J Forensic Sci, May 2004, Vol. 49, No. 3
Paper ID JFS2003345
Available online at: www.astm.org

CASE REPORT

Hideki Asamura,[1] *M.D., Ph.D.; Kayoko Takayanagi,*[1] *M.D.; Masao Ota,*[1] *Ph.D.; Kanya Kobayashi,*[1] *M.S.; and Hirofumi Fukushima,*[1] *M.D., Ph.D.*

Unusual Characteristic Patterns of Postmortem Injuries

ABSTRACT: Animal scavenging is one of the most significant causes of postmortem injuries. A large variety of scavenging animals have been reported on in previous papers. Although postmortem injuries attributable to birds are well known in the case of "aerial burial," the custom in Tibet, few cases of bird scavenging have been reported. In the two cases discussed herein, postmortem injuries were attributed to crows. Both cases, shared characteristic patterns of postmortem injuries, and in both cases death was attributed to fire. Although massive tissue loss by the crow scavenging made it difficult to determine the cause of the death and rendered personal identification difficult, 1 mL of blood drawn from the intracranial cavity and DNA analysis enabled this information to be determined, albeit with some difficulty.

KEYWORDS: forensic science, postmortem injuries, crow scavenging, charred body

Postmortem injuries attributed to animals due to scavenging and removing of cadaver remains often makes it difficult to obtain accurate information via autopsy, including the identity of the victim and cause of death. A large variety of animals known to inflict postmortem injuries have been reported to date in previous papers. Flies or maggots are the most common insects associated with decomposing bodies (1,2). Although they are able to cause massive tissue loss, observing their stages of development (from eggs to imagoes) can provide information on the length of time a cadaver has been dead. Rodents are also common scavengers known to gnaw on skeletal remains as well as soft tissues (3,4). Indoor pets (dogs and cats) inflict postmortem injuries, while pets can also inflict fatal wounds while persons are alive (5–7). Bears are one of the largest wild carnivores reported to inflict postmortem injuries (8). With tissue injuries attributed to sharks, it is often difficult to determine whether the shark attack resulted in death or merely represented feeding on postmortem remains (2).

Here we present two cases of postmortem injuries by crows. These cases shared characteristic patterns of postmortem injuries, and in both cases death was attributed to fire.

Case Histories

Case 1

A charred body was found in a supine position in a flood plain with a burnt gas tank and throwaway lighter. A significant amount of crow droppings were found around the corpse. The remaining skin was carbonized with mummification, while no skin and no soft tissue was found in face, neck, chest, and limbs. In the left buttock erythema and blisters were recognized as a sign of vital reactions. It was of much interest that string-like fluffy remains, considered to be nerve fibers and muscle fibers (including tendons), were found in every limb joint (Fig. 1). Moreover, periosteum—including skull, ribs, and bones of the limbs–was also noted as being fluffy. In the neck, cervical vertebras were exposed, and cervical organs such as the tongue, thyroid grand, trachea, and esophageal organs were lacking. No digestive organs, from stomach to colon and bladder, were recognized. Lungs, liver, spleen, and left kidney had some defects, with a serrated margin (Fig. 2*a*,*b*). These injuries showed poor vital reactions. The main bronchi were intact, and soot had collected there. Blood in the heart showed 28% Hb-CO. The cadaver was identified from dental records. A note left behind by the dead person was found in his house; it was therefore assumed that he had immolated himself.

Case 2

A carbonized charred body was found in a supine position in the back garden of a 77-year-old woman's house, while the woman, who lived alone, had been missing for several days. The cadaver was almost skeletonized, although skin remained in the right chest, back and buttocks. Skin in the back was not carbonized, and showed erythema. There were no internal organs in either the thoracic or intraperitoneal cavity; loss of the trachea was also noted. String-like fluffy remains, considered to consist of nerve fibers and muscle fibers (including tendons), were found in the head and every limb (Fig. 3). These remains were significantly noted in the forearms and hands. Some of the periosteums were found to have become fluffy. In the pelvis, ligaments also showed a fluffy appearance. In the intracranial cavity part of the brain was intact, and only 1 mL of blood, which showed 48% Hb-CO, could be obtained from the superior cerebral vein in the parietal lobe. Although intratracheal soot could not be recognized due to the loss of trachea, the corpse

[1] Department of Legal Medicine, Shinshu University School of Medicine.
Received 18 Oct. 2003; and in revised form 21 Dec. 2003; accepted 31 Dec. 2003; published 7 April 2004.

