Review

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Non-Operative Management of Blunt Abdominal and Retroperitoneal Solid Organs Trauma, with Retroperitoneal Hemorrhage – Indications, Methodology and Necessity

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INTRODUCTION The article is devoted to an actual problem — blunt trauma of the abdomen and organs of the retro-peritoneal space.

AIM OF STUDY Specify the indications for non-operative management of patients with blunt trauma of the solid organs of the abdominal cavity, retroperitoneal space, with retroperitoneal hemorrhage and measures for this treatment option.

MATERIAL AND METHODS The analysis of literature sources of Russian and foreign authors is carried out and the indications, methods and necessity of non-operative management of patients with blunt trauma of solid organs of the abdominal cavity and retroperitoneal space, retroperitoneal hemorrhages are substantiated.

CONCLUSION Non-operative management of patients with blunt trauma of solid organs of the abdominal cavity and retroperitoneal space, retroperitoneal hemorrhages is possible only in large specialized centers with a wide range of diagnostic and therapeutic capabilities.

Keywords: blunt abdominal trauma, non-operative management, solid organs of the abdominal cavity and retroperitoneal space, retroperitoneal hemorrhage

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BPsyst — systolic blood pressure
APTT — activated partial thromboplastin time
RTA — road traffic accident
GIB — gastrointestinal bleeding
RH — retroperitoneal hemorrhage
RPS — retroperitoneal space
CAT — closed abdominal trauma

CT — CT scan
INR — international normalized ratio
ICU — intensive care unit
USP — ultrasound procedure
USD — ultrasound doppler
TBI — traumatic brain injury
HR — heart rate
EBAO — endovascular balloon aortic occlusion
ERCHPG — endoscopic retrograde cholangiopancreatography
AAST — the American Association for the Surgery of Trauma
EAST — the Eastern Association for the Surgery of Trauma
Er — erythrocytes
GCS — Glasgow Coma Scale
Hb — hemoglobin
Ht — hematocrit
NOM — non-operative management
WSES — the World Society of Emergency Surgery

«Clinical examination at the time patient admission and further monitoring his condition is Ariadne's thread, leading through the labyrinth of laboratory and instrumental research towards a successful (or unsuccessful) non-operative management».
Cirocchi R et al., 2013 (cit. on [1])

INTRODUCTION

Of all the causes of death in Russia, mechanical trauma ranks third, second only to cardiovascular and oncological diseases, but among people under 45 y. o. it stubbornly holds the first place [1–5]. In 2019–2020, in developed countries, including our country, there was a slight decrease in injuries, and therefore mortality from it, due to a decrease in the number of road traffic accidents (RTA) as the main cause of concomitant and multiple injuries [2, 3]. Children's injuries have also decreased, in Russia in 2020 compared to the previous year the number of road accidents involving children decreased by 16.2% [2, 3].

Abdominal injuries of the total number of injuries in the regions of our country account for from 1.5 to 36.5% (on average 3.17%), which is comparable to the countries of Western Europe - 1.5-4.4% [2, 3, 5]. They are accompanied by a high level of disability (25–80% with concomitant injury and 5–8% with isolated one), and mortality with concomitant abdominal trauma reaches 70% [3, 4, 6].

When using active surgical tactics, 35% of patients do not reveal any damage to the abdominal organs during surgery; 10-30% of victims do not require surgical procedures [5]. The number of postoperative complications after explorative laparotomy ranges from 2.5 to 41% [7], and in case of concomitant injury, it is one of the causes of death in 10–35% [8, 9].

Over the past decades, conservative treatment (*NOM*) of patients as a complex multidisciplinary strategy has entered the standard protocols for the treatment of closed abdominal trauma (CTI) in large world specialized centers [8, 10-14]; its essence lies in the dynamic clinical and instrumental monitoring of the patient's condition, counting on an independent stop of bleeding from parenchymal organs or in performing selective endovascular embolization with ongoing bleeding and stable hemodynamics [1, 11–15]. The advantages of such patient management are the elimination of "unnecessary" laparotomy, a decrease in the mortality rate, the risk of extra- and intra-abdominal complications, the number of blood transfusions, the duration of inpatient treatment and the cost of it [7, 15].

BACKGROUND

It should be noted that conservative treatment has not yet become a generally accepted tactic for trauma to the parenchymal organs of the abdominal cavity and retroperitoneal space due to the possibility of skipping injuries of hollow organs and rebleeding [16, 17].

