The forensic potential and recognition of scarification practices by practitioners in Europe

by

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Abstract

Forensic identification of unknown human remains is a fundamental component in disaster victim identification (DVI), humanitarian contexts, and missing persons cases. While primary identifiers such as DNA, fingerprints, and dental records remain the gold standard, operational constraints frequently necessitate reliance on secondary identifiers. Within this category, ritual scarification represent a potentially valuable yet inconsistently utilised source of identification information.

This study aims to assess the global practices of ritual scarification and evaluate the extent to which it is recognised and utilised by forensic practitioners within European contexts. In particular, it examines whether scarification is appropriately understood as a structured cultural modification with potential forensic value, or whether its evidential potential is limited by external factors.

A mixed-methods approach was employed, combining a narrative literature review with practitioner-based questionnaire data. The literature review synthesised anthropological, clinical, and forensic sources relating to scarification practices, documentation systems, and comparative secondary identifiers. This was complemented by questionnaire data collected from forensic practitioners, exploring levels of awareness, confidence, and operational exposure to scarification in casework.

Findings indicate that scarification is practiced across multiple regions and is consistently characterised by patterned, intentional, and culturally embedded morphological features. However, its integration into forensic identification systems remains limited, with current DVI frameworks tending to prioritise more eurocentric identifiers such as tattoos. The study highlights implications for forensic practice, particularly in relation to training, documentation systems, and cultural competency. The findings suggest a need for improved guidance and standardisation in recognising and recording scarification, alongside enhanced practitioner education to reduce the risk of misinterpretation or omission in identification processes.

Content warning

This dissertation addresses ritual scarification as a culturally and forensically sensitive topic. It may contain depictions and descriptions of scarification, including visible blood and partial nudity, although efforts have been made to minimise and obscure explicit content where possible.

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1.0 Introduction

The forensic examination of unidentified human remains, whether in disaster victim identification (DVI) contexts, missing persons cases or humanitarian operations, is a critical component of medico-legal investigation that enables the establishment of identity and, where possible, cause and manner of death (Dahal *et al.*, 2023). DVI refers to the structured multidisciplinary process of identifying deceased individuals following mass fatality incidents (INTERPOL, 2023; Johnson and Reimen, 2019; Mor *et al.,* 2024). Within these frameworks, human identification relies on the comparison of biological and contextual identifiers to achieve a legally defensible conclusion, typically through the reconciliation of ante-mortem and post-mortem data (Holz *et al.,* 2022; Johnson, 2024; Petaros, Lindblom and Cunha, 2024).

Scars develop as part of the body's natural wound-healing response, a complex biological process that involves multiple cellular and molecular pathways (Ogawa, 2018). The primary purpose of this process is to restore the skin's structure and function after injury. When the skin is damaged, a multitude of repair mechanisms are activated to regenerate both the dermis and the epidermis (Jeschke *et al.,* 2023). Wound healing progresses through three main stages (see Figure 3): inflammation, proliferation and remodelling. During the final remodelling phase, the collagen initially laid down to close the wound is reorganised and strengthened forming permanent fibrous tissue that appears as a visible scar (Profyris, Tziotzios and Do Vale, 2012).

Unlike incidental or pathological scarring, scarification refers to the intentional and patterned modification of the skin to produce permanent marks, typically undertaken for cultural, ritual, social, or identity-related purposes (Balan, 2020; Garve *et al.,* 2017). As such, scarification occupies a dual position as both a biological outcome and a culturally constructed identifier. In forensic terms, scars and scarification can be assessed through structured morphological analysis, including parameters such as width, elevation, pigmentation variation, tissue consistency, and keloid formation (Karmisholt *et al.,* 2018; Balan, 2020). These features enable systematic documentation and, in some cases, comparative evaluation: however effective interpretation requires both anatomical and cultural literacy (Kpema, 2023).

Despite the biological permanence and information obtainable from scarification its integration into standard forensic identification frameworks remain minimal, reflecting a historical emphasis on eurocentric or biomedical markers such as dental records, tattoos or surgical implants. This suggests a potential disconnect between anthropological understanding of

scarification and its operational recognition within forensic systems. As a result, culturally significant identifiers may be systematically under-recorded or misinterpreted, limiting their evidential utility in the identification processes.

1.2.0 Research aims and objectives

The aim of this study is to evaluate the forensic relevance of scarification as a marker in human identification and assess practitioner recognition and interpretation of scarification within European forensic contexts.

This study is guided by the following research questions:

1. How is intentional cultural, ritual and meaningful scarification represented in existing literature and to what extent is it recognised as a feature relevant to human identification?
2. What structural limitations exist within current DVI frameworks regarding the documentation and interpretation of scarification?
3. To what extent does existing forensics and DVI literature provide guidance on the documentation classification or interpretation of scarification?

To meet the study aim and address the research questions, several objectives were established. A systematic review of anthropological, medical, and forensic literature was conducted to assess how scarification is represented and whether it is recognised as a human identification feature. Current Disaster Victim Identification (DVI) frameworks and associated guidance documents were critically analysed to identify structural limitations in the documentation and interpretation of scarification. The extent and nature of existing forensic and DVI guidance relating to the classification and recording of scarification was evaluated. Practitioner perspectives were collected and analysed through a structured questionnaire to assess levels of recognition, confidence, and interpretive approaches within forensic contexts. Finally, findings from both the literature and primary data were integrated to identify gaps between theoretical knowledge and operational forensic practice.

2.0 Method

2.1.0 Research design

This study adopted a mixed methods design, combining a narrative review of existing literature with primary (qualitative and quantitative) data collection through practitioner surveys and interviews. This mixed methods approach was chosen to provide both breadth (via the narrative review) and depth (via practitioner perspectives), allowing for a comprehensive understanding of the forensic applications of scarification and practitioner awareness. The integration of qualitative and descriptive data was selected due to the limited empirical research available on scarification within forensic contexts. It also reflects the need to explore the translation between theoretical frameworks, existing guidance, and practitioner experience.

2.1.1 Part A: Narrative review

Databases:

The systematic review was conducted using databases such as Scopus, PubMed, Google Scholar and the University of Staffordshire Online Library. This was done to ensure a broad coverage of literature across forensic sciences, anthropology and medical disciplines.

Search strategy:

A structured keyword-based search strategy was employed using combinations of key terms (*Table 1*) alongside Boolean operators to refine and expand search results. For example: (Scarification OR body mutilation OR ritual scarring AND victim identification OR forensic anthropology OR practitioner awareness).

To enhance comprehensiveness beyond database indexing limitations, a snowballing technique was also applied. This involved reviewing the reference list of key studies and identifying additional literature, enabling the identification of sources not captured through database searches alone. This approach was particularly important given the limited and fragmented nature of forensic literature specifically addressing scarification.

Table 1: Key search terms

Scarification	Post-mortem identification	Awareness of cultural practices
Body mutilation	Forensic anthropology	Forensic practitioner competence
Ritual scarring	Interpretation bias	Training and education
Mass fatality incidents	Secondary identifiers	Disaster victim identification
INTERPOL	Scars	Human identification
Cutaneous features	Europe	International guidance
Forensic identification	Scarification assessment	Indigenous body marking
Body modification	Scar healing	Cultural training
Scarification awareness	Missing persons identification	Scarification interpretation

Inclusion and exclusion criteria:

Studies were included if they were published in English, focused on scarification practices, uses in forensics or awareness among Europe-based practitioners. Exclusion criteria included non-human studies and literature lacking methodological detail.

No publication date restrictions were applied due to the limited and specialised nature of the topic area, as well as the reliance on both contemporary forensic research and foundational anthropological literature. In addition, grey literature was included where appropriate and necessary to supplement the peer-reviewed evidence base, given the limited availability of forensic-specific research on scarification. Grey literature sources were subject to critical appraisal to assess their credibility and relevance.

2.1.2 Part B: Questionnaire & interviews

Target audience

Participants included Europe-based forensic or death-investigation practitioners (for example, DVI responders, coroners, pathologists, forensic anthropologist or mortuary professionals). Recruitment was done through relevant organisations, professional networks and existing professional contacts, such as the British Association for Forensic Anthropology. This sampling approach was selected due to the specialist and limited population of practitioners directly engaged in DVI and medico-legal identification work.

Ethics

Ethical approval has been obtained from the University of Staffordshire and all participants provided informed consent prior to data collection. Participants were aware all participation was voluntary and responses would be anonymised. The participants were made aware anonymity would be removed, to the researcher alone, if they opted in to do a follow up interview. The research ethics form is provided in Appendix A. The participant information sheet and consent form are provided in Appendices B and C, respectively.

Questionnaire

The questionnaire was designed to explore practitioner exposure to, awareness of and interpretive confidence in relation to ritual scarification within forensic identification contexts. It also examines how scarification is currently documented within professional practice and whether practitioners perceive gaps in training, guidance or DVI documentation frameworks. The full questionnaire is provided in Appendix D.

The questionnaire consisted of primarily multiple choice and Likert-scale statements, to enable structured comparison across practitioner responses to facilitate consistency in analysis. Open-text response was limited to specific operational fields (e.g., 'Other') to allow clarification or additional context where necessary. This design decision was deliberately implemented to ensure the questionnaire was time-efficient and accessible for working forensic professionals.

Follow-up semi-structured interview

In addition to the questionnaire, participants were given the option to partake in a follow-up semi-structured interview to review their level of familiarity and experiences with scarification in a forensic context. This was done by adding a free text box at the end of the questionnaire where participants could leave their details to be contacted for a follow up interview. This was intended to provide qualitative insight into practitioner reasoning, interoperative approaches and professional experience. The interview guide is included in Appendix E.

Data analysis

Given the limited response rate, quantitative analysis was not appropriate in a statistical sense. In light of this the questionnaire data was analysed descriptively to identify key features of practitioner awareness, exposure and interpretive confidence relating to ritual scarification.

In addition, a qualitative interpretative approach was adopted, whereby the single practitioner response was analysed in relation to the wider literature base. This enabled a comparative thematic synthesis between practitioner insight and existing academic, forensic and anthropological evidence.

3.0 Literature review

3.1.0 Human identification in forensic science

The forensic examination of unidentified human remains is necessary in situations such as long-term missing persons investigations, DVI contexts and humanitarian cases. In such circumstances, forensic analysis provides the evidential basis required to determine, where possible, the identity of an unknown deceased individual (Dahal *et al.,* 2023). The identification of deceased individuals has significant legal, administrative and ethical implications and crucially affects the well-being of relatives who remain unaware of a loved one's circumstance due to unidentified bodies (Franceschetti *et al.*, 2025).

Beyond its legal function, identification carries significant ethical and social importance, particularly for families of the missing, for whom uncertainties surrounding a loved one's fate can result in prolonged psychological distress. This is reflected in the concept of "ambiguous loss", characterised by unresolved grief in the absence of confirmation of death, this is frequently reported among relatives of missing persons (Morwitz and Sturdy Colls, 2016). Consequently, the identification of human remains not only fulfils traditional requirements but also enables funerary practises and facilitate psychological closure. This highlights a dual medico-legal and humanitarian significance of forensic identification.

A missing person is anyone whose whereabouts are not known and who is being sought by another person or other persons (International Commission on Missing Persons, n.d.). United Kingdom (UK) national data reflects the scale of the issue, with 405,128 missing-related reports recorded by police in 2023/24 and approximately 1,070 deaths associated with missing person cases in the same period (National Crime Agency, 2024). Additionally, more than 400,000 missing person-related calls were recorded by UK police forces between 2023 and 2024, demonstrating the substantial and ongoing demand placed on investigative and forensic UK services by missing persons cases (National Crime Agency, 2024).

Globally, the challenge is amplified in mass fatality incidents, where large numbers of deceased individuals must be processed systematically. Between 2000 and 2023, Central Europe experienced approximately 474 disaster events, which together resulted in around 65,479

fatalities (von der Forst *et al.,* 2025). Such events placed considerable pressure on forensic systems to deliver rapid, accurate and ethically sound identification outcomes. Mass disasters, either natural or man-made are chaotic events with major adverse effects on infrastructure, environments and communities (De Boer *et al.,* 2020). Human rights violations may also be regarded as mass disasters, even though they may occur over extended periods of time and across wider geographical regions (Brough, Morgan and Rutty, 2015).

3.1.1 Disaster victim identification

DVI refers to the structured process of identifying deceased victims after a mass fatality incident (Johnson and Reimen, 2019).The process typically involves a multidisciplinary approach of forensic practitioners such as forensic odontologists, forensic anthropologists, forensic pathologists, forensic biologists and fingerprint experts (Adamovic *et al.,* 2023; INTERPOL, 2023; Mor *et al., 2024*). Although leading a disaster response is the responsibility of the government of the affected area (INTERPOL, 2023), international organisations play a critical supporting role. Bodies such as the International Committee of the Red Cross (ICRC) and the International Criminal Police Organisation (INTERPOL) provide established frameworks and operational guidance, promoting consistency in identification procedures (Cordner and Ellingham, 2017). The ICRC is characterised by its humanitarian action exercising neutrality, impartiality and independence, enabling access to conflict-affected regions where other actors may be absent (McGoldrick, 2011).

In incidents occurring across national borders or involving victims from multiple jurisdictions, coordinated international collaboration is essential to ensure effective identification processes INTERPOL (2023d). Organisations, such as the International Commission on Missing Persons (ICMP), in collaboration with INTERPOL, facilitate this with the exchange of forensic expertise, data and identification frameworks (ICMP and INTERPOL, 2007).

3.2.0 Disaster victim identification identifiers

Human identification within medico-logical contexts generally relies upon the comparison of ante-mortem and post-mortem data to establish identity to a legally defensible standard (Petaros, Lindblom and Cunha, 2024; Holz *et al.,* 2022). Within existing DVI protocols identification methods are commonly categorised into primary and secondary identifiers.

The INTERPOL DVI Guide, first published in 1984 and subsequently updated, was developed to promote consistency in identification procedures (INTERPOL, n.d; INTERPOL,

2023c). The guide introduced standardised ante-mortem and post-mortem forms, structured reconciliation procedures and defined identifiers. This standardisation is particularly critical in contemporary disasters where victims frequently originate from multiple jurisdictions and cross-border data is required. INTERPOL's authority to coordinate international DVI frameworks derives from its status as an intergovernmental organisation under international law. Wood (2026) notes that its recognised neutrality and United Nations observer status reinforce its legitimacy, enabling cross-border cooperation while maintaining evidential integrity and procedural consistency.

3.2.1 Primary Identifiers

Primary identifiers consist of DNA profiling, fingerprints and, dental records as these allow direct scientific comparison with ante-mortem data providing highly individualising information (INTERPOL, 2023c; Johnson, 2024).

DNA profiling is widely regarded as the most discriminatory identification method due to the uniqueness of genetic material, with bones and teeth representing the most reliable sources of DNA in DVI scenarios (Jamieson and Bader, 2016). DNA analysis offers high reliability and scientific validation, particularly useful in large-scale disasters involving commingled or fragmented remains. This is illustrated in the terrorist attacks of September 2001, where approximately 20,000 remains were found and DNA analysis assisted in the identification of over 1,600 victims (Butler, 2010). However, DNA identification is constrained by operational and biological factors. Extraction and analysis are time and resource intensive, often requiring specialist laboratories and trained personnel (Turingan *et al*., 2020). Additionally, DNA integrity may be compromised in extreme heat, prolonged environmental exposure or decomposition reducing amplification success (Jamieson and Bader, 2016; Hartman *et al.,* 2011). Moreover, DNA analysis relies heavily on reference samples from either ante-mortem records or familial matches (Kruijver, Meester, and Slooten, 2014). This can be limited for migrants, undocumented individuals or populations with minimal interaction with formal healthcare systems (Machado and Granja, 2021).

