Selective non–operative treatment of gunshot penetrating abdominal wounds

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Abstract

Objective. To analyse own experience and determine the feasibility and tactics of selective non–operative treatment of gunshot penetrating abdominal wounds.

Materials and methods. The study involved 74 servicemen (all men) with gunshot shrapnel penetrating abdominal wounds, who were divided into two groups: the main group – 26 (35.2% ± 0.2%) wounded who received non–surgical treatment, and the control group – 48 (64.8% ± 0.3%) wounded who received surgical treatment in the form of diagnostic laparotomy or laparoscopy. Non–surgical treatment included pain relief, antibiotic prophylaxis, tetanus toxoid administration and dressings.

Results. In general, selective nonoperative treatment of gunshot penetrating abdominal wounds was used in 1% of the wounded. Isolated abdominal wounds were present in 32 (43.2% ± 0.2%) and thoracoabdominal wounds in 42 (56.8% ± 0.3%) patients. In terms of the number of foreign bodies, wounds were single in 66 (89.2% ± 0.3%) and multiple (liver and retroperitoneal space) in 8 (10.8% ± 0.1%) patients. In the main group, there were no surgical interventions or complications, in the control group, 8 (16.7% ± 0.1%) diagnostic laparotomies and 40 (83.3% ± 0.3%) diagnostic laparoscopies were performed, and there were 2 (4.2% ± 0.1%) complications – seroma and pneumonia. The average treatment period was (5 ± 0.3) days in the main group and (8 ± 0.4) days in the control group.

Conclusions. Selective non–surgical treatment of gunshot penetrating abdominal wounds is indicated in haemodynamically stable patients without reduced level of consciousness and signs of peritonitis and intra–abdominal bleeding, abdominal pain syndrome with a follow–up period of 24 – 48 hours. The tactic of selective non–operative treatment of gunshot penetrating abdominal wounds is advisable mainly in case of damage to parenchymal organs. This tactic can be used in the presence of expert–class equipment, experienced specialists in the conditions of the third level of medical care and interaction between the second and third levels of medical care.

Key words: gunshot wounds of the abdomen; penetrating wound; selective non–operative treatment.
Materials and methods

The study included 74 servicemen (all men) who were undergoing inpatient examination and treatment at the Military Medical Clinical Centre of the Northern Region for gunshot shrapnel penetrating abdominal wounds and were divided into two groups: the main group – 26 (35.2% ± 0.2%) wounded who received non–surgical treatment, and the control group – 48 (64.8% ± 0.3%) wounded who received surgical treatment in the form of diagnostic laparotomy or laparoscopy. The average age of the wounded was (37.3 ± 2.6) years.

Inclusion criteria: haemodynamically stable condition, unimpaired level of consciousness, no signs of peritonitis and intra–abdominal bleeding, abdominal pain with a follow–up period of 24 – 48 hours, absence of free fluid and air in the abdominal cavity.

The study did not include wounded with injuries to hollow organs, signs of peritonitis and intra–abdominal bleeding, with severity of injury of IV–V degrees according to the AIS (Abbreviated Injury Scale); with combined or combined injuries; when treatment ended in death.

Complaints, anamnesis, and examination data were taken from all the wounded. General clinical blood and urine tests, biochemical blood tests, and coagulation tests were performed using the Respons 920 (Germany) and Lab Analyt (China), HumaClot Duo Plus (Germany), Labline 40 and Sunrise (Austria) with additional BIORAD and BIOSAN equipment. Ultrasound was performed according to the FAST (Focused Assessment with Sonography in Trauma) protocol during delivery and during follow–up examinations on a Logiq P8P910 ultrasound machine (USA, 2021), and MSCT of the chest cavity (CX) and abdominal cavity (AC) on a Revolution EVO machine with a tomographic pitch of 0.5 mm (2021).

Video esophagastroduodenoscopy and video colonoscopy were performed on the Olympus CV–170 video endoscopic system (2016) to exclude damage to the hollow organs.

Non–operative treatment included pain relief, antibiotic prophylaxis, tetanus toxoid administration and bandaging.

Statistica 10 software (StatSoft, Inc., USA) was used for statistical analysis.