The founder of the conservative treatment of spleen injuries is considered *Billroth T.*, who successfully applied this tactic in children more than 100 years ago [15, 17]. In 1968, *Upadhyaya P. et al.* (cited from [15, 18]) reported a large number of cases of spontaneous stopping of bleeding with injuries of the spleen in children due to hypotension, clot formation, hemostatic action of the greater omentum, tamponade of ruptured perisplenic hematoma, preservation of the capsule.

Whitessell F.B. in 1960 he discovered that ruptures of the spleen are often oriented perpendicular to the longitudinal axis of the organ, while reducing the risk of damage to segmental vessels and increasing the likelihood of spontaneous stopping of bleeding (cited from [15, 19, 20]). *Karp M.P. et al.* (1983) (cited from [6, 18]) conducted a study of the process of regeneration of liver ruptures in 117 unoperated children, it proceeded in four stages: first, blood resorption occurred, then - the fusion of the rupture, reduction of its size and restoration of the organ structure, and the process itself took place in average 3-4 months [6, 18, 21].

However, most surgeons viewed this tactic negatively, since the presence of intra-abdominal bleeding dictated the need for an emergency operation, and due to the lack of modern imaging tools, it was impossible to reliably determine the source of bleeding, estimate the amount of blood loss, exclude trauma to hollow organs and other life-threatening conditions [16, 20, 22–25]. The situation changed dramatically after the introduction of ultrasound (USG), computed tomography (CT) and angiography into practice, which made it possible to exclude with high reliability the injuries in which laparotomy is indicated [6, 19, 26, 27].

ESSENCE OF THE METHOD AND INDICATIONS TO IT

In 80% of cases with closed trauma of the liver and spleen, stopped bleeding is detected intraoperatively [26, 28]. Therefore, it is believed that the indication for emergency laparotomy is not the volume of intra-abdominal bleeding, but unstable hemodynamics, resistant to transfusion of 2-3 doses of erythrocyte mass [8].

According to the latest data from the world literature, if the patient selection criteria are met, NOM of closed liver injury is effective in 94–97% of cases [10, 21], kidney - in 80–85% (with concomitant injury - in 52.9–69%), pancreas - in 28–48.5% [20, 23, 25, 29–31], and the frequency of refusal from NOM in closed spleen injury, according to *F. Coccolini et al.* (2017) [11], who reviewed the literature from *MEDLINE, EMBASE, Scopus* from 1980 to 2016, is 4-15%.

Conservative treatment of closed trauma of the parenchymal organs of the abdominal cavity and retroperitoneal space is possible under the following conditions:

1) stable hemodynamic parameters (systolic blood pressure - BPsyst> 90 mm Hg; pulse <120 in 1 minute), no clinical picture of shock (level of evidence - A, strength of recommendation - 2; A2) [11, 20, 24, 28, 32], which complies with the recommendations of the World Society of Emergency Surgery *(WSES)* and the Eastern Association for the Surgery of US injuries *(EAST)* [24, 25, 33, 34]. A.A. Pankratov et al. (2017) [10] determined the positive predictive value of the stability of these indicators at 91.9% and 90.6%, respectively. There were no statistically significant differences in the predictive value of heart rate and BPsyst indicators.

Hemodynamic instability after initial anti-shock measures is a contraindication to conservative management [1, 21, 26];

2) stable indices of erythrocytes *(Er)*, hemoglobin *(Hb)* and hematocrit *(Ht)* (B1) [35], no symptoms of increasing hemoperitoneum. Normal initial *Hb* values do not rule out the presence of intra-abdominal bleeding [8, 20];

3) no damage to hollow organs, peritonitis, requiring emergency surgery (A1) [11]. The frequency of missing such damage is 0.8-2.3% [15];

4) the volume of blood in the abdomen according to ultrasound / CT data up to 500 ml, without signs of its increase. A.A. Pankratov et al. (2017) [10] analyzed the dependence of the effectiveness of conservative management on the volume of hemoperitoneum according to ultrasound data in combination with BPsist and pulse in a retro- and prospective analysis of the results of treatment in 209 patients. The positive predictive value of these factors and their combinations was 88-91.7% [10];

