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SURGICAL STRATEGY FOR PURULENT-SEPTIC COMPLICATIONS OF COMBAT ABDOMINAL TRAUMA

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Abstract

The incidence of combat abdominal trauma ranges from 6.7 to 9%. The nature of gunshot abdominal wounds leads to the development of functional disorders and complications (51–81%) and, as a result, a high mortality rate (12–31%). The purpose of the work is to improve the effectiveness of surgical treatment of purulent-septic complications in wounded patients with combat abdominal trauma (CAT). We analysed the treatment of 86 wounded patients with purulent-septic complications of CAT who were hospitalized at the Military Medical Clinical Centre of the Southern Region. Taking into account the location, clinical manifestations and severity of the injury, modern methods of treatment were used, namely: puncture-drainage interventions under ultrasound guidance and the NPWT system installation. The complex treatment was supplemented with antibacterial therapy and oxygen barotherapy. First of all, the wounded patients underwent US-guided puncture, drainage

interventions and stage debridement for diagnostic and therapeutic purposes. NPWT therapy was used in 11 patients with large wounds and purulent-septic complications of the soft tissues of the anterior abdominal wall. So, the use of interventional ultrasound as a priority diagnostic and therapeutic method for purulent and inflammatory complications of combat abdominal trauma improved the quality of diagnosis and reduced the number of traumatic interventions, which led to a decrease in postoperative complications and the duration of inpatient treatment. 11 (14.2%) cases of puncture-drainage interventions were ineffective, and therefore it was necessary to use traditional methods of treatment — opening and draining purulent-inflammatory foci and using NPWT therapy. Vacuum therapy is an effective method of treating purulent-septic complications of gunshot wounds of the abdominal soft tissues, which, in combination with puncture-drainage interventions, can 2.5 folds reduce the number of recurrent operations (mainly multistage surgical procedures), thereby 1.8 folds reducing the length of hospital stay. The use of current methods has improved the results of surgical treatment of purulent-septic complications in wounded patients with purulent-septic complications of combat abdominal trauma. The use of the current techniques helped to reduce the number of invasive treatment methods, facilitated recovery, reduced bed days, reduced intoxication, and increased the percentage of recovered military personnel.

Keywords: combat abdominal trauma; purulent-septic complications; modern techniques; NPWT therapy.

In the overall structure of sanitary losses, combat abdominal trauma, according to various sources, ranges from 6.8 to 9%. The specificity of gunshot wounds of the abdomen leads to the development of functional disorders and complications (51–81%) and, as a result, a high mortality rate (12–31%) [2]. The pathomorphological and pathophysiological processes that occur in the body from the moment of injury to the moment of recovery and complete wound healing should be taken into account during the treatment of complications of gunshot wounds of the abdomen. All factors that affect these processes should be kept in mind. Complications of the gunshot wound are pathological factors that disturb the regeneration and healing of the laparotomy wound. As a result of the gunshot wound, pathogenic microorganisms enter the human body and provoke such purulent-septic complications as abscesses, phlegmon, haematomas, urohematomas of the abdominal cavity and retroperitoneal space, inflammatory processes of the abdominal and pleural cavities, soft tissues and requiring repeated, multi-stage surgical interventions [8, 10]. Microbial contamination of wounds, the prevalence of gunshot wounds accompanied by shock, and surgical operations

(often multi-stage) under difficult combat conditions make primary wound healing impossible and sometimes can lead to the death of the wounded patients.

The aim of the work is to improve the effectiveness of surgical treatment of purulent-septic complications in wounded patients with combat abdominal trauma (CAT).

Materials and Methods

We analysed surgical treatment of wounded patients aged 18 to 51 years old with purulent-septic complications of CAT hospitalized at the Department of Abdominal Surgery of the Military Medical Clinical Centre of the Southern Region. During the study period, 86 wounded patients with CAT suffered from purulent and inflammatory complications of the abdominal cavity, retroperitoneal space, and soft tissues, which was 17.3% of the total number of abdominal injuries.

