ABSTRACT

The number of foreign citizens resident in Italy is approximately 5 million, making them the 8.7% of the resident population of the country. However, over the past 20 years, foreign citizens accounted for 24% of the total number of defendants involved in homicides, especially associated with robbery, disputes and assaults, generally connected to prostitution. Investigations of cases in the context of culturally diverse or minority communities can be particularly complex. This is due to the education, the cultural background and the cohesiveness of the community, alongside a negative view of law enforcement. These factors determine a relatively low resolution rate of these violent crimes in these communities.

The investigation of the suspicious death of an Indian citizen living in Italy is presented in this paper. The body was discovered in a cattle shed, and despite the initial assumption of an accidental death, the cranial lesions were not consistent with the view that the death was caused by a kick by a cow. The results of a multidisciplinary analysis, including imaging, pathology, toxicology and veterinary forensics, were directed towards a homicide, with the manner of death ultimately filed as undetermined. During the course of the investigation, the collaboration between law enforcement and the community was thwart with difficulty, and as a consequence this case is currently unsolved. In order for law enforcement to continue to play a constructive and supportive role, it is imperative that every country invest in civil education of local population and of any ethnic groups, minorities and culturally diverse people.

1. Introduction

In the current Italian legislation there is no legal definition of “cold case”. A cold case is a broad concept encompassing a homicide reported and investigated by law enforcement, in which no identification or arrest of any suspect has been achieved, and as such no criminal charges have been filed because of the absence of sufficient evidence. These cases remain open and are considered “unsolved” because homicides do not have a statute of limitation; however, they are defined as “cold” because the leads, the funds and the time available for continuing an investigation are exhausted. Some authors define as “cold” any case that has remained unsolved for two or more years, but while practice can vary between agencies, unsolved cases are typically re-examined on a two-year cycle [1]. Cold cases can be reopened even after decades, due to the application of new technologies in forensic disciplines, new confessions, or any other new investigative leads. As a consequence, the expression “cold case” has been considered contentious, as it seems to imply the absence of any hope of resolution [2]. The process of

reopening a cold case can be very complex, because the physical evidence collected at the time of the initial investigation could be damaged, misplaced, or destroyed [2], and witnesses may no longer be available or willing to collaborate. Cold cases are a reality and continue to occur despite an investigator’s most enthusiastic actions, advances in forensic science and new methods and processes in social sciences, such as psychology and criminology [3].

Italy is a country with a long history of government corruption and organized crime (e.g., Mafia, Camorra, ‘Ndragheta), with many unsolved cases. In the last 30 years almost 80% of the 600 cases of innocent victims of the Mafia have been only partially solved, or are currently unsolved due to the lack of evidence or because trials are conducted over long periods [4]. Moreover, since 1950 several intriguing cases have never been closed, such as the assassination of the “Sicilian Robin Hood” Salvatore Giuliano (1950), the murder of Wilma Montesi (1953), the serial killer Monster of Florence (active between 1968 and 1985), the disappearance of the investigative journalist Mauro De Mauro (1970) and of Emanuela Orlandi (1983), as well as mass disasters like the

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Fontana bombing (1969, involving 16 victims) and the Ustica massacre (1980, involving 80 victims). Fortunately, the Italian statistic bureau (ISTAT) reports that since the 1990s, the number of homicides in Italy has decreased, from 1197 victims in 1991 to 315 victims in 2019 [5]. Data from the Italian Minister of the Interior shows that of the 16,000 plus people arrested or reported for homicide between 1992 and 2017, more than 20% were not Italian citizens. Generally, homicides of organized crime are carried out exclusively by Italians, but the percentage of crimes perpetrated by foreign citizens approaches 30% for theft of robbery, 40% when associated with disputes and assaults, and over 80% when connected to prostitution [6].

