Forensic Science International xxx (2013) xxx–xxx

Contents lists available at ScienceDirect

Forensic Science International

journal homepage: www.elsevier.com/locate/forsciint

Case report

Fatal tiger attack: A case report with emphasis on typical tiger injuries characterized by partially resembling stab-like wounds

Hrishikesh Pathak [a,*], Jaydeo Borkar [a], Pradeep Dixit [a], Shailendra Dhawane [a], Manish Shrigiriwar [b], Niraj Dingre [c]

[a] Department of Forensic Medicine, Government Medical College, Nagpur, Maharashtra 440003, India
[b] Department of Forensic Medicine, Indira Gandhi Government Medical College, Nagpur, Maharashtra 440018, India
[c] Department of Forensic Medicine, Smt. Kashibai Navale Medical College, Pune, Maharashtra 411041, India

ARTICLE INFO

Article history:
Received 12 April 2013
Received in revised form 11 July 2013
Accepted 9 August 2013
Available online xxx

Keywords:
Fatal tiger mauling
Bite injury
Animal attack
Transfixing injury
Forensic autopsy
Panthera tigris tigris

ABSTRACT

Fatalities due to attacks by tigers on humans are uncommon and are rarely described in the medico-legal literature. We herein present a forensic investigation in a unique case of a fatal tiger attack in the wild on a 35 year old female in India by an Indian Bengal tiger (*Panthera tigris tigris*). The attack resulted in two pairs of puncture wounds over the nape area with occult cervical spine injuries resulting from transfixing of spine due to the tiger canines; multiple puncture wounds, numerous scratches and abrasions consistent with the tiger claw injuries and injury to the right jugulocarotid vessels. This case outlines the characteristic injury pattern from such an attack along with the multiple sources of the tiger injuries. The analysis of these injuries might reveal the motivation behind the attack and the big cat species involved in the attack. A tiger injury is sometimes compared with a stab injury, as the patterned injuries due to a tiger bite are characterized by multiple penetrating, stab-like wounds. So, a special attention is paid toward establishment of the cause of death from bites by the animal teeth under unknown circumstances of trauma and to exclude the possibility of a homicide beyond reasonable doubt in such cases.

1. Introduction

Fatal injuries to humans caused by attacks from felines are uncommon in the world [1]. Furthermore, from a global perspective attacks on humans by large felines are extremely rare in Europe [2] and in the United States [3] as compared to feline attacks in Asian countries. Amongst the very few reported cases of fatal and near-fatal injuries to humans from felines, most have occurred in captive conditions such as in zoos, animal farms, circuses and on the private breeder's ground [1–13]. In contrast to this, reported cases of attacks on humans by felines occurring in the wild are extremely rare [14].

This paper describes a unique case of a fatal tiger attack in the wild. In the present case, a female was fatally mauled by a tiger in the wild. At present, the medico-legal literature talks about only two fatal cases of tiger attacks, which have occurred in zoos [5,6]. To the best of our knowledge, probably this case would be the first reported human fatality due to a tiger attack from India. The purpose of the present article is to highlight the characteristic injuries inflicted by a tiger on the human body in a fatal tiger attack; and to give an insight into the method of attack on humans by the tiger and the scientific information on the injury pattern by tiger.

2. Case report

2.1. Case history

The victim, a 35 year old female was killed by a tiger in compartment no. 458 of Mandhal round, under Kuhi forest range in Nagpur division, India. The victim had gone with her husband and others to collect tendu leaves from the forest early in the morning. According to the eyewitness accounts, the victim was collecting tendu leaves while her husband had climbed the tree to pluck leaves. After a while, the husband and the others heard the victim screaming 'tiger, tiger'. By the time her husband and the others rushed to the victim's help, the tiger had already mauled her fatally. The husband with the help of others hurled stones toward the tiger that made the tiger disappear in the forest, leaving the victim's body at the site of attack. The badly mauled body of the victim was brought to Government Medical College and Hospital,

* Corresponding author. Tel.: +91 9823449805; fax: +91 7122744489.
E-mail addresses: hvpathak@rediffmail.com, hrishikeshpathak@yahoo.co.in (H. Pathak).

0379-0738/$ – see front matter © 2013 Elsevier Ireland Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.forsciint.2013.08.003

Nagpur. Later, post-mortem was performed and the body was handed over to the relatives.

