Abstract: Human bites (HB) are the third most common bite wound diagnosed in emergency departments, after dog and cat bites. Management of HB can be challenging, given the high risk of infection associated with the multiorganism-rich oral flora. Recognition and early aggressive treatment are essential steps in preventing infections and other associated complications. Methods. A retrospective, 10-year electronic chart review was performed, which identified 104 HB. Diagnosis, treatment, and outcome were noted for each case. Results. Most of the patients were male, with a male:female ratio of 4:1. A majority of patients (n = 53, 51%) presented with finger and hand injuries. Only 13.8% were bitten on the head or neck, and 25% on the upper limbs. The remainder (35.2%) of patients sustained injuries to other body parts. Twelve operations were necessary and performed by plastic and hand surgeons. More than half of the patients (60.5%) received antibiotic therapy, and 84.6% of the patients had their tetanus prophylaxis administered or received a booster by the time of treatment. Only 40.4% of patients had a post-bite serology test to rule out bloodborne viral infections, none of whom tested positive. The viral status of the biter was known in two cases. Conclusion. The goals of HB management are to minimize infection risk and its complications, and to prevent the transmission of systemic infections, such as hepatitis B/C and HIV. Accurate documentation and a management algorithm should be instituted in emergency departments in order to achieve these goals.
The following report is based on a 10-year retrospective study of human bite injuries treated at Inselspital Emergency Department (Bern, Switzerland). This is the first Swiss study in the literature related to human bites. The aim of this study is to describe the authors’ patient pool and analyze injury patterns and management in an effort to establish an algorithm and management guidelines for human bite wounds.

Methods

Between 2000 and 2010, 1083 patients were seen at Inselspital University Hospital Emergency Department after sustaining bite injuries from different species (Table 1). Of those, 104 (9.6%) patients sustaining 109 human bite injuries at different regions of their body were treated in the authors’ department. Patients were identified using the Qualicare electronic medical record (Qualidoc AG, Trimbach, Switzerland). Patient data and information were collected and analyzed retrospectively. The data collected included: general patient demographics (gender, age, and nationality); manner of assault; sex of the assailant; time and date of the bite incident; and time to presentation at the emergency department after injury. Wound location, symptoms, treatment received (local vs. systemic), need for surgery, postoperative complications, viral transmission evaluation, and any follow-up were also noted. A non-human bite wound was the only exclusion criterion.

Results

Demographics. During the study period, 104 patients presented to the authors’ emergency department (ED) at Inselspital University Hospital. Of the patients who presented, 81 were male (78%) and 23 were female (22%). The median age was 45 years (range, 16–73).

Patients. Fifty-eight patients (55.7%) stated that they were victims of an assault in a public place, 19 (18.2%) were police officers bitten during an arrest procedure or were on-duty security or bus controllers, 11 (10.6%) were victims of domestic violence, 10 (9.6%) were medical staff caring for a patient, 2 (1.92%) had bitten themselves, and 1 (0.96%) was injured playing a sport (Table 2). It was noted that 8 patients had been bitten by their wives, 1 (0.96%) was bitten by his 16-month-old daughter, and 1 (0.96%) by his child during an epileptic attack while he was providing first aid. The gender of the assailant was also analyzed. A majority of patients (60, 57.7%)...
were bitten by another male. Of the male patients, 53 (65.4%) were bitten by males, the remainder (27, 33.3%) were bitten by females. Two male patients bit themselves as a result of dementia. Fourteen (60.8%) of the female patients were bitten by females and 7 (30.4%) by males. Documentation on the assailants’ gender for 1 male and 2 females was missing (Table 2). A majority of patients (85, 81.7%) presented to the emergency the same day (within the first 24 hours) of sustaining injury. Seventeen patients (16.3%) presented with a delay ranging 1–5 days. There were two cases where the patients received primary treatment at another hospital and presented 1 month later to the authors’ department with a wound infection (Table 3).

