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Abstract: The recognition of a decedent by a family member is commonplace in forensic investigation and is often employed as identity confirmation. However, it is recognized that misidentification from facial recognition is also common and faces of the dead may be extremely difficult to recognize due to decomposition or external damage, and even immediate post-mortem changes may be significant enough to confuse an observer. The depiction of faces of the dead can be a useful tool for promoting recognition leading to identification and post-mortem facial depiction is described as the interpretation of human remains in order to suggest the living appearance of an individual. This paper provides an historical context relating to the changing view of society to the presentation and publication of post-mortem facial depictions and discusses the current ethical, practical and academic challenges associated with these images.

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A REVIEW OF THE CHANGING CULTURE AND SOCIAL CONTEXT RELATING TO FORENSIC FACIAL DEPICTION OF THE DEAD

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ABSTRACT

The recognition of a decedent by a family member is commonplace in forensic investigation and is often employed as identity confirmation. However, it is recognized that misidentification from facial recognition is also common and faces of the dead may be extremely difficult to recognize due to decomposition or external damage, and even immediate post-mortem changes may be significant enough to confuse an observer. The depiction of faces of the dead can be a useful tool for promoting recognition leading to identification and post-mortem facial depiction is described as the interpretation of human remains in order to suggest the living appearance of an individual. This paper provides an historical context relating to the changing view of society to the presentation and publication of post-mortem facial depictions and discusses the current ethical, practical and academic challenges associated with these images.

INTRODUCTION

The recognition of a decedent by a family member is commonplace in forensic investigation and is often employed as identity confirmation. However, it is recognized that misidentification from facial recognition is also common, especially in mass disaster scenarios where emotional, taphonomic and environmental factors become significant.

The depiction of faces of the dead can be a useful tool for promoting recognition leading to identification. Post-mortem facial depiction is described as the interpretation of human remains in order to suggest the living appearance of an individual [1]. The aim of post-mortem facial prediction is to recreate an *in vivo* countenance of an individual that sufficiently resembles the decedent to allow recognition [2]. In a forensic investigation the publicity campaign promoting the facial depiction may lead to recognition by a member of the public and eventually identification. Since human remains may be presented in a variety of post-mortem states, different techniques of facial analysis and depiction may be appropriate for different cases [3].

Traditionally post-mortem craniofacial analysis has been carried out by forensic anthropologists [4, 5], anatomists [6], artists [2, 7] and sculptors [8, 9] or through collaborations between scientists and artists [10, 11]. Techniques incorporate anatomical principles [12], artistic skills [7] and anthropological standards [13], and may utilise photo-editing software [14], computer modelling [15], automated systems [16], sketching [7] and sculpture [2].

HISTORICAL CONTEXT AND CULTURE

Faces of the dead may be extremely difficult to recognize due to decomposition or external damage, and even immediate post-mortem changes may be significant enough to confuse an observer. Following major natural disasters, such as the Tsunami of 2004

and Hurricane Katrina of 2005, or terrorist events, such as the Bali bombing of 2002 or the London bombing of 2005, the emotional circumstances may lead to false identification by a family member, even where facial preservation appears sufficient for recognition [17]. Ten per cent of victims of the Tsunami and 50% of victims of the Bali bombing were incorrectly identified by facial recognition [18]. In the M/S Estonia disaster visual identification by next-of-kin was tentatively used in 48% of cases, but proved to be unreliable [19] with one member of the crew even falsely identified another crew member based on ante-mortem and post-mortem photographs [20]. After the Zeebrugge ferry disaster bodies recovered immediately were mostly identified visually by next-of-kin [21]. However, one small group of relatives made premature misidentifications, whilst others had to make repeated visits, even when the corpse showed minimal physical damage, allowing subtle changes in the face to block acceptance of reality [21]. The social, legal and religious implications of misidentification are enormous and international investigative authorities advocate that it is vital to identify the deceased for the return to the family for cultural/religious observance, for grieving and acceptance of death and for judicial matters of estate [18].

Unknown human remains have been identified through visual inspection in the UK since the Middle Ages, when dead bodies were laid out for identification in public streets [22]. There is a record from 1726 of a severed head found washed up on the banks of the Thames (Horseferry Wharf) by a night-watchman. The head was placed on a spike at St Margaret's Churchyard in Westminster and eventually displayed in a jar under spirit, in order to promote recognition and avoid further decomposition [23, 24].

