Title: Elder Abuse: Evaluating the Potentials and Problems of Diagnosis in the Archaeological Record

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Abstract

The elderly are the most neglected demographic in archaeology. In today's youth-obsessed society the elderly are consistently denigrated, particularly those perceived to be physically or mentally frail. A related and growing concern in contemporary populations is the physical abuse of the elderly, believed to be an escalating phenomenon. This study is the first to examine the risk factors, social context, and patterns of trauma associated with elder abuse in the present, with the aim of providing diagnostic criteria to apply to past societies. The utility of skeletal evidence in the identification of violent trauma has been detailed in cases of child and intimate partner abuse, both modern and archaeological. Investigating the skeletal evidence for elder abuse is potentially more complex due to the confounding physiological effects of the ageing process, the lack of clinical research, and contemporary ageist attitudes towards older people. Within the clinical and bioarchaeological literature there has been a tendency to dismiss injuries in older individuals as the product of accident or opportunistic violence. A proportion of elder members of past societies are likely to have been victims of abuse and family violence. Whilst there are no pathognomonic skeletal features of elder abuse, multiple injuries to the bones of the following are indicative: cranium, maxilla-facial region, dentition, cervical vertebrae, clavicles, ribs and spiral fractures to the humeri. Attention is also drawn to decubiti as indirect skeletal indicators of immobility and possibly neglect. Archaeological context is important to consider, including non-normative burials or those indicating social marginalisation. Bioarchaeological evidence has the potential to provide a long term perspective on the care and treatment of past elders.

Keywords: old age, skeletal trauma, decubitus ulcer, family violence, domestic abuse

Introduction

The physical abuse of the elderly has been described as 'the new violence phenomenon' (Bennett and Rowe, 2003: 488). However, medical and forensic research concerning elder abuse and neglect is decades behind that of child and intimate partner abuse (Dyer et al., 2003: 339; Daly *et al*., 2011: 362). Contemporary prevalence figures estimate that between 2-10% of the elderly population are abused (including financial and emotional abuse), with physical abuse accounting for up to 25% of these cases (Lachs and Pillemer, 2004; Daly *et al*., 2011; McDowell, 2010). Elder abuse is a severely under-reported and under-diagnosed condition today and actual prevalence is thought to be much greater (Switzer and Michienzi, 2012).

Within bioarchaeological discourse, family violence has gained increasing prominence over recent years (e.g. Novak, 2006; Gaither, 2012; Wheeler *et al*., 2013); however, the potential abuse of past elders has so far been neglected. The utility of skeletal evidence in the identification of violent trauma has been detailed in cases of child and intimate partner violence, both modern and archaeological (e.g. Walker, 1997; Ross and Abel, 2011; Juarez and Hughes, 2013). Skeletal examination allows chronologically distinct abuse events to be distinguished due to the identification of injuries at different stages of healing; potentially revealing an osteobiography of abuse. Physical abuse is often repetitive in nature and while soft tissue injuries heal or decompose, skeletal tissues retain a record of this recidivism. Indeed, multiple skeletal injuries in various stages of healing are highly suggestive of abuse. Skeletal analyses have frequently been instrumental in the conviction of perpetrators of abuse in forensic cases where soft tissue evidence has been inconclusive (Walker *et al*., 1997; Abel, 2011). Abuse markers alter throughout the life course in relation to differences in the victim's mobility, ability to self-defend, social identity and age-related changes in the body's physiology (Boudreaux *et al*., 1999). Consequently, it is important that physical markers *specific* to elder abuse are identified so that reliable diagnoses can be made.

The elderly are the most overlooked demographic in bioarchaeology. This is partly due to problems of identification as current anthropological techniques tend to under-estimate the age of older individuals (Gowland 2007). It is estimated that people over 60 years of age will have constituted between 6-8% of many past populations, though this will have varied in time and space (Cockayne 2003). The potential for past elders to have been victims of abuse has hitherto not been considered. This study will synthesize the sociological, anthropological and clinical literature regarding elder abuse. The aim is to identify diagnostic skeletal criteria, together with the risk factors and social context in which elder abuse is likely to occur, and to evaluate the applicability of this evidence for archaeological contexts. This study also serves to highlight the need for a focus on the care and treatment of older members of past societies.

