

Case Report

A Rare Case of Bilateral Otorrhagia in Hanging: A Case Report

Vincenzo Ciani^{1,*}, Anna Messina¹, Maria Manno², Daniela Sapienza¹, Desirée Speranza³, Ludovica Pepe⁴, Vincenzo Fiorentino⁴, Patrizia Gualniera¹, Alessio Asmundo¹ and Cristina Mondello¹

¹ Section of Legal Medicine, Department of Biomedical and Dental Sciences and Morphofunctional Imaging, University of Messina, via Consolare Valeria, 1, 98125 Messina, Italy; anna.messina5@studenti.unime.it (A.M.); daniela.sapienza@unime.it (D.S.); patrizia.gualniera@unime.it (P.G.); alessio.asmundo@unime.it (A.A.); mondelloc@unime.it (C.M.)

² Section of Legal Medicine, ASL Novara, 28100 Novara, Italy; maria.manno@asl.novara.it

³ Department of Chemical, Biological, Pharmaceutical and Environmental Sciences, University of Messina, 98125 Messina, Italy; desiree.speranza@studenti.unime.it

⁴ Anatomic Pathology Unit, Department of Human Pathology in Adult and Developmental Age “Gaetano Barresi”, University of Messina, 98125 Messina, Italy; ludovica.pepe@studenti.unime.it (L.P.); vincenzo.fiorentino@unime.it (V.F.)

* Correspondence: vincenzo.cianci@studenti.unime.it or enzocianci.1997@gmail.com

Abstract

Introduction: Otorrhagia is an uncommon finding in forensic practice and is classically associated with skull base fractures, temporal bone trauma, or barotraumatic events. However, the literature suggests that ear bleeding may also rarely occur in deaths due to neck compression, including strangulation and hanging. **Case Presentation:** We report the case of a man died by hanging. External examination revealed an oblique ligature mark on the neck, conjunctival petechiae, and bilateral otorrhagia. At autopsy, no fractures of the skull vault or skull base were identified. Otoscopic examination showed bilateral tympanic membrane laceration. Internal examination of the neck disclosed small hemorrhagic infiltrates in the perithyroid muscles and prevertebral soft tissues, as well as bilateral carotid intimal tears consistent with Amussat’s sign. Moreover, a unilateral lesion involving the petrous portion of the temporal bone was observed. The distinctive feature of this case is the association of bilateral otorrhagia, bilateral tympanic membrane laceration, and unilateral petrous bone erosion in the absence of skull base fracture. Histology showed visceral congestion, pulmonary overdistension with rupture of interalveolar septa, cerebral edema, myocardial fiber fragmentation and trabecular remodeling and areas of necrosis of the bone fragment sampled from the right petrous temporal bone. Death was attributed to mechanical asphyxia due to hanging. **Conclusions:** This case suggests that bilateral otorrhagia in hanging may result from the combined effects of impaired cervico-cephalic venous drainage and pressure changes transmitted to the middle ear during forceful respiratory efforts. The pre-existing unilateral petrous bone lesion may have acted as a local predisposing factor, although its etiology and actual contribution cannot be established with certainty. Otoscopic examination should therefore be regarded as a potentially useful adjunct in selected cases, particularly for documenting auricular findings and supporting differential diagnosis.

Keywords: hanging; bilateral otorrhagia; post-mortem otoscopy; neck compression; forensic pathology



Academic Editor: Sara C. Zapico

Received: 17 May 2026

Revised: 16 June 2026

Accepted: 29 June 2026

Published: 1 July 2026

Copyright: © 2026 by the authors.

Licensee MDPI, Basel, Switzerland.

This article is an open access article

distributed under the terms and

conditions of the [Creative Commons](#)

[Attribution \(CC BY\)](#) license.