The present case describes the multidisciplinary forensic investigation of the suspicious death of an Indian citizen living in Italy. The body was found in the cattle shed of the farm where he was employed, and exhibited cranial lesions allegedly produced by cattle hooves. Imaging analyses and pathological findings on the body challenged the initial assumption of an accidental death, and directed the forensic investigation towards a homicide. The scarcity of scholarly literature detailing cranial lesions produced by cattle hooves hindered the forensic investigation because no determination could be ascertained on the manner of death. In addition, little to no assistance was provided to the investigators by members of the Indian community who knew the victim. As a result, the case remains unsolved to this day.

2. Case presentation

In June 2009 the body of a 46 year-old male was recovered inside a cattle shed located on farm grounds in the north of Italy (Emilia-Romagna region). The deceased was a recent migrant from India, employed on the farm and living in a village nearby. When the law enforcement arrived at the scene, the body lay under a porch. It had been moved from the cattle shed, where accordingly with the eyewitnesses it was lying in a prone position between two tied cattle. The cause of death was initially identified, by the emergency doctor called at the scene, as a cranial trauma with a parieto-occipital laceration and a depressed fracture of the cranial vault. Furthermore, a veterinary was called at the site to assess the cattle's behaviour, whilst the forensic pathologist was the last professional to reach the scene. The prosecutor's office required a full forensic investigation, to confirm the cause of death and to determine the manner of death, and whether they might be consistent with an aggression by cattle, according to the initial suspicion. As a consequence, a set of forensic analyses was performed, such as imaging, external examination, autopsy, toxicology and veterinary. The details of the forensic analyses are shown in Table 1.

Table 1
Details of the forensic analyses performed, and the results obtained.

Analysis	Details	Notes
Imaging	Head and neck X-Ray: fractures of the cranial vault and of the vertebral body of C3.	
External Examination	Scalp lacerations. Small abrasions and a small laceration on the face. Small contusions on the left arm.	No physical connection between the lacerations on the scalp.
Autopsy	Fractures of the cranial vault, cranial base, hyoid bone and the vertebral body of C3. Subarachnoid and tetraventricular hemorrhage. Hemorrhagic infiltration of the soft tissues of the neck.	No physical connection between the fractures on the cranial vault.
Toxicology	Blood Alcohol Concentration (BAC) 0.7 g/L	
Veterinary	No sign of cattle mistreatment.	No blood detected on any cattle limb/extremity.

3. Results

A post-mortem X-Ray showed multiple linear fractures on the deceased's cranial vault. Four fractures extended radially from the same area of the right frontoparietal region to the frontal bone and the right parietal bone, the longest terminated in the left supraorbital region (Fig. 1) [adapted from 7], the fifth linear fracture was located in the lower part of the occipital bone, approximately on the midline. Another fracture was observed in the antero-inferior area of the vertebral body of C3 (Fig. 2) [adapted from 7].

The external examination disclosed two distinct lacerations on the scalp. They were irregularly shaped and consistent with the underlying cranial fractures. Small abrasions and a small laceration on the right side of the face (zygomatic arch, nose, upper lip) were also detected, beside three small and oval contusions, close and parallel to each other, on the lateral surface of the left arm. The autopsy showed no physical connection between the frontoparietal and the occipital fractures on the cranial vault. The cranial base was extensively fractured, with the involvement of the anterior, medial and posterior fossae, and there were massive subarachnoid and tetraventricular hemorrhages. Hemorrhagic infiltration was observed in the posterior soft tissues of the neck, down to the level of the second dorsal vertebra, with a fracture of the right greater horn of the hyoid bone and a fracture of the vertebral body of C3. Qualitative toxicological analysis was performed with a commercial immunochemical kit (Ram®-Medisoft Group) and gas-chromatography (Dani Instruments SpA); the results revealed a blood alcohol concentration (BAC) of 0.7 g/L, indicating mild intoxication. With regards to veterinary assessments, no blood was observed on either the limbs and/



Fig. 1. Fractures radiating from the right frontoparietal region to the frontal bone (dashed arrows). Adapted from [7].