Current Elder Abuse Research

The way in which different societies conceptualise the end stages of the life course varies considerably (Achenbaum, 2005). Denigration of the elderly is largely considered to be a modern western phenomenon, whilst past elders are thought to have been treated with greater respect. However, hostile attitudes towards the elderly, particularly women, is a theme that has appeared in world literature over thousands of years (e.g. Thane, 2000; Parkin, 2003). For example, references to old age in ancient Greek comedy and satire are almost always negative (Thane 2000). In the past, as in the present, the experience and perception of old age was not only gender dependent, but was also affected by factors such as social status and impairment. For example, historical evidence from ancient Rome indicates that old age was considered to be a particularly grim and debilitating experience for the poor and dependent (Parkin 2003). In the more recent past, the link between old age and poverty was highlighted starkly in Victorian England by Charles Booth (1894), who demonstrated that a third of all individuals over 70 years of age were compelled to seek poor relief. Then, as now, the majority of people living at the margins of poverty were elderly women (Glendenning, 1997). It is simply not possible to say that one society consistently venerates the elderly and another does not; specific local or general socio-economic structures within any one group may either exacerbate or diminish the circumstances in which family violence is likely to arise.

The characterisation of ‘elder abuse’ as a distinct aspect of family violence, worthy of study in its own right, began when the term ‘granny battering’ was coined in the 1970s (Baker, 1975; Burston, 1975). This somewhat derogatory term was replaced by ‘elder abuse’ in the 1980s and this has endured to the present day. There is now a growing interest in elder abuse within the clinical and sociological literature, and an increased public and media focus on the phenomenon; usually in relation to the poor quality of care in some residential institutions. The current spotlight on the topic can be linked to a general anxiety about today’s ageing population (Biggs *et al*., 1995). An unprecedented proportion of the world’s population is now over 60 years of age and this is projected to double during the next few decades (Kalache *et al*., 2005). As there are more elderly people in the population, it seems logical to predict at least a proportionate increase in the prevalence of elder abuse cases (Phelan, 2012). However, it is important not to imply that the ageing population is the direct *cause* of this form of violence and instead examine the associated risk factors.

Elder Abuse: Definitions and Risk Factors

In 1993, the UK organization Action on Elder Abuse formulated the following definition of elder abuse, which has since been adopted by the World Health Organization: ‘A single or repeated act, or lack of appropriate action, occurring within any relationship where there is an expectation of trust, which causes harm or distress to an older person’. Likewise, in the USA, the National Research Council (2003, 40) defined elder abuse as ‘intentional actions that cause harm or create a serious risk of harm (whether or not harm is intended) to a vulnerable elder by a caregiver or other person who stands in a trusting relationship to the elder; or failure of a caregiver to satisfy the elder’s basic needs or protect the elder from harm.’ Table 1 shows current categories of elder abuse. These are intentionally broad and are not discrete or exclusive; for example, it would be difficult to argue for the absence of psychological abuse in the presence of physical abuse.

The perpetrators of elder abuse are most frequently co-habiting adults, quite often spouses or children of the abused (Biggs *et al*., 1995). Power imbalances and relationships of dependency are additional factors (Aitken and Griffin, 1996: 42). Five

key risk factors have been highlighted (Table 2). While the spotlight on elder care has often focussed on residential care and nursing homes, the majority of abuse and elder homicide is thought to occur in the home (Collins and Presnell, 2006). Recent research has emphasised the pathopsychology of the perpetrator as the key risk factor, representing a shift in focus from the physical and cognitive disabilities of the older person to the abuser (Homer and Gilleard, 1990; McCreadie, 2003). However, the identity of the abused is still relevant, and numerous studies have observed a sex-bias in prevalence, with older females being at least twice as likely to be physically abused as older males (Akaza *et al*., 2003; Cohen *et al*., 2007; O'Keeffe *et al*., 2007). The extent to which this is due to a demographic bias (i.e. women live longer than men in the Western world) has not been thoroughly explored. Individuals who are physically or cognitively impaired are also more likely to become victims of abuse (Lachs and Pillemer, 1995).