5) absence of extravasation of contrast agent into the free abdominal cavity / retroperitoneal space or liver / spleen / kidney / pancreas parenchyma on CT angiography [21-24, 32] or successful endovascular embolization, damage to these organs of I and II degrees of severity on the scale of the severity of internal injuries organs of the American Association for Trauma Surgery *(AAST)* [4, 25, 34, 36], stable central (II *AAST*) and small peripheral (I *AAST*) unstressed hematomas of the liver and spleen, without turbulent blood flow on Doppler ultrasound (USDG) [4, 5, 11, 12, 21, 32], spread of the central hematoma under the organ capsule and enlargement the size of the organ itself [15, 25]. *Gaspar B. et al. (2014)* showed that the overall effectiveness of *NOM* for liver injury, regardless of the severity of damage, is 50% (cited from [1]). A multicenter study by *Van der Wilden G.M. et al.* (2012) (cited from [1]) showed a successful combination of *NOM* with embolization of bleeding vessels in 91.3% of cases with IV – V *AAST* liver injury in the group of patients initially selected for non-operative treatment; of the total number of patients with IV-V *AAST,* the effectiveness of non-operative treatment was 60.8%;

6) absence of severe associated injuries, large total blood loss, signs of coagulopathy [15, 24, 26]. *Fang J.F. et al.* (2003) (cited from [15]), 92% of cases revealed the ineffectiveness of conservative treatment in patients with closed spleen injury on the background of liver cirrhosis, coagulopathy and portal hypertension, with 55% postoperative mortality. The absence of spontaneous stopping of bleeding was explained by an increase in pressure in the spleen parenchyma and coagulopathy. The authors have shown a direct relationship between the mortality of victims and an increase in prothrombin time, the severity of injuries and hypoproteinemia;

7) age up to 55 years in patients with damage to the spleen (B2) [11], since morphological studies have revealed structural changes in the organ and its capsule, which reduce the likelihood of spontaneous stopping of bleeding in this category of patients. It should be understood that age over 55 is a relative contraindication [15, 16, 26]. So, Abakumov M.M. et al. (2013) [28] showed the effectiveness of non-surgical treatment of patients with closed spleen injury in 80.8% of cases with initially correct selection of patients, and in 21.4% they were older than 59 years;

8) clear consciousness of the victim, since if it is violated, there is a risk of missing injuries that require emergency laparotomy. This condition is also debatable, as *Rozycki G.S. et al.* (2005) (cited from [15]) based on the treatment of 126 patients with closed trauma to the parenchymal organs of the abdominal cavity and traumatic brain injury (TBI) (the level of consciousness below 8 points on the Glasgow Coma Scale - *GCS*) showed that significant differences in the results of conservative treatment are not exist. *Pal J.D. и Victorino G.P.* (2002) (cit. according to [15]) on 1388 patients revealed that the diagnostic value of CT with stable hemodynamics and impaired consciousness below 11 *GCS* points is close to the diagnostic value of laparotomy.

9) availability of the necessary medical equipment and personnel for round-the-clock observation in the intensive care unit (ICU), CT with angiocontrast, angiography and angioembolization, endoscopic retrograde cholangiopancreatography / magnetic resonance cholangiopancreatography / percutaneous interventions (ERCP / MRCP) access to blood products (A2) [11–15, 27].

Predictors of conservative therapy failure in closed spleen injury *Carvalho F.H. et al.* (2009) (cited from [15]) considered the degree of damage to the spleen and the overall severity of the injury. *Velmahos G. C. et al.* (cited from [15]), III or more degree of damage and the need for transfusion of ⩾1 L of red blood cells were considered unfavorable prognostic factors for performing *NOM* in spleen injury in 2000, and in 2010 - V degree of spleen injury and concomitant TBI. The presence of traumatic pseudoaneurysms or active extravasation on CT increases the likelihood of failure of non-surgical treatment for any degree of spleen injury [27].

In a large literature review from *MEDLINE, PubMed, Google Scholar* by *El-Matbouly M. et al.* (2016) [17] from 1954 to 2014, it was shown that with the correct selection of patients for conservative management, in most cases, success and lower mortality are achieved. This is consistent with the findings of *Cirocchi R. et al.* (2013) (cited from [15]), who performed a systematic review of 21 studies with 16,940 patients with closed spleen injury, according to which *NOM* at I – II *AAST* is the "gold standard". In closed pancreatic trauma, the conditions for successful conservative treatment are hemodynamic stability and the integrity of the main pancreatic duct [23, 28, 29, 34, 36]. ERCP with duct stenting, percutaneous drainage of fluid accumulations is effective for her III – IV *AAST* injury in 68–94% of cases [14, 28, 34, 36].