1. Introduction

Otorrhagia represents a relatively rare finding in forensic medicine [1]. In forensic practice, it is classically associated primarily with skull base fractures, temporal bone trauma, and, in certain contexts, with barotraumatic phenomena, such as those observed in diving accidents [1,2]. However, in recent years, the literature has drawn attention to the fact that ear bleeding may also be observed, albeit exceptionally, in asphyxial deaths resulting from neck compression, particularly in cases of strangulation and hanging [3–7].

In this context, ear involvement does not appear to be limited solely to frank otorrhagia but encompasses a spectrum of findings that also includes hemotympanum and petechiae of the tympanic membrane [4–8]. This very variety of manifestations suggests that these signs may represent different expressions of a single pathophysiological mechanism or other concurrent mechanisms, usually linked to the impedance of cervico-cephalic venous outflow and the resulting pressure increase transmitted to the middle ear during respiratory efforts amidst upper airway obstruction [3,5,6]. Specifically, it has been hypothesized that compression of the neck's vascular structures leads to congestion within the head and neck region, thereby affecting the venous circulation of the middle ear as well. Furthermore, what should also be taken into account, is the potential barotraumatic effect resulting from violent inspiratory efforts against a closed glottis, leading to increased pressure within the Eustachian tube and middle ear [3,4,6].

Although the number of published cases remains relatively small, more reports have recently appeared, helping to challenge the notion that ear bleeding in deaths involving neck compression is a challenging finding [3–7]. In this light, Duband et al. [3] emphasized that otorrhagia and hemotympanum in cases of strangulation warrant particular interpretive attention. Subsequently, Rasmussen et al. [4] described petechiae of the tympanic membrane in a case of attempted suicide by hanging, suggesting that this auricular finding may fit within the broader spectrum of hemorrhagic signs resulting from stasis and increased pressure. More recently, other case reports and small series have documented the presence of otorrhagia in cases of hanging as well, reinforcing the hypothesis that this constitutes a potentially significant intravital finding, albeit not a pathognomonic one [5–8].

Of particular interest are the contributions highlighting the potential role of otoscopy in the post-mortem examination of deaths involving suspected neck compression. Indeed, several authors have observed that otoscopic exploration can reveal alterations not immediately apparent through external inspection alone, such as tympanic petechiae, hemotympanum, superficial vascular lesions, or perforations of the tympanic membrane [4,7–9]. From this perspective, otoscopy may serve as a useful adjunct to the external and internal examination of the body in selected cases, contributing to the documentation of subtle auricular findings and to the differential diagnosis of other causes of auricular bleeding [2,8,9].

However, it must be emphasized that the forensic interpretation of such findings requires caution. Although the most recent literature tends to regard otorrhagia and other auricular signs as elements supporting a diagnosis of neck compression occurring during life, they must always be evaluated within the broader context of all other autopsy, histological, and circumstantial data [5–7]. Furthermore, the differential diagnosis remains broad, encompassing not only craniocerebral trauma and barotrauma but also pathological or post-mortem conditions that, under specific circumstances, may mimic similar clinical presentations [1,2,10].

In light of these considerations, the description of new cases of hanging presenting with otorrhagia retains undoubted scientific and practical interest. On one hand, such observations contribute to elucidating the possible pathogenetic mechanisms underlying this finding, on the other, they suggest that examination of the ear, particularly otoscopy, may be considered as an adjunctive assessment in selected cases of suspected neck compression, especially when

external auricular bleeding or other ear findings are present [7–9]. The distinctive feature of the present case is the association of bilateral otorrhagia, bilateral tympanic membrane laceration, and a gross unilateral petrous bone lesion in a hanging death without skull base fracture. This case report was prepared in accordance with CARE guidelines, and the completed CARE checklist is provided as Supplementary Material File S1.