Prevalence figures are extremely problematic, in part due to the differing definitions of 'elderly' and 'abuse', which leads to a lack of comparability between studies (Baumhover *et al*., 1990; Lachs and Pillemer, 1995; 2004). Overall, the prevalence of elder abuse from studies around the world is generally estimated to be between 2-10% (Daly *et al*., 2011; McDowell, 2010). Only a minority of cases are identified through victim complaints, the rest are diagnosed by medical practitioners or care-workers (Strasser *et al*., 2013).

Clinical Indicators of Abuse

Elder abuse is still a phenomenon that remains outside of the mainstream of modern medical thinking leading to low rates of diagnosis in a clinical setting (Bennett, 2003). The reasons for this include: a lack of medical training in diagnostic criteria; the complexities of differentiating the signs of injury or neglect from natural ageing processes (e.g. poor vascular and skeletal integrity, skin fragility, dementia) (Chen and Koval, 2002; Kim *et al*., 2007), as well as ageist perceptions (Dobbs *et al*., 2008). Medical professionals have a tendency to assume a natural cause of death for elderly victims, when similar circumstances in younger adults may be deemed suspicious (Püschel, 2008).

Violent, interpersonal attack produces particular types and patterns of lesions on the soft tissues, skeleton and dentition. Skeletal lesions have long-term diagnostic power, enabling physical abuse to be identified years after the event(s), and even after an individual's death and burial. The scant clinical literature available from victims of elder abuse does recognise the diagnostic power of skeletal trauma, drawing upon orthopaedic and dental expertise (Chen and Koval, 2002; Switzer and Michienzi, 2012; Zephro and Galloway, 2013). However, the majority of published evidence tends to be anecdotal, or in the form of medical case vignettes, rather than the detailed synthesis of clinical evidence from victims (Daly *et al*., 2011; Elder Justice Roundtable 2000).

As in child abuse, many lesions associated with elder abuse are non-specific and few can be considered pathognomonic; rather it is the combination of lesions that is most diagnostic (Lachs and Pillemer, 1995). The most common injuries indicative of abuse in the elderly are located on the face, neck, thorax, genitals and hands (Püschel, 2008). Zeitler (2005) reported that approximately 30% of known elder abuse cases presented with neck, facial and dental injuries, though others have provided much higher figures (e.g., Stavrianos *et al*., 2010 argued that 75% of physical injuries are inflicted to the head, face, mouth and neck region). Table 3a synthesises generalised signs of elder abuse within a clinical context, while Table 3b draws attention to the skeletal indicators, ordered by anatomical location. A recent synthesis of the locations of injuries associated with elder abuse has been compiled by Murphy and colleagues (2013). The upper extremities were most commonly affected (44%), followed by the facial bones (23%) and cranium (12%). Unfortunately, the data-set is not directly applicable to the archaeological record as the majority of the injuries included were superficial.

Fractures

There are particular features intrinsic to the physiology of the elderly that need to be considered when interpreting fractures in terms of abuse. Metabolic changes (e.g. osteoporosis) and degenerative diseases such as secondary metastatic carcinoma result in an increased likelihood of pathological fractures (Collins, 2006). Poor vision and motor neuron problems will also increase the likelihood of falls, in addition to a variety of other degenerative diseases. However, the location and type of fracture may