In most cases, patients with kidney damage during CAT are also treated conservatively. Indications for non-operative management:

— contusion of the kidney, accompanied by micro- or single macrohematuria [13];

— small ruptures of the kidney (I – II degrees and in most cases III *AAST*) with subcapsular or non-growing perirenal hematoma up to 300 ml in volume and moderate hematuria [13, 30].

Hemodynamic status plays a more important role in the choice of tactics than the instrumental level of organ damage (A1) [7, 11], it only predicts the probability of success of *NOM* [18]. These conclusions were reached by Ruscelli P. et al. (2019) [32] in a retrospective analysis of conservative treatment of 111 patients with liver injury (100% success) and spleen injury (94.7%). The factors that determine the effectiveness of *NOM* are: correct selection and repeated frequent examination of victims in the first few days after injury (control of *Er, Hb, Ht* levels [5, 11, 12, 24] and palpation of the abdomen hourly; monitoring of consciousness, heart rate (HR), blood pressure, saturation - continuous, urine output - hourly) [7, 18].

CT with intravenous contrast is absolutely indicated for the dynamic observation of patients with *NOM* (A2), it allows you to identify structural changes in organs and follow the dynamics [5, 11, 24]. The organization of the hematoma of parenchymal organs begins on the 3rd day after the injury, after another 2 days collagen fibers are formed in it, and after 2 weeks a capsule is formed. On the 7-10th day after the injury, free fluid ceases to be determined in the abdominal cavity. We can talk about positive dynamics when restoring the structure of the organ, its contours, reducing hematoma and volume of hemoperitoneum [9, 29]. Discharge from the hospital is possible with hemoperitoneum ⩽100 ml and a decrease in the volume of an organ hematoma by 2 times or more, the appearance of signs of its organization [4, 7].

In the case of negative dynamics, but with stable hemodynamics of the victim, they resort to ultrasound, puncture and drainage under CT / ultrasound control, X-ray endobiliary and X-ray endovascular interventions [5, 11–14, 19]. Endovascular hemostasis has been successfully used for trauma to parenchymal organs [22, 23, 27], especially with a high operational and anesthetic risk or in the postoperative period with secondary bleeding from arterial pseudoaneurysms, arteriovenous fistulas and hemobilia [20, 25].

The complex of conservative measures for CAT includes:

1) creation of rest (strict bed rest for 8-10 days) [6, 7];

2) prevention / treatment of hypoxemia (A1) [24], organ failure, adequate pain relief [19];

3) replenishment of blood loss (infusion-transfusion therapy, balanced crystalloids / colloids 2: 1; in most cases, infusions start with saline solutions, the primary administration of colloidal solutions is indicated for victims with initially high central venous pressure for the prevention of pulmonary edema and respiratory distress syndrome). Optimal *Ht* or *Hb* values required to maintain hemostasis have not been established [24]. In particular, *Sartorelli K.H. et al.* (2000) (cited from [15]) Hb level <90 g / l and heart rate> 100 bpm considered as indications for blood transfusion;

4) correction / prevention of coagulopathy - by transfusion of:

а) fresh frozen plasma (if fibrinogen is less than 0.8-1 g / l; prothrombin time and activated partial thromboplastin time (APTT) are 1.5-1.8 times or more higher than the norm or APTT for more than 40 seconds, international normalized ratio (INR) more than 1.3; decrease in the number of platelets - less than $80 \cdot 10^9$/l; (B1) [24]. Fresh frozen plasma transfusion for bleeding should be done until INR and APTT normalize;

б) fibrinogen (initial dose 3-4 g (C1)) [24];

в) cryoprecipitate (at fibrinogen levels <1.5 g / L; initial dose 50 mg / kg) [24];

г) platelet mass (until the platelet level is maintained> 50 109 / L (C1)); it is recommended to maintain a platelet level> 100 109 / L in patients with ongoing bleeding, severe polytrauma, impaired platelet function (in end-stage renal failure) and / or TBI (C2) [24];

5) the injection of hemostatic drugs - tranexamic acid - with bleeding or the risk thereof, at a dose of 1 g for 10 minutes intravenously in the 1st hour from the moment of injury (reducing the risk of death by 2.5%), followed by an intravenous infusion of 1 g for 8 hours (A1) [24]; its use to prevent or control bleeding has been studied in a million patients without increasing the incidence of thromboembolic complications [24].