**Injuries.** Finger injuries were the most common among the patients. There were 38 (34.8%) finger injuries, 15 hand injuries (13.8%), 27 upper extremity injuries (25%), 15 located on the head (13.8%), and 12 injuries to other body parts, such as the shoulder (3, 2.8%), lower extremities (3, 2.8%), torso (5, 4.6%), and genitalia (1, 0.96%). Only 1 (0.96%) injury was a fight-related bite to the hand (Figure 1). Most of the injuries (88, 84.6%) were surface wounds (ie, abrasion and/or minimal skin defect). Phalanx fractures occurred in one patient (0.96%).

**Keypoints**
- The risk of local bacterial infection associated with human bites is relatively high. Infection from a human bite is documented to be between 10%–20%.1,4,5
- The importance of prophylactic antibiotic treatment is described in several reports, and the reduction in the infection rate following prophylactic antibiotics is well documented.10 In the present study, a majority of patients (60.5%) received prophylactic oral antibiotics for 5 to 10 days, and patients with delayed presentation and infection signs received intravenous antibiotics.

**Table 2.** Gender of the biter in connection to the incidence.

<table>
<thead>
<tr>
<th>Conflict</th>
<th>Law Enforcement Personnel</th>
<th>Domestic Violence</th>
<th>Sport</th>
<th>Medical Staff</th>
<th>Self Bite</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>M → M</td>
<td>37 (35.6%)</td>
<td>11 (10.6%)</td>
<td>1 (0.96%)</td>
<td>1 (0.96%)</td>
<td>2 (1.92%)</td>
<td>53 (51%)</td>
</tr>
<tr>
<td>M → F</td>
<td>3 (2.9%)</td>
<td>-</td>
<td>-</td>
<td>4 (3.8%)</td>
<td>-</td>
<td>7 (6.7%)</td>
</tr>
<tr>
<td>F → M</td>
<td>9 (8.6%)</td>
<td>7 (6.7%)</td>
<td>9 (8.6%)</td>
<td>-</td>
<td>2 (1.92%)</td>
<td>27 (26%)</td>
</tr>
<tr>
<td>F → F</td>
<td>9 (8.6%)</td>
<td>1 (0.96%)</td>
<td>1 (0.96%)</td>
<td>-</td>
<td>3 (2.9%)</td>
<td>14 (13.4%)</td>
</tr>
<tr>
<td>Total</td>
<td>58 (55.7%)</td>
<td>19 (18.2%)</td>
<td>11 (10.6%)</td>
<td>10 (9.6%)</td>
<td>2 (1.92%)</td>
<td>101 (100%)</td>
</tr>
</tbody>
</table>

M: male  
F: female

**Table 3.** Time to presentation.

<table>
<thead>
<tr>
<th>Time to Presentation</th>
<th>No. Patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same day &lt; 24 hrs</td>
<td>85 (81.7)</td>
</tr>
<tr>
<td>1 d (&gt; 24 hrs)</td>
<td>7 (6.7)</td>
</tr>
<tr>
<td>2 d</td>
<td>3 (2.9)</td>
</tr>
<tr>
<td>3 d</td>
<td>1 (0.96)</td>
</tr>
<tr>
<td>4 d</td>
<td>4 (3.8)</td>
</tr>
<tr>
<td>5 d</td>
<td>2 (1.92)</td>
</tr>
<tr>
<td>1 month</td>
<td>2 (1.92)</td>
</tr>
</tbody>
</table>
Figure 1. Location of bites.

Figure 2. Suggested treatment algorithm for human bite wounds.
patients had any postoperative complications according to follow-up records. There was no detailed documentation for the 48 other patients who returned for follow-up.

**Discussion**

Human bite injuries are a ubiquitous presentation to emergency departments (ED). They are associated with male predominance, with a male:female ratio of 12:1. In the present study, the ratio was 4:1. Most of the bites occurred during a conflict and were located mostly on fingers and upper extremities. Only 11% of the patients had wounds of the head and face, which is much less than cases reported in the literature.

The risk of local bacterial infection associated with human bites is relatively high. Infection from a human bite is documented to be between 10%–20%. This risk is much higher than any other type of bite injury, since the bacterial load of the human saliva contains more than 900 x 10^6 organisms/mL. Infection is related to bite location, time of presentation, and systemic diseases, such as diabetes mellitus, splenectomy, and immunosuppression. The infection rate of facial injuries is lower compared to other body parts because of higher vascularity. A factor of increased infection risk is the delayed presentation to the ED of more than 12 hours. The importance of prophylactic antibiotic treatment is described in several reports, and the reduction in the infection rate following prophylactic antibiotics is well documented. In the present study, a majority of patients (60.5%) received prophylactic oral antibiotics for 5 to 10 days, and patients with delayed presentation and infection signs received intravenous antibiotics.

