Letter from Croatia

SURGICAL MANAGEMENT OF CASUALTIES IN A LOW-INTENSITY WAR

Surgical management in any future conventional war of low intensity will be based upon experiences from recent war campaigns, although there is a tendency to equate combat casualty care and civilian trauma management.1,2

One of the main similarities in the management of war and civilian casualties is that a major war campaign will result in the mobilization of many surgical and nursing teams from civil hospitals with no previous experience in battlefield surgery.3,4

Battlefield surgery is the management of trauma incurred during military operations and provided for under war conditions. Civil hospitals near or on the battlefield have to provide such management for an unknown number of serious casualties, in a short period of time, with limited hospital space, capacities and personnel.5

At the beginning of the 1991–92 war in Croatia, we had such experiences in the eastern part of the country.

SITUATION

The 1991 conflict involving Croatia prompted the transformation of the Osijek University Hospital into a war hospital for the northeastern part of the country.

By September 1991, all surgical activities had to be moved to the basement rooms and corridors due to constant shelling of the city, including the hospital. During this period, 268 explosive devices (mortar and tank shells, air bombs and missiles) hit the hospital buildings.6,7 The hospitals in Vukovar,8 Vinkovci9 and other Croatian cities near the battlefield10 were also attacked.

Before the war, the Osijek University Hospital had 1600 beds and served as a teaching hospital for the Osijek Branch of the Zagreb University Medical School. The Department of Surgery had 230 beds and 35 surgeons working in 7 subspecialties. The staff had no experience or education in war surgery.

SURGICAL MANAGEMENT

From 2 May 1991 to 1 November 1992, 4545 patients with war
injuries from the city and municipality of Osijek were admitted and treated at the Department of Surgery. The causes of injuries were explosive devices in 2544 cases (56%); firearm bullets in 808 (18%), and blunt objects and other causes in 1194 cases (26.2%). Among them 1669 (36.7%) were civilians and the rest (63.3%) members of the Croatian Army or Police, or soldiers from the aggressor, the Yugoslav Federal Army. The mean age of the patients was 33 years with 3942 men (86.7%) and 603 women (13.3%). At the time of being brought to the hospital, 1359 (30%) were non-ambulatory and 3186 (70%) ambulatory. Only 204 admitted patients (4%) had altered consciousness.

Operative management was performed in 2875 patients (63%). In 48% of them, a high-dose combination of broad-spectrum antibiotics was administered. All patients received thrombo-prophylaxis. Only 1777 patients (40%) were hospitalized, and the rest (60%) were treated as outpatients after primary management. The mean (SD) hospital stay was 14.1 (9.2) days. After primary surgery, 710 (15%) were evacuated to other hospitals far from the battlefield. The number of patients and surgical operations done are shown in Table I. A total of 20,639 units of infusions (500 ml) were administered to 28% of the patients; 4192 units of blood (350 ml) to 14% of the patients and 509 units of plasma to 4% of the patients.

The incidence of complications was very low in spite of the suboptimal conditions (two adjacent operating tables in each surgical theatre and postoperative care in basement corridors). 1.7% superficial wound infections, no anaerobic infection. 3.3% amputation rate after arterial reconstruction and an overall post-operative mortality of 2.95% (134 patients). More than half (55%) of the deaths took place in the first 24 post-operative hours, another 23% in the next 24 hours, 5% in the first 6 days and 2% after this period. The number of wounded who died before being brought to the hospital was 780.

Table II gives data on body regions, causes of injury, shock and early complications. Injuries to the extremities were the most frequent but did not have the highest mortality rate as experienced in other war situations. Life and limb salvage was the main task in war surgery.

Evacuation and transportation from the site of injury was not efficiently organized in the beginning of the war and yet 48% of the wounded arrived at the hospital within the first hour and another 46% within the second hour. Transportation time was short and this altered the mortality rate in two ways: first, patients with life-threatening injuries (usually killed in action) were admitted alive and died shortly afterwards (55% of deaths in the first 24 post-operative hours) increasing hospital mortality. Second, rapid transportation allowed those who are usually 'killed in action' to have a chance at treatment and this decreased the pre-hospital mortality.

CONCLUSIONS

Explosive devices would be expected to be the most frequent cause of injury as a consequence of long-range artillery shelling and attacks on civilian targets. We recommend some improvement of the war surgery doctrine while holding to some basic surgical rules: adequate wound excision, removal of devitalized tissue and foreign bodies, good haemostasis, revision of missile path and recognition of tissues and anatomic structures injured, good drainage, reconstruction of only major vessels, application of external fixation, no spongioplasty, and no primary wound closure with an antibiotic prophylactics. As well as thrombo- prophylactics. The theory of wound ballistics should not guide civil surgeons in war conditions to follow the written rules of war surgery disregarding their general surgical practice. Therefore, a team of well-trained general surgeons from civil hospitals, guided by experienced traumatologists, could take on the task of running a battlefield hospital.

Success of civil surgery in war depends on the appropriate transformation of all professional, technical and administrative resources to war-oriented surgery.

Table II. Body regions, cause of wound, shock and infections in 4545 patients treated at the Department of Surgery, Osijek University Hospital, from 2 May 1991 to 1 November 1992

<table>
<thead>
<tr>
<th>Region</th>
<th>n</th>
<th>Wounded by</th>
<th>Shock</th>
<th>Infection Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Bullet</td>
<td>Fragment</td>
<td>rate</td>
</tr>
<tr>
<td>All injured</td>
<td>4545</td>
<td>17.8</td>
<td>55.9</td>
<td>11.3</td>
</tr>
<tr>
<td>Head and neck</td>
<td>815</td>
<td>11.0</td>
<td>77.3</td>
<td>16.3</td>
</tr>
<tr>
<td>Thorax</td>
<td>716</td>
<td>16.6</td>
<td>82.3</td>
<td>23.7</td>
</tr>
<tr>
<td>Abdomen</td>
<td>538</td>
<td>19.5</td>
<td>79.6</td>
<td>30.1</td>
</tr>
<tr>
<td>Upper extremity</td>
<td>1243</td>
<td>19.1</td>
<td>74.3</td>
<td>11.8</td>
</tr>
<tr>
<td>Lower extremity</td>
<td>1526</td>
<td>23.6</td>
<td>74.5</td>
<td>12.8</td>
</tr>
</tbody>
</table>

All values are percentages except the number of patients.

REFERENCES

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