Fingerprint analysis provides legally robust identification based on the permanence and uniqueness of friction ridge skin formed during foetal development (Houck, 2016; Monson *et al.,* 2019). Limitations of fingerprints are primarily context dependent. Ridge detail deteriorates quickly under conditions of decomposition, fire or prolonged environmental exposure, limiting its applicability in mass disaster contexts (Schotsmans, Márquez-Grant and Forbes, 2017;

Färber *et al.,* 2010). Furthermore, like DNA, structural gaps in fingerprint databases and variable recovery protocols can further restrict operational feasibility (Champod *et al.,* 2016).

Forensic odontology utilises dental morphology, restorations and eruption patterns to establish identity, often by comparing post-mortem findings with ante-mortem records enabling comparative radiography, dental record comparison and craniofacial superimposition (Hinchliffe, 2011; Garewal, Garewal and Girdhar, 2023; Langley and Tersigni-Tarrant, 2017). Dental analysis can also contribute to the formation of a biological profile, estimating age, sex, ancestry and height (Pilli *et al.,* 2023). Although tools such as the Atlas of Human Tooth Development and Eruption (AlQahtani, Hector and Liversidge, 2009) assist in dental age estimation, interpretation can still be limited by individual variation, preservation quality, and skeletal fragmentation (Boyd and Boyd, 2018).

3.2.2 Secondary Identifiers

Despite their reliability, the limitations of primary identifiers in certain contexts necessitate greater reliance on secondary identifiers (Färber *et al.,* 2010; Kruijver, Meester and Slooten, 2014; Machado and Granja, 2021; Schotsmans, Márquez-Grant and Forbes, 2017; Turingan *et al.,* 2020) Secondary identifiers are individualising features, such as personal description, medical findings and personal effects, that are generally insufficient to establish identity alone can provide supporting or corroborative evidence alongside other identification methods (Gowland and Thompson, 2013; INTERPOL, 2023; Olivieri *et al.,* 2017).

Visual recognition represents the most immediate and accessible form of identification; however, its reliability remains contested (INTERPOL, 2023c). Research highlights a significant risk of misidentification, alongside the potential for psychological distress among relatives, particularly in cases involving trauma, decomposition, or disfigurement (Caplova *et al.,* 2017; ICRC, 2009; Osborn and Easthope, 2019).

Cutaneous features, including scars, tattoos, moles and other distinguishing skin marks, represent an additional category of secondary identifiers that can assist in the visual and descriptive comparison of an individual. Such features are readily observable and may demonstrate individualising characteristics in their anatomical location and spatial distribution, with emerging research highlighting the potential for patterned skin markers to support comparative identification (Nurhudatiana *et al.,* 2016). Scars, as permanent disruptions of dermal tissue, can provide distinctive and valuable identifying information, while tattoos and similar marks may offer insights into personal identity, including affiliations or lifestyle, and

are commonly utilised in forensic comparisons (Balan, 2020). Emerging research further indicates that patterned skin features, such as moles and other pigmented or vascular marks, exhibit a high degree of individuality, with a low probability of coincidental matches when multiple features are present (Nurhudatiana *et al.,* 2016). However, within DVI practice, their evidential role remains supportive rather than definitive due to the lack of standardised methodologies and variability in practitioner interpretation and documentation (Lee, Jain and Jin, 2008).

Similarly, **personal effects** such as clothing, jewellery and other possessions provide another route for suggesting identity. However, the evidential value is inherently constrained, as items recovered with the body may not belong to the individual, introducing the risk of misidentification if used in isolation. Despite the limitations, evidence from the US Bangla Flight 211 disaster demonstrates that clothing, personal items, and physical artifacts were instrumental in identifying victims across all conditions, from intact bodies to those extensively charred (Shrestha *et al.,* 2019). In this case, personal effects contributed to the identification of approximately 63% of individuals, often in combination with other methods such as fingerprints or dental records.

Medical findings, such as orthopaedic implants, healed fractures and unique skeletal features can play a critical role in establishing a positive identification (Simpson *et al.,* 2007). Surgically implanted medical devices are particularly valuable due to their durability and unique serialisation, allowing both direct identification and comparative analysis (INTERPOL, 2023c ; Matoso *et al.,* 2013). Orthopaedic devices may also provide contextual information about the individual, including evidence of prior medical interventions, access to healthcare and potential age indicators (Wilson, Bethard and DiGangi, 2011). Furthermore, imaging techniques and anthropological analysis can reveal distinctive surgical features and are not only detectable post-mortem but also distinguishable from trauma-related changes (Lemos *et al.,* 2024). Beyond therapeutic interventions, cosmetic procedures—including gender-affirming surgeries—may also assist in identification, as they produce deliberate and symmetrical modifications to skeletal structures that leave characteristic markers (John and Jaime, 2024).

Anthropological identifiers are also classified as secondary identifiers by INTERPOL (INTERPOL, 2023c). Biological traits, including skeletal and anatomical features, are person specific and are argued to be more discriminatory than other secondary identifiers, such as personal effects (Petaros, Lindblom & Cunha, 2024). Forensic anthropology enables the rapid

identification of key anatomical landmarks to construct a biological profile (ancestry, sex, age, and stature), which, while not sufficient for positive identification, facilitates the triaging of remains for subsequent analysis (Blau and Briggs, 2011). Biological profiling is conducted through a variety of methods, including evaluation of sexual dimorphism traits in the pelvis and skull, age estimation via cranial suture closure, and other skeletal markers (Brooks, and Suchey, 1990; Key, Aiello and Molleson, 2012; Langley and Tersigni-Tarrant, 2017; Lovejoy *et al.,* 1985). Consequently, forensic anthropological analysis does not necessarily require ante-mortem data to draw meaningful conclusions regarding unidentified individuals. Although the work of Brooks, and Suchey, (1990) and Lovejoy *et al* (1985) are a foundational piece of literature, there are several observations scrutinising their reliability and applicability across the population (Buckberry & Chamberlain, 2002; Djuric *et al*., 2007; Öst, 2022).

Although primary identifiers are preferred in forensic identification, this is not always possible in practice. In cases involving deceased migrants, the absence of ante-mortem data may restrict use of primary identification methods, meaning investigations may need to rely on secondary identifiers to support identification (Machado and Granja, 2021; Olivieri *et al.,* 2018; Wilkinson, and Castaneyra-Ruiz, 2021). Secondary identifiers can also provide preliminary identification facilitating triage, limiting errors in case management and expediting the identification of victims, particularly in incidents of fragmented, burned or commingled remains (Mundorff, 2012).

Approaches to the use of secondary identifiers vary between medio-legal jurisdictions. For example, the Pima County Office of the Medical Examiner applies a cumulative assessment of secondary identifiers to support presumptive identification when primary records are unavailable, with identification confidence increasing as consistent traits accumulate and provided no unexplainable discrepancies are present (Anderson, 2008). The presence of multiple concordant features between ante-mortem and post-mortem data can significantly strengthen the evidential basis of identification. Overall integrating secondary identifiers into human identification procedures enhances efficiency, applicability and accuracy of the identification process.

3.3.0 Scarification as a individualising feature

Scarification refers to the intentional creation of permanent patterned scars on the skin, although meanings and techniques vary, it typically involves modification of the skin for cultural, spiritual, social or identity-related purposes (Garve *et al.,* 2017). Unlike accidental or

pathological scarring, which occurs accidently or as a biproduct of medical intervention, scarification is deliberately executed with the primary goal of marking the skin. It is worth noting that the term scarification is also occasionally used in biomedical contexts, for example to describe the BCG vaccination scar (Frankel *et al.,* 2016), but this differs from cultural scarification, as it is a side effect of vaccination rather than a socially or symbolically motivated practice. This section focuses specifically on cutting-based patterned scarification, excluding other forms of body modification such as abrasion or burning techniques, to maintain analytical consistency within the literature review.

3.3.1 Cultural significance and geographic distribution

Scarification has been historically documented among indigenous populations in Africa, Melanesia and Australia (Garve *et al.,* 2017). Its prevalence in darker-skinned populations has been partially attributed to the limited visibility of tattoo pigments, although some cultures, including the Māori of New Zealand and the Carajá of Brazil, combine both tattooing and scarification practices (Garve *et al.,* 2017; Guynup, 2004; The Lantern, 1994). Garve *et al* (2017) synthesise evidence from African and Amazonian communities, highlighting both ritual and medical dimensions of scarification; however, the study relies heavily on secondary sources and older ethnographies, limiting the generalisability of its findings to all populations or direct forensic application. Guynup (2004) provides descriptive, journalistic accounts of combined scarification and tattooing practices, drawing on cultural expert testimony; while not peer-reviewed and methodologically limited, it offers illustrative examples that complement ethnographic literature. Similarly, The Lantern (1994) documents Carajá scarification implements and ceremonial practices from 1938–1939; although dated and non-peer-reviewed, it contributes valuable historical context and detailed illustrations of techniques, despite limited applicability to contemporary populations.

Within West Africa, scarification carries profound symbolic significance. Among the Yoroba of Nigeria, scarification has been employed both for therapeutic purposes and religious devotion (Garve *et al.,* 2017). Specific practises include the insertion of medicinal substances into vertical facial marks to prevent trembling in children, as well as treatments for severe headaches via cuts on the forehead or ankle (Perper *et al.,* 2017). While Perper *et al*., (2017) is peer-reviewed and internationally published, it focuses on medical and historical aspects of scarification rather than its cultural or ritual meanings. As a result, although it reliably documents forms and practices, its applicability to understanding symbolic significance or informing forensic interpretation is limited.

Neighbouring countries such as Benin, Togo, and Ghana illustrate how scarification intersected with historical systems of domestic slavery during the fifteenth to nineteenth centuries. Vertical facial scarification patterns served as ethnic markers of individuals originating from northern west Africa, providing visible identifiers among enslaved populations. These markings persist symbolically in the Tchamba Vodun tradition, where they are represented in shrine art and ritual imagery depicting ancestral slave spirits (Rush, 2011). While peer-reviewed, Rush's (2011) study is early-stage ethnography with a limited geographic scope and reliance on interview data; some ethnic groups were not included, and the sensitive political context may have influenced participant responses. Consequently, although the research offers valuable insight into the symbolic interpretation of scarification, the findings are context-specific rather than broadly generalisable across West Africa. In this context, the scarification patterns function as visual references to northern origins and act as cultural reminders of the historical presence of domestic slavery.

Comparable practices are documented elsewhere in Africa, among the Baganda of Uganda, scarification (*kusandaga*) is practiced as a form of health management Sekagya *et al.* (2024). Incisions are made as a means of administering medicinal substances, with the belief that direct contact with the blood enhances their effectiveness for prevention, protection, and overall health. Scarification is typically performed by trained spiritual healers, known as *Balubaale*, although in some cases ancestral spirits are believed to enact the procedure while clients sleep (Sekagya *et al.,* 2024). Sekagya's (2024) study, published in PLOS Global Public Health, draws on interviews with twelve Baganda healers from a limited geographic and cultural scope (Central Uganda, one tribe, one category of healer), and participant demographics skew male. While providing rich qualitative insight into ritual practices, the findings are context-specific and cannot be generalised to other Baganda communities or broader Ugandan populations.

Conversely among the **Surma** and **Kardo** tribes of Ethiopia, scarification primarily functions as both an aesthetic adornment and as part of rites of passage, marking transitions into adulthood or commemorating significant achievements (Iftekhar and Zhitny, 2020). Parable-shaped forehead scars of a Surma individual can be seen in Figure 2 from (Garve *et al.,* 2017). Other tribes including the **Dassanech** tribe, participate in scarification to commemorate milestones like killing enemies in battle(Iftekhar and Zhitny, 2020). This can be seen in Figure 5 by Iftekhar and Zhitny (2020).

Figure 1: (A-B) Examples of scarification pattern resembling crocodile skin

Similarly, in Papua New Guinea, communities along the Sepik River, particularly the Latmul people, practice scarification as a rite of passage. Young men undergo patterned cuts on the back and torso to resemble crocodile skin, symbolising spiritual power, ancestral connections and the transition to adulthood. An example of this pattern is provided in Figure 1 from (BBC, 2018). While the practise has deep historical roots, its prevalence varies across villages, declining in some areas due to missionary influence and cost, yet remains widespread in others (BBC, 2018; Guynup, 2004). Although the BBC (2018) report is journalistic and lacks systematic methodology, it provides detailed contemporary observations that illustrate ongoing ritual practices, supporting the discussion of cultural variation and the persistence of scarification relevant to forensic contextualisation. While both sources are journalistic and lack systematic methodology, the aforementioned report by the BBC (2018) provides detailed contemporary observations of ongoing rituals, and Guynup (2004) illustrates both historical Māori and modern "neotribal" scarification practices. Neither is generalisable, but both highlight cultural variation and the persistence of scarification, which is relevant to forensic contextualisation.

While much of the literature examining these practices originates from anthropological and ethnographic research, which provides valuable insight into cultural meanings, such studies often rely on qualitative observations rather than systematic forensic analysis. Consequently, although these works are essential for understanding the symbolic and social functions of

scarification, their direct relevance to forensic identification has only recently begun to receive attention.

3.3.3 Pattern characteristics and physical practice

The literature emphasises that ritual scarification is not random, but follows culturally prescribed techniques and protocols, resulting in structured and intentional markings (BBC, 2018; Bonnet *et al.*, 2021; Garve *et al.,* 2017). Ritual scarification is typically characterised by patterned regularity, including symmetry, linearity and parallel arrangement (Bonnet *et al.,* 2021). These features contrast with the irregular, heterogeneous presentation of injuries resulting from assault or self-harm, which tend to lack consistent spatial organisation. Furthermore, scarification practises are generally controlled and superficial, deliberately avoiding anatomically vulnerable areas such as major blood vessels or vital structures (Bonnet *et al.,* 2021). This controlled application reflects both technical knowledge and cultural intention, reinforcing the non-random nature of such markings.

Beyond their structural characteristics, scarification patterns may also provide insight into an individual's culture or geographic background. Ethnographic evidence indicates that specific motifs are associated with particular groups (Guynup, 2004). For example, horizontal forehead scars are commonly reported among Nuer Populations in South Sudan, while Dinka Groups are associated with more complex, separated or fan-shaped designs (Garve *et al.,* 2017). Examples of scarification in the Nuer population can be seen in Figure 2 from (Garve *et al.,* 2017). Other motifs, such as fish bone or avian patterns documented in Tanzanian Communities, may carry symbolic meanings linked to identity, spirituality, or mythology (Garve *et al.,* 2017). These patterned features therefore extend beyond physical appearance, functioning as markers of social and cultural identity.

Figure 2: (a) Male Nuer in South Sudan; typical horizontal forehead scars (b) female Nuer, South Sudan; fan-shaped forehead scarification; (c) Surma boy in Ethiopia, parable-shaped forehead scars).

From a forensic perspective, the recognition and correct interpretation of these patterned characteristics is particularly important in medico-legal contexts involving vulnerable

populations, such as asylum seekers. In such cases, there's a documented risk that culturally derived scarification may be misidentified as evidence of torture, abuse, or non-accidental injury (Bonnet *et al.,* 2021). This has significant legal and ethical implications, as misclassification may affect credibility assessments, legal outcomes and safeguarding decisions.

Accordingly, the ability to identify features such as symmetry, repetition, and culture specific patterns, allowing forensic practitioners to infer intentionality and distinguish ritual modification from injury (Bonnet *et al.,* 2021). However, despite the apparent distinctiveness of these features, there remains limited formal guidance or standardised training on their recognition within forensic practise. This gap increases the likelihood of misinterpretation and highlights the need for greater integration of culturally informed knowledge into forensic identification frameworks.

