



Traumatic complete outer ear amputation by human bite, a forensic case report and review of the literature

Emmanouil I. Sakelliadis^{a,*}, Konstantinos D. Katsos^a, Konstantinos Dimitriou^a,
Christos E. Gakis^b, Dimitrios G. Vlachodimitropoulos^a, Chara A. Spiliopoulou^a

^a Department of Forensic Medicine and Toxicology, Medical School, National and Kapodistrian University of Athens, Greece

^b Department of Plastic Surgery, KAT General Hospital, Greece

ARTICLE INFO

Keywords:

Clinical forensic medicine
Human bite
Complete external ear amputation
Interpersonal violence

ABSTRACT

We present a case of a complete external ear amputation, caused by a human bite, that took place during a quarrel in a local farmers' market. The male victim was transferred to the Hospital. After surgical reattachment of the auricle, a forensic clinical examination was performed, as per legal obligation.

During examination, the victim was found to have sustained: contusions of the orbital regions (lower eyelids), bilaterally, soft tissue oedema of the forehead (to the left of the middle line), and contusion of the right neck area. He also sustained multiple soft tissue injuries (contusions, abrasions) on the torso and on both upper and lower extremities.

Clinical forensic examination of human bite injuries requires thorough description of the wound, proper photography and possibly collection of swabs for DNA identification (in case of unknown perpetrator). Nevertheless, the Forensic Pathologist is often required to perform clinical examination, only after medical care has been provided. Therefore, clinicians should be aware of the need of proper documentation and act accordingly.

1. Introduction

Amputation of the external ear seems to have great influence in the course of history, as it is known to have inspired George Washington to follow a military career, following the English declaration of war on Spain, after a ship captain had his ear cut off by the Spanish in 1731.¹ Ear amputation has also been associated, in the past, with self-mutilative behaviors (e.g. Vincent Van-Gogh), or with quarrels.² One well-known example is the incident between Mike Tyson and Evander Holyfield.³ Furthermore, in the late 19th century, someone could pay a professional thug, from the New York gangs, 15 dollars in order to have an "ear chewed off" from someone.⁴

Since then, Medicine has greatly evolved, thus allowing today successful ear reattachment in many cases.

The auricle, itself, contains elastic cartilage. The shapes of the auricular projections and depressions differ from person to person, as they are genetically determined.⁵

Human bites represent as many as 20% of all bite injuries in urban areas.⁶ They usually present in a form of oval, or semilunar, hematoma and abrasion. Their patterns may include a central contusion, linear

abrasions and contusions, lingual markings, tongue thrusting, uninterrupted arches, and tooth indentations, as weave patterns, if inflicted through clothing.⁷ Rothe et al. classifies human bite wounds as direct and indirect, according to the activity preceding the bite. Thus, direct human bite wounds may be observed in many interpersonal violence incidents, such as sexual crimes, child abuse, and physical quarrel (self-defense bites), or even in consensual sexual activity. On the other hand, indirect human bite wounds, may be caused by a blow from a fist to another person's teeth, thus they have their own pattern of injury (reverse bite injury).⁶

Literature provides a classification of the severity of bite wounds, according to which any wound with tissue necrosis or tissue loss is a Grade III bite wound.⁸

2. Case

A 45-year-old male was involved in a quarrel with two individuals, which were identified by eyewitnesses to the Police. During this fight the victim suffered many soft tissue injuries, the most severe being the complete amputation of the right external ear (Grade III bite injury),

* Corresponding author. Mikras Asias 75 Str, 11527, Athens, Greece.

E-mail address: eisakelliadis@forensicadvice.gr (E.I. Sakelliadis).

<https://doi.org/10.1016/j.jflm.2020.101936>

Received 16 October 2019; Received in revised form 27 February 2020; Accepted 5 March 2020

Available online 8 March 2020

1752-928X/© 2020 Elsevier Ltd and Faculty of Forensic and Legal Medicine. All rights reserved.

inflicted by one of the perpetrators.

The victim was transferred to the Hospital, 6 h after the fight. The severed ear was non-microsurgically replanted as a composite chondrocutaneous graft, under local anesthesia, following the Baudet technique.⁹ Forensic Pathologists from the Department of Forensic Medicine and Toxicology of the National and Kapodistrian University of Athens visited the victim in the Hospital, in order to perform the clinical forensic examination, requested by the Police.