In addition, the exhibition of post-mortem photographs was common place in 19th century Britain and USA [25], providing a means for displaying executed criminals and describing crime scenes in newspapers and publications. The observation of post-mortem images was not considered unacceptable or inappropriate, and indeed memorial portraiture (or memento mori) was popular as a cheap alternative to the painted portrait and served as a keepsake to remember the deceased, especially common for children [26]. Often the deceased was arranged so as to appear alive, shown in repose to appear asleep or propped in a family gathering, and these portraits were often considered beautiful and sensitive [27-29].

By contrast law enforcement or military images of the dead showed the bodies in all their gory detail and were used to exhibit a captured and executed criminal to the public and enhance the reputation of the police officers or military. Examples include photographs of the corpses of Jesse James in 1882 [30], John Dillinger in 1934 [31] or Ché Guevara in 1967 [32]. These images were often brutal, stark and unarranged.

In recent times the publication of post-mortem faces of victims has become increasingly seen as vulgar, sensationalist and taboo, a cultural shift that may be a reflection of a wider social discomfort with death. In the thirties and forties journalists/reporters commonly photographed murder victims, accidental deaths and suicides to publish in newspaper articles [28], but currently crime scene photography is the remit of law enforcement personnel [33], such as SOCOs or CSIs.

There are some examples of public anger associated with the publication of images showing faces of the dead that may be responsible for a cultural shift. The television coverage of the Hillsborough stadium disaster in 1989 caused public concern in relation to the close up images of the dead [34]. A questionnaire and discussion group survey found that British viewers overwhelmingly felt that these images were unacceptable with the majority stating the reasons that relatives of the victims might be watching and be upset, and that children might be watching [35]. Other objections provided in relation to television images of the dead are that the images may shock or cause offence [34] and that their publication is disrespectful to the dead. Photographs showing unidentified victims of disaster have provoked a public and political response. After the Bhopal Gas Tragedy in India in 1984 [36] one picture of the unidentified dead face of a child victim poking through the rubble became iconic as a symbol of the destructive power of methyl isocyanate, in stark contrast to the Union Carbide Corporation accounts and figures. The public outcry ultimately led to the Indian Government passing the Bhopal Gas Leak Act in March 1985, allowing the Government of India to act as the legal representative for victims of the disaster in legal proceedings. Other disasters have also provoked public debate in relation to the use of images of the victims in the media. The publication of images of falling victims from the September 11 terrorist attacks on the New York was considered exploitative and honouring in equal measure. Indeed one particular falling image was thought to epitomise the tragedy and the horror of this catastrophe in Western cultural memory [37].

With the recent advances in technology the access to and availability of images from disasters, wars and forensic incidents has increased, and there has been a cultural shift in response to this. Photographers embedded with the US military currently agree not to use photographs that show the dead or wounded if the faces can be recognised [38]. The US Department of Defence states that "*until next of kin are notified, faces should not be shown*" (DoD regulations specify 72 hours)[39]. It seems that the recognition of the decedent is one of the most important factors, as this knowledge of identity is the part that is considered disrespectful and harmful. But even death images of identified soldiers are not routinely published; in a 2005 survey Rainey [38] found that of six prominent U.S. newspapers and the nation's two most popular newsmagazines during a six-month period found almost no pictures from the war zone of Americans killed in action. During that time, 559 Americans and Western allies died.

Two US examples of post-mortem war images resulted in contrasting media responses. In 2003 the Pentagon released death images of Saddam Hussein's sons, Uday and Qusay, as evidence that they had been killed [40]. Higgins and Müller [40] state the Bush administration apparently decided that these deaths represented an exceptional case, as Defense Secretary Donald Rumsfeld commented that the publication of such photos of war casualties '*is not a practice the United States engages in on a normal basis*.' However, in 2006 the military arranged a press conference to announce the death of Abu Musab al-Zarqawi, a leader of al-Qaeda in Iraq, where an image of Zarqawi's lifeless face was enlarged to a poster size and displayed in an incongruous golden frame at a press briefing [40]. Higgins and Müller state that this time there was no Pentagon explanation of the special conditions meriting the release of this death image, other than to confirm his death and there was a strong media backlash calling the publication of the image