2. Case Presentation

The case concerns a man who died by hanging. His body was found still suspended at the scene. The collection of anamnestic data revealed previous herpetic encephalitis with mild cognitive impairment and psychic disorders under treatment. At external examination, a discontinuous ligature mark was observed on the neck, with an oblique cranio-caudal course, measuring approximately 31 cm in length and 5 to 14 mm in width, with a smooth surface and slight dehydration of the skin. The knot imprint was localized at the medial third of the right mandibular ramus, close to the chin. Hemorrhagic discoloration of the furrow, conjunctival petechiae, and bilateral otorrhagia were also present (Figure 1). Ecchymotic-excoriated lesions were also present at the root of the nose and on the eyebrow arches. In light of the scene findings, including a broken ligature still attached to a nearby branch, these lesions were considered compatible with a preceding failed hanging episode, likely occurring shortly before the fatal event, because of the fall and the facial impact with the ground. The first attempt then proved unsuccessful. At autopsy, the organs and tissues of the neck showed: small hemorrhagic areas in both peri-thyroid muscles bilaterally and prevertebral soft tissue (Brouardel's sign) and transverse intimal lesions of both carotid arteries (Amussat's sign) (Figure 2).

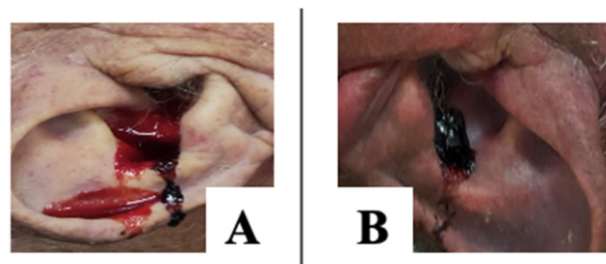


Figure 1. (A) Otorrhagia from the right ear. (B) Otorrhagia from the left ear.

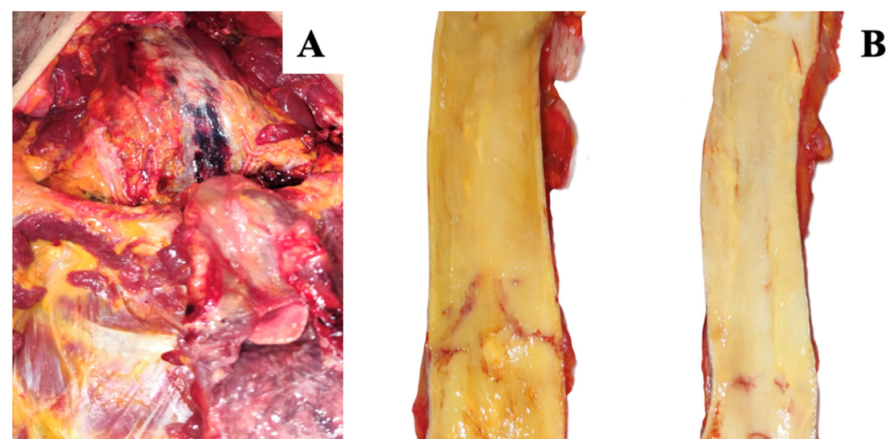


Figure 2. (A) Hemorrhagic infiltration of the cervical prevertebral soft tissues, consistent with Brouardel's sign. (B): Intimal lacerations of the right and left carotid arteries, consistent with Amussat's sign.

No fractures of the vault and the base of the skull were observed at gross examination, but PMCT was not performed. A unilateral area of bone erosion was detected in the

petrous part of the right temporal bone (Figure 3). The lesion was sampled for histological examination. Otoscopic examination revealed tympanic laceration on both sides. After auricular washing, otoscopic examination was performed: to obtain the best view of each ear canal and tympanic membrane, the head was tilted slightly towards the opposite shoulder to facilitate access of the speculum, subsequently a traction was applied on the auricle upwards and backwards to straighten the ear canal. The otoscopy revealed both on the right the subtotal tympanic perforation with integrity of the annulus, and on the left the partial tympanic perforation.