During examination, the victim was found to have sustained contusions of the orbital regions (lower eyelids), bilaterally, soft tissue oedema of the forehead (to the left of the middle line), and contusion of the right neck area. The victim also sustained multiple other soft tissue injuries (contusions, abrasions) on the torso and on both upper and lower extremities. Except from the amputated external ear, the remaining injuries were sustained during the quarrel, by mechanism different than biting (kicking and punching).

The ear wound was already covered by surgical dressing (tie-over surgical gauze), in order to avoid risk of infection and to prevent any disturbance of the healing process. Consequently, all conclusions regarding the description of the amputated ear, were drawn by the photographic material already available, which was obtained before the surgical intervention by the clinicians and before the forensic clinical examination. This prevented the use of a reference scale during photography, as described in the Standards of the American Board of Forensic Odontology.¹⁰

As shown in Fig. 1, the entire auricle, except from a part of the lobule, was completely cut off. Teeth impressions were visible both on anterior and on posterior surface of the severed auricle, as shown in Fig. 2.

The viability of the reattached external ear was not certain yet, and thus should it would be attained, at least one more surgical intervention, in order to improve the aesthetic outcome, will be necessary.

Forensic odontological examination was not feasible, as surgery was already performed. As the perpetrators were already known to the Police, no swabs were collected for DNA testing. Police did not request any clinical examination of the two perpetrators.

3. Discussion

Bite mark analysis involves the objective documentation and interpretation of injuries, whether bite marks or not. Bite mark comparison is frequently employed to provide means of identification of a suspect. The first usually precedes the second, as it provides answers to more basic questions such as: is it a human bite mark, that are necessary before



Fig. 1. The entire auricle, except from a part of the lobule, was completely cut off.



Fig. 2. Teeth impressions on the anterior (2a) and on the posterior (2b) surface of the severed auricle.

suspect identification.¹¹ In our case the answer to the above-mentioned question was available since the very onset of the investigation, as eyewitnesses confirmed the bite mark was caused by a known human perpetrator.

In order to use the term bite-mark two conditions must apply, firstly the mark must be caused by the teeth alone or in combination with other mouth parts, and secondly a representative pattern must be left on an object or a tissue by these dental structures.¹²

The anatomical location distribution of bite-mark injuries spares no part of the human body.¹⁰ Despite the fact that the existing literature is extremely scarce, almost all the published researches tend to agree that the predominant body parts injured are the extremities, and especially the arms.^{13–16} Furthermore, differences have been described, based on victims' sex, as males tend to sustain bite injuries on the arms, whilst females on the breasts.^{11,13} The face, and the head in general, was found to be the second most frequent body part bitten only by Robsam et al., and more often in female victims.¹⁶

Bite marks may occur on both victims (as attack injuries by the perpetrator) or perpetrators (as defensive injuries by the victim).¹⁷ According to a recent study from Greece, human bite injuries are inflicted more frequently when the perpetrator is known to the victim, and especially when victimization has occurred in a domestic context vs the community. Furthermore, it mainly concerns adult women as victims of intimate partner violence.¹⁸ On the other hand, according to studies from Denmark and France, human bite injuries were observed more frequently in male than female victims of interpersonal violence.^{19,20}

As above stated, the etiology of human bite injuries may include sexual crimes, child abuse, physical quarrel (self-defense bites), or even consensual sexual activity. The self-mutilative behavior of certain individuals may lead to ear amputation, in various instances, such as psychiatric disorders, but mainly in the context of imprisonment, during which use of sharp instruments, is described as the method of choice.^{2,17,21,22}

Bite marks may present a wide range of presentations, including mild bruising, abrasion, incision and even avulsion.¹⁷

Avulsion injuries of the external ear can be classified in partial avulsion with a wide pedicle, partial avulsion with a narrow pedicle and complete avulsion. Any avulsed segment should be wrapped in a gauze, placed in a sterile bag and submerged in 4 °C, until the time of surgical repair. Ideally, this repair should be without delay.²³ Avulsion bites are more frequent on projecting anatomic areas, such as nipples, noses, ears, fingers, or genitals.^{24–26} According to Pretty et al., avulsion injuries of the external ear, are usually not amenable to analysis.¹⁷

Human bite injuries usually allow the subsistence of good quality retroauricular skin, in contrast to animal bites that usually are more destructive in the surroundings tissues.²⁷

It is known that auricular trauma requires attention not only for functional but for aesthetic reasons, equally as well. The complete amputation is very rare, but various surgical techniques have been

developed for reattachment, including microvascular anastomoses and replantation.²⁸

