Injuries from bear *(Ursus thibetanus)* attacks in Kashmir

Kaşmir'de ayı *(Ursus thibetanus)* saldırılarından kaynaklanan yaralanmalar

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BACKGROUND
Strict conservation of wildlife and encroachment into its habitat have led to an increase in the number of wild animal-inflicted injuries and fatalities in Kashmir. The aim of this study was to report injuries inflicted during bear attacks and discuss their management and sequelae.

METHODS
A retrospective study was conducted in the Department of Orthopedics Government Medical College Srinagar, University of Kashmir, from January 2003 to June 2007. A total of 254 cases (186 males, 68 females) with history of bear attacks were recorded over a period of 54 months.

RESULTS
Eighty percent of victims were attacked in the maize fields and apple orchards and 20% in the dense forests while collecting firewood or tending to the cattle. Lacerations of the head and neck and fractures of the upper limbs and facial and skull bones were the striking observations. Permanent facial disfigurement, hearing loss, loss of digits, residual neurodeficit, and persistent psychological morbidity were the long-term sequelae in most of the patients.

CONCLUSION
Wild animal-inflicted injuries are a neglected part of trauma. There should be a high index of suspicion when treating these injuries, as serious underlying bone or soft-tissue damage can be overlooked. Management of these injuries involves all subspecialties of trauma to achieve the best functional outcome.

Key Words: Animals; animal injuries; bear; facial injuries; management; outcome.

AMAÇ
Kaşmir eyaletinde vahşi yaşamın ve vahşi yaşamsal alanlara tecavüzün sıkı bir şekilde korunması, vahşi hayvan kaynaklı yaralanmalarda ve ölümlerde bir artışa yol açmıştır. Bu yazıda, ayı saldırılarından kaynaklanan yaralanmalar ve sekellerin tedavisindeki düzenlemeler değerlendirildi.

GEREÇ VE YÖNTEM
Ocak 2003 ile Haziran 2007 tarihleri arasında, Kaşmir Üniversitesi Srinagar Devlet Tıp Fakültesi, Ortopedi ve Travmatoloji Bölümü'nde retrospektif bir çalışma yürütüldü; 54 aylık bir sürede, ayı saldırısı hikayesi bulunan toplam 254 olgu (186 erkek, 68 kadın) kaydedildi.

BULGULAR
Kurbanların %80'inin mısır tarlaları ile elma bahçelerinde ve %20'sinin de sık ormanlık alanda odun toplarken veya sığır otlatırken saldırıya uğradığı öğrenildi. Baş-boyunda laserasyonlar, üst ekstremite kırıkları, yüz ve kafatası kemiği kırıkları dikkat çeken gözlemlerdi. Hastaların çoğundaki uzun süreli sekeller şöyleydi: Kalıcı yüz şekil bozukluğu, işitme kaybı, parmak kaybı, kalıcı nörolojik bozukluk ve süreğen psikolojik morbidite.

SONUÇ
Vahşi hayvan kaynaklı yaralanmalar, travmanın ihmal edilen bir konusudur. Altta yatan ciddi kemik veya yumuşak doku hasarının gözden kaçırılabileceği gerekçesiyle, bu yaralanmalar tedavi edilirken kuşku düzeyi yüksek tutulmalıdır. En iyi fonksiyonel sonucu elde etmek üzere, bu yaralanmaların tedavisi travmanın tüm alt uzmanlık dallarını kapsamaktadır.

Anahtar Sözcükler: Hayvanlar; hayvan yaralamaları; ayı; yüz yaralanması; tedavi; sonuç.

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The alarming increase in the incidence of wild animal-inflicted injuries in the recent past in Kashmir has led to many mortalities and serious morbidity. The steadily increasing human population in areas in close proximity to the jungle and the reduction in the staple food of wild animals have forced these dangerous predators to move into areas occupied by humans. Animal bites are encountered frequently in trauma centers and the resulting injuries range from innocuous to life-threatening.[1] These injuries are distinct from other injuries sustained by humans, such as tearing, cutting, penetrating and crushing injuries combined with falls and large animal forces causing blunt trauma.[2] These injuries are complex and their management involves a multidisciplinary approach. Many animal attacks occur in remote areas with substantial delay before notification, rescue and presentation for definitive care.[2] Several factors need to be considered when evaluating these injuries, including type of animal involved, specific nature and location of wounds, circumstances of attack, and interval between injury and treatment. Of great concern are direct destruction of tissue and risk of infection.[1] There should be a high index of suspicion when treating these injuries, as serious underlying bone or soft-tissue damage can be overlooked.

The actual incidence of these injuries is not only difficult but also impossible to know, as most of the casualties never seek medical attention. Dog bites are reported to constitute about 50%-90% of all animal-inflicted injuries,[1-4] but in Kashmir, victims of bear and leopard attacks constitute the majority of the patients requiring medical attention.[5] The victims of bear attacks sustain complex fractures of the extremities and disfiguring injuries to the face, but fortunately few people die in these attacks. No reports in the literature have presented a sizable series of injuries from bear attacks in Kashmir.

