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The Human Ear: Its Role in Forensic Practice

ABSTRACT: The human ear has much to offer investigators in relation to many areas of forensic practice including forensic pathology, anthropology, identification and facial reconstruction and yet its full potential is often overlooked. This review paper explores current knowledge related to the human ear drawing attention to those situations where the ear could play a valuable role in a forensic investigation.

KEYWORDS: forensic science, ear, morphology, identification, postmortem interval, trauma, temperature

Prior to considering the potential uses of the human ear in forensic practice, it is necessary to understand the basic embryology, anatomy, and function of the ear. With this knowledge, one can further consider the potential value of the ear in a forensic investigation. As the majority of applications relate to the components of the external ear due consideration is placed on this element.

The human ear is composed of three parts: the external ear, consisting of the auricle (pinna) and the external auditory canal, the middle ear (tympanic cavity) and the inner ear (labyrinth) (1) (See Table 1).

With this basic anatomical knowledge, the use of the ear in forensic practice can be considered into distinct groups for external and internal examination: congenital and genetic, identification, pathological processes, trauma and estimation of the postmortem interval.

External Examination

Congenital and Genetic Variations

The external ear may be affected by congenital and genetic abnormalities that may provide clues as to the identification of an individual. Congenital absence and microtia may be seen in children with Goldenhar Syndrome and in hemi-facial microsomia. Treacher-Collins Syndrome, or mandibulofacial dystosis, is an autosomal dominant condition resulting in affected children developing low set, crumpled auricles and eyelid defects with clefting of the palate and micrognathia (2). Conversely, Fragile X and Martin-Bell Syndromes tend to produce longer more prominent pinna than average (3,4). Accessory auricles are also recognized as an embryological variant occurring as fleshy polypoid lesions placed anterior to the tragus.

The anatomical appearance of the auricle varies from individual to individual and between ethnic races. Some of the physical attributes of the auricle are genetically inherited although there has been dispute within the literature as to the exact manner in which this occurs. Darwin's tubercle, a raised area on the posterior rim of the helix, has been reported to have such an inherited variance (5). The pattern of the free lobule was proposed also by Altmann to be a dominant trait with the attached lobule representing the recessive trait. Subsequent studies appeared to confirm the patterns of inheritance (6–8). Finally the rolled superior helix has been reported as a sex-limited recessive trait more frequent in men than boys. It should be noted however that, with the exception of the rolled helix, Peeples has argued that the physical attributes of the ear are controlled by multiple genes and thus do not show simple Mendelian inheritance (9). Further work is therefore required in this field.

The other association of the attachment of the ear lobe to the face is with a hypoplastic auricle, as opposed to the normal free lobe. Farkas noted that in 2.6% (right) and 2.7% (left) of a study population ear lobes were attached with females showing a slightly increased over males (10).

Identification

Several components of the ear can be used by the forensic pathologist, the anthropologist, the fingerprint officer, or the facial reconstruction expert to assist in the identification of a living or deceased individual. For this one has to understand the surface anatomy of the external ear and the anatomical components of the internal structures (See Fig. 1).

The surface shape of the helix can be placed into one of several pre-defined groups with the lobe additionally described as free or attached (11). The position that the auricle occupies on the head can be determined from standard charts of anthropometric measurements from pre-defined points on the head and face. The size of the auricle itself can be measured or estimated again using standard points of measurement and comparative tables (11).

More recently, Rutty, using a combination of direct measurements with a probe and CT-based measurements has shown that the length of the external auditory canal, although showing no significant individual variation between the two sides shows an apparent sex difference with females possessing shorter canals (12) (See Fig. 2).

It is with the knowledge of these anthropometric, congenital and genetical variations of the auricle that the morphology of the pinna has established the field of ear identification, specifically ear-prints and the use of images from surveillance camera images. A recent article claimed a 65% rate of success in offender identification with closed-circuit systems (13).