FIG. 1—*Characteristic appearance seen in every limb joint in case 1.*

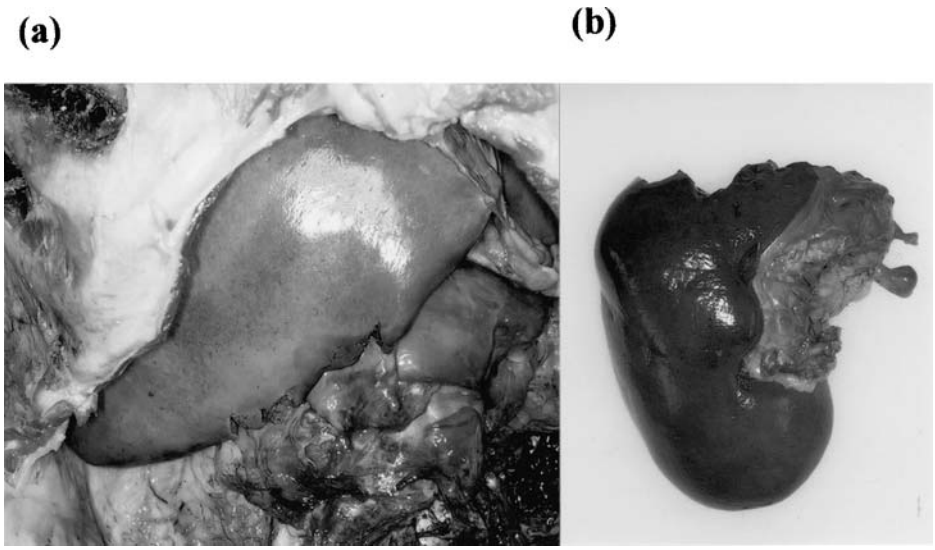

FIG. 2—*(a) Bite marks in liver caused by crows. (b) Partial loss in left kidney with characteristic margin shapes attributable to crows' bills.*

FIG. 3—*Characteristic appearance seen in every limb joint in case 2.*

was estimated to have died in the fire based on the high Hb-CO value in the blood and the erythema in the back. Through DNA analysis the corpse was determined to be that of the 77-year-old woman who had lived at the site. It was supposed that the woman had caught fire from a garbage incinerator. According to police examinations of the scene, there were significant numbers of crow tracks and droppings around the corpse, while some of the neighbors had witnessed many crows flocking in the back garden of the woman's house for the previous 2 to 3 days.

Discussion

Animal scavenging is one of the most significant causes of postmortem injury, often impeding the determination of cause of death, estimation of the postmortem interval, and personal identification of the victim. It is the custom in Tibet to leave a corpse exposed to vultures; this is called "aerial burial." It is known that vultures can skeletonize a corpse in a short time. Therefore, birds are known to be one animal that may inflict postmortem injuries; however, only

a few cases of bird scavenging have been reported. In one previous case postmortem injuries were seen in the form of unusual patchy epidermal lesions attributable to a songbird's behavior of "pecking and pulling" (9), and in another case, missing eyeballs and earlobes were attributed to crows (10).

It is well known that crows are among the largest and most clever of a variety of birds. There are approximately 40 species of crow throughout world. Most of those seen in Japan are *Corvus macrorhynchos* and *Corvus corone*, both of which types greatly favor meat despite their omnivorous nature. The former species is distributed throughout India, Southeast Asia, and Japan. It often can be seen rummaging through garbage cans in urban areas. The latter is distributed throughout the Eurasian continent, and it is considered that this species of crow is the most intelligent of all varieties. It can be seen in rural rice fields. In the present two cases, many members of the *Corvus corone* species are known to live in the area in which the corpses were found.