All the wounded patients were divided into 2 groups. Group 1 (n=54) included wounded patients with purulent-septic complications of CAT, who were treated with modern methods: puncture-drainage interventions and NPWT therapy. Group 2 (n=32) included wounded patients with purulent-septic complications of CAT treated by the traditional scheme: debridement and drainage of purulent soft tissue foci and staged surgical treatment of wounds. At the stage of medical care, the wounded patients were provided with surgical treatment of wounds, antibacterial and symptomatic therapy. At the IV treatment level (the Military Medical Clinical Centre), US-guided puncture-drainage interventions (PDIs) and staged debridement were performed for diagnostic and therapeutic purposes [7].

Results

The distribution of PDIs and their effectiveness in group 1 is shown in Table 1.

In 67 cases (85.8%) of the total number of PDIs, the treatment method proved to be the final volume of surgical intervention, which allowed for avoiding traumatic operations. In 11 cases (14.2%), PDIs were ineffective, which led to the opening, debridement and drainage of abscesses and, if indicated, the NPWT-system installation.

Phlegmons (1) and abscesses (2) of the retroperitoneal space were detected in 3 wounded patients who were treated during the medical evacuation stage. Two wounded patients underwent percutaneous nephrostomy and puncture drainage of purulent foci under ultrasound guidance. 24 wounded patients underwent US-guided puncture of abscesses and soft tissue haematomas for diagnostic and therapeutic purposes, in 16 of them the method was definitive, and in 3 cases treatment failure with minimally invasive methods led to the opening, debridement and drainage of abscesses.

Table 1

Types of US-guided puncture and drainage interventions and their effectiveness

Localisation of purulent-destructive foci	Number of wounded patients, abs.	Diagnostic and therapeutic punctures, abs.	Drainage, abs.	Effective*, abs. (%)	Ineffective**, abs. (%) / NPWT-therapy
Abdominal cavity	17	10	20	25 (90%)	5 (10%)
Retroperitoneal space	13	13	16	26 (88,2%)	3 (11,8%)
Soft tissues	24	9	10	16 (87,5%)	3 (12,5%)
Total	54	32	46	67 (85,8%)	11 (14,2%)

Notes: * — PDIs, which were effective and were the final treatment method; ** — PDIs were not effective, the final treatment method was the installation of the NPWT-system and wound closure.

As can be seen from table 1, 10 puncture and drainage interventions were performed in 17 wounded patients with purulent and inflammatory complications of CAT in the abdominal cavity (5), retroperitoneal space (13), and soft tissues (9). The final method of treatment was 67 PDI (85.8%), in 11 cases they were ineffective (14.2%), and therefore treatment was performed using NPWT therapy.

Discussion

In our opinion, the primary use of this method of wound management is most effective at the period corresponding to the second phase of the wound process (3–7 days). The specifics of the dressing application technique, its distribution, and depth are determined by the type and shape of the wound and its depth [1]. The contours of the applied polyurethane sponge are formed with scissors immediately before application so that it exactly matches the shape of the wound. It is necessary to avoid applying the sponge to the skin around the wound, as already a 3-day exposure to negative pressure of 125 mmHg can cause epidermal blisters at the contact sites [4].

In cases of blind wounds (10 wounded patients) with a deep, narrow canal, we used the "mushroom-shaped" dressing applying method for better drainage and prevention of blind tunnel formation. A sponge was formed, corresponding in width and length to the wound

canal [5]. After adequate anaesthesia (or as the final stage of surgical treatment), up to anaesthesia, a segment of the sponge was inserted deep into the canal using an instrument. A separate fragment of the sponge was placed on the wound surface, parallel to the skin surface, in such a way that reliable contact between the submerged and superficially located segments was provided [3, 11].

Vacuum drainage of wounds was performed once or several times in a continuous or intermittent mode. The need for repeated sessions of vacuum therapy was determined clinically. Dressings were changed in 3–5 days [3]. There was no gap between repeated sessions as a rule. Dressing changes followed directly after each other.

The criteria for discontinuation of VAC sessions were as follows: reduction of perifocal edema, reduction of wound discharge (by approximately 70–80% of the initial volume), clearing of necrotic tissue, fibrin deposits, purulent plaques, the appearance of bright granulations, improvement of clinical blood test results (signs of inflammation) [6, 9].

In wounded patients of group 1, the treatment period ranged from 12 to 20 days (mean (16.8 ± 2.7) days), in group 2 — from 15 to 30 days (mean (25.6 ± 2.5) days). The use of NPWT therapy 1.5–2 times accelerated wound closure and healing compared to the traditional treatment.