3.4.0 Forensic relevance of scarification

Scarification holds significant forensic value due to its capacity to be both morphologically and symbolically assessed (Bonnet *et al.,* 2021; Garve *et al.,* 2017; Karmisholt *et al.,* 2018; Kpema, 2023). In addition, it may provide informative visual indicators relating to an individual's health status, medical or treatment history (Bonnet *et al.,* 2021; Kpema, 2023). As a form of scarring, its morphology and visual characteristics can be analysed in the same way as other scar types. Additionally, its often patterned and symmetrical configuration further strengthens its usefulness as a distinguishable and classifiable physical feature (BBC, 2018; Bonnet *et al.*, 2021; Garve *et al.,* 2017; Kpema, 2023). Overall, the multi-dimensional, observable, and measurable nature of scarification positions it as a valuable identifier in forensic contexts. However, to fully understand the evidential value of scarification as an identifier, it is necessary to consider scars more broadly as biological and structurally complex outcomes of wound healing.

3.4.1 Morphology and permeance of scars

Biologically, a scar is the product of wound healing through fibrosis and cicatrisation (Kulshreshtha and Mondal, 2017). When the skin is damaged, a multitude of repair mechanisms are activated to regenerate both the dermis and the epidermis (Jeschke *et al.,* 2023). Wound healing progresses through three main stages: inflammation, proliferation and remodelling. During the final remodelling phase, the collagen initially laid down to close the wound is reorganised and strengthened forming permanent fibrous tissue that appears as a visible scar

(Profyris, Tziotzios and Do Vale, 2012). This is depicted in Figure 3 from Profyris, Tziotzios and Do Vale (2012).

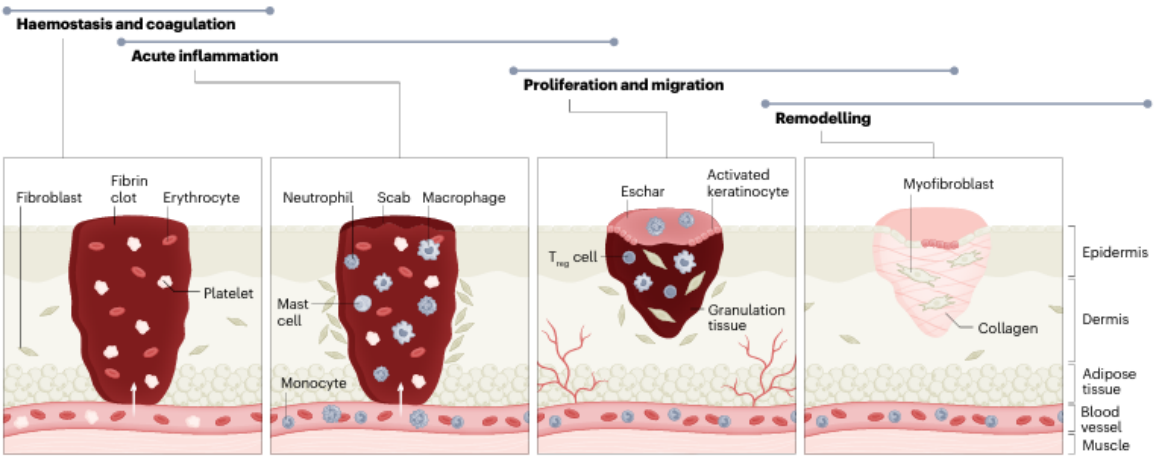

Figure 3: Wound healing phases

The forensic relevance of scarification is rooted in its permeance; while a scars size may change during physical growth, its morphological shape remains unchanged throughout an individual's life (Kulshreshtha and Mondal, 2017). This persistence provides a basis for considering scarification as a potentially valuable identifying feature. There are various scar types including but not limited to immature, mature, hypertrophic, keloid and atrophic (Jeschke *et al.,* 2023). See Figure 4 from Jeschke *et al.* (2023).

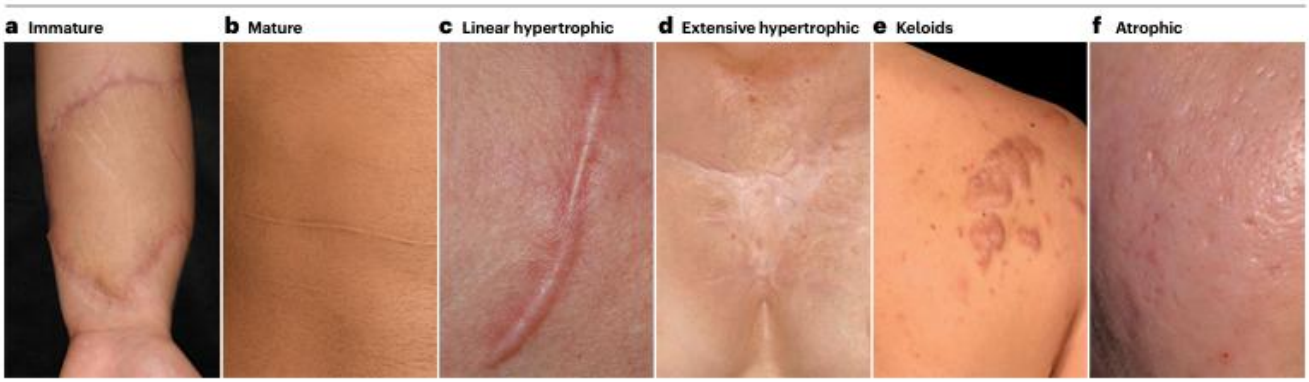

Figure 4: Different scar types

Based on the literature, keloid and hypertrophic scars are the most relevant scar types within the context of scarification, as a result, these two scar types are the primary focus of the following section, where they are examined in greater detail (Garve *et al.,* 2017; Andrews *et al.,* 2016).

Keloid scars are characterised by excessive deposition of extracellular matrix components, especially collagen, extending beyond the original wound margins (Iftekhar, 2020; Andrews *et*

al., 2016). They are more prevalent in individuals with darker skin pigmentation, occurring in approximately 15–20% of populations of African or Asian ancestry (Andrews *et al.,* 2016). Similarly, Shih and Byat (2020) note a genetic predisposition to keloid scaring among ethnicities with darker skin. From a forensic perspective, the persistence and resistance of keloids to regression, even following surgical intervention, enhances their potential utility as long-term identifiers in both living and deceased individuals (Andrews *et al.,* 2016). Whereas, hyperopic scars are a form of pathological scarring defined by excess tissue that is elevated above the surrounding skin but remains confined within the boundaries of the original wound (Shih and Byat, 2020). Hypertrophic scars are often red, inflamed, itchy, and even painful. (Seifert and Mrowietz, 2009). An example of Hypertrophic scarification can be found in Figure 5 by (Iftekhar, 2020). The main difference between keloid scaring and hypertrophic scars is the ability for hypertrophic scars regress over time whereas keloid scars do not regress naturally and may continue to grow over time (Shih and Byat, 2020). Despite their differences hypertrophic scars are frequently misdiagnosed as keloids (Seifert and Mrowietz, 2009).

Figure 5: Hypertrophic scarification by a Dassanech man from Ethiopia's Oma Valley

Although scars are generally considered permanent markers, their persistence is dependent on depth and severity. Superficial epidermal scars may fade over time, whereas full-thickness scars (defined as those extending through the epidermis into the dermis and sometimes deeper tissue) are typically permanent (Balan, 2020). Overall, scar healing can be unpredictable and is typically a long-term process with results depending on scar type, depth and underlying biological factors (Balan, 2020; Shih and Byat, 2020).

Scarring worsens with prolonged or excessive inflammation, which drives fibrosis and excess tissue formation. When exacerbated by persistent inflammation, often linked to mechanical stress, wound tension and delayed healing the scaring is intensified (Shih and Byat, 2020). According to Huang *et al.* (2013), normal wound healing involves a controlled and temporary inflammatory phase in which early immune cells are replaced by macrophages, enabling progression to tissue repair in abnormal healing, this transition is disrupted as macrophages continue releasing cytokines, prolonging inflammation and delaying repair. This sustained inflammatory response is a key mechanism underlying the development of hypertrophic and keloid scars.

In the context of cultural scarification, the wound healing response is often deliberately manipulated to enhance visibility and permanence. Individuals may "retard" the healing process through the applications of substances such as ash, clay, charcoal, crocodile dung or through repeated disruption of the wound site (Garve *et al.,* 2017; Andrews *et al.,* 2016). These interventions are intended to prolong inflammation and promote the formation of hypertrophic or keloid scars, resulting in raised, highly visible patterns (Garve *et al.,* 2017; Andrews *et al.,* 2016). While such practises are culturally and symbolically motivated, they also produce distinctive morphological features that may have forensic relevance. Ethnographic accounts provide insights into these techniques. For example, among the Surma community of the Omo Delta in south-western Ethiopia, scarification may involve elevating the skin with a wooden hook or edged thorn, before slicing or removal with a razor blade (Garve *et al.,* 2017). This can be seen in Figure 6 from (Garve *et al.,* 2017).

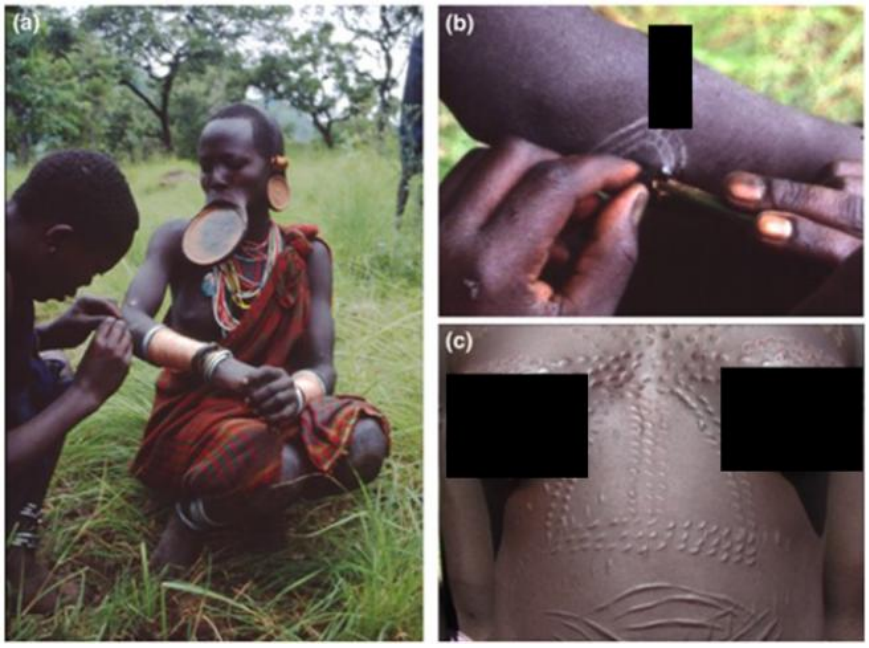

Figure 6: (a, b) Scarification of a Surma woman in Ethiopia. (c) Example of scarification on a woman in South Sudan. (Note: Due to the sensitive nature of these images some aspects have been obscured using a black box)

Unlike transient physical traits, scars can be assessed using structured, multi-parameter frameworks capturing morphological and textural properties, including width, elevation (protrusion or indentation), tissue consistency, pigmentation differences, adhesions, keloid formation, and contraction (Karmisholt *et al.,* 2018). This multidimensional approach demonstrates that scars are analytically decomposable into measurable components, enhancing their potential evidential value.

In clinical contexts, several standardised tools have been developed to facilitate scar assessment, most notably the Vancouver Scar Scale (VSS) and the Patient and Observer Scar Assessment Scale (POSAS) (Karmisholt *et al.,* 2018). The VSS evaluates pigmentation, vascularity, pliability, and height while the POSAS combines clinician evaluation with patient-reported symptoms such as pain and itchiness (Jeschke *et al.,* 2023). While primarily designed for therapeutic monitoring rather than identification, their existence highlights an important point: scar morphology can be systematically recorded and compared using reproducible criteria. This has clear implications for forensic practice, where the ability to standardise observations is fundamental to ensure reliability and evidential robustness. The Visual Analogue Scale (VAS) provides a basic severity score based on appearance, and the Japan Scar Workshop Scale (JSS) distinguishes between scar types and helps guide treatment (Jeschke *et al.,* 2023). This can be beneficial for those who underwent scarification and have since decided to attempt to remove or alter these markings.

However, the application of these tools to forensic identification is not without limitation. Karmisholt *et al.* (2018) acknowledge that commonly used scales, such as POSAS, may be suboptimal, particularly in capturing subjective or perceptual aspects of scar appearance. This introduces an inherent degree of observer variability, which may affect consistency in documentation and comparison. In a forensic context, where evidential standards require objectivity and reproducibility, such variability may reduce the reliability of scar-based identification, particularly when assessments are conducted by practitioners with differing levels of expertise.

Despite these limitations, the structured assessment of scars supports their classification as secondary identifiers within identification frameworks (INTERPOL, 2023c). Their evidential strength lies not necessarily in isolation, but in their combined use with other identifying

features, where distinctive patterns, anatomical placement, and morphological consistency can contribute to a cumulative identification profile. However, their interpretation requires a level of cultural and anatomical literacy that may not be consistently present among forensic practitioners, highlighting the need for a multidisciplinary approach to scarification analysis due to its intersection between biological, cultural, and symbolic domains (Kpema, 2023).

This highlights a critical gap between theoretical potential and operational use. While scars can be systematically described and may exhibit distinctive, persistent features, there remains limited integration of such approaches within formal identification protocols. The absence of standardised forensic frameworks for scar analysis, combined with variability in practitioner training and awareness, suggests that scarification is currently underutilised as an identifying feature.

However, the potential impact of scar modification or removal must also be considered in DVI contexts. Several clinical approaches have been shown to be effective in treating hypertrophic scars and keloids, such as surgical excision with postoperative radiotherapy, cryotherapy and laser therapy (Huang *et al.,* 2013). Additionally scar morphology and size may also be altered or removed through plastic surgery (Balan,2020). This highlights a limitation in the reliability and consistency of scar-based identification, particularly where post-modification morphology deviates from the original pattern.

Despite these advantageous biological properties, the forensic application of scarification remains unexplored. While the permanent and distinctiveness of such markings suggest clear potential, as a secondary identifier, there is limited empirical research evaluating the reliability, consistency or integration into existing identification frameworks (discussed in Chapter 3.5). This highlights a much broader issue within forensic practice, where biologically robust features may be overlooked due to a lack of standardisation and practitioner familiarity.

3.4.2 Comparison with tattoos

Tattoos provide durable, often unique markers that can survive decomposition, revealing patterns, designs, or text useful for identifying personal details such as names, dates, cultural background, occupation, or affiliations (Brookes and Thompson, 2019; Byard, 2013; Furtado *et al.,* 2024; Miranda, 2020; Perju-Dumbravă, *et al.,* 2016; Vaughan, 2007). They are recognised within human identification as a common and valuable secondary identifier, with

structured recording of their location, style and anatomical placement incorporated into ante-mortem and post-mortem documentation systems like PlassData (Pulcinelli *et al.,* 2024).

Tattooing can be defined as a culturally mediated form of permanent body modification in which the skin is intentionally altered to create enduring marks with aesthetic, symbolic and identity-related meanings (Cárdenas and Torres, 2024). Historically linked to ritualistic ancestral and social functions, tattooing has evolved into a widely practised form of self-expression through which individuals construct and communicate identity (Cárdenas and Torres, 2024; McCandlish, and Pearson, 2023). The prevalence of tattoos among forensic populations is notably high, with this trend in contemporary contexts amplified by increased social visibility, reflecting broader patterns of body art adoption in Western societies (Furtado *et al.,* 2024; Vaughan, 2007; Wohlrab et al., 2009). Empirical research demonstrates their high prevalence among forensic casework populations and supports the development of objective classification systems to improve compatibility and reduce interpretation bias (Holz *et al.,* 2022). Their utility stems from their distinctiveness, persistence and ability to reflect both personal identity and social context (Byard, 2013; Riley, 2006).