The reconstruction of the severed ear poses a challenge to the head and neck or plastic surgeon, as it is related to the unique nature of the auricle that receives blood supply from small sized vessels.²⁹ Microsurgical techniques require the presence of suitable blood vessels for anastomosis. If none is present, then the amputated ear is treated as a graft and is buried in a retroauricular pocket.³⁰ Microsurgical ear replantation was successfully performed in the clinical setting by Pennington in 1980. Firstly suggested by Mladick in 1978 and then reported by Pribaz et al. in 1997, non-microvascular replantation, is achieved by means of “burying” the ears after de-epithelialization.^{31–33} Even delayed replantation (up to 54 hours of ischemia) has been attempted with success.³⁴

Alternative treatments have been suggested, with various surgical techniques, even with the use of leeches, hyperbaric oxygen, aspirin, prostaglandin, and dextran-40.^{35–38}

Complete amputation is correctly thought to be more challenging than subtotal amputation, as there is no residual blood supply present and as there is consequently an urgent need to vascularize the severed auricle.³⁹

Certain difficulties may arise, even after a successful reattachment (e.g. oedema or poor circulation), thus not permitting the final success of the operation.³⁴ It is thus necessary to adopt a “wait and see” strategy.

In general, 20–25% of human bites become infected.⁶ There is low risk for the victim of contracting HIV, hepatitis B or hepatitis C from a human bite, apart from blood exposure occurrence.²⁰ Early antibiotic treatment for 3–5 days, for fresh, deep wounds, for persons at high risk of infection and persons with implants (e.g. artificial heart valves, orthopedic prosthesis) is suggested.⁶

In Greece, a Forensic Pathologist is required to examine every victim of interpersonal violence that has made an allegation to the Police. The forensic report will be used by the Prosecutor in order to assess the severity of injuries according to the Greek Penal Code, based on the Forensic Pathologist’s findings and on an estimation of incapacity time. The Greek Penal Code defines categories of bodily harm, based on the severity of injuries (actual, grievous). Our case is a grievous bodily harm as it concerns an amputation, which requires prolonged hospitalization and uncertain outcome.

A Forensic Pathologist should be able to distinguish a bitemark from any other patterned injury, based on the class characteristics, such as the oval to round shape, the dental arches opposing each other, and the rectangular contusion of the centrals and the laterals.³

Several factors concerning the perpetrator (e.g. physical strength, and force of bite), the victim (e.g. gender, and age), and others (e.g. clothing, and environmental conditions) should be taken into consideration for every allegation, in order to properly confirm a human bite injury, and to identify the biter.³ Furthermore, many other variables may affect the patterns displayed in a bitemark, such as skin thickness, and elasticity, and position during the biting.⁶

In everyday practice a physician working in a hospital will very often be the first to identify a bite mark. Keeping in mind that it might be difficult to obtain a Forensic Practitioner immediately (either a Forensic Pathologist or a Forensic Odontologist), the attending physician will be required to document the injuries and to collect any evidence required. On the other hand, emergency treatment takes precedence over forensic evidence collection.¹⁷

In our case surgical replantation of the severed ear, clearly was more important that proper documentation of the injuries for judicial purposes, a fact that may provide sufficient explanation regarding the omissions in the injury documentation by the attending physicians.

4. Conclusions

Image documentation of the bite wounds, combined with forensic dental examination, can prove to be an asset, in cases when the

perpetrators are unknown, especially, when saliva contamination obscures DNA identification.

Clinical forensic examination of incidents of human bite injuries, requires detailed description of the wound, proper photography and possibly collection of swabs for DNA identification, in case the perpetrator is unknown. Nevertheless, the Forensic Pathologist is often required to perform clinical examination, only after medical intervention has been provided. Therefore, clinicians should be aware of the need for proper documentation of each incident and act accordingly.

Declaration of competing interest

We have no conflict of interest to declare.