2.2. Autopsy findings

An external body examination showed the following wounds: in the nape area, four deep puncture wounds were found in two pairs, with two wounds situated sideways, parallel to each other (Fig. 1). The first pair consisted of two deep puncture wounds on the right side of the nape of neck (Fig. 1 – injuries nos. 1 and 2 due to left and right upper canine respectively), one above the other, at a distance of approximately 7 cm. The maximum diameter of the wounds was up to 3.5 cm, and the depth was up to 3 cm in the soft tissues of the nape. Similarly, the second pair consisted of two deep puncture wounds on the left side of the nape of neck (Fig. 1 – injuries nos. 3 and 4 due to left and right lower canine respectively), one above the other, at a distance of approximately 5.5 cm. The maximum diameter of the wounds was up to 2 cm and the depth was up to 3 cm in the soft tissues of the nape. The wounds in one plane were approximately 7.5 cm away from the second parallel plane. All the four puncture wounds caused by the canines of the tiger showed abraded margins and tearing of the subjacent muscle mass.

Apart from these characteristic paired puncture wounds caused by the canines over the nape area, there were injuries caused by the tiger's claws on the body. Similar to the abraded puncture wounds due to the canines, the puncture wounds due to the claws were also abraded. The injuries due to the tiger's claws were present over the body on the following areas: On the right supra-clavicular area, there was a puncture wound with a maximum diameter of 4 cm (Fig. 2a). There were multiple characteristic claw marks over the skin overlying the medial end of the right clavicle and the lower one-third part of the right sternocleidomastoid (Fig. 2a). On the left infra-clavicular region and the anterior face of the left shoulder, there were puncture wounds with a maximum diameter of 2 cm and 0.5 cm respectively (Fig. 2b). On the right lateral cervical region there was a puncture wound with a maximum diameter of 3 cm, opposite the anterior edge of the right sternocleidomastoid muscle at the junction of the upper and middle thirds and perpendicular to the jugulocarotid vessels. On the posterior face of the thorax between the scapulae, there were three puncture wounds with maximum diameter varying from 1 cm to 0.4 cm (Fig. 3a). On the front part of the left arm there was a characteristic claw mark of the tiger (Fig. 3b). In addition to the above mentioned injuries, the victim's body showed many scratches, abrasions, puncture wounds and lacerations due to the tiger's claws located mainly over the arms, cervical region and the torso.

The internal examination of the victim's body showed a fracture of the right clavicle and fracture-dislocation of the left

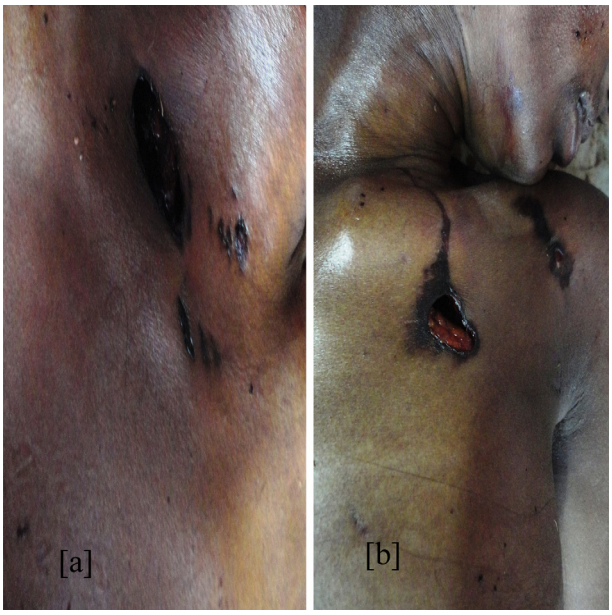

Fig. 2. Puncture wounds and claw marks from the tiger claws on right supra-clavicular region (a); and left infra-clavicular and shoulder region (b) – indicating a strong compression into the ground at the time of restrain.