Conclusions

1. Considering that interventional US does not require general anaesthesia, its use as a primary diagnostic and therapeutic method of treatment of purulent and inflammatory complications of CAT made it possible to improve the quality of diagnosis and reduce the level of traumatic interventions, which led to a decrease in postoperative complications and the duration of inpatient treatment.

2. 11 (14.2%) cases of puncture-drainage interventions were ineffective, and traditional methods of treatment were used: opening and draining purulent-inflammatory foci and NPWT therapy.

3. Vacuum therapy is an optimal method that allows you to quickly clean the wound surface, fill the wound defect with granulation tissue and prepare the wound for plastic closure.

4. The use of modern techniques, such as NPWT therapy and puncture-drainage interventions in the complex treatment of purulent-septic complications of combat abdominal trauma, allows to 2.5 times reduce the number of repeated operations (mainly staged surgical procedures), thereby 1.8 times reducing the length of hospital stay.

References

1. Belyi V.Y., Zarutskyi Y.L., Zhovtonozhko A.I., Aslanian S.A. Essays on the surgery of combat abdominal trauma. Kyiv : MP Lesya. 2016. 212 [In Russian].
2. Gerasymenko O.S., Masunov K.L., Tertyshny S.V., Dhauadi F. Surgical treatment of purulent-necrotic diseases of soft tissues. Modern aspects of military medicine. 2016; 23: 23-25 [In Ukrainian].
3. Herasymenko O.S., Yenin R.V., Sheptko K.V., Herasimenko S.D. Optimization of diagnostic abdominal gunshot wounds in combat conditions. World of Medicine and Biology. 2019; 1(67): 38-42 [In Ukrainian].
4. Humeniuk K.V. Experience in providing qualified surgical care to the wounded in the anti-terrorist operation in a military mobile hospital. Abstr. of the XXIII Congress of Surgeons of Ukraine. Kyiv. Clinical surgery. 2015. 15-18 [In Ukrainian].
5. Kashtalian M.A., Herasymenko O.S., Shapovalov V.Y., Khoroshun E.M., Yenin R.V., Haida Y.I. et al. Organisational issues of optimising the diagnosis of combat abdominal injuries. Problems of military health care. 2019; 51: 91-99 [In Ukrainian].
6. Lebed V.P. Minimally invasive methods in the diagnosis and treatment of closed abdominal injuries of parenchymal organs. Kharkiv Surgical School. 2011; 4(49): 117-121 [In Russian].
7. Svitlychnyi E.V., Hrechanyk O.I. Ultrasound diagnostics of trauma and its complications. Kyiv: SPD Chaplynska N.V. 2016. 215 [Ukrainian].
8. Svitlychnyi E.V., Muradian K.R., Gerasymenko O.S., Koshykov M.O., Gaida Y.I., Yenin R.V. Application of ultrasound imaging methods in the removal of foreign bodies in gunshot wounds. Medical perspectives. 2018; 23; 4(1): 101-104 [In Ukrainian].
9. Herscovici D. Vacuum assisted wound closure (VAC therapy) for the management of wounded with high-energy soft tissue injuries. J. Ortho Trauma. 2003; 17: 683-688.
10. Khomenko I.P., Tertyshnyi S.V., Vastyanov R.S., Talalayev K.O. Soft tissues gunshot defects ultrasound investigation use in reconstructive-restorative surgery. World of Medicine and Biology. 2021; 3(77): 169-174.
11. Khomenko I.P., Lurin I.A., Nehoduiko V.V., Tertyshnyi S.V., Popova O.M., Vastyanov R.S., Weis B. Soft tissue perfusion evaluation algorithm in the scheme of gunshot defects “closure”. World of Medicine and Biology. 2023; 1(83): 169-173.

Author Contributions

Conceptualization, (Herasymenko O.S. & Kashtalian M.A.); methodology, (Kashtalian M.A. & Haida Ya.I.); formal analysis, (Shkliarevych P.O. & Atanasov D.V.); data curation, (Kashtalian M.A.); writing - original draft preparation, (Haida Ya.I. & Okolets A.V.); writing - review and editing, (Shkliarevych P.O. & Atanasov D.V.); supervision, (Herasymenko O.S.).

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Data Availability Statement

The data presented in this study are available on request from the corresponding author.

Conflicts of Interest

The authors declare no conflict of interest.