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Case report

Gunshot wound in skeletonised human remains with partial adipocere formation

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ABSTRACT

We present a case of skeletonised human remains. In the present case report, a body was exhumed from the ground above a cemetery. On exhumation, the body was partially-skeletonised with adipocere formation on the upper part of the body. Autopsy of the body showed two bullets in the right thigh muscle and lumbar vertebrae between L4 and L5. Postmortem changes and destruction of soft tissue made it impossible to determine direction of fire through the body, even in a careful complete autopsy.

1. Introduction

Exhumation can be defined as the act of digging something from the burial ground.[1] It is performed only for special reasons such as moving the body to a different location or to be buried closely with family members. Taphonomic effects of erosion on deliberately buried bodies have been studied. In the case of wind erosion, the bone becomes very poorly preserved while, water erosion may cause both the remains and the deposits to be lost at the same time, although the bones may be well preserved. This observation is particularly useful for the investigation of clandestine burial and time since deposition.[2] Ground penetrating radar (GPR) was used to detect cadavers buried in different types of soil, and it was found that it may be difficult to detect cadavers soon after they are skeletonised as the surrounding area may not provide a strong contrasting area to be detected by GPR. Also, bodies buried at deeper depths may not give good detection as they showed reduced decomposition rates.[3] Alternatively, odour analysis of decomposing buried human remains may be used to detect human remains in burial grounds.[4]

Adipocere is often being found in buried bodies. Adipocere is yellowish, cheesy product which has an ammoniacal odour. There are factors in the surrounding soil either accelerate or slow the formation of adipocere in buried bodies.[5] It was documented that soil conditions particularly its water content is a crucial factor in enhancing the formation of adipocere,[6] while decomposition of soft tissue will stimulate changes in the soil microenvironment.[7] In addition, the presence of coffins slows down the formation of adipocere, but clothings enhance its formation.[8] Literature has depicted that the time required for adipocere formation varies from three days to five years.[9] Nevertheless, aeration of adipocere in corpses disappear within several years.[10]

Identification in fragmented human bones can be difficult due to commingled human and animal remains. The process of documentation and handling of multiple fragmented human bones have been positively identified in death cases in Germany especially during world war II.[11] Besides having morphologic means of identification, mtDNA of skeletal remains may be useful even in human remains, buried centuries ago.[12] It has been documented that postmortem radiographic examination is useful in determining gunshot injuries and bullet locations both in human and in animals.[13,14] Here, we describe a case of a buried body with gunshot wounds, in which computerized tomography (CT) and magnetic resonance imaging (MRI) were used to localize the bullets.

2. Case report

In this case report, we describe a body, which was buried in a clandestine burial above an old grave. Identification of the grave

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was done by the cemetery authorities and family members of the deceased. This was necessary to respect the body and to prevent further disturbance. The grave yard was closed by the police from possible interference by the public or media. The criminal suspects were brought in to identify the grave before the magistrate and the pathologist. Protective and disposable masks, gowns, and gloves were worn by the personnel to protect themselves from possible transmission of disease.

Exhumation of the grave showed that the deceased's head was buried under a cement block, which was 43 cm below the ground surface. The body was clad in short-sleeved shirt and trousers, and was in left lateral position with all four limbs flexed. Some adipocere formation was found on upper part of the body with partially-skeletonised lower body. The skeletal remains were dug in one piece along with some soil into a body bag. This was done to avoid loss of evidence and to prevent unnecessary movement of the skeleton. Collection of soil samples from the grave was not performed, as there was no suspicion of drug or heavy metal poisoning. In sudden death, when other specimens are unavailable due to degradation, bone marrow can be useful specimen for detection of drug in drug poisoning.[15] The body was buried in a grave measuring 2.3 metres × 85 cm 85 cm in length, width and depth, respectively.

In one study, TraumaSCAN-Web, a Java based system was used to assess thoraco-abdominal penetrating trauma from gunshot and stab wounds, and this system is based on geometric calculations on anatomic involvement in injury.[16] However, in this case, computerized tomography (CT) and magnetic resonance imaging (MRI) were used to assess the skeletal remains prior to autopsy. It showed presence of two bullets between L4 and L5 (Fig. 1) vertebrae and distal right thigh. The bullets (copper-jacketed) retrieved from the vertebrae and right thigh measured 1.3 by 0.4 cm and 1.2 by 0.4 cm, respectively. The bullets were sent to a ballistics laboratory as evidence, where they were confirmed to be 9-mm copper-jacketed bullets.