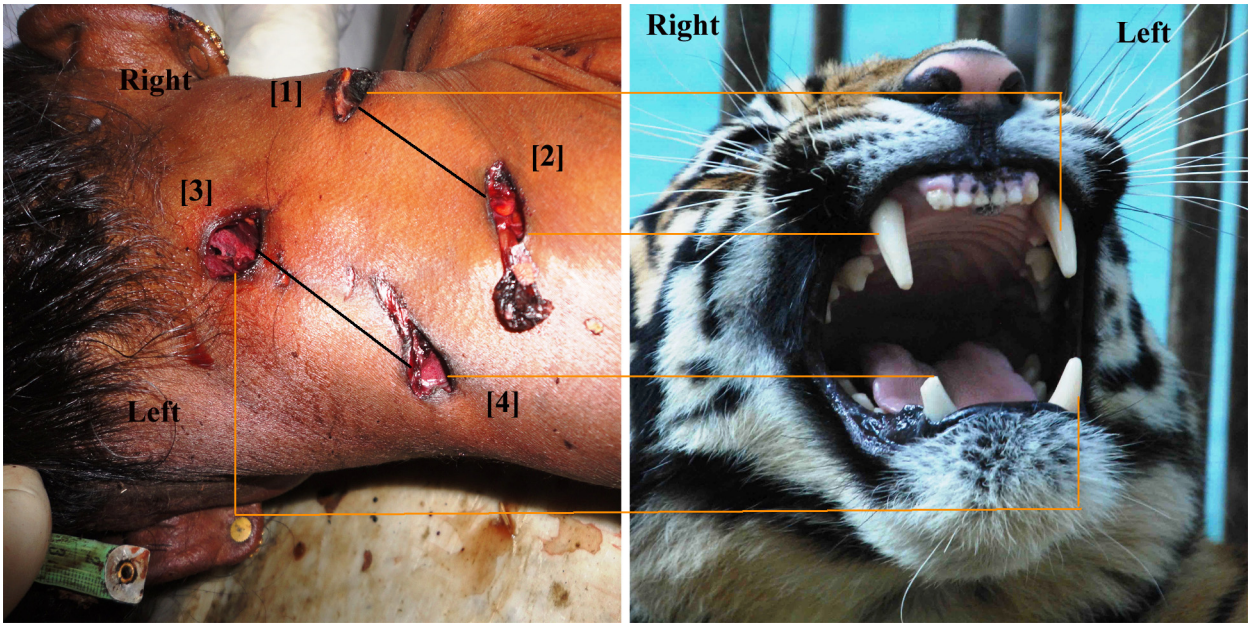

Fig. 1. The nape of neck with four deep puncture wounds linked with the corresponding tiger canines to give the readers a clear idea as how the tiger had gripped the victim at the moment of attack. The puncture wounds in first pair on right side of the nape i.e. injuries nos. 1 and 2 are due to left and right upper canine respectively. The puncture wounds in second pair on left side of the nape i.e. injuries nos. 3 and 4 are due to left and right lower canine respectively.

Please cite this article in press as: H. Pathak, et al., Fatal tiger attack: A case report with emphasis on typical tiger injuries characterized by partially resembling stab-like wounds, Forensic Sci. Int. (2013), http://dx.doi.org/10.1016/j.forsciint.2013.08.003

Fig. 3. (a) Puncture wounds due to tiger claws on the posterior face of thorax between the scapulae – suggesting that the victim was struck to ground from behind, which is a known method of attack by tiger. (b) Claw mark on the front part of left arm – resulting while manipulating the victim's body in an attempt to restrain the victim.

Fig. 4. The neck region at autopsy with transfixing injury to the cervical spine – the prevertebral muscles are hemorrhagic with compound fractures of C3 and C6 vertebral bodies due to through and through penetration by the canines of tiger.

sterno-clavicular joint with hemorrhage in the surrounding soft tissues. A detailed autopsy of the neck revealed a complete laceration of the right jugulocarotid vessels subjacent to the puncture wound described above over the right lateral cervical region. The right vagus nerve was intact. The soft tissues around the right nerve-vessel bundle were hemorrhaged. In the spine, the prevertebral muscles were hemorrhagic, with compound fractures of the C3 and C6 vertebral bodies due to through and through penetration by the canines of the tiger as a result of enormous bite force used in the killing bite at the canines (Fig. 4). The spinal cord at these levels was completely lacerated with multiple foci of hemorrhages.

At autopsy, the test performed for detection of the air embolism was negative. The internal organs were pale. No pathological changes due to disease were found during autopsy either macroscopically or microscopically. The forensic toxicological analysis of blood and urine samples was negative for alcohol. Moreover, the other toxicological investigations of blood, urine and vitreous fluid, applying routine methods, were negative.

The victim was dressed in a sari (a very long piece of cloth elaborately swathed around the body – the traditional dress of women in India) and a blouse (upper trunk garment). There were multiple tears and blood stains over the victim's sari and blouse. Damage seen on the clothing corresponded to the injuries on the victim's body.

The cause of death was deemed to be the transfixing injury to the cervical spine associated with the injury to the right jugulocarotid vessels. Here, the "transfixing injury" refers to the injury to the neck structures, wherein the neck is fixed by means of the set of upper and lower canines followed by through and through penetration of the soft tissues and the bony tissues of the neck with the strong and long canines of the tiger. The death was classified as accidental.