According to Rohith *et al.* (2020), the American Board of Dermatology classifies tattoos into five categories: amateur, professional, cosmetic, medical, and traumatic. Amateur tattoos are produced by untrained individuals and typically show irregular depth and inconsistent ink quality, whereas professional tattoos are applied by trained practitioners with uniform depth and multi-coloured designs. Cosmetic tattoos function as permanent makeup, while medical tattoos record health-related information such as allergies or identifying conditions. Traumatic tattoos arise from accidental injury or external force and may provide forensic insight into the circumstances and mechanism of injury. An example of different tattoo types can be found in Figure 7 from (Rohith *et al.*, 2020). In a similar fashion to scarification tattooing can represent milestones, tribal affiliation, religious affiliation and therapeutic practices (Rohith, *et al.*, 2020). The tribal tattoo patterns can be found in Figure 8 from Rohith *et al.* (2020).

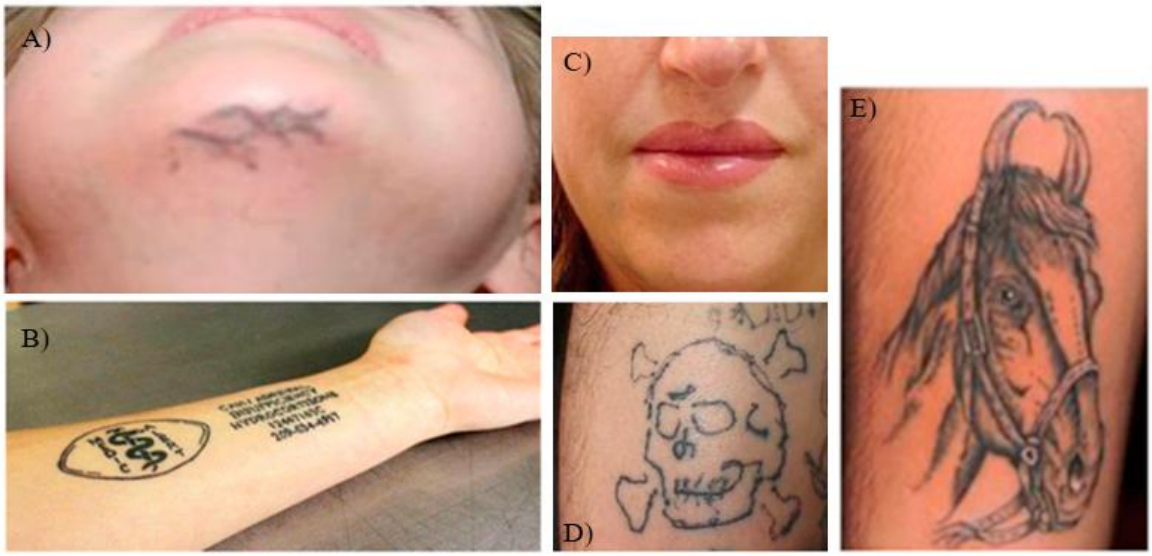

Figure 7: Examples of different tattoo types: (A) Accidental tattoo, (B) Medical tattoo, (C) Cosmetic tattoo, (D) Armature tattoo, (E)Professional tattoo

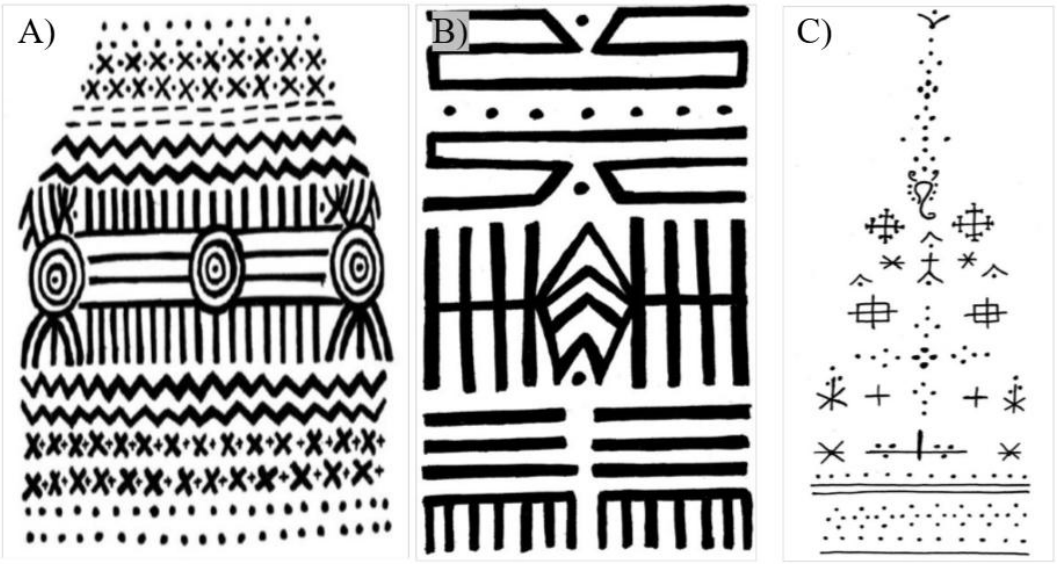

Figure 8: (A) Bhil tribal tattoo pattern (B) Baiga tribal tattoo pattern, (C) Rabari tribal tattoo pattern.

The style, complexity and placement of tattoos can offer investigative insight: custom designs may be linked to specific artists, while military Insignia, gang symbols and cultural motifs can indicate origin or affiliation (Lee, Jain and Jin, 2008). An example of some well-known gang tattoos are shown in Figure 9 from Lee, Jain and Jin (2008).

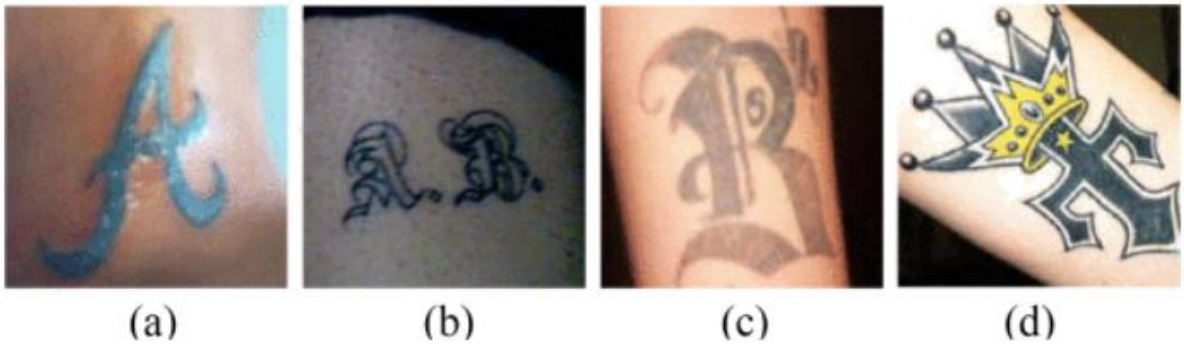

Figure 9: Examples of well-known gang tattoos: (a) Ambrose, (b) Adidas boys, (c) Brazers, and (d) Latin kings

Similarly to scarification, a tattoos permanence makes them a valuable identifier (Vaughan, 2007). Their reliability is strengthened through structured recording and adherence to established comparative principles, comparable to those used in forensic odontology and radiographic analysis (Furtado *et al.,* 2024). The deposition of pigment within the dermal layer enables tattoos to persist after death, often remaining visible despite post-mortem change or adverse environmental conditions. Where visibility is compromised, techniques such as radiographic imaging for metallic-based inks, hydrogen peroxide application, and infrared photography can enhance detection.

Moreover, ante-mortem data may also be supplemented by social media imagery which, despite limitations in resolution, can provide useful reference material in DVI contexts (Furtado *et al.,* 2024). Comparative analysis of tattoos relies on the systematic examination of ante-mortem and post-mortem imagery, with emphasis on coincident features such as shape, colour, design, and overall morphology (Furtado *et al.,* 2024). Variations in tattoo execution, arising from factors such as individual skin properties, needle pressure, and artist technique, introduce distinctive characteristics that enable individualisation, comparable to signature verification or artwork authentication.

This is demonstrated in the Brumadinho disaster, where post-mortem remains exhibiting a distinctive samurai-style tattoo on the left deltoid were matched with ante-mortem images from databases and social media (Furtado *et al.,* 2024). Multiple coincident features in facial design and line morphology were identified with no exclusionary differences, supporting a positive identification. This can be seen in Figure 10 from(Furtado *et al.,* 2024). Similarly, following the 2015 Shoreham Air show crash in England, which resulted in the death of 11 people, there were over 1200 body parts. Several of the victims had distinctive tattoos and these were used to facilitate timely identification hypotheses which were ultimately confirmed by DNA (Blau *et al.,* 2023).

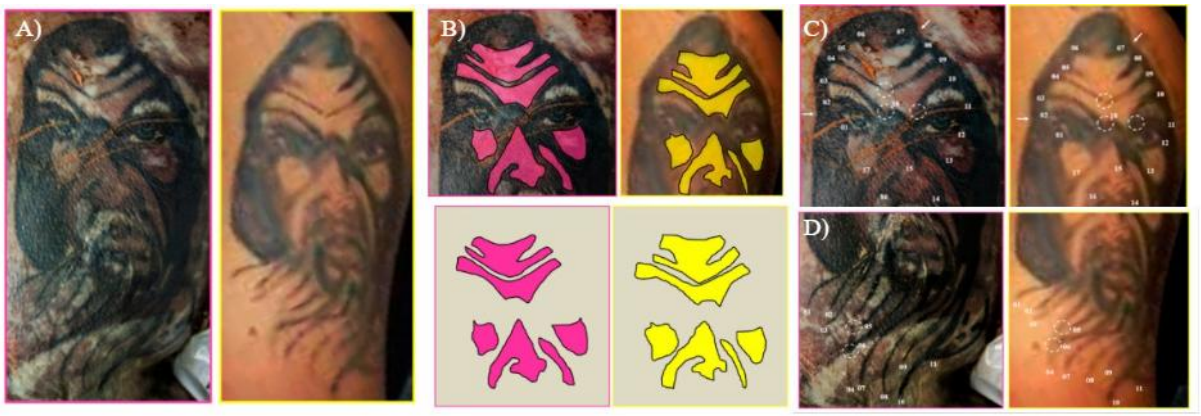

Figure 10: Tattoo comparative exam: (a) Post-mortem (pink) and ante-mortem (yellow) side by side of tattoo, (b) coincident outlines and expression lines of the male figure's face (numbered 01 to 17), (c) Areas outlined by the expression lines of the male figure's face, and coincident points of contact (white dotted circles) (d) Coincident points: the number of tips and the coincident points of contact, the morphology, and the arrangement of the beard hairs (numbered 01 through 11). Additionally, the points of contact are identified (white dotted circles).

Despite the successful uses of tattoos as identifiers, they do require careful interpretation in forensic contexts (Miranda, 2020; Vaughan, 2007). Variations in design, style and placement, whether due to individual artistic choices, modifications over time, or partial concealment, can make tattoos difficult to interpret (Riley, 2006). For instance, errors and lettering, overlapping tattoos or alterations can create ambiguity. Furthermore, tattoos may change meaning or context depending on wearers social or geographic mobility. A symbol originally associated with a particular region, community or group may not reliably indicate current affiliation or origin particularly if the individual has migrated.

Existing classification systems, such as the ANSI/NIST ITL 1–2000 standard, categorises tattoos into broad types (human, animal, plant, abstract, symbols and other categories) then further into sub-classes (Brookes and Thompson, 2019; De Zotti and Uccheddu, 2025; Holz *et al.,* 2022). These can be seen in Figure 11 from Lee, Jain and Jin (2008). The ANSI/NIST ITL 1–2000 standard works by having a short written description to each imputed image, so it can be searched in a database using keywords (Brookes and Thompon, 2019). To further the forensic applicability of tattoo database, recent research has focused on the development and application of AI-based recognition systems (De Zotti and Uccheddu, 2025). While these databases provide a framework for organizing tattoo images, accurate annotation is critical, and reliance on human interpretation introduces subjectivity (Brookes and Thompon, 2019).

Figure 11: Sample tattoos from the eight major classes in the ANSI/NIST ITL 1–2000 standard (a) Human, (b) Animal, (c) Plant, (d) Flag, (e) Object, (f) Abstract, (g) Symbol, and (h) Other.

Specific cultural or historical tattoos can provide valuable forensic insight in DVI or cross-border cases (Vaughan, 2007). Byard (2011) found that tattoos depicting the 19th-century Australian bushranger Ned Kelly were limited to white males aged 20–67. Although based on a selective population, the study demonstrates that certain tattoos carry significance, aiding hypotheses about a decedent's origin or social affiliations. These findings emphasize the importance of considering cultural specificity and practitioner awareness of potential biases when interpreting tattoos in forensic contexts.

Empirical research confirms that perceptual variation is a significant factor in forensic tattoo analysis. Brookes and Thompson (2019) demonstrated through questionnaire-based studies that individuals interpret tattoo images in widely differing ways, with no consistent pattern linked to age, gender, or type of tattoo. This variability is particularly relevant when comparing ante-mortem descriptions provided by relatives with post-mortem observations, as minor discrepancies (such as describing a gecko as a lizard) can still aid identification but also reveal the inherent risk of human error. These factors the risk of misinterpretation relying solely on tattoos without corroborating evidence can lead to misidentification or over-interpretation (Miranda, 2020).

Similar to scars tattoos can also be removed. According to Kurniadi *et al.* (2020), laser-based tattoo removal is currently the most effective method for pigment clearance. However, outcomes are variable, and complete removal is not always achieved. Residual pigment, hypopigmentation, or textural skin changes may persist, meaning evidence of a previous tattoo can remain detectable despite clinical intervention. Alternative methods such as salabrasion, dermabrasion, electrocautery, cryosurgery and chemical peeling have also been used. Although, these involve physical or chemical disruption of the skin and are more commonly associated with scarring and suboptimal cosmetic outcomes.

Upon review, the literature surrounding tattoos, their representations, meanings and use as an identifier is extensive (Brookes and Thompson, 2019; Miranda, 2020; Vaughan, 2007). Despite the similarities with scarification, tattoos are more widely recognised within the forensic literature. However, due to these similarities, existing tattoo frameworks can be used as a comparative basis for examining scarification, which similarly functions as a culturally mediated, permanent body modification with potential forensic utility.

3.4.3 European context

In Europe, the forensic significance of scarification is heightened by migration, multicultural populations and exposure to international disasters. Migration trends have led to increasingly culturally diverse populations, meaning that individuals presenting with traditional body modifications, such as scarification, are more likely to be encountered in forensic contexts.

Between 2016 and 2019, over 12,000 migrants are believed to have died or gone missing while attempting to enter Europe (International Organization for Migration, 2025). Despite continued migration trends into Europe between 2020 and 2021 the identification rate of the deceased migrants is critically low with Italy only identifying 8% of the deceased (International Committee of the Red Cross, 2024). These figures underscore challenges faced by European forensic practitioners in managing and identifying the dead, particularly when they may originate from countries outside Europe. The presence of scarification may therefore be relevant in a variety of forensic scenarios, including routine forensic investigations, in persons investigations, as well as DVI contexts.

3.5.0 Practitioner awareness

3.5.1 practitioner training and guidance

Upon review, there is very little literature regarding practitioner training in relation to scarification as an identifier within forensic identification, particularly in the context of DVI. As a result, understanding of practitioner awareness is largely derived from the analysis of internationally recognised operational frameworks, most notably those developed by INTERPOL and the ICRC. These frameworks represent the most widely adopted guidance in DVI contexts and provide a basis for evaluating practitioner training (Cordner and Ellingham, 2017).

The DVI Guide (INTERPOL, 2023c) functions as the primary international forensic framework, designed for both strategic and operational practitioners. It promotes a “uniform response” across jurisdictions and is underpinned by a high level of procedural standardisation, including the structured use of primary and secondary identifiers and formalised ante-mortem and post-mortem data collection. The guidance emphasises practitioner competency through training, accreditation, and adherence to internationally recognised protocols, supporting interoperability in complex, multinational disaster contexts.