raise suspicion: mid- and lower facial fractures, rib fractures, and spiral or oblique fractures of the extremities are more indicative of abuse than accident (Püschel, 2008; Dyer *et al*., 2003; Rubio, 2009). In a study of intimate partner violence, the region of the head, neck and face was the only one found to be statistically significantly related to abuse (Wu *et al*., 2010). A comparative study of blunt force cranial fractures from accidental falls versus homicidal blows found that in the latter 75% occurred above the 'hat brim zone' (Kremer *et al*., 2008). Furthermore homicidal blows tend to result in comminuted or depressed fractures, whilst those from falls produced linear or radial fractures (Guyomarc'h *et al*., 2010). Facial fractures are rarely caused by accidental falls, but are a common sequelae of blows to the face, which may also result in dental fracture, or avulsion of single-rooted teeth. The neck region has additionally been identified as a common site of injury in elder abuse. Ossification of the thyroid and cricoid cartilage occurs in later life and these structures may preserve evidence of trauma in skeletonised human remains (Wedel and Galloway, 2013). In order to diagnose abuse from evidence of trauma, a much more compelling case can be made if more than one chronologically distinct episodes can be identified on the skeleton. Fractures in various stages of healing are much more suggestive of abuse than a single trauma event.

Hip fractures and compression fractures of the vertebrae should not be considered indicative of abuse as these are commonly observed in elderly individuals as a consequence of osteopenia (Chen and Koval, 2002). However, fractures in individuals who are immobile should raise further suspicion, although in those elderly with severe loss in bone mass, it is possible for such trauma to occur through normal care provision (Brogden and McDowell, 2003). Immobility is not always possible to infer from skeletal remains, but may be indirectly implicated through atrophy in some or all of the bones, osteopenia, or osseous lesions associated with severe pressure sores (see below; Tilley and Oxenham, 2011).

Decubitus Ulcers

Decubiti occur when parts of the body are subject to pressure for long periods, blood flow is restricted and soft tissue becomes necrotic. These lesions provide an indirect indicator of immobility. An analysis of prevalence amongst elderly residents of nursing homes in Germany demonstrated that 25% exhibited pressure sores (DiMaio

and DiMaio, 2001). By contrast, a study of post-mortem records of victims of elder abuse from the USA noted that almost all of the victims (95.4%) had pressure sores (Shields *et al*., 2004). While decubiti cannot be interpreted directly in terms of abuse and neglect in the clinical context, when severe and untreated, they add to the index of suspicion.

Pressure sores are graded on a scale of one to four, with four being the most severe, penetrating the muscle, bone and supporting structures (Figure 1). As a consequence, the infection elicits a skeletal response visible in the bioarchaeological record. In individuals who are bed-ridden, pressure sores are most commonly observed in the sacrum, greater trochanters of the femur, calcanei, and occipital bone of the skull, while in chair-ridden individuals they will be more common on the ischial tuberosities (DiMaio and DiMaio, 2001; 2002) (Figure 2). In a clinical context, the majority of grade three and four sores are found on the sacrum (DiMaio and DiMaio, 2001). A common complication of severe decubiti is osteomyelitis (Dimant and Tinael, 1987; Yoshikawa and Curham, 2002). Osteomyelitis associated with pressures sores is difficult to diagnose clinically (Livesley and Chow, 2002). However, a 'virtual autopsy' study of elder individuals using Computed Tomography successfully imaged the skeletal changes associated with chronic decubiti that would not ordinarily be observed during conventional post-mortems (Daly and Fowler, 2011).

Almost no research has examined the presence of pressure sores from a bioarchaeological perspective. The *os coxa* of a 19th century older female excavated from the London Hospital exhibited pressure atrophy bilaterally on the ischial tuberosities, which is likely to have occurred as a consequence of pressure sores (Figure 3) (Fowler and Powers, 2013). In the forensic anthropology literature, Klepinger (1978) describes bilateral erosive lesions on the greater trochanters, with little or no new bone growth, resulting from pressure atrophy and associated with overlying pressure sores.