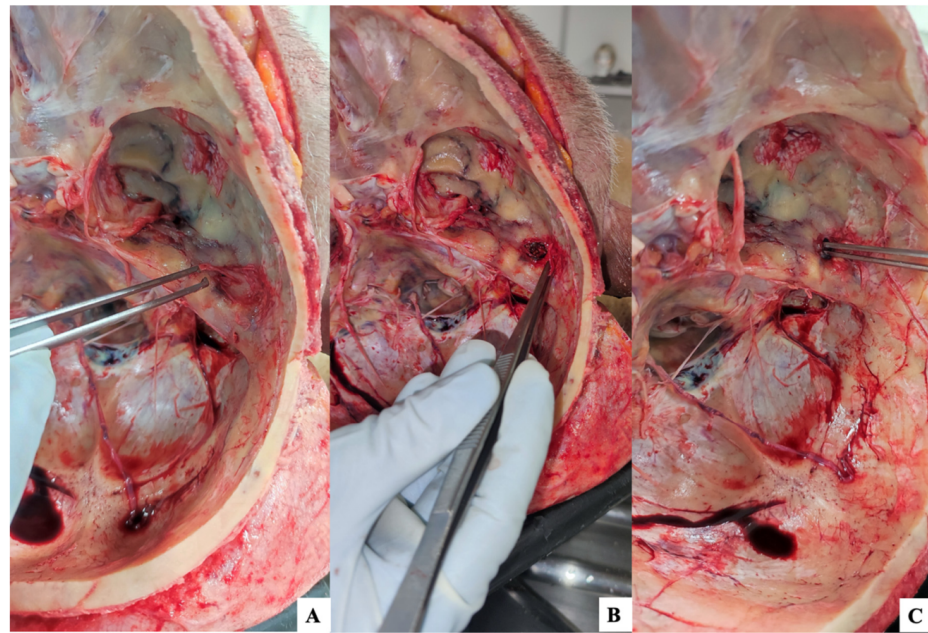


Figure 3. (A–C) Bony defect involving the petrous part of the right temporal bone, with smooth/blunted margins.

The main histological findings at routine hematoxylin-eosin staining were organs congestion, large respiratory areas due to rupture of interalveolar septa, cerebral edema and myocardial myofibers break up. Histological examination of the sampled petrous bone fragment showed trabecular remodeling and areas of necrosis. No histological examination of tympanic membrane was performed. Toxicological analyses were not performed. The cause of death was traced back to mechanical asphyxia due to hanging.

3. Discussion

The presented case supports that otorrhagia, although a rare finding in deaths by hanging, warrants particular attention within the scope of the medico-legal assessment of asphyxial deaths resulting from neck compression. In our case, the presence of bilateral otorrhagia associated with bilateral tympanic laceration, in the absence of fractures to the cranial vault or base, points toward a mechanism directly linked to the asphyxial dynamics rather than to major head trauma, which remains the classically most frequent cause of ear bleeding [1,2]. From this perspective, the auricular finding should not be regarded as a merely incidental detail, but rather as a potential element to be integrated into the broader anatomico-pathological picture of hanging.

From a pathophysiological standpoint, available literature data converge on the hypothesis that otorrhagia in cases of neck compression stems from the interplay of at least two mechanisms. The first involves obstruction of cervico-cephalic venous outflow, resulting in congestion of the venous networks of the head and neck, including the middle

ear circulation, the second is linked to the pressure surge generated by violent respiratory efforts against upper airway obstruction, with potential transmission of this pressure, via the Eustachian tube, to the tympanic cavity [3–6]. In this sense, petechiae of the tympanic membrane, hemotympanum, tympanic perforation, and otorrhagia may represent distinct manifestations of a single continuum of injury, the concrete expression of which depends on the intensity and duration of the asphyxia insult, local anatomical conditions, and possible individual tissue fragility [4–8].