The aim of this paper was to report a sizable series of bear-inflicted injuries and discuss their management and complications.

MATERIALS AND METHODS

A retrospective study was conducted in the Department of Orthopedics Government Medical College Srinagar of the University of Kashmir. This is one of the prestigious tertiary care trauma and research centers of India, catering to a population of five million. The case histories of all the patients who presented to this institution from January 2003 to June 2007 with history of injury from bear attacks were reviewed. The records of these victims were also reviewed in the Wildlife Protection Department of Jammu and Kashmir. The results were formulated after combining the information collected from these two different sources.

RESULTS

A total of 254 cases were recorded over a period of 54 months. There were 186 (71.7%) males and 68 (28.3%) females, including 16 children (Table 1). Two hundred and three (80%) victims were attacked in the maize fields and apple orchards; only 51 (20%) victims were attacked in the dense forests. Deep lacerations to the scalp, face and trunk were the most common findings, affecting 163 (64%) patients. Upper limb (24%) and facial (19%) and skull bone (18%) fractures were a striking observation. Hearing loss, intracranial bleed and fractures of the ribs were seen in 12.%, 6% and 4.7% of patients, respectively. Avulsion of tendons and nerves of the forearm and hand was seen in 28% of patients. Injuries to the eyes and external ears were less common (Table 2). Long-term sequelae in most of the patients were permanent facial disfigurement (10.6%) (Fig. 1), loss of digits (4.3%), hearing loss (12.5%) and stiffness of the joints (21.5%). Residual neurodeficit (1.9%) and persistent psychological morbidity were seen in some patients (Table 3). There were two mortalities. One was due to massive

Table 1. Sex distribution of the victims

Sex	No. of victims	No. of children
Males	186 (71.7%)	9
Females	68 (28.3%)	7

Table 2. Injury pattern

Total number of patients	254
Deep lacerations to the scalp, face and trunk	163 (64%)
Upper limb fractures	61 (24%)
Lower limb fractures	8 (3%)
Rib fractures	12 (4.7%)
Skull fractures	46 (18%)
Facial bone fractures	49 (19%)
Intracranial hemorrhage	16 (6%)
External ear injuries	5 (2%)
Internal ear injuries	32 (12.5%)
Eye evisceration	2 (0.8%)
Femoral vessel injury	1 (0.4%)
Tendon and nerve avulsions	71 (28%)

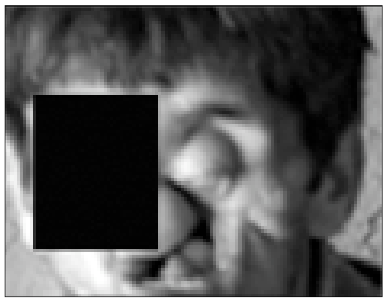

Fig. 1. Severe lacerations to the face and avulsion of the maxilla leading to permanent disfigurement of the face.

Table 3. Sequelae of injuries

Number of patients	131 / 254
Disfigurement of face	27 (10.6%)
Residual neurodeficit	5 (1.9%)
Hearing loss	32 (12.5%)
Stiffness of joints	54 (21.5%)
Loss of eye	2 (0.8%)
Partial amputations of limbs	11 (4.3%)

intracranial hemorrhage and delayed presentation for definitive care; the second case did not receive the tetanus prophylaxis and medical care in a timely manner and died later of tetanus.

The survivors were admitted and treated as per the Advanced Life Trauma Support with an average follow-up of 24.5 months (5-42 months). Copious irrigation and debridement of the wounds was done immediately. A combination of parenteral antibiotics (cephalosporin, amino glycoside and fluoroquinolone) was started and modified according to the culture sensitivity. Tetanus prophylaxis was given to unimmunized patients and rabies vaccine to all patients. Some bear-inflicted wounds were clean and closed primarily. Delayed primary closure or skin and soft tissue reconstruction was done after the subsidence of infection. Most of the patients needed repeated debridement over a period 2-4 weeks. The compound fractures were initially stabilized by external fixation (Fig. 2) till the signs of infection were resolved, when conversion osteosynthesis was performed. Craniotomy was done in 16 patients with intracranial hemorrhage; varying degrees of neurodeficit persisted in five patients. Evisceration of the eye was done in two patients who had complete perforation of globe (Fig. 3). In patients with metacarpal fractures and tendon lacerations, stiffness of hand persisted after completion of treatment. Tables 1, 2 and 3 present the sex distribution, injury pattern and the sequelae among the survivors.

DISCUSSION

Among the injuries sustained by man, road traffic accidents, fall from heights, firearm injuries, and mass disasters have been the focus of most reports. Wild animal-inflicted injuries are thought to be rare and are given less attention. Stringent conservation of wildlife has simultaneously disturbed the balance between humans and wild animals, with a manifestation of increased conflict between the two. Wild animal-inflicted injuries have a distinct place in trauma management and require the attention of every subspecialty of traumatology. This is an evolving part of trauma that needs special attention, so that set protocols can be formulated for the management of these rare but serious injuries.