Results

In the study groups, isolated abdominal wounds were recorded in 32 (43.2% ± 0.2%) and thoracoabdominal wounds in 42 (56.8% ± 0.3%) patients. In terms of the number of foreign bodies, 66 wounds (89.2% ± 0.3%) were single, 8 (10.8% ± 0.1%) were multiple.

Among the locations of the gunshot wound entry wound (Table 1), the lateral surface of the chest prevailed – 42 (56.8% ± 0.3%), followed by the lumbar region – 16 (21.6% ± 0.2%), the lateral surface of the abdomen – 10 (13.5% ± 0.2%), the anterior surface of the abdomen – 6 (8.1% ± 0.1%), which is associated with the presence of personal protective equipment (bulletproof vest).

Table 1. Localisation of the gunshot wound entrance wound

<table>
<thead>
<tr>
<th>Localisation</th>
<th>Group.</th>
<th></th>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>basic</td>
<td>control</td>
<td>Together</td>
<td></td>
</tr>
<tr>
<td></td>
<td>abs.</td>
<td>%</td>
<td>abs.</td>
<td>%</td>
<td>abs.</td>
</tr>
<tr>
<td>Front surface of the abdomen</td>
<td>3</td>
<td>4.0 ± 0.1</td>
<td>3</td>
<td>4.0 ± 0.1</td>
<td>6</td>
</tr>
<tr>
<td>Lateral surface of the abdomen</td>
<td>4</td>
<td>5.4 ± 0.1</td>
<td>6</td>
<td>10.8 ± 0.1</td>
<td>10</td>
</tr>
<tr>
<td>Lumbar region</td>
<td>9</td>
<td>12.1 ± 0.1</td>
<td>7</td>
<td>9.5 ± 0.1</td>
<td>16</td>
</tr>
<tr>
<td>Side surface of the chest</td>
<td>10</td>
<td>13.5 ± 0.2</td>
<td>32</td>
<td>43.2 ± 0.2</td>
<td>42</td>
</tr>
<tr>
<td>In total ...</td>
<td>26</td>
<td>35.2 ± 0.2</td>
<td>48</td>
<td>64.8 ± 0.3</td>
<td>74</td>
</tr>
</tbody>
</table>

Table 2. Localisation of foreign bodies in gunshot penetrating abdominal wounds

<table>
<thead>
<tr>
<th>Localisation</th>
<th>Group.</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>basic</td>
<td>control</td>
<td>Together</td>
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<tr>
<td></td>
<td>abs.</td>
<td>%</td>
<td>abs.</td>
<td>%</td>
<td>abs.</td>
</tr>
<tr>
<td>Liver</td>
<td>10</td>
<td>13.5 ± 0.2</td>
<td>22</td>
<td>29.7 ± 0.3</td>
<td>32</td>
</tr>
<tr>
<td>Kidney</td>
<td>3</td>
<td>4.0 ± 0.1</td>
<td>4</td>
<td>5.4 ± 0.1</td>
<td>7</td>
</tr>
<tr>
<td>Spleen</td>
<td>1</td>
<td>1.3 ± 0.1</td>
<td>2</td>
<td>2.7 ± 0.1</td>
<td>3</td>
</tr>
<tr>
<td>Retroperitoneal space</td>
<td>7</td>
<td>9.5 ± 0.1</td>
<td>6</td>
<td>8.1 ± 0.1</td>
<td>13</td>
</tr>
<tr>
<td>Large gland</td>
<td>2</td>
<td>2.7 ± 0.1</td>
<td>4</td>
<td>5.4 ± 0.1</td>
<td>6</td>
</tr>
<tr>
<td>Intestinal mesentery</td>
<td>1</td>
<td>1.3 ± 0.1</td>
<td>4</td>
<td>5.4 ± 0.1</td>
<td>5</td>
</tr>
<tr>
<td>Two bodies</td>
<td>2</td>
<td>2.7 ± 0.1</td>
<td>6</td>
<td>8.1 ± 0.1</td>
<td>8</td>
</tr>
<tr>
<td>In total ...</td>
<td>26</td>
<td>35.2 ± 0.2</td>
<td>48</td>
<td>64.8 ± 0.3</td>
<td>74</td>
</tr>
</tbody>
</table>
Analysis of the localisation of foreign bodies in gunshot penetrating abdominal wounds (Table 2) showed the predominance of gunshot wounds to the liver – 32 (43.2% ± 0.2%), followed by gunshot wounds to the retroperitoneal space – 13 (17.6% ± 0.2%), two organs – 8 (10.8% ± 0.1%), kidney – 7 (9.5% ± 0.1%), large omentum – 6 (8.1% ± 0.1%), mesentery – 5 (6.7% ± 0.1%), spleen – 3 (4.0% ± 0.1%). Thus, gunshot injuries of parenchymal organs prevailed – 42 (56.8% ± 0.3%).