With the ineffectiveness of the above drugs, the use of a recombinant activated coagulation factor VII (*rF*VII*a*) is indicated (C1) [24];

6) the injection of antibacterial agents for the prevention of infectious complications – for 5-12 days [19, 34, 36] - "protected" cephalosporins, fluoroquinolones of the III-IV generation as a starting therapy. With the development of infectious complications, antibiotic therapy is corrected depending on the species composition of the microflora and its sensitivity to antibiotics;

7) administration of inotropic drugs for myocardial dysfunction (C1) [24];

8) prevention of stress gastroduodenal bleeding (its development in polytrauma is accompanied by mortality up to 70%) by the introduction of proton pump blockers (A1) [24]. The absolute indications for the prevention of gastrointestinal bleeding (GI bleeding) are: artificial ventilation, hypoxia (increases the risk of GI bleeding by 15.6 times), hypotension (increases the risk of GI bleeding by 3.7 times), coagulopathy (increases the risk of GI bleeding by 4.3 times). times), sepsis (increases the risk of GIB by 2 times) [7, 24];

9) continuous catheterization of the bladder for hourly monitoring of urine output - its decrease <0.5 ml / kg / h indicates inadequate fluid therapy [7, 24];

10) warming the patient, since more than 50% of victims with abdominal trauma and intra-abdominal bleeding suffer from hypothermia (C1), which is accompanied by a significantly greater lethality [24]: it is necessary to remove cold damp clothes, increase the temperature in the ICU / operating room to 29 ° C, provide air heating, the use of warming blankets and heated mattresses, warm oxygen, 39 ° C crystalloid solutions, in extreme cases, devices for warming patients [6, 7];

11) prevention / treatment of paresis of the gastrointestinal tract: nasojejunal intubation, drugs, prokinetics (metoclopramide, erythromycin (A1) [6, 25]), intravenous administration of potassium preparations, hypertensive enemas, epidural blockade. Three days after the start of conservative management, enteral nutrition is started [27, 34, 36];

12) prescribing synthetic analogs of somatostatin (octreotide) for suspected or confirmed pancreatic injury [22, 26, 27, 29, 33, 36, 37].

Revision of retroperitoneal hemorrhage (RPH) is not indicated in patients with a proven source of bleeding from fractures of the pelvic bones, with closed kidney injury I – III *AAST* and adrenal trauma of any degree in the case of stable hemodynamics [23, 31].

Revision of the retroperitoneal space is necessary for extraperitoneal bladder rupture and kidney damage IV – V *AAST* [23, 31], ongoing bleeding (including hematuria lasting more than 24 hours in combination with progressive posthemorrhagic anemia and hemodynamic instability, unless there is another surgical cause) or its recurrence, USP / CT signs of enlargement or pulsation of retroperitoneal urohematoma [23, 24].

Relative indications for revision - detachment of the renal pole, urohematoma volume> 300 ml, renal artery thrombosis in case of an unsuccessful attempt at X-ray endovascular hemostasis [23, 30].

If RPB is detected during an emergency laparotomy and its source is unknown, then to revision are subjected [31]:

1) upper medial RPS, since in 50% of cases it is caused by trauma to the pancreas, and in a third - by ruptures of large vessels [23];

2) widespread or increasing RPB during laparotomy, if its source is not a fracture of the pelvic bones - a sign of ongoing intense bleeding into the retroperitoneal space [23];

3) RPB adjacent to the hollow organs of the gastrointestinal tract and large vessels - so as not to miss life-threatening damage [23];

4) RPB with a breakthrough into the abdominal cavity and hemoperitoneum of more than 500 ml, since the likelihood of such bleeding to stop spontaneously is low due to the lack of a tamponizing effect [23];

5) RPB in case of rupture of a pathologically altered kidney, since there is a high probability of purulent-inflammatory complications [23, 30].

Patients with RPB without signs of ongoing bleeding, peritonitis and phlegmon of retroperitoneal tissue, admitted 6 or more hours after the injury, are treated with conservative therapy, which in most cases is effective [23, 30].