tasteless and gruesome. The Center for Strategic Communication at Arizona State University responded by drafting a memo [41] advising policymakers to reconsider the publication of such death images - especially given the global context in which they may be disseminated and reproduced. Higgins and Müller [40] then compare this to the government action in 2011 when U.S. forces killed al-Qaeda leader Osama bin Laden. They report that gruesome photographs were taken of bin Laden's body at the site of his death, showing that he had been shot in the face, and state that the existence of these raised serious ethical questions for the press and the Obama administration. It is noted that Obama took responsibility for the non-publication decision, acknowledged that the photos depict graphic bodily injury, and cited potential threats to national security as his reason for concealment. Higgins and Müller [40] go on to state that the internet has made uncensored images of atrocity and 'body horror' more accessible and widespread, but in a networked society, there is no ultimate control over reproduction contexts, and so offensive, graphic imagery easily proliferates despite government efforts at control. They further state that such openness is a natural condition of open society and liberal democracy.

The newspaper and television media have also responded to the use of images in order to promote disaster victims. In a comparative study of news images of Hurricane Katrina and the Indian Tsunami, Bulla and Borah [42] found that the US media (New York Times and the Washington Post) framed Katrina relatively differently from the tsunami. In the 'lives-lost' frames, both newspapers showed the dead from the tsunami as large, close-up shots, but showed long shots and smaller images of the Katrina victims [42, 43]. This suggests that the media respond differently to death images from their own country than those from abroad. In another comparative study of the 2005 Hurricane Katrina in the USA and the 2008 Wenchuan Earthquake in China, Yan [44] found that even though the Wenchuan Earthquake killed at least 68,000 people, there were no pictures depicting the dead at all in 40 Chinese newspapers. Among the 1,836 victims of Katrina, only two deaths were pictured in 40 US newspapers. Yan [44] suggests that death was viewed as an expected loss and this deathless coverage focused on the survivors and emotional response to death.

But how do the public feel about the use of facial images of the dead for identification purposes? Images of the dead have been frequently used within a DVI response [45-47] in order to record the victim's appearance for visual identification by the family. An early example is the Canadian Desjardins train disaster in 1857, where the victims were photographed specifically with the aim of visual recognition by relatives [48]. This is especially necessary where subsequent decomposition is inevitable due to the post-mortem conditions, such as where there is limited cold storage. Aitken [49] stated that after the Indian Tsunami there was controversy over whether to display images of the deceased in the hope of identification, as the majority of victims showed early or extensive decomposition and/or trauma. Black [50] stated that in Thailand images of the deceased were initially pinned to notice boards for viewing by family members searching for their loved ones, but that this was stopped once the international DVI teams took responsibility for victim identification. After the Hillsborough football stadium disaster in 1989 the police recorded the faces of the victims using a Polaroid

camera and posted these images on a noticeboard to enable recognition by families without forcing the relatives to walk along lines of bodies [51].

In forensic investigation many government organisations currently use the internet to post photographs of dead bodies for identification purposes and these images are no longer considered taboo. For many years in India [52, 53] Criminal Investigation Departments have posted images of mutilated and decomposing bodies on internet sites related to unidentified bodies, to aid recognition and, although there is usually a warning statement associated with the content, the access is open and uncontrolled. Recently some Western countries have followed suit [54, 55] and in November 2012 the UK Missing Persons Bureau launched a new website in order to post authentic images of unidentified bodies found in Britain in the hope that friends and family members will be able to identify them [56]. Images deemed to be distressing were marked with a warning, and required specific confirmation before viewing. The launch of this website did not receive negative media coverage [57] and this may indicate a recent cultural shift in public sensitivity. However, if past disaster figures are to be believed, misidentification from authentic facial images of the dead will be high [18-21].

FACIAL DEPICTION OF THE DEAD FOR IDENTIFICATION PURPOSES

One of the problems with the use of post-mortem images is that the face of a dead body does not necessarily resemble the person in life. Even initial post-mortem changes, such as corneal clouding, slackness of the jaw, pallor and loss of muscle tone, can cause confusion and doubt in the mind of a relative when viewing the body. Without a recognisable hairstyle, facial expression or skin colour the face may appear very different from in life, and the family member may respond with uncertainty or misidentification. The desire to identify a loved one may cause the relative to imagine facial details that are not visible. Alternatively, hope for the return of the missing person may preclude recognition where the face is not well preserved. Therefore, in these circumstances it may not be appropriate to exhibit the body in its existing condition. Trauma and decomposition of the face may be distressing to the relative and in these cases the police may employ a forensic artist to produce a living facial depiction from the post-mortem photograph [7, 58]. The ACPO Facial Identification Guidance 2009 states that '*the purpose of an interpretation is to provide a more appropriate facial image to aid identification.*'[59]