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TABLE 1—*The anatomy of the external, middle and inner ear with appropriate relationships and function.*

	Anatomy	Vascular Supply	Innervation	Function
External ear	Pinna—formed embryologically from six mesenchymal hillocks of the 1st and 2nd branchial arches. • formed from skin, cartilage and intrinsic muscles. Auditory Canal—forms from the 1st branchial pouch. • volume of approximately 0.85 mL	Arterial—post auricular and superficial temporal artery (external carotid artery) and the deep auricular artery (internal maxillary artery) Venous—correspondingly named vessels. Lymphatic drainage—superficial parotid, mastoid and superficial cervical lymph nodes.	Pinna— Motor—facial nerve Sensory—auriculotemporal and auricular branch of vagus nerve. Auditory canal—complex supply from the trigeminal, facial, glossopharyngeal and vagus nerves.	Collects and conducts soundwaves from the surrounding environment to the tympanic membrane creating vibrations
Middle ear	Roof—tegmen tympani of the petrous temporal bone, separating cavity from meninges overlying temporal lobe. Floor—bone plate separating cavity from internal jugular vein Anterior—bone plate separating cavity from internal carotid artery with the ostia of the auditory canal. Tensor tympani muscle. Posterior—opening to the mastoid antrum, with the pyramid and stapedius muscle. Lateral—tympanic membrane with malleolus and chorda tympani. Medial—inner ear with round and oval windows.	Arterial—from the deep auricular branch of the internal maxillary, from the stylomastoid branch of the posterior auricular , and tympanic branch of the internal maxillary artery. Venous—superficial to the external jugular vein-deep into the transverse and superior petrosal sinuses, pterygoid plexus and veins of the dura mater, and into Eustachian tube plexus. Lymphatic—to the palatine tonsils.	Mainly to the tympanic membrane derived from the tympanic branch of the glossopharyngeal, the auricular branch of the vagus, and the auriculotemporal branch of the mandibular division of the vagus nerve.	Acts to match the impedance of air in the auditory canal to the impedance of the inner ear; transmitting vibrations from the tympanic membrane to the inner ear. Communication with the mastoid antrum, and the nasopharnyx via the Eustachian tube for the purpose of air pressure equalisation.
Inner ear	Bony labyrinth—composed of the vestibule, semicircular canal and cochlea. Membranous labyrinth—utricle and saccule.	Labyrinth—internal auditory, from the basilar, and the stylomastoid, from the posterior auricular arteries. Venous drainage to accompanying vessels.	Bony labyrinth—Vestibular branch of the 8th cranial nerve. Membranous labyrinth—Cochlear branch of the 8th cranial nerve.	The perception of the transmitted vibrations and the maintenance of balance.

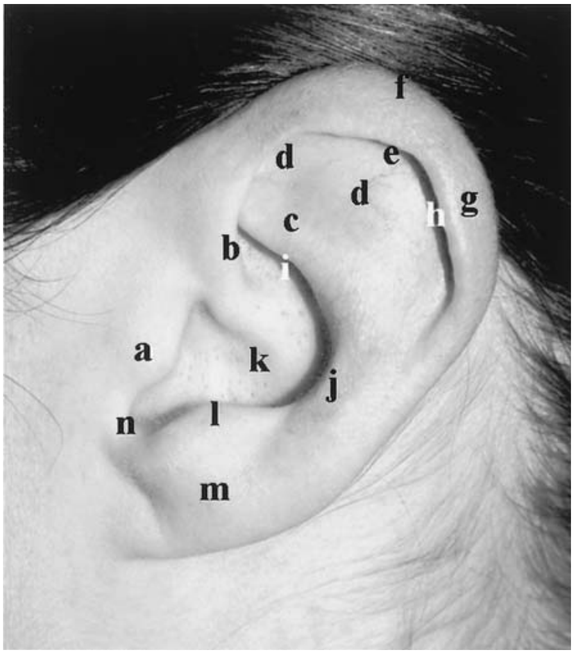

FIG. 1—*The surface anatomy of the external ear: a) tragus, b) crus of helix, c) lower crus of antihelix, d) triangular fossa, e) upper crus of antihelix, f) helix, g) Darwin's tubercle, h) scaphoid fossa, i) upper concha, j) antihelix, k) lower concha, l) antitragus, m) lobule (hypoplastic) and n) intertragic notch. (Photograph courtesy of A. Pringle, Glenfield General Hospital, Leicester, U.K.)*