Overall, selective non–surgical treatment was used in 1% of patients with gunshot penetrating abdominal wounds.

When choosing the treatment tactics, great importance was attached to instrumental research, in particular, the results of MSCT, which allowed to determine the nature of the injury with high accuracy and predict further development of the clinical situation (Figs. 1, 2).

In the main group, there were no surgical interventions and complications, in the control group, 8 (16.7% ± 0.1%) diagnostic laparotomies and 40 (83.3% ± 0.3%) diagnostic laparoscopies were performed, complications were recorded in 2 (4.2% ± 0.1%) patients: seroma and pneumonia.

The average treatment period was (5 ± 0.3) days in the main group and (8 ± 0.4) days in the control group. Patients after laparotomy were granted medical leave for 30 calendar days by the decision of the military medical commission, while the wounded in the main group had no grounds for leave.

Discussion

Mandatory laparotomy for abdominal trauma allows for earlier and more accurate detection of some unexpected injuries, but leads to a higher incidence of non–therapeutic laparotomies, longer hospital stays and higher hospital costs.

The danger of non–therapeutic laparotomy in trauma patients has been recognised for decades, which makes it advisable to avoid "unnecessary" surgical interventions. At the same time, the risks of complications in case of delayed surgery are high. Therefore, in order to choose the optimal and
reasonable tactics for the treatment of gunshot penetrating abdominal wounds, it is necessary to take into account both of these points [8–11].

Based on our experience and the results of this study, we believe that the non–operative treatment of gunshot penetrating abdominal wounds has the right to be implemented in practice. However, this technique can be used only to a limited extent and in compliance with the basic requirement of no signs of peritonitis and intra–abdominal bleeding.

A thorough history and complaints are required, as well as a comparison of the wound canal and the foreign body with the location of vital organs, vascular and nerve bundles, etc.

An important component for determining the treatment tactics was instrumental diagnostic examination (ultrasound and MSCT), which allowed to clearly define the clinical situation and predict its development, as well as possible foreign body migration [2, 3].

In the presence of small foreign bodies in the liver, kidney, spleen, large omentum and retroperitoneal space, no indications for their removal were established.

It is clear that at the second level of medical care for gunshot penetrating wounds of the abdomen with signs of free fluid and gas in the abdominal cavity and doubts, indications for surgical intervention are formed: minilaparotomy, tupper revision of the abdominal cavity or laparocentesis with drainage of the abdominal cavity.

In view of the above, the tactics of non–operative treatment of gunshot penetrating abdominal wounds should be applied at the III level of medical care. The use of this tactic at the second level of medical care is possible provided that peritonitis and bleeding are excluded, which is confirmed by the results of ultrasound and MSCT.

**Conclusions**

1. Selective non–operative treatment of gunshot penetrating abdominal wounds should be performed in haemodynamically stable patients without reduced level of consciousness and signs of peritonitis and intra–abdominal bleeding, abdominal pain syndrome with a follow–up period of 24 to 48 hours.

2. In most cases, the tactic of selective non–operative treatment of gunshot penetrating abdominal wounds can
be used in case of damage to parenchymal organs.

3. This tactic allows avoiding "unnecessary" surgical interventions and returning the serviceman to service as soon as possible, but is possible only if there is expert-class equipment, experienced specialists in the conditions of the third level of medical care and interaction between the second and third levels of medical care.

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**Ethical aspects.** All procedures performed in the study involving patients complied with ethical standards for clinical practice and the 1964 Declaration of Helsinki, as amended.

**References**


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