In contrast, the Management of Dead Bodies After Disasters: a Field Manual for First Responders (Cordner *et al.,* 2006) reflects a non-specialist training model, oriented towards first responders operating in the immediate aftermath of mass fatality events (Cordner and Ellingham, 2017). Unlike technical forensic frameworks, the manual does not explicitly distinguish between primary and secondary identifiers; however, it implicitly establishes a hierarchy of identification methods. The DVI Guide (INTERPOL, 2023c) prioritises rapid, accessible, and standardised data collection, with an emphasis on visual recognition, basic documentation, and the recording of "obvious" identifying features. While it lacks the technical depth of forensic-specific frameworks, it plays a critical role in shaping early-stage practitioner engagement with unidentified remains.

Despite differences in intended audience and operational context, there is a consistent limitation across both frameworks in relation to cultural competence and practitioner awareness. Within the DVI Guide (INTERPOL, 2023c), culturally specific identifiers such as tattoos and piercings are explicitly recognised and systematically incorporated into documentation protocols. However, there is a notable absence of any reference to ritual scarification as a distinct identifying feature. This omission suggests that the framework is implicitly aligned with identification markers more commonly encountered in Western contexts, thereby limiting its applicability in culturally diverse scenarios.

Similarly, the Management of Dead Bodies After Disasters: a Field Manual for First Responders (Cordner *et al.,* 2006) instructs practitioners to record visible features, including scars, tattoos, and birthmarks, yet does not differentiate between incidental scarring and culturally intentional practices such as scarification. This lack of specificity is particularly notable given the manual's inclusion of other culturally influenced identifiers, such as dental modifications and piercings. By omitting structured guidance on recognising or interpreting patterned scarification, the manual effectively produces practitioners who are underprepared and insufficiently equipped to identify culturally embedded body modifications. As with the DVI Guide (INTERPOL, 2023c), this prioritisation of Western markers over culturally diverse identifiers risks the misinterpretation, omission, or loss of critical forensic evidence related to scarification, potentially compromising the identification process in cross-cultural or international contexts. Modifications such as tattoos and piercings are increasingly normalised in Europe and widely documented in the literature, having made the transition from marginal to mainstream forms of self-expression (Karara *et al.,* 2025; Wohlrab *et al.,* 2009). While tattoos and piercings are widely studied and increasingly regulated within European healthcare

literature, scarification remains comparatively underrepresented, often receiving limited attention despite being included within broader definitions of body modification.

A key point of convergence between the two frameworks is the implicit reliance on individual practitioner awareness. While both acknowledge the importance of cultural sensitivity, neither integrates this into a structured or technical training component. In the DVI Guide (INTERPOL, 2023c) framework, practitioners are expected to remain "individually aware" of cultural variation, whereas the Management of Dead Bodies After Disasters: a Field Manual for First Responders (Cordner *et al.,* 2006) encourages consultation with local communities or religious authorities. As a result, the recognition and interpretation of culturally specific modifications, such as scarification, may be inconsistent and dependent on prior exposure or experience. Although these approaches support respectful practice, they simultaneously indicate a training gap: the recognition and interpretation of culturally specific identifiers is not systematically embedded within formal training.

Ultimately, these findings suggest that, despite differences in complexity and application, both frameworks reflect a broader structural issue within DVI training. Specifically, there is a tendency to prioritise standardised, easily codifiable identifiers, while culturally specific body modifications remain underrepresented. This results in a form of systemic omission, whereby scarification is not actively excluded but is insufficiently recognised within formal training models. Consequently, the responsibility for identifying and utilising such features is effectively transferred to the individual practitioner, leading to variability in practice and potential gaps in the identification process.

3.5.2 Documentation

Although emergency management agencies worldwide have developed a variety of nationally or organisationally specific systems for recording and coordinating disaster information (Coppola, 2015), it is not feasible to review them all within the scope of this research. This section therefore focuses on internationally recognised frameworks for documenting human remains within DVI contexts, specifically the DVI Form: Post-Mortem (Unidentified Human Remains), DVI Form: Ante-Mortem (Missing Persons) and the Management of Dead Bodies After Disasters: a Field Manual for First Responders (Cordner *et al.,* 2006; INTERPOL, 2023a; INTERPOL, 2023b) Annex. These forms are the most widely adopted globally and provide a consistent basis for evaluating DVI documentation protocols (Cordner and Ellingham, 2017: INTERPOL (2023d). Throughout the remainder of this dissertation the DVI Form: Post-

Mortem (Unidentified Human Remains) and DVI Form: Ante-Mortem (Missing Persons) will be referred to as the INTERPOL PM form and INTERPOL AM form respectively.

INTERPOL

The standardised INTERPOL PM (INTERPOL, 2023b) and INTERPOL AM (INTERPOL, 2023a) reflect a practitioner training model grounded in the systematic collection of quantifiable forensic data, underpinned by a clear hierarchical structuring of identification markers. Within these forms, primary identifiers are deemed the most extensive and technically detailed documentation, including specific recording protocols, coding systems and genetic markers. In contrast, secondary identifiers are organised under broader categories such as "body description" and "effects," encompassing physical characteristics, medical findings, and body modifications. While these categories include prompts for tattoos, piercings, healed fractures, surgical interventions, and implants, the classification of skin markings remains generalised, with "scars" serving as an umbrella term without further differentiation.

A critical evaluation of this structure reveals a notable absence of explicit reference to ritual scarification. Although such features could theoretically be recorded within generic "scars" or "distinctive features" fields, the lack of a dedicated category or descriptive guidance indicates that practitioners are not formally trained, through these standardised tools, to recognise or interpret scarification as a culturally significant identifier. This omission is striking when contrasted with the specific and structured treatment of tattoos and piercings, which are afforded dedicated fields and descriptive emphasis. As a result, scarification is implicitly positioned as a routine medical or incidental finding, rather than a distinct, culturally embedded marker of identity.

The design of the forms further suggests an underlying assumption regarding the relative forensic utility of different identifiers. By requiring practitioners to record scarification within supplementary or free-text sections—such as "supporting information"—the system frames such features as ancillary rather than central to the identification process. This not only reduces their visibility within the data collection workflow but may also contribute to inconsistencies in recording practices. In operational terms, this creates a potential procedural blind spot, whereby practitioners, guided by checkbox-driven documentation, are more likely to actively search for and record pre-defined categories (e.g., tattoos), while overlooking or insufficiently documenting features that lack explicit prompts.

From a training perspective, this reflects a model in which cultural competency is not embedded within the core technical framework but is instead treated as an implicit or individual responsibility. Practitioners are not provided with standardised criteria to distinguish between surgical, traumatic, and culturally patterned scarring, nor are they guided in documenting the morphological or spatial characteristics that would enable meaningful ante-mortem/post-mortem comparison. This limitation is particularly significant in post-mortem contexts involving decomposition, burning, or fragmentation, where subtle surface features may represent critical identifying evidence if properly recognised and recorded.

Consequently, the structure and content of the INTERPOL AM and INTERPOL PM forms point toward a broader systemic issue within DVI training and practice: the prioritisation of globally standardised, easily codified identifiers at the expense of culturally specific, yet potentially highly individualising, markers (INTERPOL, 2023a; INTERPOL, 2023b). The inclusion of tattoos and piercings, contrasted with the omission of ritual scarification, suggests an implicit Western or globalised bias in the construction of identification frameworks (Karara *et al.,* 2025; Wohlrab *et al.,* 2009). This not only shapes practitioner awareness but also risks the marginalisation of certain populations within forensic identification processes.

Overall, while the forms are highly effective in promoting consistency and interoperability across international contexts, they simultaneously reveal a gap in the integration of cultural body modifications into formal forensic methodologies, reinforcing the need for a more inclusive and technically robust approach to practitioner training.

The Management of Dead Bodies After Disasters: a Field Manual for First Responders

The Management of Dead Bodies After Disasters: a Field Manual for First Responders (Cordner *et al.,* 2006) organises data collection into three broad categories: physical description, associated evidence, and recorded information. Physical description prioritises immediately observable characteristics such as sex, approximate age, height, and distinguishing features, while associated evidence includes clothing and personal effects. Recorded information, by contrast, captures whether primary identifiers, such as fingerprints or photographs, have been obtained.

Although the Management of Dead Bodies After Disasters: a Field Manual for First Responders (Cordner *et al.,* 2006) does not explicitly distinguish between primary and secondary identifiers, its structure implicitly prioritises those features that can be rapidly documented in the field. In this context, secondary identifiers are foregrounded due to their

accessibility, while primary identifiers are treated as data points to be collected and analysed at a later stage by specialists. This reflects a tiered training model in which first responders are tasked with the rapid capture of visible and contextual information, rather than detailed forensic interpretation. While operationally efficient, this approach may limit the depth and accuracy of recorded observations, particularly for features requiring cultural or technical understanding.

Within the Management of Dead Bodies After Disasters: a Field Manual for First Responders framework, there is a notable absence of specific guidance relating to ritual scarification (Cordner *et al.,* 2006). The form includes explicit prompts for commonly recognised features in westernised areas such as scars, tattoos, piercings, birthmarks and moles; however, scarification is not identified as a distinct category (Karara *et al.,* 2025; Wohlrab *et al.,* 2009). Instead, it is subsumed under the generic classification of "skin marks," with no accompanying instruction to support differentiation between accidental, pathological, or culturally intentional scarring. This lack of specificity is particularly striking when compared to the inclusion of detailed prompts for dental modifications, such as inlays or filed teeth, suggesting that certain forms of cultural body modification have been recognised within forensic protocols, while others have been overlooked.

This omission has important implications for practitioner awareness and training. The prioritisation of tattoos and piercings—features commonly encountered within Western contexts—alongside the absence of scarification may indicate an implicit Western-centric bias within identification frameworks (Karara *et al.,* 2025; Wohlrab *et al.,* 2009). As a result, practitioners may be well-equipped to recognise and document familiar body modifications yet lack the necessary training to identify and interpret culturally specific markings. This reflects a form of "surface-level" awareness, in which practitioners are encouraged to record visible features without the contextual knowledge required to understand their potential forensic significance.

Consequently, the absence of explicit prompts for scarification may contribute to passive oversight in practice. Practitioners are more likely to actively search for and document features that are clearly specified within standardised forms, such as tattoos, whereas scarification may only be recorded when it is particularly prominent. This creates a risk that patterned or culturally meaningful scarification is either inadequately documented or entirely overlooked, reducing its potential utility within the identification process.

Furthermore, the structural positioning of scarification within the category of general "distinguishing features" suggests that it is perceived as a non-systematic or incidental marker, comparable to birthmarks or minor scars. This contrasts with anthropological evidence demonstrating that scarification often follows highly structured, culturally specific patterns that may provide insight into an individual's identity or origin (BBC, 2018; Bonnet *et al.*, 2021; Garve *et al.,* 2017; Kpema, 2023). By failing to recognise this systematic nature, current documentation frameworks may underestimate the potential evidential value of scarification as a secondary identifier.

The Management of Dead Bodies After Disasters: a Field Manual for First Responders (Cordner *et al.,* 2006) broader emphasis on visual identification as a preliminary and error-prone method further reinforces the marginalisation of such features. Without a structured approach to recording and interpreting scarification, its role is reduced to that of a supplementary detail rather than a potentially informative identifier. This highlights a disconnect between anthropological understanding of scarification and its treatment within forensic practice.

Overall, the analysis of DVI documentation frameworks reveals a consistent gap in recognising and recording scarification. Both INTERPOL and ICRC forms emphasise standardised, easily codifiable identifiers while underrepresenting culturally specific body modifications(Cordner *et al.,* 2006; INTERPOL, 2023a; INTERPOL, 2023b). This omission has direct implications for practitioner training and awareness, as practitioners are not systematically equipped to identify or document scarification, increasing the risk of evidence being overlooked or misinterpreted. Addressing this gap requires both technical revision of documentation tools and enhanced training in cultural competency, ensuring that scarification and other culturally embedded identifiers are integrated into forensic practice in a robust and consistent manner.

3.6.0 Gaps in Literature

Upon review of the existing literature there are several significant gaps in relation to the forensic application of scarification, particularly when compared to other forms of body modification such as tattoos. These gaps are not limited to a lack of empirical data but extend to broader issues of disciplinary focus, methodological development, and practitioner training.

The most prominent gap is the lack of dedicated forensic research evaluating scarification as an identifying feature. While scars are frequently acknowledged within the category of

secondary identifiers, there is minimal empirical research assessing the reliability, accuracy, or evidential value of culturally patterned scarification in identification contexts. In contrast, tattoos have been extensively studied, with established classification systems, comparative methodologies, and documented case applications (Furtado *et al.,* 2024; Holz *et al.,* 2022; Pulcinelli *et al.,* 2024; Rohith, *et al.*,2020). This disparity suggests that scarification remains underrepresented within forensic science despite its comparable potential as a persistent and individualising feature.

Another prevalent gap lies in the disciplinary origin of existing literature, which is predominantly anthropological, journalistic or ethnographic in nature (Garve *et al.,* 2017; Guynup, 2004; The Lantern, 1994). While these studies provide valuable insight into the cultural, symbolic, and geographic significance of scarification, they are not designed to address forensic questions of identification, standardisation, or evidential reliability. As a result, there is a disconnect between cultural understanding and forensic application, with limited translation of anthropological knowledge into operational forensic frameworks.

There is also a notable absence of research examining practitioner awareness, training, and competency in recognising and interpreting scarification. Existing forensic frameworks, including those developed by INTERPOL and the ICRC, provide general guidance on recording scars but do not differentiate between incidental scarring and culturally intentional modifications (Cordner *et al.,* 2006; INTERPOL, 2023b). The lack of literature evaluating how practitioners interpret such features, or whether they receive any formal training in this area, represents a critical gap, particularly given the reliance on individual judgement identified in current practice.

Furthermore, there is limited research exploring the integration of scarification into DVI protocols. While secondary identifiers are recognised as valuable in cases where primary methods are unavailable, scarification is rarely explicitly referenced within DVI guidelines or documentation systems. This omission suggests that its potential role in large-scale identification scenarios, particularly those involving culturally diverse populations, remains largely unexplored.

Additionally, there is a noticeable lack of standardised methods for recording and comparing scarification. Unlike tattoos, which benefit from structured databases and classification systems, scarification lacks formalised recording criteria, digital databases, or comparative

tools. (Brookes and Thompson, 2019; Furtado *et al.,* 2024; INTERPOL, 2023a; INTERPOL, 2023b; Pulcinelli *et al.,* 2024). The absence of such infrastructure limits the ability to systematically analyse or utilise scarification in identification processes and contributes to its underutilisation in forensic practice.

Taken together, these gaps highlight a broader issue within forensic science: the prioritisation of standardised, widely recognised identifiers at the expense of culturally specific, yet potentially informative, features. Addressing these limitations requires a multidisciplinary approach that integrates anthropological insight with forensic methodology, alongside the development of empirical research, training frameworks, and standardised documentation practices. Consequently, this study seeks to contribute to this emerging area by examining practitioner awareness and the potential role of scarification within contemporary forensic identification.

4.0 Results and Discussion

The integration of questionnaire findings with the literature demonstrates a consistent and analytically significant pattern: ritual scarification holds demonstrable forensic value as a secondary identifier yet remains structurally marginalised within contemporary DVI practice. Although the questionaries dataset is limited to a single respondent, its interpretive value is strengthened when situated within the broader literature base, which consistently identifies systemic limitations in the recognition, documentation, and operational application of cultural scarification.

Across both literature and empirical data, a central structural tension emerges between theoretical recognition and operational implementation. Scarification is well documented within anthropological and ethnographic literature as a patterned, culturally significant and potentially individualising feature; however, this knowledge is not consistently translated into forensic workflows, resulting in a persistent knowledge–practice gap.