Fig. 2. Antero-inferior fracture of the vertebral body of C3 (dashed arrow). Adapted from [7].

or the extremities of the cattle tied closer to the body, while other cattle were also tied in their stalls at that time of the day. The veterinary concluded that the cattle were calm and healthy, with no evidence of distress or previous mistreatment.

4. Discussion

Several villages in the Emilia-Romagna region of Italy host migrant communities from India. Immigration to Italy from India started in the 1970s, initially justified by the need of farm workers especially skilled in cattle rearing. In 2018 it totalled 4.2% of extra-UE residents [8] and in 2021, with more than 165,000 residents, the Indian community has come to represent the fifth largest migrant community in Italy, after citizens from Romania, Albania, China and Ukraine. The present investigation suffered several critical setbacks, starting from the repositioning of the body from the original death scene before the arrival of law enforcement, the initial assumption of the manner of death and the late intervention of the forensic pathologist. Another reason why this became a cold case is the fact that the overall investigation was hindered by the ambiguous involvement of the members of the Indian community who knew the victim, who offered little to no assistance, refused to communicate or provided the investigators with confusing, conflictual and inconclusive information [3,9,10].

According to a study performed in the US on fatalities caused by animals, the majority of death events are caused by farm animals – especially cows and horses –, followed by bees and wasps stings causing subsequent anaphylaxis, and dog attacks [11]. Considering the common occurrence of such events and the location in which the body was discovered in the present case, the manner of death was initially suspected as an accident, whereby the victim was kicked by a cow. However, a further and thorough analysis of the case ruled this initial conclusion as extremely unlikely, and the manner of death was filed as undetermined. The results of the forensic pathology examination steered towards an intentional killing of the victim, attacked at his workplace while mildly intoxicated by alcohol. The victim's scalp showed two

distinct lacerations. Their anatomical location (one parietal and one occipital, both close to the median line), their macro-morphology (irregular margins connected by bridges of fibrous connective tissue) and their dimensions (6.5 cm and 2.5 cm), suggested that they both had been inflicted by the direct impact of a blunt object. The energy of the impact was considerable, which was identified by the extensive severity of the underlying cranial fractures and cerebral hemorrhages, detected by X-Rays at the autopsy. The distance and the absence of any physical connection between the two scalp lacerations and the corresponding linear fractures on the cranial vault suggest that they had been produced by two distinct blows to the head of the victim. The violent and unexpected hyperflexion of the neck produced the fracture of the vertebral body of C3 [12] and of the hyoid bone. After the attack, the victim fell and hit the right side of his face. The three small, oval, close and parallel contusions on the left arm suggest that the victim's arm was grabbed by a human hand. No defence wounds were observed on the hands, fore-arms and arms of the victim.

Blunt force injuries to the head are a frequent traumatic cause of death, and are the most common injuries observed in homicides [13], hence their relevance in medicolegal investigations. Blunt force injuries are associated with extensively studied fracture patterns, such as linear, depressed and other types [14–17]. The study of the biomechanics of cranial fractures links the different forces applied to the cranial bone, a biological plastic material composed by a flexible organic matrix and a hard inorganic mineral phase, with specific fracture patterns [18–20]. The reaction of bone to an applied force depends primarily on the energy of the force, which is a combined result of magnitude and velocity, and the size and the shape of the hitting object, the presence of clothing, the victim's age and the relative positions of both the victim and the attacker. Attacks are classified as low energy impacts, whereas gunshot and explosive wounds are considered high energy impacts [13,18,21].

Bovine-related attacks and injuries pose a significant risk to rural communities [22]. Kicks by animals are the most common cause of blunt injuries, followed by other mechanisms such as charging, being trapped between the animal and a static object such as a gate or wall and being crushed, butting, and trampling. The force produced can fracture multiple bones, including vertebrae and ribs [23]. Stationary cattle can kick with their hind limbs forward to their shoulder and outward, whereas mobile cattle typically kick backward [24,25]. This range of movement is related to the anatomy of their lower limb [26]. Kicking can result from temperament, fear or pain [25] and, in dairy cattle operations, milking holds the highest risk of injury [27]. The literature on cranial lesions produced by cattle hooves generally agrees that their typical morphology is that of an incomplete oval-shaped, or 'C'-shaped, lacerated wound affecting soft tissues. It generally overlies a hematoma of the scalp and a depressed cranial fracture, sometimes composed by comminuted bone fragments [28].