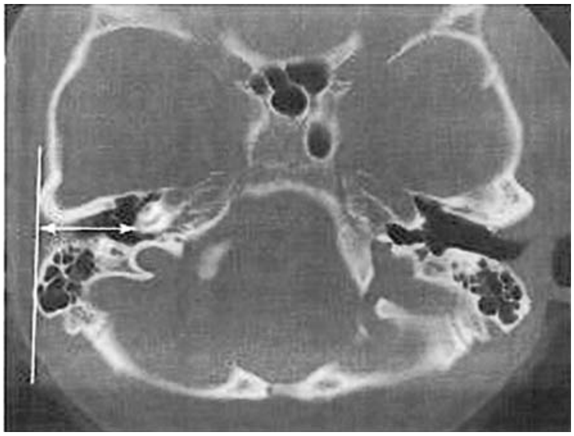

FIG. 2—*Computerized tomography scan of the external auditory canal with measurement means. Recent studies have highlighted the variation in length of the canal between males and females (12).*

Although one considers ear print identification to be a modern tool of the forensic investigators, this is not the case (14). "Earology" was first reported by Johann Casper Lavater (1741–1801) and was used by individuals such as Haken Jorgensen (1879–1927) who established a system of recording the morphology of the ear using ear measurements and ear moulds from criminals in Denmark at the turn of the last century.

However, these studies work on the assumption that each of one's ear is unique, i.e., that there are differences between both ears of a single individual and between any two individuals. To date, far too little data exist to establish the accuracy of this controversial hypothesis and more evidence-based research is required (15,16). Not only do we not have enough data related to the individual morphometry of the auricle including the affect of sex, race and genetically alterations, but also few have taken into account other potential influences on the appearance of the external ear such as decorations, diseases, and surgery. One of the authors has been involved in a rape case where the victim specifically remembered the assailant wearing ear studs and yet the detainee denied ever having pierced ears. A simple clinical examination subsequently identified the presence of lobar piercings.

Piercing as a decorative form has been practiced for centuries, many societies ritualizing the act as a statement of affluence, affiliation, or purely as a passing of significant phases in an individual's life. The majority involved lobar piercings although cartilaginous piercing were prevalent in some societies including the Kenyan Masai. A variety of styles have developed over recent years, many emulating such cultural beginnings and careful documentation may assist in the positive identification (See Fig. 3).

Earlobe stretching has been practiced predominately within Indonesia and South America though it has experienced a modern renaissance within the United States and the United Kingdom. Apertures are created by "scalpelling" with "plugs" and "spools" placed in the resulting holes. Alternatively the wearing of heavy pendants may be used to stretch the lobe beyond normal limits. Tattoos, though less common to the pinna, may be seen and can provide a recognizable feature.

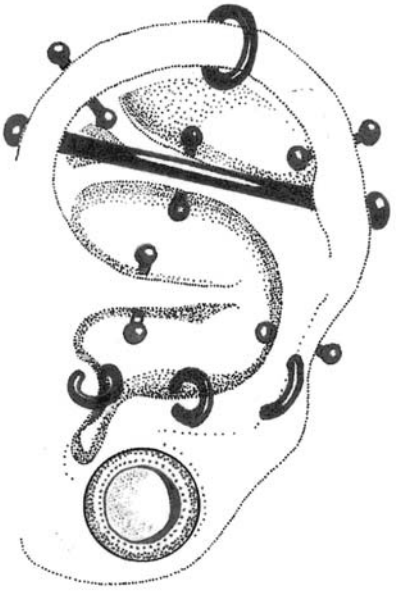

FIG. 3—*The various forms of piercings commonly encountered with their descriptive names: a) Industrial, b) Inner Helix, c) Helical, d) "Outer Conch" (through the cartilage), e) "Rook", f) "Daith", g) "Inner Conch" (through the cartilage), h) "Orbital", i) Anti-tragus, j) lobar scalpelling with spool inserted, k) Tragus.*
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Pathological Processes

The appearance of the external ear can be altered by both primary local disease processes such as infections or tumors, as well as systemic diseases, such as the tophaceous deposits of gout. Other diseases can be considered from the appearance of the pinna and may have a bearing on the ultimate cause of death include the diagonal linear creasing of the lobe frequently reported to be associated with ischaemic heart disease though of uncertain aetiology (17–19).

