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CASE REPORT

Unusual death of a baby: a dog attack and confirmation using human and canine STRs

Akiko Tsuji · Atsushi Ishiko · Hirohisa Kimura · Masanobu Nurimoto · Keiko Kudo · Noriaki Ikeda

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Abstract We performed an autopsy on a 3-month-old baby boy who had only one area severe and extensive wound to his head and face. Three unrelated miniature dachshunds were in the house. After our investigation, we were able to confirm that the wound had in fact been caused by a dog attack, and we were able to identify the offending dog among the three dogs using both human and canine short tandem repeat obtained from samples taken from the suspected dog and from the scene of the attack.

Keywords Forensic science · Dog attack · Canine · DNA typing · STR · Likelihood ratio

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A. Tsuji · A. Ishiko · K. Kudo · N. Ikeda (✉)
Department of Forensic Pathology and Sciences,
Graduate School of Medical Sciences, Kyushu University,
3-1-1, Maidashi, Higashi-ku,
Fukuoka 812-8582, Japan
e-mail: norii@forensic.med.kyushu-u.ac.jp

A. Ishiko
Forensic Science Laboratory,
Fukuoka Prefectural Police Headquarters,
Fukuoka 812-8576, Japan

H. Kimura · M. Nurimoto
Section of Parentage Verification, Division of Animal Genetics,
Maebashi Institute of Animal Science,
Livestock Improvement Association of Japan,
Kanamaru 316, Maebashi,
Gunma 371-0121, Japan

Introduction

Many cases of dog attacks have been reported, and usually, the injured party requires treatment or surgery at a hospital, although in some cases, death results due to the severity of the wounds [1–4]. Any part of the body can be the site of a dog attack. For example, in the case of the face, this can be the nose, ear, lips, or eyes. Recent advances allow canine short tandem repeat (STR) analysis to be used in such cases for confirmation of a dog attack [5–7]. Multi-locus canine STR analysis has a high specificity, similar to human STRs, and there is already a database for forensic DNA identification of dogs [8–11].

We performed an autopsy on a baby who had severe wounds concentrated on the only one area to his head and face. We verified that the wound had in fact been caused by a dog attack, and we identified the offending dog from among the three dogs using human and canine STR.

Materials and methods

Case

A 3-month-old baby boy was found dead on the floor in front of the sofa in the living room. He had been in his father's arms on the sofa when his mother went out shopping. The father had been severely intoxicated and had fallen asleep on the sofa. The baby was found dead near the father's feet by the mother when she returned 5 h later. The mother gave evidence that the father had been still sleeping and been unsteady on his feet for severely intoxication when she had come home. An autopsy was performed 16 h after the body was found. The deceased was 62 cm in height and weighed 5.5 kg. The dorsal aspect