In Case 1, the defects with a serrated margin found in the lungs, liver, spleen, and left kidney are attributed to the bite of the *Corvus corone* given the distinctive shapes and sizes of these marks. The string-like fluffy remains in both of the present cases were assumed to be nerve fibers, tendons, and ligaments. While crows pulled the soft tissues (including muscle tissue) off with their bills, the nerve fibers, tendons, and ligaments were left adhering to the bones, as these tissues were too strongly attached for the crows to remove. Moreover, it was considered likely that these remains had become frayed and fluffy by the pecking and pulling of the crow's bills. The fluffy periosteums were also assumed to have occurred as a result of this same pecking and pulling behavior. It was concluded that these features might be considered characteristic of crow scavenging.

In Case 2, if blood had not been obtained from the brain, it could not have been estimated whether the victim had burnt while alive or after death. If the corpse had been completely skeletonized, not even the cause of the death could have been determined. Animal scavenging, including by crows, is likely to render it difficult to obtain accurate information, including personal identification of the victim and cause of death. In general, it is known that dental and fingerprint information is important in identifying the deceased. In Case 2, a severely damaged cadaver lacked sufficient dental material and fingerprints for identification, however, personal identification by DNA analysis proved effective (11).

The present two cases of crow scavenging showed some characteristic features. It may not be coincidental but rather inevitable that both of the cases represented death by fire. Crows may prefer burnt flesh, as crow scavenging has not been seen in a long time, except for in the cause of the charred bodies, despite a large existing population of crows.

References

1. DiMaio VJ, DiMaio D. Time of death. In: Forensic Pathology, 2nd ed. Florida: CRC, 2001;39–40.
2. Byard RW, James RA, Gilbert JD. Diagnostic problems associated with cadaveric trauma from animal activity. Am J Forensic Med Pathol 2002;23:238–44. [PubMed]
3. Haglund WD, Reay DT, Swindler DR. Tooth mark artifacts and survival of bones in animal scavenged human skeletons. J Forensic Sci 1988;33: 985–97. [PubMed]
4. Haglund WD. Contribution of rodents to postmortem artifacts of bone and soft tissue. J Forensic Sci 1992;37:1459–65. [PubMed]
5. Rossi ML, Shahrom AW, Chapman RC, Vanezis P. Postmortem injuries by indoor pets. Am J Forensic Med Pathol 1994;15:105–9. [PubMed]
6. Munnynck KD, Voorde WV. Forensic approach of fatal dog attacks: a case report and literature review. Int J Legal Med 2002;116:295–300. [PubMed]
7. Chapenoire S, Camiade B, Legros M. Basic instinct in a feline. Am J Forensic Med Pathol 2001;22:46–50. [PubMed]
8. Carson EA, Stefan VH, Powell JF. Skeletal manifestations of bear scavenging. J Forensic Sci 2000;45:515–26. [PubMed]
9. Dettling A, Strohbeck-Kuhner P, Schmitt G, Haffner HT. Animal bites caused by a song bird. Arch Kriminol 2001;208:48–53. [PubMed]
10. Hayase T, Yamamoto K, Yamamoto Y, Nishitani Y, Abiru H, Fukui Y. Analysis of postmortem injuries inflicted by animals and the environment. Acta Crim Japon 1999;65:226–34.
11. Asamura H, Takayanagi K, Ota M, Kurita H, Kurashina K, Fukushima H. Personal identification by mitochondrial DNA control region: case of severely damaged cadaver lacking dental and fingerprint information. Res Pract Forens Med 2002;45:157–61.

Additional information and reprint requests:
Hideki Asamura
Department of Legal Medicine
Shinshu University School of Medicine
Asahi 3-1-1, Matsumoto, Nagano 390-8621, Japan
Tel: +81-0263-37-3218
Fax: +81-0263-37-3084
E-mail: asamura@sch.md.shinshu-u.ac.jp