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## Case Report

# Injury patterns of fatal bear attacks in Japan: A description of seven cases

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### ABSTRACT

In recent years, the number of bear attacks has risen in Akita prefecture, Japan. Here, we present the injury patterns of seven fatal bear attacks, and discuss the implication of these findings. We included five cases of Asiatic black bear attacks and two cases of Ezo brown bear attacks. In all cases, the injuries, 2–5 parallel linear lacerations with severe hemorrhaging and decollement, were mainly located on the upper body. These injuries were thought to be fatal as, upon a first encounter, bears often stand and first attack the victim's head and face using their claws. Four lacerations were located at the vertex of the trapezoid in all cases, without severe hemorrhaging on the neck, extremities, or around the antemortem injuries. These injuries were thought to be bite marks incurred by the bears' four large canines, mainly occurring postmortem during the process of predation. These findings differed from those of fatal biting around the neck by other animals such as lions, mountain lions, or large-sized dogs. Further, laceration with avulsion of the skin was found in the inguinal region, without severe hemorrhaging. In some cases, the intestine had been removed from the inguinal injury for predation. In conclusion, the injuries of bear attacks are different from those caused by other animals, owing to the characteristics of bears. By investigating the injuries caused by fatal bear attacks, we can better understand the patterns of such injuries. Especially, the diameter between the canines is sometimes useful to estimate the size and the number of offending bears.

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## 1. Introduction

Two species of bears, the Asiatic black bear (*Ursus thibetanus japonicus*) and the Ezo brown bear (*Ursus arctos yesoensis*), inhabit Japan. Asiatic black bears live in Honshu and Shikoku [1]; adults weigh 50–150 kg and are 110–150 cm long [1,2]. They eat leaves, nuts, insects, and sometimes meat from carcasses [3]. Ezo brown bears live in Hokkaido [1]; adults weigh 100–300 kg and are 200–230 cm long [1,2]. They have a distinctive hump between their shoulders [4,5] and eat plant shoots, berries, insects, roots, salmon, and deer [6,7].

Fatal bear attacks are rare in Japan; however, the number of bear attacks in Akita prefecture has risen in recent years. Climate change has also been attributed to the surge in bear attacks in Japan recently, as it has forced a growing number of wild animals to leave their natural habitat in search of food [8]. Encounters with

bears are occasionally fatal [9]. Especially, it has been reported that there is an increased danger from female bears with cubs in developed areas where black bears have become habituated to people [10]. Herein, we report on the injury patterns of fatal bear attacks based on the autopsy findings from seven cases in Akita. Additionally, we discuss the implication of these findings.

## 2. Cases

### 2.1. Victims

Table 1 summarizes the findings from the seven cases. Three (43%) of the cases were males and 4 (57%) were females; the ages ranged from 61 to 79 years, with a mean age of 69.4 years. The estimated time interval from the attack to discovery ranged from 1 h to 1 week; the majority of cases were discovered within one day of the attack. Complete autopsies were performed for all cases.

### 2.2. Type of offending bear and case abstracts

Five of the cases were picking wild bamboo shoots on a mountain at different times when they were killed by one or more

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**Table 1**  
Summary of seven fatal bear attack cases.

No.	Age	Sex	Type of bear	Estimated time from attack to discovery	Cause of death	Time	Location
1	70s	Female	Ezo Brown bear	1 h	Cervical injury	Daytime	Zoo
2	60s	Female	Ezo Brown bear	1 h	Exsanguination	Daytime	Zoo
3	70s	Male	Asiatic black bear	1 day	Exsanguination	Daytime	Mountain
4	70s	Female	Asiatic black bear	1 day	Exsanguination	Daytime	Mountain
5	60s	Male	Asiatic black bear	1 day	Exsanguination	Daytime	Mountain
6	60s	Female	Asiatic black bear	1 day	Exsanguination	Daytime	Mountain
7	60s	Male	Asiatic black bear	1 week	Exsanguination (suspected)	Unknown	Mountain

Asiatic black bears. On the other hand, two zoo staff members were killed by two Ezo brown bears that escaped from their cage at a zoo in one incident. The majority of the fatalities occurred during the daytime.