The autopsy findings in our case appear consistent with this interpretation. The presence of conjunctival petechiae, hemorrhagic ridges of the sulcus, cervical muscle hemorrhages, transverse intimal lesions of the carotid arteries compatible with Amussat's sign, and general signs of visceral congestion is consistent with mechanical asphyxia due to hanging occurring during life. In this context, otorrhagia may be interpreted as a further peripheral manifestation of hemodynamic and respiratory compromise [3,5,6,11,12]. Furthermore, the bilateral nature of the phenomenon points more strongly toward a systemic mechanism linked to cervical compression than toward an isolated local cause, especially considering that, in this case, one failed and one fatal hanging episode were documented, occurring within a short interval of one another. Indeed, in the literature concerning strangulation and hanging, ear bleeding has been described in both unilateral and bilateral forms, sometimes associated with tympanic perforation, lending support to a pathogenesis that is not exclusively traumatic, but rather hemodynamic-barotraumatic in nature [3,5,6].

One aspect of our case that deserves consideration is the unilateral bone erosion within the right petrous temporal bone. Histological examination of the sampled bone fragment showed trabecular remodeling and areas of necrosis. These findings confirm a structural pathological alteration of the petrous bone, but they are nonspecific and do not allow the etiology of the lesion, including any relationship with the previous herpetic encephalitis, to be established. The lesion may therefore have represented a local predisposing condition, potentially increasing tissue fragility in the petrous-temporal region. However, since the lesion was unilateral whereas both otorrhagia and tympanic membrane lacerations were bilateral, it cannot fully explain the overall auricular findings by itself. Accordingly, this finding should be interpreted cautiously as a possible contributory factor rather than as a demonstrated cause of otorrhagia. Although inflammatory and infectious processes involving the temporal bone and petrous apex may be associated with bone erosion and local structural fragility, no definite etiological significance can be assigned to this lesion in the present case [13–16].

Indeed, in forensic medicine, blood originating from the ear is traditionally interpreted primarily as a possible indication of fractures of the skull base or temporal bone, or of significant craniocerebral trauma [1,2]. Beyond trauma, other potential causes of auricular bleeding or hemotympanum must also be considered, including barotraumatic phenomena, certain middle ear pathologies, and, in specific circumstances, post-mortem events or asphyxial mechanisms other than classic neck compression [1,2,10]. Recent literature, in fact, counsels caution: auricular findings observed in cases of hanging possess undoubted indicative value, yet, when considered in isolation, they cannot currently be deemed pathognomonic, nor are they sufficient to serve as the sole basis for a definitive judgment regarding, for instance, vitality [5–8,10,17,18].

In this context, one of the most intriguing aspects emerging from recent studies concerns the role of otoscopy. Several authors have emphasized that post-mortem otoscopic examination can reveal alterations not always discernible through external inspection alone, such as tympanic petechiae, hemotympanum, superficial vascular changes, or perforations of the tympanic membrane [4,6,8,9]. This specific point appears particularly

significant, as it suggests that the true forensic value of ear examination lies not merely in identifying externally visible otorrhagia, but rather in analyzing the full spectrum of findings within the tympanic membrane and middle ear. Our case is consistent with this perspective, suggesting that otoscopy may be a useful adjunct in selected cases involving suspected hanging or strangulation, especially when auricular bleeding is present or when differential diagnosis is required [6,8,9]. At the same time, this case demonstrates that a proper interpretation of otorrhagia requires a correct methodical approach: the exclusion of major alternative traumatic causes, a thorough examination of cervical and cranial structures, correlation with other signs of mechanical asphyxia, and, if deemed potentially useful in specific cases, the integration with an otoscopic examination [1,4,8,9]. From this perspective, otorrhagia should not be interpreted as an isolated sign, but rather as an accessory and potentially informative finding capable of enriching the medico-legal cause of death assessment and its dynamics.