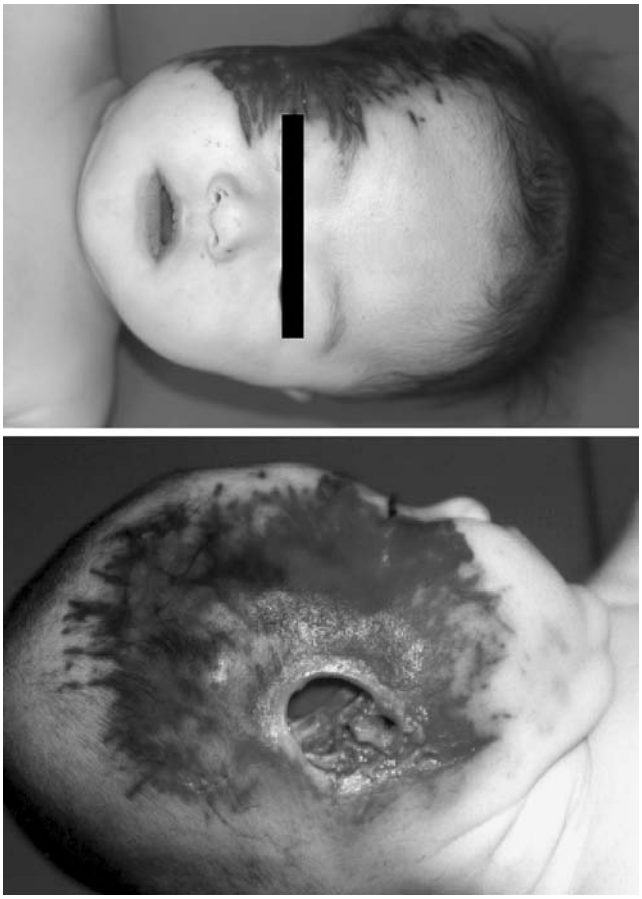

Fig. 1 Severe circular wound at the site of the right ear

of the body showed no livor mortis, and there was only one area extensive and severe circular wound at the position of the right ear with loss of skin, soft tissue, and the right ear itself. A linear or wide circumference abrasion with a radiating pattern was seen around the wound. The skull demonstrated a round defect at the site of the wound, and small pieces of brain were found outside the wound. Furthermore, there were some lacerations at the edge of the abrasion on the right upper cheek (Fig. 1). The surface of the right temporal lobe of the brain was injured just beneath the site of the perforating wound. There were no other injuries on the body. The systemic organs were severely anemic. The cause of death was diagnosed as loss of blood from the wound; however, there were only a small number of bloodstains on the rug at the location where the victim was found. However, there were some bloody pools resembling bloody vomit or excreta on the floor of other rooms of the house. In particular, one of these bloody pools was large and contained small pieces of cartilaginous tissue that were recognized as comprising the baby's right ear based on their shape and size (Fig. S1). There were three unrelated miniature dachshunds, and one of them was running freely on the same floor of the house. We suspected that the dog running freely had attacked the baby, had bitten, and swallowed the ear and blood and had, then, vomited a large amount, as there were bloodstains visible around the mouth of the suspected dog. The other two dogs were in the hutch and had no bloodstains anywhere on their bodies. However, there was a chance that the suspected dog had simply licked the victim's blood after the child had died. We autopsied the suspected dog after killing by pentobarbital by the owner's agreement. However, we could not find any tissues from the organs for digestion of the dog. Accordingly we performed both human and canine STR analysis of samples taken from the suspected dog and from some of the bloody pools for confirmation and identification of the perpetrator.

Samples

A blood sample of the victim was taken from the heart at autopsy.

The following samples were obtained from the suspected dog: forepaw; swab from the paw, mouth; swab from around the mouth, stomach; gastric contents, and duodenum; contents of the duodenum.

The following samples were obtained from the scene: S-A; pool of blood with pieces of the ear, S-B; mucous blood found on the floor in another room, and S-C; weak bloodstain found on the rug at the location where the baby had been found dead.

DNA analysis

DNA was extracted from each sample by the phenol chloroform method. Human STR analysis was performed using the AmpFlSTR Identifiler™ PCR Amplification kit (Applied Biosystems, Foster City, CA, USA). PCR products were run on the ABI Prism 310 DNA Sequencer (Applied Biosystems); 10 μl of template were used. Canine STR analysis was performed based on the repeat sequences and primer sequences that were adopted from http://www.ncbi.nlm.nih.gov/gquery/gquery.fcgi and developed by Livestock Improvement Association of Japan (LIAJ) shown in Table S1. The manuscript about animal identity testing included allele designation [13]; however, we had chosen the locus having been used by LIAJ because we needed the Japanese database of miniature dachshunds for calculation of the likelihood ratio. We used Qiagen Multiplex PCR Kit (Qiagen), and PCR products were run on the ABI 3730 Analyzer.