In severe crushed pelvic fractures with damage to the posterior and anterior semirings, massive retroperitoneal bleeding and hemorrhagic shock, immediate stabilization of the pelvic ring is required (B1) [25]. Stabilization of the posterior half-ring with the Gantz anti-shock frame allows you to quickly (5-10 minutes) achieve hemostasis. If, after that, unstable hemodynamics persists for 20 minutes, extraperitoneal pelvic tamponade (B1) is indicated, which makes it possible to stop bleeding in ¾ victims [25].

With preservation of unstable hemodynamics, endovascular balloon occlusion of the aorta (EVBOA) is indicated at the level of the 3rd zone of the abdominal region to temporarily stop intrapelvic bleeding (C2) [24, 35, 38]. Contraindications to EVBOA are severe TBI and severe chest trauma. *Maruhashi T. et al.* (2017) [39] observed in a patient with an unstable pelvic fracture and retroperitoneal bleeding, with extravasation of contrast agent, minor hemothorax (without signs of ongoing bleeding) after EVBOA and endovascular embolization of the internal iliac arteries, recurrent intrapleural bleeding with the development of total hemothorax, which required thoracotomy, in which an obvious source of bleeding was not identified.

Patients with pelvic fractures with stable hemodynamics with suspected ongoing PC are to undergo to CT with contrast to identify the source of bleeding. Detection of extravasation from the arterial bed serves as an indication for intervention, optimally – endovascular embolization [7, 24]. In cases where this is impossible for technical reasons or due to the nature of the vascular injury, open surgery is performed (B1) [24].

Venous extravasation is less dangerous, therefore, with a small volume of hematoma (up to 500 ml), you can limit yourself to dynamic observation using imaging methods [7]. With a large hematoma and instrumental signs of ongoing bleeding, endovenous embolization is indicated. The impossibility or ineffectiveness of this treatment p may require direct intervention. Transperitoneal dissection and revision of the hematoma are fraught with aggravation of bleeding. Therefore, its extraperitoneal revision is advisable. It is not always possible to detect the source of venous bleeding during revision of the hematoma, therefore in some cases it is necessary to resort to extraperitoneal tamponade. The compression effect of the tamponade is achieved by temporarily leaving the tampons in the hematoma and closing the surgical wound [7].

Unstable hemodynamic parameters and progressive anemization, despite ongoing treatment, including adequate fluid therapy and blood transfusion, indicate an arterial source of hematoma and ongoing bleeding. This dictates the need for urgent surgical intervention. [6, 7]. *Dudanov I.P. et al.* (2000) [7] for fractures of the pelvic bones, accompanied by shock and the formation of a retroperitoneal hematoma, recommend to perform arteriography, if signs of damage to the great vessels are detected, emergency laparotomy is indicated, and in case of trauma of the distal vessels, embolization of the internal iliac artery can be performed.

The presence of clear signs of ongoing intra-abdominal (more than 500 ml) or retroperitoneal bleeding in patients with CAT with unstable hemodynamics and the absence of other reasons for shock is an absolute indication for immediate laparotomy. (B1) [6, 17, 24].

It is also indicated for ineffective endovideosurgical / endovascular hemostasis, inability to visualize the source of ongoing bleeding [6, 9, 20, 24].

At the same time, with stable hemodynamics and dubious indications for laparotomy after a comprehensive diagnosis - detection of up to 500 ml of fluid in the abdominal cavity during USP / CT, a tendency to its increase during dynamic examination, *NOM* ineffectiveness, negative data of non-invasive research methods in the presence of clinical signs damage to hollow organs (abdominal pain, indistinct peritoneal symptoms, weakening of peristalsis), fractures of the pelvic bones, spine and lower ribs in combination with dubious or transient signs of damage to internal organs, ambiguous results of the initial examination in patients with craniocerebral, spinal trauma who are in a state of alcohol or drug intoxication, analgesia, sedation, when the mechanism of abdominal trauma cannot exclude damage to the abdominal organs, if there are signs of trauma on the abdominal wall or in the lumbar region, laparoscopy comes to the fore [40—45].

CONCLUSION

Conservative management of patients with the pathology under consideration is currently considered possible only in large specialized centers with a wide range of diagnostic and treatment options around the clock; it is an effective and safe alternative to surgical treatment with proper patient selection. Despite modern advances in the treatment of patients with abdominal trauma, it must always be remembered that delaying the operation is more dangerous than the risk of the operation itself, especially in hemodynamically unstable patients with clear signs of ongoing intra-abdominal or retroperitoneal bleeding.

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