The post-auricular lesion acanthoma fissuratum, the so-called "spectacle frame acanthoma," is a lesion of chronic irratation possessing a central groove that can assist in the identification of personal traits or provide background information on an individual (20). Infections may also be recognizable externally including the Chicero's ulcer of cutaneous leishmaniasis (21).

Surgery

To recognize different types of auricular surgery is also to assist in the piercing together of an individual's life history. Reconstruction is currently offered to children within the U.K. born with microtia. The two main techniques for this being osseointegration, the principle of permanently attaching a prosthesis with titanium sockets, and autologous rib reconstruction that requires the removal of cartilaginous tissue from the patients developing thoracic wall to create a framework over which skin can be grafted. These techniques aim to produce a normal morphological appearance, both giving acceptable outcomes (22).

Due to the aetiology of skin tumors, the pinnae are common sites for primary basal cell carcinomas, squamous cell carcinomas, and malignant melanomas. Wedge-resections of portions of the lobe may be used to remove these lesions, though complete pinna resection may be necessary for larger tumors (23).

Peri-auricular surgery may also be evident on external examination. These include cosmetic procedures, such as facelifts (rhytidectomies) consisting of a transverse post-auricular and a vertical pre-auricular scar, and otoplasties for prominent lobes with scars along the posterior aspect of the auricle where cartilage and possibly skin has been resected to alter the angulation.

Mastoidectomy scars, usually for cholesteatomas or suppurative infections, are also recognizable posterior to the auricle as a large scar over the mastoid process. Cochlear implants (or bionic ears) may be present externally identifiable as a receiver-stimulator package and electrode array inserted under the scalp to which the transmitting coil is attracted either by means of magnetism or permanent bony fixation. Such devices or other evidence of hearing impairment/loss could provide vital information as to the ability of a person to hear and avoid an incident, for example, an on-coming vehicle in a pedestrian road traffic incident.

Postmortem otoscopy may also reveal the presence of "grommets" or ventilation tubes inserted through the tympanic membrane used to treat otitis media with effusions.

Trauma

Traumatic injury may occur to the external components, either as a result of blunt trauma or incised injury such as those seen during a non-focused assault, or as a preferential injury such as a bitemark. Likewise, the internal structures can be damaged pro-

FIG. 4—*Extension of blunt trauma from the scalp involving the pinna. Extensive laceration is noted resulting from repeated impact with a "shod-foot."*

FIG. 5—*Non-accidental injury in a child: an abrasion is present to the posterior aspect of the ear resulting from pinching of the pinna.*

FIG. 6—*A similar injury presented in Fig. 5 though as a result of surgical gauze; the patient had been artificially ventilated by means of an endotracheal tube. The tube had been secured around the head by surgical gauze. There was no evidence of physical child abuse. Reproduced with permission from Springer, London (26, 50).*

ducing a spectrum of changes related to pathological processes, or from the extension of an injury affecting the calvaria.

Animals or humans, either adult or child, may cause bite marks to the ear. As opposed to many areas of the body, a bite to the auricle cannot be self-inflicted. Identification of the perpetrator requires the skills of a forensic odontologist and includes the use of specialist photographic techniques or dental imprint morphology.

Blunt trauma, in the form of slaps or punches, could result in haematoma formation within the pinna due to peri-chondral haemorrhage (24). Such lesions require surgical evacuation to prevent cartilaginous necrosis that would ultimately result in auricular deformities such as the "cauliflower ear." Complete or sub-total avulsion of the pinna can be seen in blows from a shod foot, i.e., kicks or stamps (25). Forceful ear tugging, as sometimes occurs in child abuse, could also result in the tearing of the pinna from its root, and avulsion of jewellery producing lobar deformities. Extension of lacerations or incised wounds from the posterior aspects of the scalp to involve the pinna can be seen in those struck blows with weapons such as cleavers or axes. The authors have also witnessed a case where both pinnas were removed postmortem to simulate antemortem torture. Caution must be expressed with abrasions to the posterior aspect of the pinna especially if bilateral and in children as this may be caused iatrogenically by the use of taping to secure endotracheal or nasogastric tubes on intensive care units rather than caused by blunt trauma (26). (See Figs. 5 and 6).