Results

We were able to identify the human DNA profile from the samples obtained from the suspected dog. The human DNA

Table 1 Human DNA profiles from the sample of the suspected dog

Locus	Victim	Paw	Mouth	Stomach	Duodenum
D8S1179	14,15	14,15	14,15	14,15	–
D21S11	32.2,33.2	32.2,33.2	32.2,33.2	32.2,33.2	–
D7S820	10,10	10,10	10,10	10,10	–
CSF1PO	10,12	10,12	10,12	–	–
D3S1358	15,16	15,16	15,16	15,16	–
TH01	7,7	7,7	7,7	7,7	–
D13S317	9,11	9,11	9,11	9,11	–
D16S539	10,12	10,12	10,12	10	–
D2S1338	19,24	19,24	19,24	–	–
D19S433	14,14	14,14	14,14	14,14	–
vWA	16,16	16,16	16,16	16,16	–
TPOX	8,8	8,8	8,8	8,8	–
D18S51	14,16	14,16	14,16	–	–
Amelogenin	*X*,*Y*	*X*,*Y*	*X*,*Y*	*Y*	–
D5S818	11,12	11,12	11,12	12	–
FGA	22,24	22,24	22,24	22	–

– Not determined

profile found in the swab from the paw and in the swab from around the mouth was identical to that of the victim. The human DNA profile found in the gastric contents was partially the same as that of the victim. However, we were unable to identify any human DNA profile in the sample taken from the duodenum (Table 1).

Human DNA analysis of the three samples obtained from the scene showed the victim's DNA profile, except for D18S51 of S-B (Table S2). The canine STR profile of S-A, which was considered to contain the saliva of the dog, was compared with the suspected dog's STR profile at 13 loci. The four loci INU042, AHTh171, FH2326, and FH2289 were not detected from S-A; however, the other nine loci were detected and were consistent with the suspected dog's DNA profile (Table 2). The total likelihood ratio calculated using the database of the LIAJ for miniature dachshunds, which is the ratio of the probability of a match if the DNA in the evidence sample and that from the suspect came from the same individual to the probability of a match if they came from a different individual, was 59,627,182,812 (probability of identity was 0.99999999998; Table S3). This value of the total likelihood ratio verified that both sets of DNA from the autopsied dog and the attacked dog had originated from the same.

Discussion

Based on the shape, the pattern of abrasion, the lacerations, and the skull defect, we considered that the wound had been made by the canine teeth and/or paws. However, we doubted at first whether the injury had really been caused by the dog alone. Moreover, we also considered both homicide or child abuse, as the baby had died near the father's feet. Boglioli et al. [12] reported a case of child abuse that had been camouflaged by a dog attack. In our case, we considered that the dog had torn off and chewed the right ear, before swallowing it, together with much blood, before vomiting. However, there were no pieces of tissue or bone of the victim macroscopically visible in the gastric contents of the dog, because the dog had vomited all the tissues. This made it difficult at first to obtain clear evidence that the suspected dog had attacked and injured the baby and that the attack had induced his death. We succeeded in identifying the dog that had attacked the victim by using both human and canine STR analysis of some of the samples obtained from the dog and the scene

Table 2 Canine STR profiles of the suspected dog and the pool of blood that contained the victim's ear

Locus	Suspected dog	S-A
AHT121	19,23	19,23
FH2001	6,9	6,9
FH2328	8,10	8,10
AHTk253	19,19	19,19
INU042	20,22	–
AHTk211	12,14	12,14
AHTh171	18,21	–
FH2611	24,24	24,24
FH2326	24,31	–
C22.279	17,17	17,17
FH2054	11,15	11,15
INU055	15,17	15,17
FH2289	30,34	–

– Not determined

that had comprised a mixture of both human and canine DNA. The wound with vital reaction, the cause of death as loss of blood from the wound, and the canine STRs showed that the suspected dog had attacked the victim while the victim was alive, had swallowed much blood, and had killed him. Police established that his father had been really sleeping and had not been concerned in his baby's death. Accordingly, it is essential that much greater information regarding the safety of dogs kept indoors, such as miniature dachshunds, needs to be obtained. We conclude that the greatest care must be taken when a dog is kept indoors with unconscious or helpless people such as a baby and old ones.

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