In the present case, the main alternative causes of otorrhagia were considered in relation to the autopsy and circumstantial findings. Skull base fracture and major cranio-cerebral trauma were considered first, since these represent classical causes of ear bleeding in forensic practice. No fractures of the cranial vault or skull base were identified at gross autopsy examination. However, post-mortem computed tomography was not performed, and this represents a limitation, since very subtle fractures cannot be completely excluded. With regard to temporal bone trauma or local temporal bone disease, the right petrous temporal bone lesion showed smooth/blunted margins macroscopically, and histology revealed trabecular remodeling and areas of necrosis. These findings are more consistent with a chronic or pathological structural alteration than with an acute traumatic fracture, although its precise etiology could not be established. Moreover, because the petrous lesion was unilateral whereas both otorrhagia and tympanic membrane lacerations were bilateral, it cannot by itself explain the overall auricular findings. Barotrauma was also considered, but the circumstantial investigation did not reveal elements suggestive of diving, explosion, aviation-related pressure changes, or other relevant pressure-related events. Middle ear disease was considered as a further possible cause. However, no history of chronic otitis media, previous ear surgery, or recent otological disease was available from the anamnestic data and medical records.

4. Conclusions

The present case suggests that otorrhagia, although rare, may occur in deaths by hanging and, in the absence of alternative traumatic cranial causes, still represent a finding of medico-legal interest. In our case, the association between bilateral otorrhagia, bilateral tympanic membrane laceration, and other post-mortem signs of mechanical asphyxia supports the hypothesis that ear bleeding constitutes a finding compatible with hanging. Even if this finding lacks pathognomonic value, it was useful to enhance the potential value of post-mortem otoscopy, which should continue to be considered merely optional, allowing for a better documentation of these auricular findings.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/forensicsci6030058/s1>, File S1: This case report was prepared in accordance with the CARE guidelines for case reports, and the CARE checklist has been completed and submitted along with this manuscript.

Author Contributions: Conceptualization, C.M. and V.C.; methodology, C.M. and V.F.; formal analysis, D.S. (Desirée Speranza) and P.G.; investigation, A.A. and D.S. (Desirée Speranza); data curation C.M. and V.C.; writing—original draft preparation, V.C., A.M. and L.P.; writing—review and

editing, D.S. (Daniela Sapienza) and A.A.; supervision, C.M. and M.M. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable. This study was performed using data from human cadavers. This article does not contain any studies with (living) human participants or animals performed by any of the authors. The subject involved in this study underwent a judicial autopsy in order to identify the cause of death. In Italy, forensic autopsies and related post-mortem investigations that are performed within the framework of a judicial proceeding (either upon prosecutorial order or under the authority of the judiciary) is exempted from the approval by an Institutional Review Board (IRB) or Ethics Committee. Such procedures are conducted under the provisions of the Italian Code of Criminal Procedure (Articles 359–360, 116, 224 et seq.), which govern medico-legal examinations performed for judicial purposes. The case concern one deceased subject within a legal/forensic context. Prosecutors opened an investigation, and a judicial autopsy was ordered. Therefore, ethics committee approval was not required.

Informed Consent Statement: Patient consent was waived due to it is not necessary for an anonymized case report of a forensic autopsy in the author's country. In compliance with Italian Law art. 110 D.Lgs. 196/2003 and Presidential Decree 285/1990, Chapter VI, Articles 40–43.