Postmortem examination in exhumation cases is basically the same as in fresh body, but may require some modifications where necessary.[17] A lot of information may be gained from exhumed cases, for instance soft tissues may survive between 8 years to about 16 years of burial time. This is particularly applicable for burials in cold temperature, in which changes of injuries may still be visible.[18,19] Nevertheless, in this case the soft tissue was completely disintegrated. There was no skin or soft tissues to document the bullet pathway in the body. The soft tissues had disintegrated due to postmortem changes. The body was partially-skeletonised on lower part of the body, in which several tattoos were present on the abdomen, back and anterior left thigh. This was particularly useful for identification purposes. In addition, two bullets were retrieved from the right thigh and between the lumbar vertebrae, L4 and L5. The vertebrae were not fractured, but the medial condyle of left femur showed a bullet path with surrounding contusions.

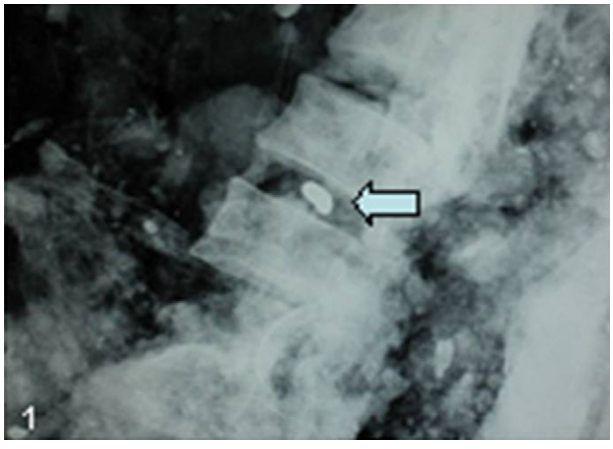

Fig. 1. Photograph of CT scan and MRI demonstrating a bullet between two lumbar vertebrae, L4 and L5.

Anthropologic assessment showed an incomplete skeletal inventory with several extremities bones missing. The coccyx bone showed a right lateral deviation, which provided a unique identification feature (Fig. 2a). Additionally, intra-medullary nailing was present in the right femur with the end of the nail abutting the bone proximally (Fig. 2b). There was evidence of partially fused spiral fracture with spurs and callus formation of the middle third of right femur. There were some peculiar greenish stains in the distal right thigh, which was consistent with that of a copper-jacketed bullet. A bullet was retrieved from the medial condyle of right femur with surrounding contusion (Fig. 2c and d).

Further, the stature was determined by using mean values of methods by 'Dupertuis and Hadden's and 'Trotter and Gleser'. Racial affiliation was determined by using the average of several indices such as cephalic, brachial, crural, inter-membral and intra-membral indices. The age was estimated by taking mean values from examination of cranial suture closure, pubic symphyseal surfaces and rib bone. Sex was assessed by examining pelvis, femur, humerus, skull, long bone, sternum, mandible and scapula. Based on anthropologic assessment, the deceased was European male with mean stature of 178.07 cm and estimated age of 41 years old.

3. Discussion

According to the suspect, the deceased had received two shots in the right knee and abdomen. It may be argued that for the bullet to reach lumbar vertebrae, two possibilities are anticipated. The shot could have been discharged to the abdomen or it could be a shot directly to the back. If a shot to the abdomen is anticipated, the bullet would have lost its kinetic energy upon traversing the peritoneum and internal organs in order to reach the vertebrae. However, the presence of advanced decomposition with absence of soft tissue has made it very difficult to determine direction of fire in this case. On the contrary, it could also be a shot direct to the back, which may or may not show fracture of the vertebrae. Studies have shown that penetrating bullet to the back did not cause fracture of the surrounding vertebrae, but dissipates thermal and kinetic energy into the surrounding tissues.[20] In this case, the lumbar vertebrae were not fractured. Hence, the allegations made by the suspects could either be true or false.

As per the police, the deceased was a criminal suspect, who had involved in car thefts around the country. He was kidnapped by a group of gangsters, who had shot him in the right knee. A CCTV at a hotel had successfully captured his picture, who was seen limping on his right leg. He received a fatal shot to the abdomen and died. He was buried in a clandestine grave with the help of his accomplices. The body was later dug by animals and re-buried, during which cement mixture was poured to the head in order to cover it completely.

In this case, the deceased was shot and buried in a clandestine burial. Because the deceased was a criminal, the license for exhumation was issued by the magistrate court to gain new forensic evidence. The identification of the deceased was made by the suspects based on the identification of the burial place, the deceased and his personal effects. In brief, the circumstantial evidence well corroborated to the accounts given by the suspects.