

CASE REPORT

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The diagnosis of a murder from skeletal remains: a case report

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Abstract A skeletonised body was found in a Danish forest. The examination of the bones revealed several incisions on the skeleton, one located on the cervical column, two on the sternum, one perforating incision to the right iliac crest, and several superficial ones to the ribs and the right tibia. The skeletonized body was thought to be that of a young man in the twenties with a height of 170 cm. It was estimated that the body had been lying at the spot for at least 1 or 2 y and had been murdered by several stab wounds to the chest and abdomen. Police enquiries subsequently revealed that the deceased was a 23-year-old male

with a height of 171 cm. A man confessed to having murdered the victim 1½ years earlier with several stab wounds to the face/neck, chest, abdominal wall and thigh.

Key words Forensic anthropology · Skeletal remains · Stab wounds

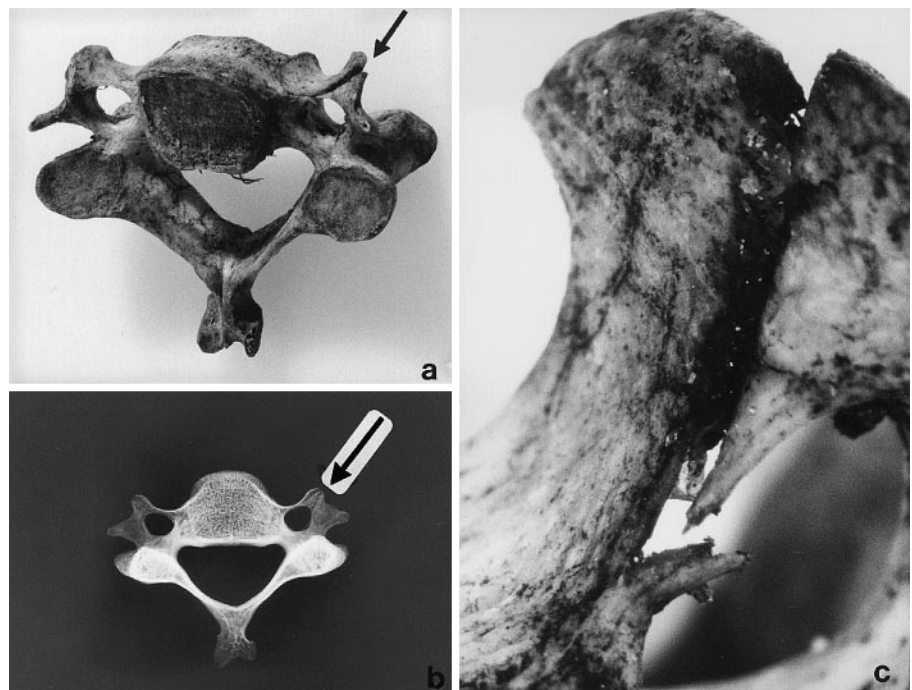
Introduction

Forensic anthropology is a discipline which for legal purposes deals with the identification of skeletal remains with regard to the determination of sex, age, height, race and, if possible, cause of death.

Denmark does not have specialists in forensic anthropology, and this discipline is therefore mainly dealt with

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Fig. 1 a–c A sharp lesion through (a) the left processus transversus of the cervical vertebra ($\times 1.4$), (b) an X-ray photograph of the lesion (marked with an arrow) ($\times 0.8$) and (c) a stereomicroscopic view showing the displacement of the fracture ends ($\times 13$)



by forensic pathologists who are specially interested and skillful within this area. The Department of Forensic Medicine in Copenhagen has, however, recently expanded into this area.

The following case is of interest not only because the identity of the individual was established from skeletal remains but also because the cause and manner of death could be determined.