4.1 Questionnaire results and discussion

The primary data for this study was obtained through a structured online questionnaire distributed to forensic practitioners within Europe; this can be seen in Appendix F. Although the survey remained active for 87 days, it yielded a single respondent, a forensic anthropologist based in the UK with 4-7 years of professional experience. While the limited sample size prevents generalisation, the response provides a focused insight into practitioner perspectives within a specialised forensic discipline.

Notably, the low response rate itself may be analytically meaningful. Given the practitioner-facing nature of the questionnaire, limited engagement may reflect low familiarity with scarification within the field of forensics, reinforcing its peripheral positioning within operational awareness. This aligns with the literature, which demonstrates that scarification is geographically and culturally concentrated in specific populations, particularly in parts of Africa, Melanesia, and Papua New Guinea (Garve *et al.,* 2017; Rush, 2011; Sekagya *et al.,* 2024). This suggests that its visibility within forensic casework is context-dependent and likely uneven across different populations. This is further consolidated by the respondent's response stating they have never encountered scarification, and it had never aided in a positive identification.

In addition, forensic utility and therefore visibility of identification markers can be dependent on case composition and preservation conditions (Boyd and Boyd, 2018; Caplova *et al.,* 2017; Färber *et al.,* 2010; ICRC, 2009; Machado and Granja, 2021; Osborn and Easthope, 2019; Schotsmans, Márquez-Grant and Forbes, 2017; Turingan *et al.,* 2020). As scarification is a modification of the skin soft tissue would need to be present for it to be utilised (Garve *et al.,* 2017; Jeschke *et al.,* 2023; Shih and Byat, 2020). This suggests that marginalisation is not solely epistemic but structurally produced through both population demographics and preservation conditions.

The respondent reported they have never encountered ritual scarification in their professional practice and consequently scarification has never contributed to an identification in any cases they have contributed to. Despite this lack of practical encounter, the participant indicated a high level of theoretical familiarity, stating they 'strongly agree' that they can identify scarification and differentiate intentional scarification from accidental or surgical scarring. This suggests there is a disconnect between theoretical competence and operational exposure. The absence of literature on scarification implemented into DVI workflows despite other cutaneous features being used repeatedly for identification purposes highlight the lack operational exposure (Blau *et al.,* 2023; Cappella *et al.*, 2024).

The practitioners self-reported confidence despite no practical exposure suggests a form of interpretive competence grounded in conceptual familiarity rather than validated forensic experience. This creates a critical interpretive issue; practitioner confidence is not necessarily grounded in validated forensic application. Instead, it likely reflects conceptual familiarity derived from anthropological and descriptive sources rather than applied medico-legal training. This is likely attributable to the fact that the participant reported their understanding of scarification as deriving from a combination of forensic training, academic study, and self-directed learning or personal interest. As identified in Chapter 3.6, there is a gap in forensic-based literature on scarification. This distinction is significant, as anthropological accounts emphasise cultural meaning and ritual structure, whereas forensic practice requires evidential defensibility and reproducibility (Dror, 2023; Garve *et al.,* 2017; Guynup, 2004). This demonstrates a potential risk to forensic practice, particularly where overconfidence in interpretation may occur in procedures that carry both legal and humanitarian consequences (Franceschetti *et al.*, 2025; Paradis and Tallman, 2025). Within all aspects of forensics practitioner competence and ability is highly valued (College of Policing, 2024; European Network of Forensic Science Institutes, 2021; Home office, 2023; Neuteboom *et al.,* 2024).

Whereas in regards to scarification even internationally recognised guides lack sound and robust methodology to adequately identify, interpret and record scarification (Cordner *et al.,* 2006; INTERPOL, 2023). As a result, practitioners should be appropriately trained and assessed to ensure comprehensive evidence collection and to increase the likelihood of successful identification.

The respondent "strongly agreed" that they were familiar with scarification as a cultural, ritualistic, and personal body modification practice, with knowledge reported as deriving from formal forensic training, academic study, and self-directed research rather than direct casework experience. However, when assessing scarification as a forensic identifier, the respondent selected "agree" rather than "strongly agree". This difference may reflect recognition of scarification's cultural and contextual relevance, alongside a more cautious evaluation of its applied forensic utility. This cautious positioning can be interpreted in light of the limited forensic-specific literature and lack of structured integration of scarification within DVI frameworks, meaning that anthropological knowledge is not fully translated into operational forensic practice. Creating a link between the anthropological and historical literature to forensic practice requires institutional change an may be a hard concept to understand unless studied at depth. As seen in other forensic disciplines, advancement is contingent upon institutional and regulatory development rather than individual practitioner knowledge alone (Almashaqbeh, Alshurafat, and Al Amosh, 2023).

The gap between anthropological knowledge and forensic applicability is further evidenced by the respondent's inability to identify key challenges in using scarification as an identifier, stating "I have not worked any cases with this." This indicates that critical evaluation is constrained by limited operational exposure, with practitioner perspectives shaped primarily by theoretical rather than practical knowledge. A degree of interpretive tension is evident in the respondent's profile, as limited operational exposure is cited in relation to difficulties identifying challenges in using scarification as an identifier, yet evaluative judgements are still made regarding documentation adequacy and interpretive practice. This suggests that, in the absence of case-based experience, practitioner perspectives may fluctuate between acknowledging limitations in some areas while still offering informed assessments in others. Consequently, conclusions regarding scarification may reflect a combination of theoretical familiarity and partial operational insight rather than consistent practice-based grounding.

The respondent “Strongly disagree” existing documentation templates adequately capture scarification details. This is reflected in the way both the ICRC and INTERPOL documentation is presented (Cordner et al., 2006; INTERPOL, 2023a; INTERPOL, 2023b). They were also unable to identify a preferred method of identification. This may suggest that no single method is sufficient on its own, indicating the need for a multi-step recording approach. This is a common with other identifiers such as anthropological identifiers and forensic odontology (INTERPOL, 2023b). In the Management of Dead Bodies After Disasters: a Field Manual for First Responders after a written description of distinguishing features the practitioner is also urged to create a sketch of the findings and not if any photographs were taken highlighting a multi-modal form of recording (Cordner *et al.,* 2006). This is also implied din the literature where Kpema (2023) noted scarification requires a multidisciplinary approach as well as anatomical and cultural literacy in combination to draw meaningful conclusions. This implies DVI recording forms require more research into the presentation of recording scarification. Despite the existing documentation inadequacy in capturing scarification the respondent strongly agrees they are confident with recording and describing scarification identification records. This suggests in practice there are ways of recording and describing scarification that is seen as beneficial. This brings further attention to the need of innovative practitioner approved/input forms.

When asked and for useful resources, the respondents selected a ‘Searchable database/ Visual reference guide of known scarification patterns. This indicates recognition of a potential gap within current forensic documentation and interpretive tools, even in the absence of direct case experience such practitioner feedback is significant in forensic disciplines, as it can inform the refinement of operational protocols, and highlight areas where existing systems are insufficient (Elkins, Joseph and Skrant, 2025; Williams, Downing and Miyamoto, 2024). In this context, there is a clear indication of the need to develop structured databases to support training and improve the consistency of scarification identification within forensic practice. This is a reasonable suggestion considering similar cutaneous features such as tattoos have multiple database/visual reference guide (Brookes and Thompson, 2019; Lee, Jain and Jin, 2008). Additionally, primary identifiers also have reference databases suggesting they are feasibly applied in forensic contexts (De Jongh and Rodriguez, 2012; Zeye *et al.,* 2024). Consequently tattooing has been used in many dvi and human identification cases (Blau *et al.,* 2023; Furtado *et al.*, 2024).

4.2 Literature review results and discussion

The literature consistently demonstrates that scarification holds forensic value due to its morphological persistence. Scars represent stable anatomical features with high permanence, increasing reliability for identification purposes (Andrews *et al.,* 2016; Karmisholt *et al.,* 2018; Kulshreshtha and Mondal, 2017). This permanence is significant in forensic contexts because it allows for long-term retention of identifiable features, even when other markers may degrade. However, the literature also implies that morphological stability alone does not guarantee forensic applicability, as interpretation remains dependent on practitioner recognition, interpretation and documentation practices (Brookes and Thompon, 2019; Holz *et al.,* 2022; Kpema, 2023; Riley, 2006). Their shape, location, and structural consistency provide potentially individualising characteristics that may support differentiation at the level of the individual (Jeschke *et al.,* 2023; Iftekhar, 2020; Andrews *et al.,* 2016). However, this individualising potential is largely theoretical in the absence of standardised forensic classification systems specifically designed for scarification.

Beyond morphological persistence, scarification also holds significant value as an informative forensic feature. The literature indicates that scarification patterns may provide contextual information relevant to identification, including geographical origin, community affiliation, age range, cultural practice, and in some cases health-related or milestone indicators (BBC, 2018;Garve *et al.,* 2017: Iftekhar and Zhitny, 2020; Kpema, 2023; Perper *et al.,* 2017). This positions scarification not only as a physical identifier but also as a biocultural marker, capable of contributing both direct and contextual information in forensic investigations. In this sense, scarification may offer interpretive value comparable to other patterned modifications of the body. Despite this there are multiple direct mentions and recording section for scars, implants, piercings and tattoos across both the ICRC and INTERPOL recording forms (Cordner *et al.,* 2006; INTERPOL, 2023a; INTERPOL, 2023b).

Despite scarification's similarities to tattoos it does not receive equivalent forensic recognition. Both forms of cutaneous modification can produce patterned, visually distinctive markers that may carry individual or cultural significance (Brookes and Thompson, 2019; Byard, 2013;Cárdenas and Torres, 2024; Garve *et al.,* 2017; Iftekhar and Zhitny, 2020; McCandlish, and Pearson, 2023; Miranda, 2020; Perper *et al.,* 2017; Perju-Dumbravă, *et al.,* 2016; Rohith, *et al.*,2020). However, tattoos are more consistently standardised and integrated as forensic identifiers (Holz *et al.,* 2022; INTERPOL, 2023a; INTERPOL, 2023b; INTERPOL, 2023c;

Pulcinelli, *et al.,* 2024). This disparity suggests a broader systemic imbalance in the valuation of different forms of skin modification within forensic frameworks, potentially reflecting underlying eurocentric orientations embedded within DVI protocols (Furtado *et al.,* 2024; Vaughan, 2007). This highlights a key issue: if tattoos and scarification share functional similarities as patterned cutaneous modifications, the disparity in forensic treatment requires further explanation.

Despite its demonstrable forensic relevance, scarification remains under-researched, underutilised, and marginalised within forensic workflows. There is a significant lack of literature addressing its specific role within DVI frameworks, and this marginalisation is reflected in current operational documentation practices. Existing international frameworks do not provide detailed guidance scarification

Existing international DVI frameworks do not provide detailed guidance on how to identify, categorise, or forensically evaluate ritual scarification. While the INTERPOL DVI Guide (INTERPOL, 2023) recognises "secondary means of identification" such as personal descriptions and medical findings, it primarily emphasises tattoos and piercings as the main examples of cutaneous identifiers to be systematically recorded. Although the framework promotes general principles of dignity and cultural sensitivity (INTERPOL, 2023), it does not translate these principles into operational guidance for scarification documentation.

This absence may reflect the historical development of DVI standards, which have evolved incrementally since the introduction of the INTERPOL guide in 1984 (INTERPOL, n.d.), rather than through comprehensive structural revision. As a result, earlier omissions may have persisted without systematic reassessment in line with contemporary multicultural forensic practice. This is consistent with the relative scarcity of scarification-focused literature prior to 2017, with most substantive contributions emerging more recently (Iftekhar and Zhitny, 2020; BBC, 2018; Bonnet *et al.,* 2021; Garve et al., 2017; Kpema, 2023; Sekagya *et al.,* 2024). This imbalance suggests that scarification has historically been underrepresented in both anthropological and forensic discourse, potentially contributing to its limited integration within established DVI frameworks. This may also reflect broader eurocentric orientations within the historical development of forensic standards, in which documentation priorities were shaped by more familiar forms of identification and later only partially expanded to include culturally diverse practices.

A notable implication within the INTERPOL guidance is the expectation that practitioners self-educate regarding culturally specific practices (INTERPOL, 2023c). This requirement can be understood as a direct consequence of the limited integration of scarification within formal DVI classification systems, where structured guidance and operational definitions are not consistently provided. In contrast to other areas of forensic practice, where competency is supported through standardised frameworks and training structures, the absence of equivalent guidance for scarification shifts interpretive responsibility onto individual practitioners (Cordner, 2026). This indicates that the reliance on self-education is not a standalone training expectation, but is structurally produced by gaps in existing documentation systems.

The limitations of DVI frameworks in capturing scarification in a structured and standardised manner are consistently identified across both the questionnaire findings and the literature review. Current international guidance omits specific reference to scarification, despite providing detailed coverage of tattoos as a comparable cutaneous identifier. This inconsistency reflects limited operational guidance, resulting in greater reliance on practitioner interpretation in practice.

4.3 Recommendations and Further work

The findings of this study highlight several systemic and operational gaps in the recognition, documentation, and utilisation of scarification within forensic identification. Addressing these limitations requires coordinated development across training, documentation systems, forensic guidance, and future research directions.

4.3.1 Training and competency development

A key area for development lies in the enhancement of practitioner training and competency frameworks. The findings suggest that current approaches may prioritise primary identifiers and eurocentric identifiers lacking any mention of scarification. Future training should therefore incorporate applied case-based learning scenarios including potential identifiers on a global scale to ensure comprehensive understating of the population and different identifiers.

In addition, structured comparative morphological analysis should be introduced to enable practitioners to assess scarification with greater accuracy and repeatability. Cultural competency training should also be formally integrated as a core component of forensic education rather than remaining an optional or peripheral area of study. Collectively, these

developments would support more consistent interpretation and reduce reliance on individual experiential exposure.

4.3.2 Documentation systems and recording practices

The findings indicate a need for more explicit integration of scarification within DVI frameworks. Current documentation systems require refinement in order to more effectively capture the complexity of scarification as a forensic feature. Standardised reporting templates should be expanded to include more detailed fields that allow for the recording of pattern distribution and anatomical arrangement. Where appropriate and evidentially justified, there should also be scope for indicating suspected cultural origin or stylistic classification. In addition, structured visual documentation protocols should be implemented, including the use of annotated imagery supported by forensic measurement scales. These improvements would enhance the descriptive resolution of forensic records and reduce the loss of culturally significant information through overly generic categorisation.

4.3.3 Visual reference systems and comparative tools

A further priority is the development of a forensically validated visual reference database for scarification. Unlike existing systems that rely primarily on textual classification, such a resource would facilitate pattern recognition and comparative analysis in operational forensic contexts. An effective system would include high-quality, standardised visual examples of scarification patterns, supported by contextual metadata such as geographic and cultural associations. It should also be designed for integration into existing DVI workflows and include consistent forensic recording standards, including measurement scales and imaging protocols. The development of such tools would help bridge the gap between descriptive recognition and operational identification.

4.3.4 Implications for forensic practice

Improved integration across training, documentation systems, and policy frameworks would likely lead to a reduction in the misclassification of culturally significant features. It would also improve the retention of potentially valuable identification information that is currently lost through generic categorisation. In addition, it would support more consistent forensic practice across jurisdictions and enhance both accuracy and cultural sensitivity within identification processes. These improvements are particularly relevant in increasingly globalised forensic contexts, where identification cases frequently involve culturally diverse populations.

4.3.5 Future research directions

Further research is required to strengthen the empirical and operational foundation of scarification within forensic science. Future studies should prioritise larger and more diverse practitioner samples, including international DVI personnel, humanitarian forensic teams, and practitioners working in regions where scarification is more prevalent, such as parts of Africa, Melanesia, and Australia. This would allow for cross-jurisdictional comparison and help determine whether the findings of this study are consistent beyond a European forensic context.

Future research should also incorporate analysis of operational case files, including post-mortem reports and forensic documentation, to assess how frequently scarification is recorded in practice and how it is categorised. This would also enable evaluation of the extent of misclassification and variation in documentation across different jurisdictions, providing a stronger evidence base than self-reported practitioner perspectives alone.