Peri-auricular bruising, especially over the mastoid process, is classically associated with an underlying skull fracture (Battle's sign) though bruising can also be seen in this area at the point of impact in those suffering a traumatic sub-arachnoid haemorrhage. (See Figs. 7 and 8).

Injuries to the tympanic membrane may be difficult to observe unless one performs postmortem otoscopy. In the case of direct head trauma, a haemo-tympanum may be identified in association with a skull fracture or the membrane may be perforated following a blow, usually a slap, to the side of the head. These are reported in cases of child abuse and in boxers, resulting from a rapid increase in air pressure within the auditory canal. A specific type of torture known as "telefono" also induces similar lesions (25). Unilateral blunt trauma to the pinna of children with associated unilateral cerebral oedema and retinal haemorrhages (so called "Tin ear syndrome") is reported to be pathonomonic of child abuse (51, 52)

FIG. 7—*Battle's sign. Bruising is present over the posterior aspect of the pinna and the mastoid process. See Fig. 8.*

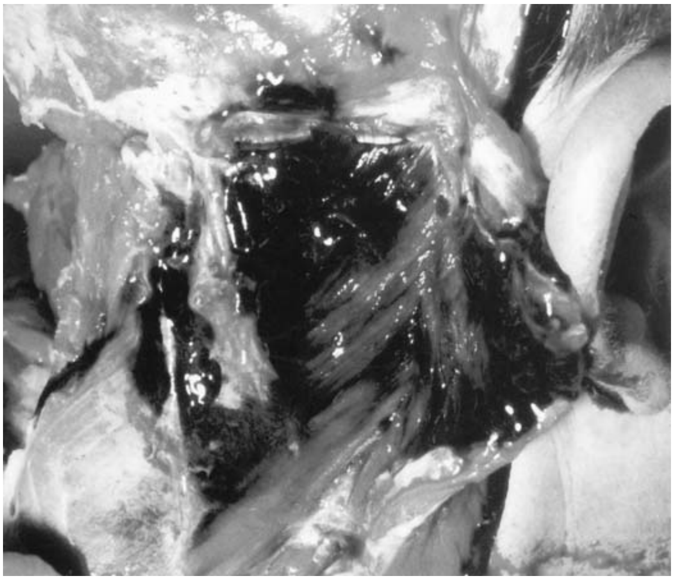

FIG. 8—*Battle's Sign. Dissection of the posterior aspect of the neck in the same body reveals extensive haemorrhage into sternocleidomastoid and erector spinae muscles. The cause was identified as a traumatic sub-arachnoid rupture of the basilar artery.*

Perforations of the membrane are also an indicator of systemic changes in relation to a death. Examples include rupture following sudden decompression as experienced by divers or passengers on depressurized planes (27). Discovery of these lesions may assist the pathologists in determining the events surrounding a death. Ruptures are also produced as a consequence of blast injuries, either during the discharge of a firearm close to the ear or following an explosion such as the detonation of a bomb. In such cases the perforation typically develops in the pars tensa anteriorly and may result in ossicle dissociation, ossicular damage, or rupture of the labyrinthine window (27). Cadaver studies from the early 20th century revealed that perforations occur at pressures of 20 p.s.i. in adults and 33 p.s.i. in children, with 50% of adult individuals experiencing defects at 15 p.s.i. (28). It should also be noted that cochlear damage could occur in the absence of frank perforation (29).

Electrocutions, be it judicial or accidental, can result in trauma to the ear including tympanic membrane perforation. The discovery of such lesions in an unexplained death should instigate a thorough search for entry and exit electrical marks or the dermal "ferning" pattern classically seen in lightning strikes (24). One should also consider contacting the local meteorological office to enquire as to the nature of the weather on the day in question. Unlike with blast injuries, perforations result from the conduction of electrical charge through the ear canal resulting in the near-total destruction of the tympanic membrane with an absence of associated ossicle damage (30). Dermal burns may also be present to the auricle ranging from a first-degree burn resembling sunburn to a full thickness burn (31). Though in such cases a verdict of accidental death is drawn, it should be noted that non-lethal weapons such as stun-batons and tasers are increasingly being used in violations of human rights (32). As such tympanic damage may theoretically be received during such assaults focused around the head region.