Identification of Elder Abuse in the Past

The clinical evidence for elder abuse and neglect follows similar patterns to those incurred through child and intimate partner violence towards younger women, though

with some key differences relating primarily to the physiology of the ageing body. It is unfortunate that clinical research on elder abuse continues to be under-represented. The majority of the published evidence simply repeats standard tables of likely physical markers, but without underlying, in-depth, empirical data obtained from large samples of established ante- and post-mortem cases of elder abuse. Nonetheless, patterns of skeletal lesions and criteria for use by bioarchaeologists, which relate to trauma and decubiti, have been collated here in order to facilitate a differential diagnosis.

To summarize; fractures indicative of elder abuse are likely to be located to the cranium, facial bones and dentition, neck (cervical vertebrae and clavicles), upper extremities (spiral fractures to the humeri) and torso. By contrast, compression factures to the vertebrae, fractures to the ulnae and radii, or to the femoral neck are more likely to be the consequence of accident or age-related metabolic disease. Fractures at different stages of healing are also highly significant and multiple injuries of the skeletal elements described above strengthen the diagnosis. Ante-mortem fractures that have completely healed are less easy to interpret as it is possible that the trauma occurred at a much earlier stage of a person's life. Likewise, peri-mortem trauma can sometimes be difficult to distinguish from post-mortem trauma in archaeological contexts, particularly when dealing with fragmentary remains. However, within bioarchaeology, there has been considerable progress over recent years in identifying peri-mortem trauma resulting from inter-personal violence (e.g. Loe, 2009; Ríos *et al*., 2014). The relationship between immobility and trauma is also important to decipher in clinical cases of elder abuse. In archaeological contexts, it is possible to make inferences concerning immobility through observation of specific impairments, or more generalised indicators such as osteoporosis, bone atrophy, and the presence and anatomical location of decubiti.

Pressure sores have rarely featured in the palaeopathological literature, despite having a high prevalence amongst elderly individuals today and the likelihood of skeletal sequelae in severe cases. Decubiti should be considered as a differential diagnosis when periosteal new bone formation, osteomyelitis, or erosive lesions are observed in the anatomical locations identified (Figure 2). It seems very likely that these lesions are under-diagnosed in palaeopathological analyses and this study raises awareness of

this issue. In an archaeological context, it is possible that such lesions could be misidentified as post-mortem erosion and an awareness of the likely location of pressure sores and the distribution of these erosive lesions is important for diagnosis. While decubiti alone are not indicators of abuse, they provide indirect evidence that an individual was either bed- or chair-ridden and are of value for the study of impairment as well as care and treatment in the past.

An obvious limitation of identifying elder abuse in past populations relates to taphonomic and methodological problems in identifying elderly people. Bone mass peaks by about 20 years of age, then reduces at a rate of approximately 1% per year, although for women there may be a menopausal acceleration (LeBoff and Galowacki 1999: 161). The bones of older adults, in particular females, are therefore significantly less mineralised and more susceptible to poor preservation in the archaeological record. Furthermore, current techniques of osteological age estimation employ extremely broad older age categories (e.g. 50+ years) and are renowned for under-estimating the age-at-death of older individuals. These problems stem from individual variation in the expression and degeneration of the morphological features used to estimate age, in addition to statistical biases in current techniques (Gowland 2007). These problems are being addressed through the development of novel techniques for identifying the very old (e.g. Falys and Prangle 2014; Cave and Oxenham 2014) and the use of Bayesian statistical methods (Gowland 2007).

While there are many forms of abuse (Table 1), it is only physical abuse and potentially neglect that we may be able to access in the archaeological record. In the diagnosis of abuse in a clinical setting context is important, including: cleanliness, dress, appearance of the skin, mental cognisance, interactions between the carer and patient. In an archaeological setting context is also vital; for example, indirect evidence of the social marginalisation of older individuals may be apparent from the burial record, including non-normative, or spatially distinct burials. For example, Blom and colleagues (2014) discuss the burial of an older female from a Tiwanaku site, buried in a simple pit with no grave goods. Unusually her cranium has not been shaped in childhood and isotopic evidence suggested a childhood that was not local to the area, although she had likely resided there for some years prior to death. The authors also note that she had sustained repeated episodes of trauma prior to death,

including a minimum of 14 rib fractures in different stages of healing as well as healed facial fractures. Both the contextual and skeletal evidence in this instance is suggestive of elder abuse.