Case report

In spring 1994 the skeletal remains of a human being were found in a small forest in the middle of Jutland. All the skeletal remains were recovered except for some fingerbones, one radius and the hyoid bone. Several cut marks were found on the bones, one was found through the left transversal process of a cervical vertebral body (Fig. 1), two were located at the sternum, one at the edge of the manubrium with a perforating lesion (Fig. 2) and a superficial one at the distal part of the sternum. In addition sharp lesions were found in six different ribs, two of which perforated the ribs (Fig. 3) and the others were superficial sharp lesions. One perforating

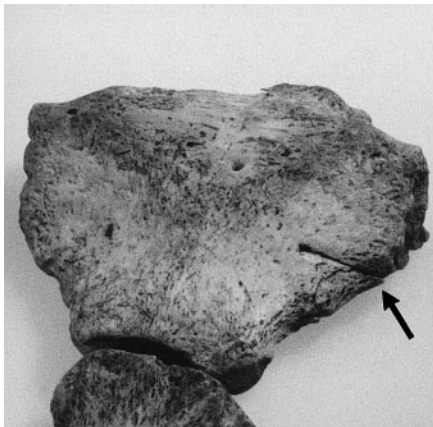


Fig. 2 A sharp lesion through the edge of the manubrium (*arrow*) ($\times 0.9$)



Fig. 3 Sharp lesions (marked with an arrow) through the ribs with the sharp contours of the rib ends (see Fig. 8 for more details) ($\times 0.8$)

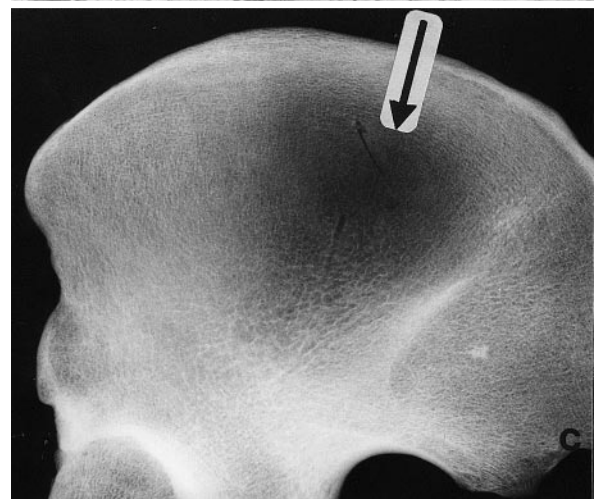
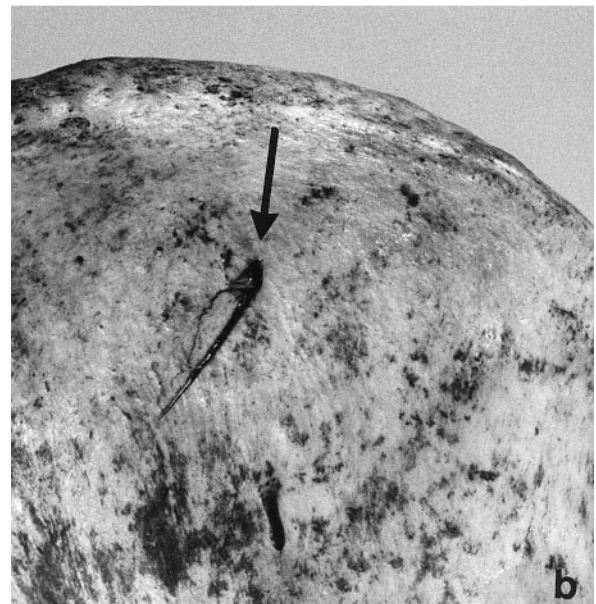


Fig. 4a-c An overview of (a) the male configured pelvis with a sharp lesion through the right iliac bone (*arrow*) ($\times 0.2$), (b) a close up view of the sharp lesion showing the displacement and bleeding at the edge of the lesion and that the knife was single-edged (*arrow*) ($\times 1.2$), and (c) X-ray picture of the lesion (*arrow*)



Fig. 5 Superficial marks at the upper part of the right tibia (*arrow*) ($\times 1$)

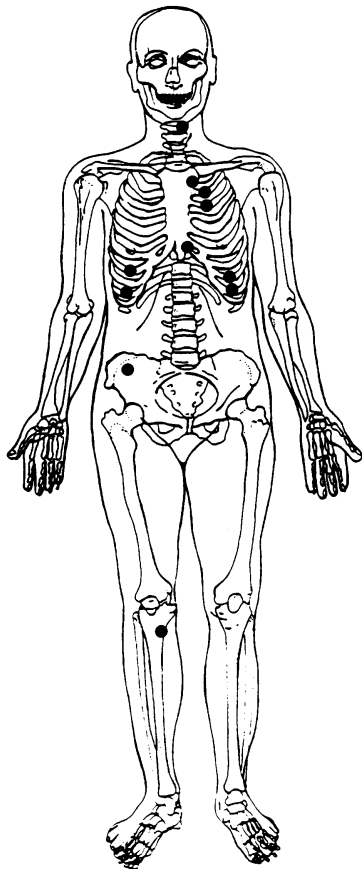


Fig. 6 Schematic drawing showing the location of all the sharp lesions (*marked with dots*)

sharp lesion was found through the right iliac crest (Fig. 4) and two superficial marks were seen at the upper part of the right tibia (Fig. 5). The locations of the lesions are shown in Fig. 6.