In the present case, no characteristic features of a typical cattle kick were observed on the victim's body. The two scalp lacerations were distant and distinct, as were the two areas of impact on the cranial vault, from which linear non-depressed fractures extended. However, the extensive fracture pattern of the cranial base and the massive intracerebral hemorrhages suggest that both blows were inflicted with considerable force, which also produced the violent hyperflexion of the neck and the consequent fractures of the vertebral body of C3 and of the hyoid bone. Moreover, no excrement, straw or other vegetal material was associated with the cranial wounds, and the cattle were calm and well-groomed, showing no trace of blood on their limbs and extremities. Finally, the fracture on the right side of the cranium is consistent with the pattern most frequently observed in violent assaults, indicating that the attacker is right-handed and surprised the victim from behind [14, 29].

At present this case remains unsolved. Generally, the solve rate of homicides in culturally diverse communities is relatively low due to factors connected to education, cultural background, community cohesiveness and little to no trust in law enforcement. Over time, all these

factors contribute to a case becoming a cold case [3,9,10]. To improve the solution rate of violent crimes, both in Italy and in most populations, a community effort is necessary to break the stereotyping of minorities and culturally diverse ethnic groups. Furthermore, it is pivotal to provide them with civic education (or citizen education), especially focused on the rights and obligations of citizen in society, and to reinforce the positive role of law enforcement by highlighting their commitment to public support and availability to anyone [30]. The combination of the correct application of procedures in different disciplines of forensic science with the support and collaboration of the involved community is a key strategy for a successful outcome to an investigation.

Key points

- Cranial fractures caused by cattle hooves tend to present a distinctive pattern.
- The characterization of the injuries to the soft tissues and the resultant cranial fractures is critical when identifying cattle hooves as the wounding mechanism.
- Forensic cases are generally more likely to become cold in the event of an undetermined manner of death, especially in culturally diverse communities.

CRediT authorship contribution statement

Edda E. Guareschi: conceptualization, writing - original draft, writing - review & editing Paola A. Magni: conceptualization, project administration, writing - review & editing.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

- [1] M. Innes, A. Clarke, Policing the past: cold case studies, forensic evidence and retroactive social control, *Br. J. Sociol.* 60 (3) (2009) 543–563.