Older female burials from Roman Britain are more often subjected to marginal burials than their younger counterparts (Gowland 2007). For example, an older female from Roman Lincolnshire was buried in a ditch and covered with backfill; her skeleton exhibited some (ambiguous) evidence for peri-mortem trauma to the left frontal bone. The burial was away from a formal cemetery or settlement and the position of the body suggested little care in its deposition. The circumstances of burial and the possibility of cranial trauma raises the suspicion of abuse. Another burial of an older female from Roman York, reported by Holst (unpublished), was buried in a formal cemetery, though the body had been decapitated and the skull placed next to the legs. The decapitation burial rite is well-known from Roman Britain and the removal of the head is generally believed to have occurred after death; while often regarded as denoting a 'deviant' status, the reasons for this practise are unknown (Philpott 1991). Distinct from the decapitation trauma, this older female also exhibited evidence of extensive peri-mortem trauma in the region of the face and neck – common anatomical locations in cases of elder abuse. This evidence is again suggestive of elder abuse. In the Roman world, a wife would be financially dependent upon her husband during his lifetime (Parkin 2003). Women usually married in their late teens to early twenties, while men tended to marry in their thirties (Harlow and Laurence 2011); consequently there was a good chance that a wife would outlive her husband. If a widow had no independent income, she would then become dependent upon her children for support. Societies in which there are relationships of economic and physical dependency, and responsibility for care falls to the immediate family, are those in which elder abuse is a possible outcome (Bennett *et al*., 1997).

Conclusion

What constitutes abuse is subject to culturally specific interpretation: abuse has been described as being 'in the eye of the beholder' (Callahan, 1988:454). What is regarded as child abuse varies cross-culturally and similar ambiguities are likely to arise at the older margins of the life course. When considering elder abuse in the past we need to be cognisant of the fact that old age is subject to different interpretations cross-

culturally and can only be understood when situated within the context of the life course as a whole. The shifting power dynamics within families as people age need to be considered in order to arrive at a more nuanced life course perspective on the pattern and nature of traumatic lesions indicative of abuse. Within bioarchaeology, elder abuse should at least be on our 'radar' as a differential diagnosis when interpreting trauma and other osseous lesions on the skeletons of older individuals. We also need to consider the more subtle skeletal lesions associated with decubiti and the information they may provide concerning immobility. Finally, in archaeology we have neglected the older demographic almost entirely and this needs to be addressed. Archaeologists have the potential to provide a long-term perspective on the care and treatment of past elders and thus are positioned to make significant contributions to important contemporary debates regarding this global issue.

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Physical Abuse	The infliction of physical harm or injury
Sexual Abuse	Unwanted sexual contact
Psychological Abuse	The infliction of mental anguish
Material Abuse	The illegal or improper exploitation and/or use of funds or resources
Active Neglect	The refusal or failure to undertake a caregiving obligation, including conscious attempt to inflict physical or emotional pain or stress
Passive Neglect	The refusal or failure to fulfil a caretaking obligation, excluding conscious attempt to inflict physical or emotional pain

Table 1: Categories of abuse originally proposed by Wolf and Pillemer (1989), though here sexual abuse has been separated from physical abuse in line with more recent definitions.

Risk Factor	Characteristics
Intra-individual dynamics	**Abuser**: Mental health issues, drug or alcohol abuse, relating primarily to the abuser (up to 35% of perpetrators). **Victim**: Frailty; poor health; cognitive impairment may increase the likelihood of being abused by three to four times (not all studies concur with this). However, the characteristics of the abuser are a more significant risk factor than those pertained to the abused.
Inter-generational transmission of violence	A history of longstanding abuse within families, usually those who are co-habiting (with the exception of financial abuse). The vast majority of abuse occurring within the home is from spouses or adult children. For example, spousal abuse that continues in later life, or 'inverted abuse' (e.g. an abused child or spouse, then becomes the abuser).
Dependency	Current evidence indicates that it is often the abuser who is financially dependent on the victim, though the victim may be physically dependent.
Carer stress	The original assessment by Eastman (1984) which characterised the abuser as the stressed adult daughter of a physically dependent mother has been superseded since the 1990s.
Social isolation	The majority of victims are older females who tend to live in the private rather than public domain. Limited social contacts means that abuse may occur unimpeded.