Human remains may suffer from post-mortem trauma to the soft tissues, such as avulsions (tears), bruising, lacerations, puncture wounds, scrapes and distortion, or to the skeleton, such as fractures, fragmentation and compression injuries [60-62]. There may be insect or animal activity, such as feeding, scattering of body parts, infiltration or burial. Some environments may lead to preservation of the soft tissues, such as peat bogs (acidic tanning of the skin), deserts (mummification) or warm moist wrappings (adipocere formation). In addition, the position of the body may lead to facial feature distortion. Even mild pressure, such as the weight of a body bag, may alter facial features. There are a series of post-mortem stages relating to human bodies, but there is a high variability to the timing of these stages, dependent upon the climate and

conditions of the body. Some climates may lead to rapid deterioration of the body, so that the individual is unrecognisable in a matter of days, whereas other climates will preserve a body for many centuries (e.g. peat bogs). The signs of death are usually noted as algor mortis, rigor mortis, livor mortis, and decomposition [60-62]. Even before decomposition begins the face may be unrecognisable. Skin colour may be unreliable due to pallor and eye colour may be unreliable due to corneal darkening. The jaw of the cadaver becomes slack giving an unusual facial expression and the outer angle of the eye will appear up-turned due to the effects of gravity and rigor mortis of the ligaments of the eye [7, 60-62]. Decomposition or putrefaction is the final post-mortem stage, and is the gradual deterioration of the tissues and discolouration of the skin. Fermentation within the body cavities will occur, and gas production will bloat the face. The eyelids become swollen and tightly closed; the lips, swollen and pouting; the cheeks, puffed out, and the distended tongue, protrudes between the lips [60-62]. Hair may become loose at the roots, and may be easily lost. Decomposition will eventually lead to skeletonisation.

Traditionally the forensic artist/anthropologist will produce a sketch of the face or use photo-editing software to alter the post-mortem image [7, 58]. This will involve the removal of distracting detail (such as dirt, blood, maggots and detritus), the elimination of trauma (such as bruising, wounds, feature distortion and inflammation), the addition of feature detail (such as open eyes, closed mouth, hair and missing parts) and the interpretation of areas effected by decomposition based on taphonomic knowledge (such as swollen, discoloured or putrefied areas). Forensic artists/anthropologists who carry out this work will require anatomical, taphonomic and imaging experience in order to interpret the post-mortem image. A high level of artistic skill will also be necessary to produce a realistic facial depiction and to highlight any details that may be aid recognition, such as dental anomalies, scars, facial creases, tattoos, clothing, headgear, jewellery or hair accessories. Procedural guidelines for post-mortem sketches can be found in Taylor [7], Gibson [58] and Wilkinson & Tillotson [63]. Post-mortem depictions are then presented to the public to promote recognition. It must be noted that a high degree of estimation and interpretation can be involved in the production. Never-the-less post-mortem depictions can be very useful in forensic investigations and are utilised to protect the public from disturbing and distasteful images.

Craniofacial reconstruction (otherwise known as facial approximation) is the process utilised to reproduce the facial appearance of an individual from skeletal remains. Traditionally facial reconstruction involves the analysis of skeletal detail to determine facial morphology, but it may be possible to analyse both soft and hard tissues where clinical imaging or dissection are employed. Facial reconstructions may be presented to the general public with a variety of surface detail and how they are presented is an interesting challenge for practitioners. Research suggests that incorrect surface detail, such as hairstyle [64], glasses and facial hair [65], can have an alarmingly strong negative effect upon recognition levels. It has also been shown that we find faces more difficult to recognize without surface detail and colour [66]. However, the amount of known appearance detail will be different for each investigation and some scenes will reveal details such as facial hair, skin colour, eye colour, hair or clothing, whilst others offer no detail other than skeletal appearance. Even where some details are known, there may be possible variation to the appearance (e.g. White skin can vary from fair to

olive, and long hair can be worn loose or tied up) and these variations may have a great effect upon resemblance and recognition. Psychology research suggests that faces lit from above (to simulate daylight) are more easily recognised [67, 68] and three-quarter views [69, 70] or rotating views [71] provide the more information relating to face shape and the highest recognition [72]. Facial reconstruction has been a valuable tool for forensic investigation and many individuals have been successfully identified as a direct result of a publicity campaign employing a facial reconstruction [73-75].