3. Discussion

The tiger is the largest and the most powerful species of felidae [15]. The teeth of the tiger are exceptionally stout. The long and slightly curved canines of the tiger, measuring about 6–9 cm are longest among the living felids and are perfect stabbing tools of the tiger. All toes bear large, curved and compressed claws up to 8–10 cm long, measured over their curve. Claws are normally drawn back into their sheaths and are bared only for catching prey or in defense. The tigers usually prey upon the larger mammals and do not consider humans as their prey [16]. The reasons behind a tiger attack on humans are closely related with violation of courtship rituals or their own territory by the victims, destruction of their natural habitat, prey depletion and mistaken identity [4,14]. Thus, the incidence of conflicts between humans and tigers is likely to be on the rise.

The tiger, living in the wild, kills its victim very quickly. At the time of attack, the tiger rushes at the victim from as close a distance as possible, trying to throw it off its feet by the enormous force of the impact. Most often it strikes its victim from behind, going for the nape and the side parts of the neck. The long canines and the ripping teeth of the tiger allow the tiger to penetrate deep into the victim's tissue [16]. The specialized proprioceptive receptors in the area of its teeth and jaws can inform the tiger about the contact of its canines with the osseous tissue [17]; and based on these perceptions, the tiger can adjust the position and the intensity of its grip in the most optimal way so that the teeth can enter the intervertebral space [1]. A usual mechanism of killing its victim is to shake the latter violently by the neck, thereby causing cervical spine lesions due to hyperflexion and hyperextension injuries. Such an attack strategy also results in injuries to the jugulocarotid vessels, the trachea; and suffocation [5,13].

Please cite this article in press as: H. Pathak, et al., Fatal tiger attack: A case report with emphasis on typical tiger injuries characterized by partially resembling stab-like wounds, Forensic Sci. Int. (2013), http://dx.doi.org/10.1016/j.forsciint.2013.08.003

Regarding the biting force of a tiger, it has been established that the strong and large jaws of tiger are capable of producing substantial bite force [2]; and the maximal bite force is used in the killing bite at the canines [18]. Measured at the apex of the canines, forces of approximately 1500 N are easily applied [18,19]. These enormous bite forces allow the tiger to simply crush the osseous tissues of the neck [5,6] and the skull [2,4].

In our case, the tiger attack was suggestive of predatory nature, as the animal attacked the victim while working in the forest range in the absence of any provocation. The location of the bites, punctures and scratches reinforce this observation, as they are suggestive of sequential predation movements for prey immobilization and restrain. The injuries observed on the victim's body in present case corresponded with the known methods of tiger attack [5,6].

Moreover, the findings of the present case and the previously reported cases, illustrates that the big cats are capable of producing serious occult injuries to the bony and the vascular structures of the neck [13]. Due to this reason, in case of a surviving victim, a high index of suspicion needs to be maintained during treatment, as serious underlying bony and vascular damage can be easily overlooked. Hence, the surviving patients should be subjected to computed tomographic scanning and X rays to evaluate the bony injuries; and to CT angiography, MR angiography, carotid ultrasound and digital subtraction angiography for evaluation of vascular injuries.

Injuries to humans caused by large felines are sometimes compared with a stab injury [7]. So, a special attention has to be paid during the forensic examination in unobserved incidents of attacks by felines to rule out a homicide beyond reasonable doubt. The canines penetrate through the skin, tears the soft tissues and crushes the osseous tissues, where as the object in case of stab injury rips apart the skin, soft tissues and bones in the same plane. Moreover, the characteristic pattern and the location of injuries due to feline attack; such as paired puncture wounds over the nape of neck due to canines, claw marks, injuries due to transfixing of the spine and lack of injuries that could not have been caused by felines themselves will be of great help in differentiation.

Lastly, the authors would like to suggest that, in cases of attacks by felines, the wound edges should be swabbed to obtain the DNA of attacking species. Though, this has not been done in the reported cases of big cat attacks; and even in the present case, we feel that obtaining the feline DNA from the victim will be of great use, especially in case of man-eating animals. This will help the wild life authorities to establish the identity of man-eating animals and their subsequent removal from the area [20,21]. Moreover, feline DNA obtained from swabbing of wound edges will be very helpful in establishing the cause of death from bites by animal teeth under unknown circumstances of trauma, and thus ruling out the possibility of a homicide beyond reasonable doubt in such cases.

4. Conclusion

We presented the characteristic features of injuries observed in a unique case of a fatal tiger attack in the wild. As in the present case, the location and features of the injuries might indicate the motivation behind the attack. We showed that paired deep puncture wounds over body part with occult bony injuries is characteristic of a tiger attack. It is possible to make a distinction between tiger injury and stab injury by studying the external and internal features of wound. Cervical lesions due to transfixing injury are an evidence of tiger attack, even if the corpus is incomplete, severely decomposed or circumstances of trauma are unknown. Moreover, the injuries due to tiger bite should be recognized as patterned injuries by forensic pathologist, as the conflicts between humans and tigers are likely to be on the rise.