Table 2: Risk factors associated with elder abuse (Compiled from Baumhover et al. 1990; McCreadie 2003; Bennett and Rowe 2003; Homer and Gilleard 1990; Lachs and Pillemer 1995, 2004; Switzer and Michienzi 2012; Aitken and Griffith 1996; Collins 2006; Biggs, *et al*. 1995. NB not all studies concur with these risk factors)

Generalised Clinical Indicators of Elder Abuse

- Verbal description of the mechanism of injury from the patient or carer is inconsistent with the observed pattern of trauma.
- Delays between injury and medical attention
- Poor personal hygiene
- Rashes and sores
- Skin turgor as a sign of dehydration
- Malnutrition
- Burns
- Lacerations and abrasions
- Traumatic alopecia
- Contractures
- Presence of multiple fractures in the absence of severe osteopenia or other underlying pathological cause (e.g. metastatic carcinoma).
- Fractures in the elderly who are immobile are more suspicious.
- Bruises in multiple stages of healing; bruises reflecting shape of article or in unusual patterns; bruises from abuse tend to be greater than 5cm and located on the face, neck, lateral right arm and posterior torso; falls do not usually produce bruising on the inside of thighs.

Table 3a. Generalised clinical injuries associated with elder abuse.

Localised Skeletal Injuries Associated with Elder Abuse	
Location	**Injury**
Dentition	• Fractured teeth • Subluxated or avulsed teeth • Fractures of maxilla and mandible • Poor oral care
Face	• Fracture to orbit, nasal bones, zygomatic bones
Cranium	• Blunt or sharp force trauma • Comminuted or radial fractures above the 'hat rim' line. • New bone formation in response to scalp haematomas NB Subdural haemorrhage secondary to inflicted trauma is a common cause of death in elder abuse.
Trunk	• Decubiti (pressure sores) located on the ischial tuberosity, sacrum, vertebral processes. NB decubitus ulcers in non-lumbar/sacral areas are thought to be more likely associated with abuse. • Multiple rib fractures • Fractures of the dorsal and lumbar spine • Skeletal trauma in location of breasts (i.e. ribs) or genitalia (i.e. pubis)
Upper Extremities	• Poorly aligned fractures indicating a lack of medical treatment • Spiral or oblique fractures are less likely to occur in immobile elderly • Defensive injuries on inner arms, dorsal hands or forearms • Decubiti on the scapulae or elbows
Lower Extremities	• Defensive injuries on inner thighs • Decubiti on calcanei and greater trochanters

Table 3b: Localised skeletal indicators of elder abuse.

(Tables 3a and 3b compiled from data in: Püschel, 2008; McDowell, 2010; Bennett, 2003; Bennett *et al*., 1997, Chen and Koval, 2002; Lachs and Pillemer, 1995; 2004; Shields *et al*., 2004; Lindbloom *et al*., 2005; Collins, 2006; Rubio, 2009; Stavrianos *et al*., 2010; Switzer and Mickienzi, 2012; Bennett and Kingston, 1993; Biggs *et al*. 1995: Wiglesworth *et al*., 2009; Murphy *et al*., 2013; Wedel and Galloway, 2013).

Figure 1. Grades of severity recorded for decubiti in a clinical context.

Figure 2. Common location of decubiti in a bed-ridden individual, lying supine.

Figure 3. Left ischial tuberosity of an older female excavated from the London Free Hospital, 19th Century. Note the atrophied surface of the entire surface of the ischial tuberosity, with some new bone formation evidence on the surface.