Data Availability Statement: All the data are reported in the paper.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Knight, B. *Forensic Pathology*, 4th ed.; Oxford University Press: New York, NY, USA, 2016; pp. 352–359, 369–373, 381–392.
2. Amberg, R.; Strutz, J. Differential diagnosis of hematotympanum in forensic autopsy. *Laryngorhinootologie* **1995**, *74*, 312–316.
3. Duband, S.; Timoshenko, A.P.; Morrison, A.L.; Prades, J.M.; Debout, M.; Péoc'h, M. Ear bleeding: A sign not to be underestimated in cases of strangulation. *Am. J. Forensic Med. Pathol.* **2009**, *30*, 175–176. [[PubMed](#)]
4. Rasmussen, E.R.; Larsen, P.L.; Andersen, K.; Larsen, M.; Qvortrup, K.; Hougen, H.P. Petechial hemorrhages of the tympanic membrane in attempted suicide by hanging: A case report. *J. Forensic Leg. Med.* **2013**, *20*, 119–121. [[CrossRef](#)] [[PubMed](#)]
5. Živković, V.; Cvetković, D.; Nikolić, S. Otorrhagia as an intravital phenomenon in a case of incomplete atypical hanging. *J. Forensic Sci.* **2021**, *66*, 775–778. [[PubMed](#)]
6. Wankhede, A.G. Potential usefulness of otoscopy in the evaluation of hanging deaths: A report of two cases. *J. Forensic Sci.* **2022**, *67*, 809–812. [[PubMed](#)]
7. Barranco, R.; Tettamanti, C.; Bonsignore, A.; Ventura, F. Otorrhagia in strangulations: An important but often underestimated finding in forensic pathology. *J. Forensic Sci.* **2022**, *67*, 1739–1742. [[CrossRef](#)] [[PubMed](#)]
8. Nair, A.S.; Meshram, V.; Shekhawat, R.S.; Soni, K.; Khera, S.; Kanchan, T. Digital otoscopic examination of tympanic membranes in confirmed suicidal hanging deaths: Preliminary autopsy study. *J. Forensic Sci.* **2025**, *70*, 2525–2529. [[CrossRef](#)] [[PubMed](#)]
9. Kučerová, Š.; Hejna, P.; Dobiáš, M. Benefits of otoscopy in forensic autopsy practice. *Soud. Lek.* **2016**, *61*, 14–17. [[PubMed](#)]
10. Bugelli, V.; Campobasso, C.P.; Angelino, A.; Gualco, B.; Pinchi, V.; Focardi, M. Postmortem otorrhagia in positional asphyxia. *Am. J. Forensic Med. Pathol.* **2020**, *41*, 217–219. [[CrossRef](#)] [[PubMed](#)]
11. Plattner, T.; Bolliger, S.; Zollinger, U. Forensic assessment of survived strangulation. *Forensic Sci. Int.* **2005**, *153*, 202–207. [[CrossRef](#)] [[PubMed](#)]
12. DiMaio, V.J.; DiMaio, D. *Forensic Pathology*, 2nd ed.; CRC Press: Boca Raton, FL, USA, 2001.
13. Prasad, S.C.; Prasad, K.C.; Kumar, A.; Thada, N.D.; Rao, P.; Chalasani, S. Osteomyelitis of the temporal bone: Terminology, diagnosis, and management. *J. Neurol. Surg. B Skull Base* **2014**, *75*, 324–331. [[CrossRef](#)] [[PubMed](#)]
14. Elmaraghy, C.; Bishop, R.; Barron, C.; Adunka, O. Petrous apex lesion following meningitis: Management and discussion. *J. Surg. Case Rep.* **2021**, *2021*, rjab371. [[CrossRef](#)] [[PubMed](#)]
15. Sharma, N.; Jaiswal, A.A.; Banerjee, P.K.; Garg, A.K. Complications of chronic suppurative otitis media and their management: A single institution 12 years experience. *Indian J. Otolaryngol. Head Neck Surg.* **2015**, *67*, 353–360. [[CrossRef](#)] [[PubMed](#)]
16. Flood, L.M.; Kemink, J.L.; Graham, M.D. The investigation and management of petrous apex erosion. *J. Laryngol. Otol.* **1985**, *99*, 439–450. [[PubMed](#)]

17. Pollak, S.; Große Perdekamp, M.; Thierauf-Emberger, A. Death by hanging: Possibilities and limits of medico-legal evidence. *Int. J. Leg. Med.* **2026**, *140*, 1367–1388. [[CrossRef](#)] [[PubMed](#)]
18. Blandino, A.; Sbrissa, L.P.E.; Galante, N.; Pianese, G.; Flutti, E.; Travaini, G.V. Mechanical Asphyxia by Hanging: A Look Back in Search for Evidence. *Forensic Sci. Int.* **2025**, *375*, 112561. [[CrossRef](#)] [[PubMed](#)]

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.