References

- Liston SL. Traumatic amputation of the external ear: the war of Jenkins’ ear and George Washington. *Nov Am J Surg*. 1984;148(5):599–601. PubMed PMID: 6388379. Epub 1984/11/01.
- Weinstock R, Copelan R. Self-amputation of the ear: a case study. *Apr Can J Psychiatr Revue Canadienne De Psychiatrie*. 1988;33(3):242–243. PubMed PMID: 3383100. Epub 1988/04/01.
- Dorion RB. Human bitemarks. In: Dorion RB, ed. *Bitemark Evidence-A Color Atlas and Text*. second ed. Boca Raton: CRC Press; 2011:241–281.
- Senn DR. History of bitemark evidence. In: Dorion RB, ed. *Bitemark Evidence-A Color Atlas and Text*. second ed. Boca Raton: CRC Press; 2011:3–22.
- Kahle W, Frotscher M. The ear. In: Kahle W, Frotscher M, eds. *Nervous System and Sensory Organs. Color Atlas of Human Anatomy*. fifth ed. vol. 3. Stuttgart: Thieme; 2003:362–363.
- Rothe K, Tsokos M, Handrick W. Animal and human bite wounds. *Jun 19 Dtsch Arzteblatt Int*. 2015;112(25):433–442. quiz 43. PubMed PMID: 26179017. PubMed Central PMCID: PMC4558873. Epub 2015/07/17.
- Bernstein ML. The nature of bitemarks. In: Dorion RB, ed. *Bitemark Evidence-A Color Atlas and Text*. second ed. Boca Raton: CRC Press; 2011:53–65.
- Rueff F, Bedacht R, Schury G. Bite injury. Special situation as to clinical aspects, therapy and course of healing. *Mar 25 Med Welt*. 1967;12:663–668. PubMed PMID: 5586321. Epub 1967/03/25. Die Bissverletzung. Sonderstellung in Klinik, Behandlung und Heilverlauf.
- Norman ZI, Cracchiolo JR, Allen SH, Soliman AM. Auricular reconstruction after human bite amputation using the Baudet technique. *Jan Ann Otol Rhinol Laryngol*. 2015;124(1):45–48. PubMed PMID: 25024463. Epub 2014/07/16.
- ABFO. *Standards and Guidelines for Evaluating Bitemarks*. 2018 [updated 02/19/2018; cited 2020 08/01/2020].
- Souviron R, Haller L. Bite mark evidence: bite mark analysis is not the same as bite mark comparison or matching or identification. *Dec J Law Biosci*. 2017;4(3):617–622. PubMed PMID: 29868189. PubMed Central PMCID: PMC5965497. Epub 2018/06/06.
- Stark M. Bite mark injuries. In: Stark M, ed. *Clinical Forensic Medicine*. third ed. New York: Humana Press; 2011:155–167.
- Vale GL, Noguchi TT. Anatomical distribution of human bite marks in a series of 67 cases. *Jan J Forensic Sci*. 1983;28(1):61–69. PubMed PMID: 6680751. Epub 1983/01/01.
- Pretty IA, Sweet D. Anatomical location of bitemarks and associated findings in 101 cases from the United States. *Jul J Forensic Sci*. 2000;45(4):812–814. PubMed PMID: 10914575. Epub 2000/07/29.
- Freeman AJ, Senn DR, Arendt DM. Seven hundred seventy eight bite marks: analysis by anatomic location, victim and biter demographics, type of crime, and legal disposition. *Nov J Forensic Sci*. 2005;50(6):1436–1443. PubMed PMID: 16382842. Epub 2005/12/31.
- Robsam SO, Ihechi EU, Olufemi WO. Human bite as a weapon of assault. *Mar Afr Health Sci*. 2018;18(1):79–89. PubMed PMID: 29977261. PubMed Central PMCID: PMC6016993. Epub 2018/07/07.
- Pretty IA, Hall RC. Forensic dentistry and human bite marks: issues for doctors. *Aug Hosp Med*. 2002;63(8):476–482. PubMed PMID: 12212419. Epub 2002/09/06.
- Katsos K. *Clinical Forensic Examination: Study of Injuries in Reported Cases of Physical Violence* (Doctoral Thesis). Athens: National & Kapodistrian University of Athens; 2019.
- Brink O. When violence strikes the head, neck, and face. *Jul J Trauma*. 2009;67(1):147–151. PubMed PMID: 19590325. Epub 2009/07/11.
- Savall F, Lechevalier A, Herin F, Vergnault M, Telmon N, Bartoli C. A ten-year experience of physical intimate partner violence (IPV) in a French forensic unit. *Feb J Forensic Leg Med*. 2017;46:12–15. PubMed PMID: 28039764. Epub 2017/01/01.
- Alroe CJ, Gunda V. Self-amputation of the ear: three men amputate four ears within five months. *Sep Aust N Z J Psychiatr*. 1995;29(3):508–512. PubMed PMID: 8573057. Epub 1995/09/01.
- Sakelliadis EI, Papadodima SA, Sergeantanis TN, Giotakos O, Spiliopoulou CA. Self-injurious behavior among Greek male prisoners: prevalence and risk factors. *Apr Eur Psychiatr*. 2010;25(3):151–158. PubMed PMID: 19926259.
- Malloy K, Hollander J. *Assessment and Management of Auricle (Ear) Lacerations*. Wolters Kluwer; 2019 [updated Feb 13, 2019; cited 2019 Sep 18, 2019]. Available from: www.uptodate.com.