### 2.3. Cause of death

In six of the cases, the cause of death was exsanguination due to the fatal bear attack. In the other case, in which the individual was attacked by the Ezo brown at the zoo, the cause of death was cervical injury (Fig. 1a, b).

## 3. Injury patterns

As described below, the majority of injuries showed similar patterns and were different from those caused by other animals.

### 3.1. Lacerations with decollement

In all cases, there were 2–5 parallel linear lacerations found on the head, face, upper extremities, or back (Fig. 2a). The lacerations usually had decollement with severe hemorrhaging (Fig. 2b); these lacerations were considered to be caused by the bear's claws (Fig. 2c).

### 3.2. Bite marks

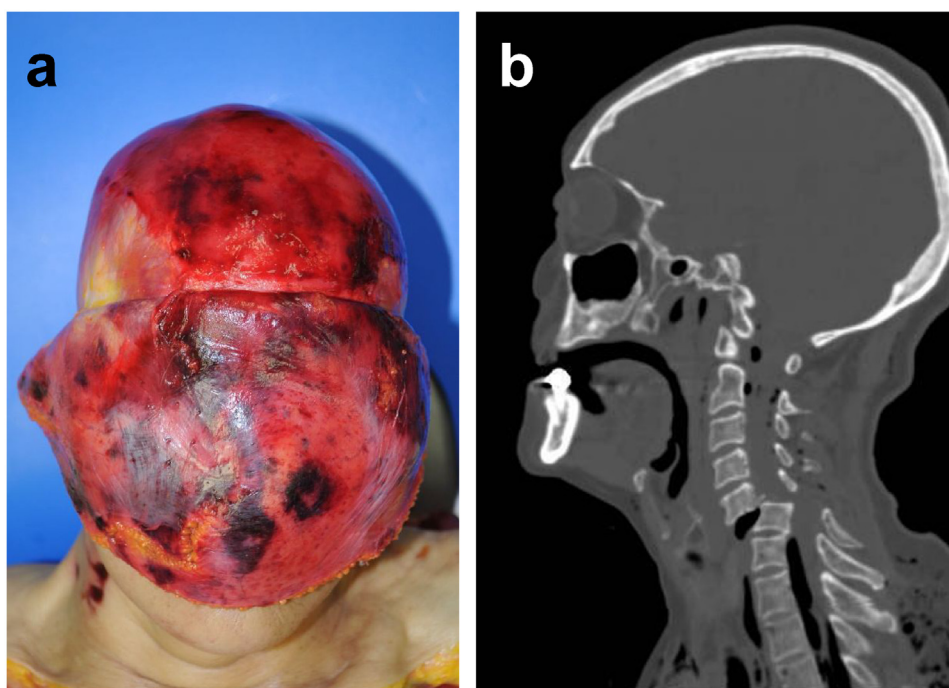
In all cases, four lacerations were located at the vertex of the trapezoid (Fig. 3a, b). These lacerations usually occurred without severe hemorrhaging and were thought to be bite marks (Fig. 3c). The bite marks were typically found on the neck, extremities, or around the antemortem injuries. There were no cases of bite marks with severe hemorrhaging.

### 3.3. Others

Lacerations with avulsion of the skin were found in the inguinal region in 67% of cases; however, these injuries were not associated with severe hemorrhaging (Fig. 4a). In some cases (33%), the intestine had been removed from the inguinal injury (Fig. 4b).

### 3.4. Distribution of injuries

We analyzed the distribution of the injuries in six cases after excluding the case with severe predation whose postmortem interval was 1 week. Lacerations with severe hemorrhaging were mainly located on the head, face, and upper extremities. These injuries were thought to be antemortem injuries (Fig. 5a). Injuries without severe hemorrhaging were mainly located on the lower



**Fig. 1.** Findings for case 1. a) Subcutaneous hemorrhage over the parietal region. b) Postmortem computed tomography (PMCT) image before autopsy. Multiplanar reconstruction from PMCT showed that the cervical spine was dislocated.

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