Fig. 7 Pubic symphysis indicative of late phase I where the horizontal ridges are well marked, and there is no clear distinction between the *upper* and *lower* part of the symphysis

Stereomicroscopical examination of the perforating sharp lesions disclosed displacement and discolouration of the fracture ends (Fig. 1). The lesions to the manubrium, the ribs and the iliac crest could all be seen on X-rays (Fig. 4).

The cranium and the pelvis had male characteristics [1] such as a male sciatic notch, a male subpubic angle, larger mastoid processes and prominent muscle markings. The height of the individual was estimated to be 170 cm on the basis of the length of the humerus and the femur using the formula of Dupertuis & Hadden [2].

The cranial sutures of the skull were open except for a small part of the posterior sagittal suture, the pubic symphysis corresponded to a late phase I with ridges and furrows with no distinct delimitation of either extremity according to the age grading of Brooks & Suchey [3] (Fig. 7), the sternal end of the third rib was graded as phase III according to the grading of Iscan, Loth et al. [4] (Fig. 8), and the surface of the sternal end of the clavicle showed a morphological phase I-II according to the description of Szilvazzy [5].

X-ray examination did not show any sign of pathological changes of the skeleton, and no age-related degenerative changes of the skeleton e.g. arthrosis were found. From these findings the age of the deceased was suggested to be within the range of 25–30 years.

The final report submitted to the police concluded that the deceased was probably a male in the age range 25–30 years who had been murdered by several stab wounds to the neck, chest, abdomen and legs. It was estimated that the body had been lying in the forest for several months, most probably for more than a year.

Police investigations subsequently disclosed that the deceased was a 28-year-old Iranian refugee with a height of 171 cm. His



Fig. 8 Sternal end of the third rib showing phase 3 with a wide V-shape of the rib end and thin edges with a regular scallop-like pattern along the edges

identity was verified by the forensic odontologist. Another Iranian refugee admitted to having murdered the deceased hitting and stabbing him with a hunting knife several times to the face/neck, breast, abdomen, and legs. The murder took place about 18 months before the body was found.

Discussion

The case reported is an illustration of how much information can be obtained from skeletal remains. An autopsy disclosed several stab wounds leading to the conclusion that the deceased was stabbed to death. This was subsequently verified.

It can be difficult to determine if bone lesions have been sustained ante or post mortem, however, stereomicroscopy may help to determine this as the fracture ends will show displacement and discolouration due to haemorrhaging.

Sex can usually be determined on the basis of the characteristic appearance of the cranium and the pelvis [6]. A good estimate of age in adults above the age of twenty is best obtained from the combination of the closure of the cranial sutures [1], the pubic symphysis [3], the rib ends [4], and the morphological appearance of the sternal end of the clavícula [5]. All these age markers were used in our case to determine age leading to an age estimation which was very close to the true age. The absence of sign of arthrosis or degenerate changes of the vertebral column confirmed that the deceased was a young person.

Other age markers than those used in this case might be useful i.e. specific measurements on the pelvis and skull [7], or on the long bones [8, 9]. Other methods to mention are histomorphometry of cortical bones [10, 11],

the spongiosal structure of long bone [12] [13] or the cortical thickness [14]. Most of these methods are not widely used because of lack of experience, and their value for the estimation of age have to be explored further. A recently published study by Brockstedt et al. [11] indicated that age- and sex-related changes can be identified from cortical bone mass – at least in the iliac crest. Histomorphometry on trabecular bone structure has shown age- and sex-related changes using recent histomorphometric and stereological techniques [15] indicating that histomorphometry of trabecular bone structure may also be of value for age estimation.

The final identification of an individual may not always be easy in case the teeth or a dental report are missing. The new computerized technology combined with detailed morphological and osteometrical methods [16] may be a valuable tool in future.

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