24. Dental WH. *Identification and Forensic Odontology*. London: Henry Kimpton Publishers; 1976.
25. Whittaker DK, MacDonald DG. *A Color Atlas of Forensic Dentistry*. Ipswich, England: Wolfe Medical Publications Ltd; 1989:108.
26. DiMaio DJ, D VJM. *Forensic Pathology*. second ed. Boca Raton: CRC Press; 2001.
27. Pearl RA, Sabbagh W. Reconstruction following traumatic partial amputation of the ear. *Feb Plast Reconstr Surg*. 2011;127(2):621–629. PubMed PMID: 21285767. Epub 2011/02/03.
28. Destro MW, Speranzini MB. Total reconstruction of the auricle after traumatic amputation. *Nov Plast Reconstr Surg*. 1994;94(6):859–864. PubMed PMID: 7972435. Epub 1994/11/01.
29. Kyrmizakis DE, Karatzanis AD, Bourolias CA, Hadjiioannou JK, Velegrakis GA. Nonmicrosurgical reconstruction of the auricle after traumatic amputation due to human bite. *Dec 1 Head Face Med*. 2006;2:45. PubMed PMID: 17140448. Pubmed Central PMCID: PMC1693551. Epub 2006/12/05.
30. Lin PY, Chiang YC, Hsieh CH, Jeng SF. Microsurgical replantation and salvage procedures in traumatic ear amputation. *Oct J Trauma*. 2010;69(4):E15–E19. PubMed PMID: 20938253. Epub 2010/10/13.
31. Pennington DG, Lai MF, Pelly AD. Successful replantation of a completely avulsed ear by microvascular anastomosis. *Jun Plast Reconstr Surg*. 1980;65(6):820–823. PubMed PMID: 7384284. Epub 1980/06/01.
32. Mladick RA. Salvage of the ear in acute trauma. *Jul Clin Plast Surg*. 1978;5(3):427–435. PubMed PMID: 359221. Epub 1978/07/01.
33. Pribaz JJ, Crespo LD, Orgill DP, Pousti TJ, Bartlett RA. Ear replantation without microsurgery. *Jun Plast Reconstr Surg*. 1997;99(7):1868–1872. PubMed PMID: 9180709. Epub 1997/06/01.
34. Garcia-Murray E, Adan-Rivas O, Salcido-Calzadilla H. Delayed, bilateral, non-microvascular ear replantation after violent amputation. *Jun J Plast Reconstr Aesthetic Surg*. 2009;62(6):824–829. PubMed PMID: 18083644. Epub 2007/12/18.
35. Alagoz MS, Uysal AC, Isgoren S, et al. A new method in the treatment of ear amputation: experimental and clinical study. *Sep Ann Plast Surg*. 2007;59(3):277–286. PubMed PMID: 17721215. Epub 2007/08/28.
36. Hullett JS, Spinnato GG, Ziccardi V. Treatment of an ear laceration with adjunctive leech therapy: a case report. *Oct J Oral Maxillofac Surg Off J Am Assoc Oral Maxillofac Surg*. 2007;65(10):2112–2114. PubMed PMID: 17884550. Epub 2007/09/22.
37. Bada AM, Pope GH. Use of hyperbaric oxygen as adjunct in salvage of near-complete ear amputation. *Apr Plast Reconstr Surg Glob Open*. 2013;1(1). PubMed PMID: 25289195. Pubmed Central PMCID: PMC4174167. Epub 2013/04/01.
38. Lee SK, Lim YM, Lew DH, Song SY. Salvage of unilateral complete ear amputation with continuous local hyperbaric oxygen, platelet-rich plasma and polydeoxyribonucleotide without micro-revascularization. *Nov Arch Plast Surg*. 2017;44(6):554–558. PubMed PMID: 29076317. Pubmed Central PMCID: PMC5801785. Epub 2017/10/28.
39. Ozcelik D, Unveren T, Toplu G. Subtotal ear amputation with a very narrow pedicle: a case report and review of the literature. *May Ulus Travma Acil Cerrahi Derg*. 2009;15(3):306–310. PubMed PMID: 19562558. Epub 2009/06/30.