Conflict of interest

The authors declare that they have no conflict of interest.

Acknowledgements

The authors wish to express their thanks to Mr. Kundan Hate, Hon. Wildlife Warden (Nagpur Dist.) and Regional Tiger cell Member, for providing the photograph of tiger's dentition.

References

[1] S.D. Cohle, C.W. Harlan, G. Harlan, Fatal big cat attacks, Am. J. Forensic Med. Pathol. 11 (1990) 208–212.
[2] P. Emami, T.M. Kaiser, J. Regelsberger, E. Goebell, J. Fiehler, M. Westphal, et al., Case report: surviving a tiger attack, Neurosurg. Rev. 35 (2012) 621–624.
[3] M. Anderson, P. Utter, J. Szatkowski, T. Patrick, W. Duncan, N. Turner, et al., Cervical spine injury: tiger attack, Orthopedics 31 (2008).
[4] M. Chum, W. Puing, Traumatic tiger attack, J. Neurosurg. Pediatrics 8 (2011) 530–534.
[5] S. Chapenoire, B. Camiade, M. Legros, Basic instinct in a feline, Am. J. Forensic Med. Pathol. 22 (2001) 46–50.
[6] M.P. Kohout, J. Percy, W. Sears, J.D. Yeo, Tiger mauling: fatal spinal injury, Aust. N.Z. J. Surg. 59 (1989) 505–506.
[7] H. Bock, D.L. Ronnenberger, P. Betz, Suicide in a lion's den, Int. J. Legal Med. 114 (2000) 101–102.
[8] C.E. Rollins, D.E. Spencer, A fatality and American mountain lion: bite mark analysis and the profile of the offending lion, J. Forensic Sci. 40 (1995) 486–489.
[9] P. Hejna, A fatal leopard attack, J. Forensic Sci. 55 (2010) 832–834.
[10] R. Bahram, J.E. Burke, G.L. Lanzi, Head and neck injury from a leopard attack: case report and review of the literature, J. Oral Maxillofac. Surg. 62 (2004) 247–249.
[11] J.S. Vogel, J.R. Parker, F.B. Jordan, T.L. Coury, A.R. Vernino, Persian leopard (*Panthera pardus*) attack in Oklahoma: case report, Am. J. Forensic Med. Pathol. 21 (2000) 264–269.
[12] J.F. Delahaye, J. Mylonas, M. Causeret, M. Penneau, Blessures mortelles par panthere, J. Med. Leg. Droit Med. 37 (1994) 575–578.
[13] M.B. Wiens, HarrisonF P.B., Big cat attack: a case study, J. Trauma 40 (1996) 829–831.
[14] M.F. Neto, D.G. Neto, V. Haddad Jr., Attacks by Jaguars (*Panthera onca*) on humans in central Brazil: report of three cases, with observation of a death, Wilderness Environ. Med. 22 (2011) 130–135.
[15] P.J. Nyhus, R.L. Tilson, J.L. Tomlinson, Dangerous animals in captivity: ex situ tiger conflict and implications for private ownership of exotic animals, Zoo Biol. 22 (2003) 573–586.
[16] V. Mazak, *Panthera tigris*, Mamm. Species 152 (1981) 1–8.
[17] P. Leyhausen, Cat Behavior: The Predatory and Social Behavior of Domestic and Wild Cats, Garland STPM Press, New York, 1979.
[18] S. Wroe, C. McHenry, J. Thomsan, Bite club: comparative bite force in big biting mammals and the prediction of predatory behavior in fossil taxa, Proc. R. Soc. B 272 (2005) 619–625.
[19] P. Christiansen, S. Wroe, Bite forces and evolutionary adaptations to feeding ecology in carnivores, Ecology 88 (2007) 347–358.
[20] S.K. Gupta, J. Bhagavatula, K. Thangaraj, L. Singh, Establishing the identity of the massacred tigress in a case of wildlife crime, Forensic Sci. Int. Genet. 5 (2011) 74–75.
[21] J. Bhagavatula, L. Singh, Genotyping faecal samples of Bengal tiger *Panthera tigris tigris* for population estimation: a pilot study, BMC Genet. 17 (2006) 48.

Please cite this article in press as: H. Pathak, et al., Fatal tiger attack: A case report with emphasis on typical tiger injuries characterized by partially resembling stab-like wounds, Forensic Sci. Int. (2013), http://dx.doi.org/10.1016/j.forsciint.2013.08.003