Finally, further research should explore how practitioner competence in recognising scarification is developed and assessed within forensic education and professional training frameworks. This should include evaluation of existing curricula, identification of gaps between theoretical instruction and applied skill, and the development of standardised competency frameworks for culturally specific identifiers. Such work would directly address the training gaps identified in this study and contribute to more structured and consistent forensic education models.

5.0 Limitations

This study is subject to several methodological and practical limitations which should be considered when interpreting the findings. These limitations do not invalidate the results but instead contextualise the scope and transferability of the conclusions drawn.

5.1 Sample size

A primary limitation of the study is the restricted sample size. Within the questionnaire component, this reflects the highly specialised nature of forensic roles relevant to this research, which inherently limits participant availability. Additionally, the potential for non-response bias must be acknowledged. Practitioners who chose to participate may have had a pre-existing interest in or awareness of scarification, whereas those who did not respond may hold differing levels of knowledge or engagement. As a result, the findings may over represent informed perspectives limiting their general visibility across the wider forensic practitioner population. However, given the exploratory nature of this study, the aim is not statistical generalisation but analytical insights, and the responses remain valuable in identifying key themes and gaps within current practise.

5.2 Limitations of the literature review

Despite employing systematic search strategies, defined inclusion, exclusion criteria, and the use of multiple databases, the literature review remains subject to selection and publication bias. Relevant studies may have been omitted, particularly non-English publications, which may disproportionately exclude research from regions where scarification is more prevalent. Furthermore, publication bias may result in the over representation of studies reporting significant or novel findings, while routine or negative findings remain under reported. These factors may influence the breadth and balance of the evidence base, although efforts were made to mitigate this through transparent methodology and critical appraisal.

6.0 Conclusion

This study aimed to evaluate the forensic relevance of scarification as a identification marker and to assess practitioner recognition and interpretation within European forensic contexts. The first research question, relating to how scarification is represented in the literature and its recognition as an identification feature, was addressed through the systematic literature review. The findings indicate that scarification is predominantly represented within anthropological and ethnographic discourse rather than forensic literature, despite demonstrating characteristics comparable to established secondary identifiers used in human identification. The second research question, focusing on structural limitations within DVI frameworks, was addressed through analysis of both practitioner questionnaire data and existing DVI guidance. The findings demonstrate that current frameworks provide limited structured consideration of scarification, with an absence of clear operational criteria contributing to variability in documentation and interpretation. The third research question, examining the extent of forensic and DVI guidance available for classification and recording, was also addressed through documentary analysis. The results show that explicit guidance on scarification is minimal, with existing frameworks prioritising other cutaneous identifiers such as tattoos, and lacking standardised protocols for scarification assessment.

Overall, the study demonstrates that scarification possesses clear forensic relevance as a persistent and potentially distinctive human identifier; however, its application within formal identification systems remains limited. This limitation is driven by insufficient guidance, inconsistent interpretive practices, and a lack of standardisation within operational frameworks. The findings collectively identify a clear gap between the theoretical potential of scarification and its practical implementation in forensic contexts. As a result, scarification currently functions as a supplementary rather than systematically integrated identifier within DVI and wider forensic practice.

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APPENDICES

Appendix A: Approved research ethics form

RESEARCH ETHICS

Proportionate Review Form

The Proportionate Review process may be used where the proposed research raises only minimal ethical risk. This research must: focus on minimally sensitive topics; entail minimal intrusion or disruption to others; and involve participants who would not be considered vulnerable in the context of the research.

PART A: TO BE COMPLETED BY THE RESEARCHER

Name of Researcher:	**Simran Kaur**
School:	**Health, education, policing and sciences**

Student/Course Details (If Applicable)		
Student ID Number:		**22016428**
Name of Supervisor(s)/Module Tutor:		**DR Kirsty Squires**
PhD/MPhil project: ☐		
Taught Postgraduate ☐ Project/Assignment:	Award Title:	**Forensic Investigation**
Undergraduate ☒ Project/Assignment	Module Title:	**Forensic Research Project**

Project Title:	The forensic potential and recognition of scarification practices by practitioners in Europe
Project Outline:	This project explores the forensic potential of scarification and examines how well Europe-based death investigation practitioners recognise and document it in the identification process. While scarification has long been practiced in various societies for many years, it remains under-represented in forensic identification protocols and training. The research aims to evaluate existing literature on scarification within forensic contexts and to assess practitioner awareness, documentation methods and perceived forensic value. Findings will contribute to improving professional understanding and may inform future guidance or training on recognising culturally significant body modifications in human identification work.
Give a brief description of participants and procedure (methods, tests etc.)	Participants will be Europe-based professionals involved in forensic or death investigation roles (for example, disaster victim identification responders, coroners, forensic anthropologists and mortuary professionals). All participants will be aged 18 years or over and have professional experience relevant to post-mortem examination or identification processes. Data will be collected through an anonymous online questionnaire using Microsoft Forms to gather information on professional experience. Familiarity with scarification and current documentation practices. At the end of the questionnaire, participants may voluntarily opt-in for a short follow up interview to explore their perspectives in greater depth. No personal or identifying information will be collected unless a participant chooses to provide contact details for interview scheduling.

1

	The questionnaire will be on Microsoft Forms and should take no longer than 20 minutes to complete. Questions will be broken up into six sections: Background and experience, confidence and familiarity, forensic utility and attitudes and procedures, documentation practices and follow up interview. The majority of the questions will be multiple-choice or on a Likert scale, with very few being open-text box. The data will be examined using thematic analysis to identify key patterns in the questionnaire and interview responses. Participants will be identified through relevant organisations (such as BAFA, BAHID, BABAO, etc.), professional networks and existing professional connections. Individuals who meet the inclusion criteria will be invited to take part in the project via email.		
Expected Start Date:	**06/10/25**	Expected Date:	**06/04/26**

Relevant professional body ethical guidelines should be consulted when completing this form.

Please seek guidance from the School Ethics Coordinator if you are uncertain about any ethical issues arising from this application.

There is an obligation on the researcher and supervisor (where applicable) to bring to the attention of the School Ethics Coordinator any issues with ethical implications not identified by this form.

Researcher Declaration

I consider that this project has no significant ethical implications requiring full ethical review	☒

I confirm that:		
1.	The research will **NOT** involve members of vulnerable groups. Vulnerable groups include but are not limited to: children and young people (under 18 years of age), those with a learning disability or cognitive impairment, patients, people in custody, people engaged in illegal activities (e.g. drug taking), or individuals in a dependent or unequal relationship.	☒
2.	This research will **NOT** involve sensitive topics. Sensitive topics include, but are not limited to: participants' sexual behaviour, their illegal or political behaviour, their experience of violence, their abuse or exploitation, their mental health, their gender or ethnic status. The research must not involve groups where permission of a gatekeeper is normally required for initial access to members, for example, ethnic or cultural groups, native peoples or indigenous communities.	☒
3.	The research will **NOT** deliberately mislead participants in any way.	☒
4.	The research will **NOT** involve access to records of personal or confidential information, including genetic or other biological information, concerning identifiable individuals.	☒
5.	The research with **NOT** induce psychological stress, anxiety or humiliation, cause more than minimal pain, or involve intrusive interventions. This includes, but is not limited to: the administration of drugs or other substances, vigorous physical exercise, or techniques such as hypnotherapy which may cause participants to reveal information which could cause concern, in the course of their everyday life.	☒
6.	The research **WILL** be conducted with Participants' full and informed consent at the time the study is carried out: • The main procedure will be explained to the participants in advance, so that they are informed about what to expect. ☒ • Participants will be told their involvement in the research is voluntary. ☒	YES ☒ N/A

	• Written consent will be obtained from participants. *(This is not required for self-completion questionnaires as submission of the completed questionnaire implies consent to participate).*	☒	☐
	• Participants will be informed about how they may withdraw from the research at any time and for any reason.	☒	
	• For questionnaires and interviews: Participants will be given the option of omitting questions they do not want to answer.	☒	
	• Participants will be told that their data will be treated with full confidentiality and that, if published, every effort will be made to ensure it will not be identifiable as theirs.	☒	
	• Participants will be given the opportunity to be debriefed i.e. to find out more about the study and its results.	☒	
7.	A risk assessment has been completed for this research project		YES ☐ N/A ☒

If you are unable to confirm any of the above statements, please complete a **Full Ethical Review Form**. If the research will include participants that are **patients**, please complete the Independent Peer Review process.

8. Information and Data Please provide answers to the following questions regarding the handling and storage of information and data:
a) How will research data be stored (manually or electronically)? All data will be stored electronically. Data collected will be stored on the university's password-protected SharePoint account, accessible only to the researcher (Simran Kaur) and their supervisor (Kirsty Squires).
b) How is protection given to the participants (e.g. by being made anonymous through coding and with a participant identifier code being kept separately and securely)? To ensure participants are anonymous throughout the course of this research, each respondent will be assigned a participant identifier code based on the order their completed questionnaires are received. For example, the first answered questionnaire will be labelled participant 1 (P1), the second participant 2 (P2) and so on. Participants will receive a detailed consent form outlining the purpose of the research, what participation involves and their right to withdraw at any time. The online questionnaire will be fully anonymous and will not request identifying details. Participants who choose to provide contact information for an optional follow-up interview will have this information stored securely (in a password protected Microsoft Excel File in the researcher's SharePoint area) by the researcher a used solely for arranging the interview.
c) What assurance will be given to the participant about the confidentiality of this data and the security of its storage? Participants will be informed that all data will be treated as confidential and used solely for academic research purposes. All identifying information will be removed or coded, and any potentially sensitive material will be anonymised before analysis.

d) Is assurance given to the participant that they cannot be identified from any publication or dissemination of the results of the project? Participants will be assured that no individual will be identifiable in any report, publication, or presentation arising from the research. All results will be reported in aggregate form or using anonymised quotations where applicable. No personal or identifying details will be disclosed at any stage. Each participant will be assigned a code number based on the order their completed questionnaires are received. For example, the first answered questionnaire will be labelled participant 1 (P1), the second participant 2 (P2) and so on; these will be used in the final project write-up.
e) Who will have access to this data, and for what purposes? Access to data will be limited to the researcher and academic supervisor for verification purposes. The researcher will be the only person who knows which person corresponds to which identifier. The data will be used solely for the completion and assessment of the final-year project and related academic outputs.
f) How will the data be stored, for how long, and how will it be discarded? The anonymised research data will be securely stored on the university's SharePoint for a period of 10 years after the completion of the project. After this period, all digital files will be permanently deleted.

Supporting Documentation

All key documents e.g. consent form, information sheet, questionnaire/interview schedule are appended to this application.	☒

Signature of Researcher:	*S.kaur*	Date:	20/11/2025

NB: If the research departs from the protocol which provides the basis for this proportionate review, then further review will be required and the applicant and supervisor(s) should consider whether or not the proportionate review remains appropriate. If it is no longer appropriate a full ethical review form **MUST** be submitted for consideration by the School Ethics Coordinator.

Next Step:

STUDENTS: Please submit this form (and supporting documentation) for consideration by your Supervisor/Module Tutor.

STAFF: Please submit this form to your Head of Department or a Senior Researcher in your School. Once they have reviewed the form, this should be forwarded to the Research Administration in RIIS (ethics@staffs.ac.uk) who will arrange for it to be considered by an independent member of the School's College of Reviewers.

PART B: TO BE COMPLETED BY SUPERVISOR/MODULE TUTOR (if student) or HEAD OF DEPARTMENT/SENIOR RESEARCHER (if staff)

I consider that this project has no significant ethical implications requiring full ethical review by the School Research Ethics Committee.	☒
I have checked and approved the key documents required for this proposal (e.g. consent form, information sheet, questionnaire, interview schedule).	☒

Signature of Supervisor/ Head of Department/ Senior Researcher:	Kirsty Squires	Date:	8.12.25

Next Step: Please forward this form to the Research Administrators in RIIS (ethics@staffs.ac.uk) who will arrange for it to be considered by an independent member of the School's College of Ethical Reviewers, having no direct connection with the researcher or his/her programme of study.

PART C: TO BE COMPLETED BY A MEMBER OF THE SCHOOL'S COLLEGE OF ETHICAL REVIWERS

This research proposal has been considered using agreed University Procedures and is now approved.	☒
Or	☐
This research proposal has not been approved due to the reasons given below.	
Recommendation (delete as appropriate): Approved	

Name of Reviewer:	Mia Abbott	Date:	05/12/2025
Signature:	M. Abbott		

Signed (School Ethical Coordinator)		Date:	

Appendix B: Information sheet

Information Sheet

Name of Project: The forensic potential and recognition of scarification practices by practitioners in Europe
Researcher: Simran Kaur – BSc Forensic Investigation
University: University of Staffordshire

Information about the Project

As part of my undergraduate degree, I am conducting a research project on scarification practices, focusing on their potential use in forensic identification and their level of recognition among European based forensic and death investigation practitioners.

This study aims to:

- Explore how scarification may assist in human identification
- Assess practitioner awareness, documentation practices and training needs in Europe

The research will combine a systematic review of existing literature on scarification practices and their documented forensic applications. An anonymous online questionnaire distributed to Europe-based forensic and death investigation professionals designed to assess familiarity, documentation methods and perceived forensic value of scarification. Participants will be invited to optional follow-up interviews to gather qualitative insights into practitioner experience.

Your participation will help highlight current practitioner awareness and identify any training needs.

The basis for inclusion as a participant

You have been invited to participate because you are a Europe-based forensic or death-investigation practitioner (for example, a disaster victim identification responder, coroner, forensic anthropologist or mortuary professional).

Participants will be identified through relevant organisations, professional networks and existing professional connections. Individuals who meet the inclusion criteria will be invited to take part in the project via email. Participants should be aged 18 years and over and have experience in post-mortem, identification or related forensic work.

The Testing Process
If you agree to participate you will be asked to complete an anonymous online questionnaire.
The survey includes questions regarding:

- Your job role, professional experience and familiarity with scarification
- How you record and interpret scarification
- Your views on scarification's forensic potential

At the end of the questionnaire, you may choose to volunteer for a brief follow-up interview to discuss the topics in the survey in more depth. Participation is voluntary, and no identifying information will be collected unless you choose to provide it for follow-up contact. If you decide to share your contact details, this information will be stored securely and accessible only to the researcher and their supervisor (Kirsty Squires). It will be used exclusively for arranging a follow up interview.

Risks and Benefits of Taking Part

There are no anticipated risks, some questions may prompt reflection on cultural or professional practice. Your contribution will help improve awareness, documentation and training regarding the use of scarification in the identification process.

Participation and Confidentiality

Your participation in this study is completely voluntary, and you have the right to withdraw at any time. Please note that any data or images collected up to the point of withdrawal may be used within the study. No personal information about you will be stored unless you consent to a follow-up interview. The anonymised research data will be securely stored on the university's SharePoint for a period of 10 years after the completion of the project. After this period, all digital files will be permanently deleted.

GDPR statement

Your data will be processed in accordance with the General Data Protection Regulation 2016 (GDPR).
The data controller for this project will be University of Staffordshire. The university will process your personal data for the purpose of the research outlined above. The legal basis for processing your personal data for research purposes under the GDPR is a 'task in the public interest'. You can provide your consent for the use of your personal data in this study by completing the optional section (section 5) of the questionnaire on Microsoft Forms, this will allow the researcher to contact you for a follow up interview.

You have the right to access information held about you. Your right of access can be exercised in accordance with the GDPR. You also have other rights including rights of correction, erasure, objection, and data portability. Questions, comments and requests about your personal data can also be sent to the University of Staffordshire Data Protection Officer. If you wish to lodge a complaint with the Information Commissioner's Office, please visit www.ico.org.uk.