ETHICAL ISSUES RELATING TO FACIAL DEPICTION RESEARCH

A major ethical problem relating to craniofacial research is how to assess the accuracy of a depiction without revealing the identity of the subject. Since this research relates to facial images subject anonymity is impossible and the usual methods utilised to reduce recognition, such as the use of eye blocks or pixilation, are inappropriate for research where recognition is paramount. Some psychology research [76, 77] suggests that pixelated faces and eye blocks do not hide the identity of the subject and covering up some of the face does not allow satisfactory resemblance evaluation, as we can recognise familiar faces even from poor quality images [78] with as few as 7 x 10 pixels representing the face [79]. Consent for publication may be provided by the subject and these must follow ethical research guidelines [80]. Consent then allows the publication and use of identifiable facial images, but there are other ethical problems associated with facial depiction research.

In the past facial depiction research relied on the utilisation of donated bodies [2, 4, 81, 82] or previous forensic cases [5, 83-86] and evaluation was carried out through comparison of the facial depiction with cadaver photographs [2, 4], death masks [81, 82] or ante-mortem images [4, 83-86]. Comparisons and evaluations were made using recognisers who either judged the likeness of the depiction in relation to the target [4, 84, 86] or who tried to pick the target from a pool of faces by comparison to the depiction [83, 85, 86]. One of the other problems with these accuracy studies is that the participants involved are not familiar with the target (unlike in a forensic investigation) and there is much evidence to suggest that we recognise familiar faces using different types of memory and brain regions [87, 88]. However, it would be ethically and practically difficult to evaluate recognition using family members from forensic investigations or for donated bodies, even where consent may have been provided by the donor. In some face recognition studies [89-93] celebrities have been used to represent familiar faces as large numbers of potential recognisers can be utilised from the public. However it is extremely unlikely that celebrities would donate skeletal material or CT data for facial depiction research.

More recently living consenting subjects and Computed Tomography (CT) data have been utilised for accuracy studies [2, 94-96]. CT data enable the 3D digital visualisation of the skeletal structure and even allow replication of this material through stereo-lithography [97, 98]. This permits the direct evaluation of the depiction in relation to the face of the living person, either by comparing photographs [2, 96] or by morphometric comparison of the surfaces of the depiction and the target face using 3D software [94,

95]. However, even when living, consenting subjects are used it is still practically difficult to test recognition with sufficient familiar participants to allow meaningful conclusions to be drawn, and research has to rely on geometric evaluation or unfamiliar recognition. In addition there are ethical issues relating to the radiation dose related to CT scanning [99] and a 2009 study of medical centres in the San Francisco Bay Area calculated an elevated risk of one extra case of cancer for every 400 to 2,000 routine chest CT exams [100]. In many countries (e.g. UK, Australia) CT scanning can only be used for diagnostic purposes [99] and the use of scans from healthy subjects is not ethically permitted for research purposes [101]. The use of diagnostic CT data also produces practical problems [102] as the scans may not include the whole head (for example, the orbits are often not scanned due to the risk of radiation damage to the eyeball), the patient may be outside of the 'normal' population (e.g. head injury or congenital condition) or there may be soft tissue distortion related to the head band, pillow or position of the head in the scanner. Cone Beam CT may resolve some of these issues in future research [103, 104] as the radiation dose is low and the patient can sit up during scanning, limiting the effects of gravity of the facial soft tissues.

CONCLUSION

The public response to the use of facial depiction of the dead for human identification is in constant flux. Over the last century there has been an increased social discomfort with death and a reticence to present post-mortem photographs to the public without image sterilisation, but the recent utilisation of internet sites to post authentic images of dead faces for identification purposes suggests that this discomfort is related to context, source, and political and social implications. The public appear to be more tolerant of distasteful and sensitive images where warnings are provided in relation to content and where the intended use is recognition to aid identification. However, there is evidence that authentic images of post-mortem faces may lead to high misidentification rates and the use of forensic facial depiction images may be preferable for promoting recognition and identification.

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