Wild animal injuries are distinguished by a combination of cutting, penetrating and crushing

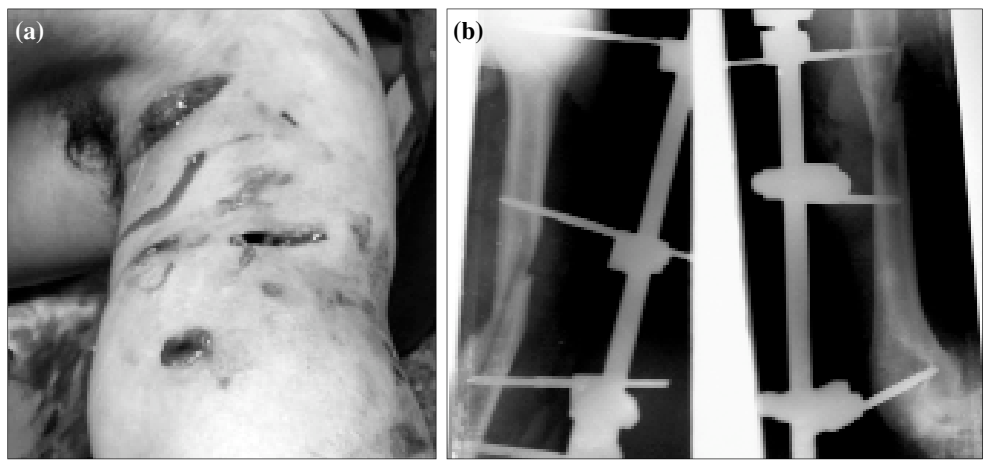

Fig. 2. (a, b) Lacerations to the arm and fracture of the humerus in a young man stabilized with external fixation.

Fig. 3. Perforation of the globe in a young girl resulting in evisceration of the eye.

injuries, with significant contamination from claws and teeth. Fall of a large animal on the body combined with strike by the extremities can lead to both blunt and penetrating trauma. To further compound the problem, the conflicts often occur in remote areas that involve a substantial delay with respect to notification, rescue and definitive care.[2] The risk of disease transmission, death and disfigurement is omnipresent in these cases.[1-12]

Life-threatening injuries resulting from wild animal bites are always treated first.[13] When a mammal's bite breaks the skin, aggressive management is indicated to prevent infection and provide a good cosmetic and functional result. Bites caused by wild animals may cause local infection, and wounds are potentially contaminated with a variety of pathogens. In addition, animals can transmit systemic diseases, many of which induce substantial morbidity and mortality.[14]

There has been an alarming increase in the incidence of wild animal attacks in the recent past in Kashmir, a state known as "the paradise on earth". The Asian black bear, Persian leopard and wolf are among the commonly attacking animals, with 60-70% of attacks by bears. The population of black bear outnumbers the other form of wildlife in Kashmir and the chances of confronting a bear are higher than that of a leopard. The bears are encountered in the harvesting season by the males who enter the maize fields and apple orchards to harvest the crop. Females who enter the dense forests alone for collecting firewood are attacked and sometimes killed.

The bear usually attacks for self defense with special predilection towards the face, causing minor injuries to some but major fractures and serious disfigurement in others (Figs. 1, 2). In addition, to bite by powerful jaws, the common means of attack by the bear is to slap the head and facial region of the victim, leading to fractures of skull and facial bones, extra- or intracranial hemorrhage, hearing loss and deep lacerations to the face. Compound fractures of the upper limbs, tendon lacerations and hearing loss (due to powerful slap) are commonly seen in the victims of bear attack.

A significant delay (6-18 hours) is involved to reach a composite trauma center, which further compounds the problem and leads to more damage.

The management of these injuries should start from the site of conflict, which involves measures to stop bleeding from the wounds, fluid and blood transfusion and immediate transport to an appropriate trauma center. A detailed examination of the whole body should always be carried out in these patients. The management of these injuries requires a team approach involving the orthopedic surgeons, plastic surgeon, otolaryngologist, ophthalmologist, maxillofacial surgeon, emergency medicine specialist, microbiologist and psychiatrist. The patients should routinely be subjected to radiography of the skull, cervical spine, chest and upper limbs. Computerized tomography scan of the skull and maxillofacial regions is often needed. These injuries involve substantial struggle on the part of victim on the ground, which forces mud, grass and other contaminating material into the wounds. Vigorous irrigation and removal of all foreign material are of paramount importance. Suturing of the wounds should be delayed till the risk of infection has passed. Administration of tetanus prophylaxis in unimmunized patients and rabies vaccine in all patients should be a routine protocol. Antibiotics should routinely be administered. The compound fractures should be stabilized by external fixation and later converted to osteosynthesis if desired.

In conclusion, the steadily increasing human population in areas close to the jungle and stringent conservation of wildlife has disturbed the balance between humans and wild animals, with a manifest increase in the conflict between the two. The bear usually attacks for self defense with a special predilection to the face. The bear attacks are generally nonfatal, leading to complex fractures and serious disfigurement. These conflicts take place in remote and rural areas lacking composite trauma centers, and urgent decision for proper referral of these patients will have a significant impact on the final outcome. The management of these patients requires a team approach involving all subspecialties of trauma.

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