We describe a blast injury caused by a human suicide bomber that led to a penetrating bone fragment containing tissue positive for hepatitis B surface antigen. The tissue acted as an infectious source that was disseminated by the explosion.

**Patient Description**

Following the explosion of a human suicide bomber, 32 people who suffered blast injuries presented to the emergency room of our hospital. Of these, 22 patients were admitted; 4 had severe injuries, 5 had moderate injuries, and the remainder was mildly wounded. We present one of these patients.

On examination, this 31 year old woman was fully conscious, with multiple skin abrasions and lacerations due to impacted blast fragments. She had first-degree facial burns and some deep injuries in her legs. Bilateral traumatic tympanic membrane perforations were noted. There were no apparent chest or abdominal injuries. Computed tomography scans of the neck and chest revealed no internal damage, but several high density fragments were noted in the right cervical subcutaneous tissues (Figure), as well as in the left breast, pubis, right hand and both legs.

The patient was taken to the operating room where embedded bone fragments were removed from the neck (Figure), breast and pubis. The postoperative recovery was uneventful and she was discharged home on postoperative day 60, following prolonged orthopedic treatment because of the leg injuries. Her hearing test showed bilateral high tone sensorineural hearing loss with normal speech reception thresholds.

The bone fragments were sent to the Israel Institute of Forensic Medicine, and examination revealed findings positive for HBsAg (by the AXSYM system, Abbott, USA). Human immunodeficiency virus test was negative. Accordingly, the patient was treated with active and passive hepatitis B vaccinations.

**Comment**

Powerful explosions commonly cause conventional blunt and penetrating trauma. Knowledge of the potential mechanisms of injury will greatly aid the management of blast injury patients [1].

Human bone fragments, which act as foreign bodies and are of biologic infected origin, are a new concept in blast injuries. Primary blast injuries occur as a direct effect of change in atmospheric pressure caused by the blast wave. Secondary blast injuries occur when objects accelerated by the energy of the explosion strike the victim [1], causing blunt or penetrating ballistic trauma (as described here) by the bone fragments.

Traditional blast injuries include burns, impacted shrapnel from the bomb itself, and tympanic membrane damage and hearing threshold shifts from pressure waves. In the case of a suicide bombing, the blast shrapnel may include soft tissue and bone fragments from the bomber himself, creating a novel and gruesome way of disseminating infectious disease. We believe that the routine submission of such retrieved bone fragments for formal virologic analysis is warranted. Real-time ultrasound can be used to guide the surgeon both in seeking dynamic bone fragments and removing the foreign body [2].

Because of the above described case, the Israel Ministry...
of Health has ordered active immunization against hepatitis B for all injured patients in such terror attacks.

To the best of our knowledge this is the first report on human bone fragments acting as foreign bodies in a blast injury [3,4].

References


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Oxymorons – the combination of contradictory or incongruous words

<table>
<thead>
<tr>
<th>Act naturally</th>
<th>Passive aggression</th>
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<tr>
<td>Found missing</td>
<td>Clearly misunderstood</td>
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<tr>
<td>Genuine imitation</td>
<td>Temporary tax increase</td>
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<tr>
<td>Same difference</td>
<td>Tight slacks</td>
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<td>Almost exactly</td>
<td>Plastic glasses</td>
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<td>Government organization</td>
<td>Definite maybe</td>
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<td>Alone together</td>
<td>Pretty ugly</td>
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<tr>
<td>Silent scream</td>
<td>Exact estimate</td>
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<tr>
<td>Small crowd</td>
<td>Microsoft Works</td>
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<td>Sweet sorrow</td>
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Capsule

Schwann cells and nerve disorders

The glial cells of the peripheral nervous system, the Schwann cells, play important supporting roles, such as producing myelin, but their generation appears to facilitate two important nervous system disorders. Neurofibromatosis type 1 (NF1) is an inherited disorder characterized by the development of multiple benign tumors in the nervous system (neurofibromas) that occasionally progress to malignancy. Affected individuals have germline mutations in one allele of the tumor suppressor gene NF1, and their tumors show loss of expression of the other allele. Neurofibromas contain a complex mixture of cell types, but it has been unclear which of these cells gives rise to the tumors.

Using a sophisticated mouse model in which NF1 expression can be selectively ablated in specific cell types, Zhu et al. (Science 2002;296:884) show that the tumors arise specifically from Schwann cell precursors. Interestingly, however, tumor development was greatly accelerated when the surrounding non-neoplastic cells carried only one functional allele of NF1, illustrating the importance of tumor-host interactions in tumorigenesis. The causative agent of leprosy, Mycobacterium leprae, prefers to infect Schwann cells and the resulting demyelination of nerve fibers leads to a progressive loss of sensation. It has been assumed that the nerve damage was mediated indirectly by the host’s immune responses against the bacteria, but Rambukkana et al. (p. 927; see the Perspective by Brophy) show that the M. leprae directly causes demyelination via a contact-mediated mechanism. Nerve injury stimulates compensatory Schwann cell proliferation, and in this way M. leprae generates more habitable cells to occupy.