Despite the rare risk of tetanus transmission in these wounds, and the precaution that was taken by administering tetanus vaccine, 2 cases have been reported in the literature, 1 of which was fatal. In this retrospective study, the documentation of tetanus prophylaxis was well recorded. Only three patients had poor tetanus immunization documentation. The rest received tetanus prophylaxis or booster where required, in accordance to basic surgical principles.

Transmission of viral diseases via human bites remains a controversial issue. Hepatitis B/C and HIV infection can occur as a complication of a human bite. Seventy-five percent of patients with hepatitis B have a detectable antigen in their saliva. Although only 4 cases are reported, the Department of Health (DoH) guidelines acknowledge the risk of hepatitis B transmission through a human bite. Small amounts of HIV are possible to be present in the saliva, but exposure to the saliva alone is not considered a risk factor, unless a mix of saliva and infected blood coexists, along with the required skin breach for bodily fluid exchange. The possibility of viral transmission from an HIV-infected victim to the assailant must be also considered. Five cases of HIV-1 infection following a human bite are reported in the literature. Baseline serology testing for hepatitis B surface antigen, hepatitis C antibody, and HIV antibodies, is appropriate after a human bite, as well as retesting at 3 and 6 months. According to the Centers for Disease Control and Prevention (CDC), the risk appears to be higher if the viral titer of the biter is high. Standard CDC guidelines should be followed for the treatment for exposure to viral diseases. In the present study, the authors noticed that medical records lacked documentation of the biter’s viral status in most cases. In an effort to enhance internal documentation and to prevent viral transmission, an algorithm was developed that the authors believe the hospital’s ED physicians should follow (Figure 2).

The timing and the modality of surgical treatment of human bite injuries affects wound infection, as well as cosmetics. Some surgeons prefer primary wound closure, especially when the patient presents early after the injury and they indicate low infection and complication rate. Other surgeons suggest that primary closure improves the cosmetic outcome. Human bite injuries should not be underestimated in order to prevent infection. Adequate irrigation and debridement, along with antibiotic and tetanus prophylaxis, is recommended. Surgical revision must be performed when required, especially when cartilage or joints are exposed and when avulsion with tissue loss is present. In the authors’ experience,

**Keypoints**

- Surgical revision must be performed when required, especially when cartilage or joints are exposed and when avulsion with tissue loss is present.
- In the authors’ experience, surgical treatment in the cases where fractures or avulsions had occurred took place within the first 24 hours of a patient’s presentation to the ED.
- Due to the polymicrobial nature of these wounds and the increase in antibiotic resistance, ED physicians should be aware of the common organisms involved and their susceptibility to commonly used antibiotics. Despite the lower risk of viral transmission, serology testing is recommended for the victim, and the biter, when possible.
surgical treatment in the cases where fractures or avulsions had occurred took place within the first 24 hours of a patient’s presentation to the ED.

Follow-up documentation seems to be of great importance in order to assess healing and possible complications. Follow-up within 24 to 48 hours is recommended, and according to the authors’ collected data, initial follow-up for most of the authors’ patients was in line with these recommendations.

Conclusion

Human bites can be dangerous wounds and have drastic complications and morbidity. Emergency physicians should be more aware about these risks, and should be knowledgeable in evaluating and managing human bites in order to avoid complications. Early treatment, appropriate prophylaxis, and surgical evaluation are crucial to achieve optimal treatment outcomes. Due to the polymicrobial nature of these wounds and the increase in antibiotic resistance, ED physicians should be aware of the common organisms involved and their susceptibility to commonly used antibiotics. Despite the lower risk of viral transmission, serology testing is recommended for the victim, and the biter, when possible. Accurate documentation, proper evaluation techniques, and a management algorithm specific to human bites, should be instituted to facilitate the role of ED residents and physicians when faced with these injuries.

References