



Case Report

Compound mechanism of fatal neck injury: A case report of a tiger attack in a zoo



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ABSTRACT

Fatal injuries caused by attacks by large wild cats are extremely rare in forensic medical practice in Europe. There are very few cases described in the forensic medical literature concerning incidents in zoos similar to the tiger attack on a 58-year-old male zoo employee that we present here. While preparing a runway for tigers, the man was attacked by a male Sumatran tiger. Another zoo employee was an eyewitness to the accident; in his testimony he described the sequence of events in detail. The autopsy showed the injuries typical of a tiger attack: traces of claws and canine teeth indicating that the victim of the attack was knocked down from behind, along with deep and extensive fatal wounds to the neck. The injuries were inflicted by means of a compound mechanism: tissues were penetrated by the animal's canines, crushed with great force (transfixing injury), and violently distended. The skin revealed four characteristic deep wounds caused by canines as well as bite marks resulting from the action of six incisors. The neck area revealed extensive damage, including torn muscles, the esophagus and trachea, large blood vessels of the neck, and fractures of vertebrae C2 and C5 with internal channels resulting directly from penetration by the animal's canines. The mechanism of distension, as a result of the animal jerking its head after biting the victim in the neck, produced a complete tear of the spine and the vertebral arteries, as well as an intramural rupture of the carotid arteries which has never been described before. In the interests of a detailed assessment of bone damage, the cervical spine was macerated. The applied autopsy techniques and detailed analysis of injuries enabled us to demonstrate the compound mechanism that inflicted them, combining penetration of tissues by the canines, crushing, and distension.

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1. Introduction

Cases of attacks by large wild cats (tigers, leopards, pumas, lions) on humans are reported relatively rarely in the medical literature, including forensic reports, a fact highlighted by most authors of published case reports [1–22]. Some of the reported cases concern: attacks on zoo employees [1–4]; an attack on a zoo visitor during an attempt to feed an animal [5]; an accident in a private zoo [6]; an attack on a tiger trainer during a show [7]; an attack in an animal sanctuary in Oklahoma [8]; uncommon case of suicide in a lions' den of a zoo [9]; and an attack on 2 year-old girl by her father's pet leopard [10]. Others describe events occurring in the animal's natural environment, e.g. attacks by tigers and leopards in India [11–14], by jaguars in Central Brazil [15]; by lions in Tanzania [16], by pumas in the mountains of California [17]; by

leopard in Rocky Mountains [18]; an attack on an 8-year-old girl in British Columbia by cougar [19]. Some of the reports in the literature concern cases of people who survived such attacks, as well as conclusions and discussion focused on effective ways to treat injuries [5,10,12,15,18,19], including complications resulting from infection.

The aim of the present publication is to present a detailed analysis of the mechanism of infliction of fatal neck wounds as a result of compound injuries caused by the action of the animal's teeth, including injuries never before described in detail in the literature of forensic medicine.

2. Case report

2.1. Case history

One morning in September 2015, at the Wrocław (Poland) Zoo, a fatal accident occurred involving a 58-year-old man, a long-time experienced zoo employee. While preparing a runway for tigers,

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the man was attacked by a male Sumatran tiger (*Panthera tigris sumatrae*). Another zoo employee was an eyewitness to the accident; in his testimony he described the sequence of events in detail, explaining that the tiger jumped on the victim's back, catching him by the neck and shoulders with its jaws, and knocked him down with the full weight of its body. Then it tore at the victim's body and dragged it along the runway. Once incapacitated, the animal underwent veterinary observation. At the site of the incident, on one part of the runway, extensive blood stains were found on the grass and earth as well as traces left by the dragging of a body. The recumbent body of the man was found under a bush in another part of the runway. The body was lying face up, with the arms straightened, raised above the head, and bent unnaturally, and with the left lower thigh rotated, with a laceration of the left calf and extensive damage to the pant legs. The shirt of the deceased had been displaced and rolled up to armpit height. Following an inspection of the scene by the prosecutor and police officers, the body of the deceased was sent to the Department of Forensic Medicine at the Medical University for a forensic autopsy.

2.2. Autopsy findings

In the present case a forensic autopsy was carried out and expanded to include: sectioning of the soft tissues of the neck following exsanguination; testing for cardiac air embolism (with a negative result); and sectioning of the soft tissue of the back and lower limbs. Before proceeding to the autopsy, the team reviewed the available forensic literature concerning cases of attacks on humans by tigers. On the right side of the neck of the deceased, a characteristic bite wound was found, consisting of four deep wounds (arbitrarily designated as A–D) in the shape of an elongated oval, with even edges, configured as two pairs of wounds positioned opposite one another (Fig. 1). The front pair consisted of a longitudinal oval wound (A), 6×1.1 cm, and a transverse oval wound (B), 4×2.5 cm, spaced approximately 5.5 cm apart. The rear pair, two transverse oval wounds, (C), 3.2×1.3 cm, and (D), 3.5×1.5 cm, were spaced approximately 9 cm apart. Between wounds A and B, a cluster of six regularly configured wounds was noted, forming an arc about 3.5 cm in length, with the vertex facing forward (Fig. 1). These consisted of three superficial, quite regular, puncture wounds and three irregular abrasions, which became shallower towards the lower ends. The diameter of these wounds ranged from 0.4 to 0.6 cm. Four of these wounds were accompanied by small punctate abrasions with a diameter of 0.1–0.2 cm, located approximately



Fig. 1. Damage to the neck caused by the animal's canines and incisors.

0.1 cm behind the arc. Swabs were taken for DNA testing from the skin of the deceased in the vicinity of these wounds. Detailed tissue sectioning revealed the presence of extensive damage to the soft tissues and organs of the neck and cervical spine. Following the autopsy, a section of the cervical spine was secured in its entirety and macerated in order to conduct a detailed assessment of traumatic damage within the bone. Four deep wounds, labelled A, B, C, and D, penetrated the area of the organs in the neck to a depth of 7 to 9 cm. Wounds A and B gouged out parallel channels, spaced about 5.5–7 cm apart, running upwards, backwards, and to the left in the trabecular area of the cervical vertebrae C2 (wound A) and C5 (wound B) to a depth of about 2 cm (Fig. 2), with comminuted fractures of these vertebrae.

Detailed examination of the bone revealed the separation of the dens of vertebra C2 from the base, combined with fission of the right part of the vertebral arch in the transverse plane and fracture of the right portion of vertebra C1 in the frontal plane, with a rupture of the articular cartilage on the upper articular surface (wound A). The extensive injury to the bone described here was accompanied by a partial tear of the ligaments connecting vertebrae C1 and C2 (in addition to the ligaments of the atlanto-axial joint; the dens was connected to vertebra C1). The wound B was accompanied by complete tearing of the cervical spine (involving all of the ligaments and the intervertebral disc) at the level between vertebrae C5 and C6, with rupture of the spinal cord and both vertebral arteries, including displacement of fragments of the spine at a distance of about 5 cm from one another. The right common carotid artery exhibited intramural transverse rupture involving the tunica intima and tunica media, with a delamination between them about 1 cm wide; the continuity of the adventitia was preserved, but showed features of distension (Fig. 3), as confirmed by histopathological examination. The large carotid vessels on the left side exhibited complete rupture at the height of



Fig. 2. Macerated cervical spine; arrows mark the location where the tiger's canines pierced the vertebral bodies.

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