Estimation of the Post-Mortem Interval

The ear may not be foremost when it comes to the consideration of postmortem interval, yet it may provide a temperature-based means of such estimations. Within clinical practice, devices have been available to record a temperature from the external auditory canal (EAC) since 1946 when Williams and Thompson first utilized a Western Electric V611 thermistor in a plastic ear mold to record a single patients ear temperature during one night (33). It was not until Benzinger's clinical work on recording core temperatures from the EAC using a thermocouple applied to the tympanic membrane that temperature recording from the EAC was fully realized (34). M. Benzinger hypothesized that as the tympanic membrane received the same blood supply from the internal carotid artery, which also supplies the hypothalamus and in turn regulates core temperature, that the tympanic temperature is a truer representation of core temperature than other sites, specifically the rectum (35). It was reported that the tympanic temperature was approximately 1.5°C lower than the rectal temperature but was easy to obtain, reproducible and showed consistent patterns of response to external warming or cooling. Later the United States of America Aerospace Program studied the EAC as a potential site of temperature measurement in astronauts, developing what we know today as the Infrared thermometer, which is used in clinical practice worldwide (36,37). The thermometer is easy to use and yields a "core temperature" reading within a matter of seconds. Despite the apparent simplicity and accuracy, there are a considerable number of potential problems that can arise in clinical practice from the use of such instruments and care must always be taken when using a temperature recorded with an infrared thermometer.

There are few autopsy-based studies considering the use of temperatures from the EAC and the calculation of the time since death. Both Nokes and Baccino have published small studies concerning the recording and use of temperatures in standard time since death algorithms although these studies have conflicting conclusions as to whether or not the EAC can be used for this purpose (38–41). The M.D. thesis of Rutty details a large cadaver-based study, showing that a temperature can be recorded from the EAC, that it can be used with selected or modified time since death algorithms and that there are very few "factors" that have to be considered or applied to the algorithms unlike other sites such as the rectum (12).

When using a temperature recorded from the EAC after death, one has to remember that in life the EAC is approximately 1.5°C lower in temperature than the rectum. This will affect the calculation when using a standard algorithm if not taken into account. Both Nokes and Rutty have shown that there is no "lag phase" for the EAC and therefore its cooling pattern approximates to a single exponential curve as opposed the standard double exponential curve of the rectum (42,12). Thus if one applies a temperature recorded from the EAC to an algorithm designed for the rectum, the estimation will be grossly incorrect. One can use the simple Rule of Thumb method but one has to add an additional constant to the calculation that may be thermometer dependent. The best algorithm to use with an EAC temperature appears to be the Henssge nomogram designed for the brain which yields not only reasonable estimations but also has a smaller window for the 95% confidence limits (±1.5 h as opposed to the standard ±3) (43).

Very few factors alter the cooling of the EAC after death. Baccino and Rutty have shown that if the head is on one side, the exposed EAC should be chosen although in preference a temperature should be recorded from both canals and an average temperature used (39,12). Although hair coverage to the head alters the cooling of the brain, there appears to be no apparent affect on the EAC temperature. As for other body sites, the temperature within the EAC is dependent upon the normal body circadian temperature rhythm and may be altered by ambient temperature. To date no other factor, for example, clothing, body position, physical exercise or alterations in local blood supply, appears to influence the cooling of the EAC.

Thus if one can use the EAC for the estimation of the time since death, why is it not performed more frequently? The rectal temperature applied to the Henssge nomogram is, to date, probably the most used and best method for this purpose although when a rectal temperature should not or cannot be used then the EAC may prove a good alternative. If you only have a disembodied head then an estimation of time since death is still possible using the EAC temperature assuming that the decapitation occurred within 16 h of its discovery. It must be remembered, however, that should a body be brought in dead to hospital and its temperature is recorded in the accident and emergency room using an infrared thermometer, you cannot simply apply that temperature to the standard rectal based algorithms as the estimation will be incorrect.