Further Questions and Contact Details
If you have any questions or would like further details regarding the project or the testing that you will be asked to undertake then please contact me:

Name: *Simran Kaur*
University email account: K016428m@student.staffs.ac.uk

Telephone Number: +447737 237543

If you have further questions or would prefer to contact a member of staff at the University then please contact my Project Supervisor:

Name: Kirsty Squires
Telephone: +441782295904
Email address: Kirsty.Squires@staffs.ac.uk
University address:
University of Staffordshire,
Science Centre,
Stoke-on-Trent,
ST4 2DF, UK

Appendix C: Consent form

Title of Project: The forensic potential and recognition of scarification practices by practitioners in Europe

I ..... agree to take part in the final year project outlined above.

I understand:

1. The reason for this study and how any results will be used.

2. My participation in the project is voluntary, and I will have the right not to answer any questions and withdraw from the project at any time. Please note that any data or images collected up to the point of withdrawal may be used within the project.

3. Any data or images collected will be treated with confidentiality and will not be identifiable.

Signed: ..... (Participant)

Date: .....

Please return the completed form to Simran kaur via email at: K016428m@student.staffs.ac.uk by 20/03/2026.

Appendix D: Scarification questionnaire questions

Scarification Questionnaire

Project title: The forensic potential and recognition of scarification practices by practitioners in Europe

This questionnaire should take approximately 8–12 minutes to complete.
Please answer as accurately and honestly as possible. There are no right or wrong answers.

Note: For the purpose of this study, Scarification refers only to intentional, purposeful body modification practices that create scars. This may include cultural, ritualistic or symbolic forms of scarification carried out through cutting, abrasion, skin removal, or controlled injury intended to heal into patterned scar tissue. Scarification does not include tattoos, piercings, surgical scars, self-harm scars, accidental injuries or subdermal or transdermal implants. While such scars may be relevant in human identification, they are not included in the definition of scarification for this study.

Section 1: Participant Background

1. What is your current job title/role?
    - Pathologist / Forensic pathologist
    - Coroner / coroners officer
    - Disaster victim identification (DVI) practitioner
    - Mortuary or post-mortem technician
    - Forensic anthropologist
    - Other (please specify)
2. What is your primary workplace setting?
    - Academic/research institution
    - Forensic laboratory
    - Hospital
    - Mortuary
    - Humanitarian or International Response Organisation
    - Private consultancy
    - Other (please specify)
3. In which country is most of your professional practice based?
    - Open text box
4. How many years of experience do you have in this field?
    - Under 1 year
    - 1-3 years
    - 4-7 years
    - 8-12 years
    - 13-20 years
    - Over 20 years

Section 2: Exposure to body modifications in casework

1. How frequently do you encounter scarification?
    a. Never, rarely, sometimes, often, very often
2. In cases where scarification was present, what contexts applied? (select all that apply)
    a. Living individuals
    b. Deceased individuals
    c. Migrant or unidentified persons
    d. Suspects
    e. Victims
    f. Other (please specify)
3. Based on cases you have personally worked on, how often has scarification contributed to an identification of an individual?
    a. Never, rarely, sometimes, often, very often
4. In your view what are the main challenges (if any) in using scarification as an identifier?
    a. Open text box

Section 3: Confidence and familiarity

5. How much do you agree with the following statements? (Strongly agree, agree, disagree, strongly disagree)
    - I am familiar with scarification as a cultural, ritualistic or personal body modification practice.
    - I can identify scarification
    - I can differentiate intentional scarification from accidental scaring or surgical scars
    - I am confident in recording and describing scarification in identification records
    - Scarification is a useful identifier in human identification
    - Existing documentation templates adequately capture scarification details.
6. Where does your knowledge of scarification come from? (select all that apply)
    - Formal forensic training
    - Academic study (e.g., anthropology)
    - Professional casework
    - Personal research or general interest
    - Colleagues/peer learning
    - I have little to no prior knowledge

Section 4: Documentation practices

1. How is scarification typically documented in your workplace?
    a. Written description
    b. Anatomical drawing or body chart
    c. Photographic documentation
    d. Oral description

e. Digital record
f. Unsure
g. Not applicable

2. What is your preferred method to document scarification for identification? (Tick all that apply)
    a. Written description
    b. Anatomical drawing or body chart
    c. Photographic documentation
    d. Oral description
    e. Digital record
    f. Other (please specify)

3. What is your preferred form (if any) to document scarification?
    a. INTERPOL Disaster victim identification form
    b. Locally developed or workplace specific form
    c. National crime agency or police forensic documentation form
    d. Hospital documentation form
    e. Other please specify

4. What resources would be most helpful for improving recognition and documentation of scarification?
    a. A searchable database/ visual reference guide of known scarification patterns
    b. Documentation forms specifically adapted for scarification
    c. Workshops or online modules on recognising and documenting scarification
    d. Other (text box)
5. Do you have any additional comments or reflections on recognising or documenting scarification?
    a. Open text box

Section 5: Follow up interview

If you are willing to be contacted for a short follow up interview, please leave an email address.

Note: Providing your email address will remove anonymity – do not provide unless you consent to the researcher using your details to contact you for a follow up interview.

a. Open text box

Appendix E : Scarification follow-up semi-structured interview

Scarification interview questions:

Section 1: Practitioner exposure and context

1. How has your exposure to scarification changed over the course of your career, if at all?

Section 2: Recognition and interpretation

2. What indicators do you personally rely on when determining whether scarring is intentional rather than accidental or surgical?
3. Do you think scarification should be a primary or secondary identifier in human identification, and why?
4. Have you observed any recurring trends in the cases where scarification appears – for example, in a certain job role, in a certain location or when there has been certain events or demographic changes)
5. why do you think these patterns occur?
6. In your experience are there specific styles or patterns of scarification you recognise?
    a. How did you learn about them?

Section 3: Casework impact

7. Can you recall a case where scarification influenced your interpretation of an individual's background or identity, even if it did not lead to a formal identification?
8. In your experience what potential does scarification have as an identifier compared to other body modifications (E.G. tattoos, piercings)?

Section 5: Broader reflections

9. From your perspective how well prepared is your field to accurately deal with scarification?
10. How do you think recognition and documentation of scarification could be better integrated into forensic training or standard procedures?
11. Is there anything about scarification or your experiences with it that you think the research community overlooks?

Section 6: closing question

12. Is there anything else you would like to share about your experiences or professional opinions regarding scarification that we have not covered?

Appendix F: Questionnaire results

Responses Overview

Active

Responses	Average Time	Duration
1	03:41	87 Days

1. **Information about the Project:** As part of my undergraduate degree, I am conducting a research project on scarification practices, focu sing on their potential use in forensic identification and their level of recognition among European based forensic and death investigation practitioners. **This study aims to:**

   - Explore how scarification may assist in human identification
   - Assess practitioner awareness, documentation practices and training needs in Europe

   The research will combine a systematic review of existing literature on scarification practices and their documented forensic applications. An anonymous online questionnaire distributed to Europe-based forensic and death investigation professionals designed to assess famili arity, documentation methods and perceived forensic value of scarification. Participants will be invited to optional follow-up interviews to gather qualitative insights into practitioner experience. Your participation will help highlight current practitioner awareness and identify a ny training needs.

2. **The Testing Process:** If you agree to participate you will be asked to complete an anonymous online questionnaire. The survey includes questions regarding:

   - Your job role, professional experience and familiarity with scarification
   - How you record and interpret scarification
   - Your views on scarification's forensic potential

   At the end of the questionnaire, you may choose to volunteer for a brief follow-up interview to discuss the topics in the survey in more de pth. Participation is voluntary, and no identifying information will be collected unless you choose to provide it for follow-up contact. If yo u decide to share your contact details, this information will be stored securely and accessible only to the researcher and their supervisor (Kirsty Squires). It will be used exclusively for arranging a follow up interview.

3. **Risks and Benefits of Taking Part:** There are no anticipated risks, some questions may prompt reflection on cultural or professional pra ctice. Your contribution will help improve awareness, documentation and training regarding the use of scarification in the identification pr ocess.

4. **Participation and Confidentiality:** Your participation in this study is completely voluntary, and you have the right to withdraw at any tim e. Please note that any data or images collected up to the point of withdrawal may be used within the study. No personal information ab out you will be stored unless you consent to a follow-up interview. The anonymised research data will be securely stored on the universit y's SharePoint for a period of 10 years after the completion of the project. After this period, all digital files will be permanently deleted.

5. **GDPR statement**Your data will be processed in accordance with the General Data Protection Regulation 2016 (GDPR). The data controller for this project will be University of Staffordshire. The university will process your personal data for the purpose of the research outlined a bove. The legal basis for processing your personal data for research purposes under the GDPR is a 'task in the public interest'. You can pro vide your consent for the use of your personal data in this study by completing the optional section (section 5) of the questionnaire on Mi crosoft Forms, this will allow the researcher to contact you for a follow up interview. You have the right to access information held about you. Your right of access can be exercised in accordance with the GDPR. You also have other rights including rights of correction, erasure, objection, and data portability. Questions, comments and requests about your personal data can also be sent to the University of Stafford shire Data Protection Officer. If you wish to lodge a complaint with the Information Commissioner's Office, please visit www.ico.org.uk.

6. **Further Questions and Contact Details**If you have any questions or would like further details regarding the project or the testing that y ou will be asked to undertake then please contact me:

- Name: Simran Kaur
- University email account: K016428m@student.staffs.ac.uk
- Telephone Number: +447737 237543

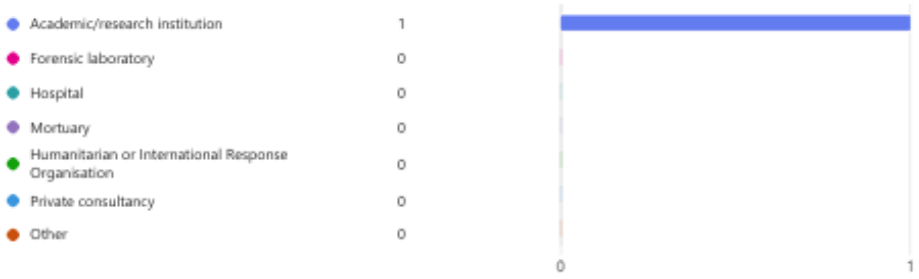
If you have further questions or would prefer to contact a member of staff at the University then please contact my Project Supervisor:

- Name: Kirsty Squires
- Telephone: +441782295904
- Email address: Kirsty.Squires@staffs.ac.uk
- University address: University of Staffordshire, Science Centre, Stoke-on-Trent, ST4 2DF, UK

7. Question

8. What is your current job title/role?

9. What is your primary workplace setting?



10. In which country is most of your professional practice based?

1
Responses

Latest Responses
"Uk"

11. How many years of experience do you have in this field?

Under 1 year	0
1-3 years	0
4-7 years	1
8-12 years	0
13-20 years	0
Over 20 years	0

12. How frequently do you encounter scarification?

Never	1
Rarely	0
Occasionally	0
Frequently	0
Always	0

13. In cases where scarification was present, what contexts applied? (select all that apply)

Living individuals	0
Deceased individuals	0
Migrant or unidentified persons	0
Suspects	0
Victims	0
Other	0

14. Based on cases you have personally worked on, how often has scarification contributed to the identification of an individual?

Never	1
Rarely	0
Occasionally	0
Frequently	0
Always	0

15. In your view what are the main challenges (if any) in using scarification as an identifier?

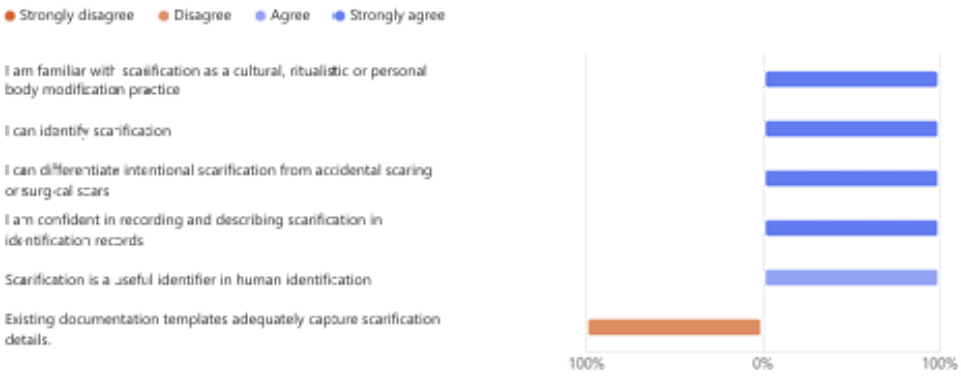
1

Responses

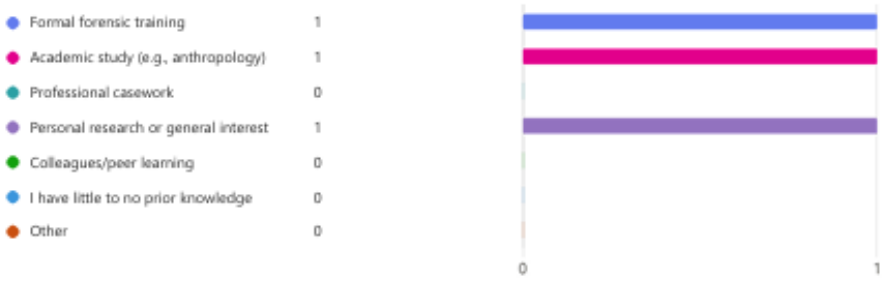
Latest Responses

"I have not worked any cases with this"

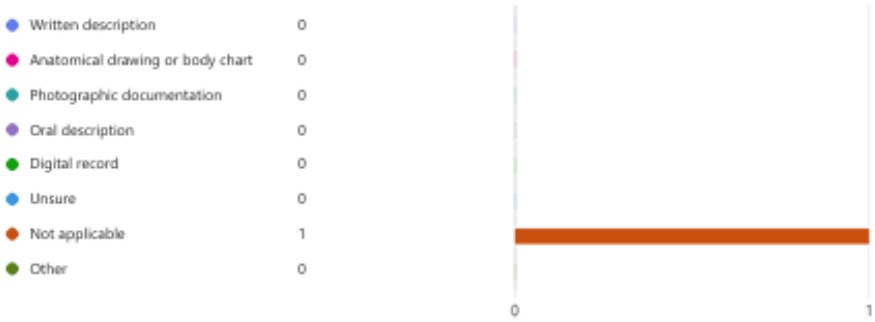
16. How much do you agree with the following statements?



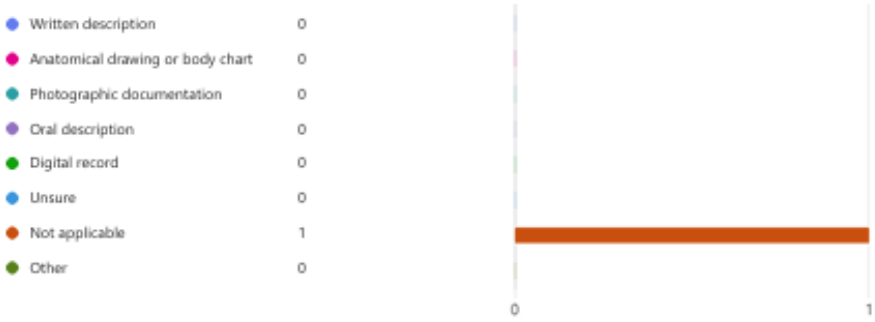
17. Where does your knowledge of scarification come from? (select all that apply)



18. How is scarification typically documented in your current/last place of work?



19. What is your preferred method to document scarification for identification? (Tick all that apply)



20. What is your preferred form (if any) to document scarification?

21. What resources would be most helpful for improving recognition and documentation of scarification?

22. If you are willing to be contacted for a short follow up interview, please leave an email address. Note: Providing your email address will r emove anony:nity – do not provide unless you consent to the researcher using your details to contact you for a follow up interview.

0 responses submittec

0

Responses