- [2] R.H. Walton, *Practical Cold Case Homicide Investigations Procedural Manual*, CRC Press, Boca Raton, FL, 2014.
- [3] D. Keatley, D.D. Clarke, A timeline toolkit for cold case investigations, *J. Crim. Psychol.* 10 (2) (2020) 47–63.
- [4] R. Tondo, 'No Peace without Justice': Families of Italy's Mafia Victims Wait for Closure, *The Guardian*, 2021.
- [5] A.A. VV, Available from: <https://www.istat.it/it/archivio/253279>, 2021.
- [6] M. Barbagli, A. Minello, *Igor e gli altri: gli omicidi degli stranieri in Italia*, in *La Voce, Info*, 2018.
- [7] E.E. Guareschi, Postmortem imaging in forensic cases, in: *Forensic Pathology Case Studies*, Elsevier/Academic Press, 2021, pp. 79–93.
- [8] L. Giacomello, et al., La comunita' indiana in Italia. Rapporto annuale sulla presenza dei migranti, Ministero del Lavoro e delle Politiche Sociali, Italy, 2018, p. 77.
- [9] S.M. Shepherd, R. Lewis-Fernandez, Forensic risk assessment and cultural diversity: contemporary challenges and future directions, *Psychol. Publ. Pol. Law* 22 (4) (2016) 427–438.
- [10] D. Keatley, S. Cormier, Cold case investigation the doctor and the detective: bridging the gap between police and academics to solve cold cases, *J. Crim. Psychol.* 10 (2) (2020) 45–46.
- [11] J.A. Forrester, T.G. Weiser, J.D. Forrester, An update on fatalities due to venomous and nonvenomous animals in the United States (2008–2015), *Wilderness Environ. Med.* 29 (1) (2018).
- [12] R.M. Marcon, et al., Fractures of the cervical spine, *Clinics* 68 (11) (2013) 1455–1461.
- [13] W.U. Spitz, D.J. Spitz, R. Clark, Spitz and Fisher's *Medicolegal Investigation of Death: Guidelines for the Application of Pathology to Crime Investigation*, fourth ed., Charles Thomas Publisher, Ltd, Springfield, IL, 2006.
- [14] E. Kranioti, Forensic investigation of cranial injuries due to blunt force trauma: current best practice, *Res. Rep. Forensic Med. Sci.* (5) (2015) 25–37.
- [15] H.E. Berryman, S.A. Symes, Recognizing gunshot and blunt cranial trauma through fracture interpretation, in: K.J. Reichs (Ed.), *Forensic Osteology: Advances in the Identification of Human Remains*, Charles C. Thomas, Springfield, IL, 1998, pp. 333–352.
- [16] D. Fleming-Farrell, et al., Virtual assessment of perimortem and postmortem blunt force cranial trauma, *Forensic Sci. Int.* 229 (1–3) (2013), 162.e1–162.e6.
- [17] F.M. Azar, J.H. B. S.T. C. W.C. C. Campbell's *Operative Orthopaedics*, 2021.
- [18] V.J.M. Di Maio, D. Di Maio, *Forensic Pathology*, second ed., CRC Press, Boca Raton, FL, 2001.
- [19] N.V.e. Passalacqua, C.W.e. Rainwater, *Skeletal Trauma Analysis*, Wiley Blackwell, Chichester, West Sussex, 2015.
- [20] P.J.a. Saukko, B.a. Knight, *Knight's Forensic Pathology*, fourth ed., CRC Press, Boca Raton, 2016.
- [21] A. Galloway, *Broken Bones: Anthropological Analysis Of Blunt Force Trauma*, Charles C. Thomas, Springfield, IL, 1999.
- [22] C.G. Murphy, et al., Cow-related trauma: a 10-year review of injuries admitted to a single institution, *Injury* 41 (5) (2009) 548–550.
- [23] M. Watts, E.M. Meisel, I.K. Densie, *Cattle-related Trauma, Injuries and Deaths*, SAGE Publications, London, England, 2014, pp. 3–8.
- [24] K.H. Dogan, S. Demirci, in: *Livestock Production*, K. Javed (Eds.), *Livestock-Handling Related Injuries and Deaths*, IntechOpen, 2012.
- [25] R. Doyle, J. Moran, *Cow Talk: Understanding Dairy Cow Behaviours to Improve Their Welfare on Asian Farms*, CSIRO Publishing, 2015.
- [26] V.I. Ugboko, et al., Facial injuries caused by animals in northern Nigeria, *Br. J. Oral Maxillofac. Surg.* 40 (5) (2002) 433–437.
- [27] D. Boyle, et al., Injury from dairy cattle activities, *Epidemiology* 8 (1) (1997) 37–41.
- [28] N.K. Tumram, Fatality by hoof of cattle in an elderly cow-herder: is there a specific pattern of hoof injury?, in: *American Academy of Forensic Sciences, 73rd Annual Scientific Meeting, 2021. Virtual Conference (H66)*.
- [29] A.C. Aufderheide, C. Rodriguez-Martin, O. Langsjoen, *The Cambridge Encyclopedia of Human Paleopathology*, vol. 478, Cambridge University Press, Cambridge, 1998.
- [30] E.J. Delattre, *Character and Cops*, Rowman & Littlefield Publishing Group, Lanham, Maryland, 2011.