Internal Examination

Forensic assessment of the internal structures involves specialized dissection. Following the opening of the calvarium and subsequent examination of the brain, the ear structures may be dissected. In-situ examination is possible using a hammer-and-chisel approach to remove the roof of the middle and inner ear although this is a destructive method; however, formal removal of the temporal bone often provides better means of examination.

Several dissection techniques have been described. The "bone-plug" methods involve either an intra- or extra-cranial approach with the use of a specialized tool to core out selected areas of the

FIG. 9—*Internal view of the calvaria following removal of the brain and dura. Note the presence of haemorrhage within the petrous temporal bone.*

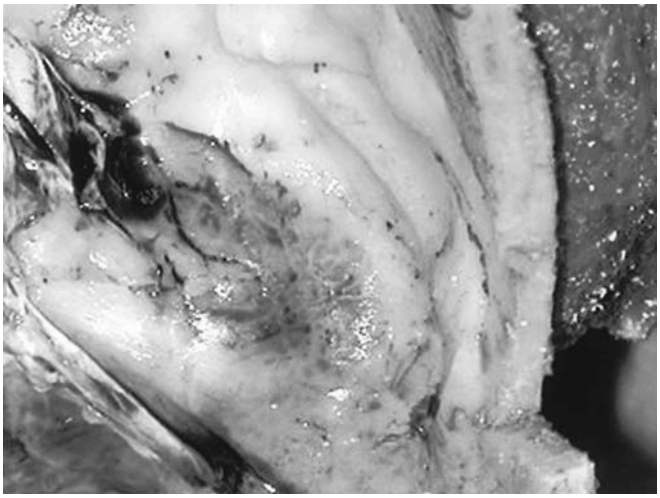

FIG. 10—*Close-up view of Fig. 9 revealing the haemorrhage into the mastoid air spaces classically associated with asphyxial or drowning related deaths. The cause of such change is assumed to be due to raised internal pressures within the middle ear.*

ear as a single cylindrical plug, being centered either over the auditory meatus externally or the arcuate eminence internally. The plug may then be removed following soft-tissue dissection. Conversely the petrous temporal bone may be removed in its entirety as highlighted by Burton and Rutty (44). Two sets of parallel cuts made around the petrous with an oscillating bone saw results in the removal of the bone that may then be fixed and assessed at a later date. Both styles of dissection are adequate though the authors warn of the possibility of reconstruction problems and calvarial stability following bilateral resection, for which mortuary assistants may not be grateful.

Identification

The most extreme form of postmortem examination involves the morphological assessment of skeletal remains. Due to its composition and basal location, the petrous bone is often identifiable even after fragmentation, be it due to trauma or fire. The ability to infer gender based on morphological characteristics has long been practiced in osteology though the use of the petrous bone has been considered somewhat controversial (45–47). An attempt to standardize the points of measurement was highlighted by Wahl and Graw (47). Though some points produced comparatively better results the correlation between predicted and true sex was 71%.

Pathological Processes

Haemorrhage into the mastoid air spaces may be seen in deaths due to asphyxia or drowning, possibly caused by a raised pressure within the ear though similar changes can be seen in non-asphyxia related death (25). Its presence, however, should always raise the suspicion of an unnatural death.

The presence of middle ear infections requires postmortem otoscopy and confirmation on formal dissection with appropriate microbiology. Uncommonly suppurative conditions can result in osteomyelitis of the temporal bones, thrombophlebitis of the sigmoid sinus, bacterial meningitis or the development of abscesses either in the temporal lobes or the cerebellar hemispheres (24). Ultimately such conditions may result in sudden death and could be detectable at postmortem. Middle ear infections should also be excluded in cases of pyrexia of unknown origin especially paediatric cases.

Less common but potentially fatal infections include cephalic tetany, resulting from extension of clostridium tetani from the middle ear (48), and otitis externa malignans, a pseudomonas infection typically identified in the elderly and the immuno-compromised producing in osteomyelitis and meningitis (24).

Acoustic neuromas (Schwannomas) developing adjacent to the cerebropontine angle could result in death due to the compromise of cerebro-spinal fluid drainage from the fourth ventricle, resulting in a raised intra-cranial pressure. Such lesions occur with greater frequency in patients with Type II (central) neurofibromatosis (49).

Trauma

Skull fractures commonly involve extensions from the point of impact on the temporo-parietal area of the head that subsequently progress along the petrous temporal bone towards the center of the vault. The presence of a blood or cerebrospinal fluid-stained otorrhea should raise suspicion of such lesion due to dural damage and fracture deformities that may result in the aforementioned Battle's sign. Pre-or postmortem radiology may detect the presence of such fractures or possibly sub-dural air indicating a communication with the upper respiratory tract. In such cases, the ossicles may be severely damaged though the inner ear is often intact.

Fronto-occipital impacts result in the less common longitudinal fractures passing from the occiput around the foramen magnum and across the petrous temporal bone. Inner ear damage is common in such injuries though conversely the ossicles are often undamaged (27).

Conclusions

Although numerous methods of examination have been developed, the assessment of the ear is an under-utilized means of gaining potentially critical information about an individual in a forensic setting. The ear may be neglected due to its passive nature in death or the smallness of its dimensions. Routine autopsy examination, including postmortem otoscopy, may provide details of personal traits to investigating officers, natural diseases or means of identification, taking relatively little time to perform. In the extreme form, the cause of death may be ascertained by correlation of the appearances within the auditory structures with systemic findings at necropsy. Work rightly continues in this field with the estimation of the postmortem interval, sexing of individuals and body identification, including earprints in both the living and the dead, being topical issues of current research.

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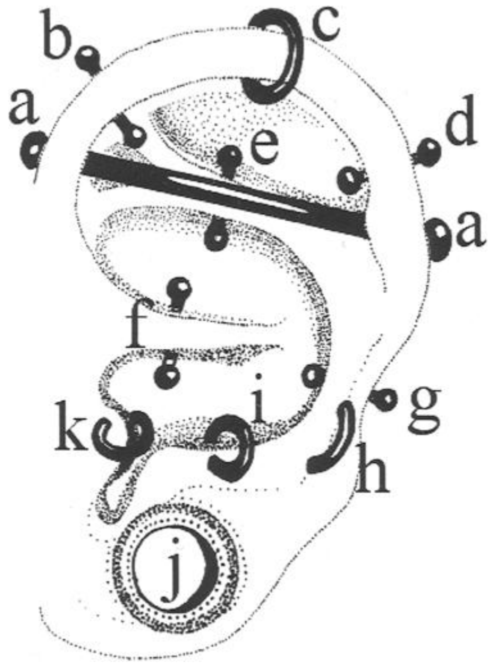
ERRATA

Erratum/Correction of Swift B and Rutty GN. The Human Ear: Its Role in Forensic Practice. J Forensic Sci 2003 Jan.;48(1):153–160.

It has come to the attention of the Journal the fact that the hand-drawn image (Fig. 3) of the ear with piercings isn't labeled with regards to the figure legend. Below is the new/correct Fig. 3.

The Journal regrets this error. Note: Any and all future citations of the above-referenced paper should read Swift B and Rutty GN. The Human Ear: Its Role in Forensic Practice. [published erratum appears in J Forensic Sci 2003 May;48(3)] J Forensic Sci 2003 Jan;48(1): 153–160.



Erratum/Correction of Sinha SK, Budowle B, et al. Development and Validation of a Multiplexed Y-Chromosome STR Genotyping System, Y-PLEX™6 for Forensic Casework. J Forensic Sci. 2003 Jan.;48(1):93–103.

On page 99, the legend reads as:

FIG. 4—Profile of the positive control sample from 0.2 ng of template DNA using the Y-PLEX™6 kit.

should read:

FIG. 4—Profile from 0.2 ng of template DNA using the Y-PLEX™6 kit.

The Journal regrets this error. Note: Any and all future citations of the above-referenced paper should read: Sinha SK, Budowle B, et al. Development and Validation of a Multiplexed Y-Chromosome STR Genotyping System, Y-PLEX™6, for Forensic Casework. [published erratum appears in J Forensic Sci 2003 May;48(3)] J Forensic Sci 2003, 48(1):93–103.