OPTIMIZATION SURGICAL TACTICS FOR THE TREATMENT OF CLOSED ABDOMINAL INJURIES AND THE POSSIBILITY OF MINIMALLY INVASIVE INTERVENTIONS

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Abstract: Closed abdominal injuries with injuries to the hollow organs of the abdominal cavity are accompanied by high mortality, which, depending on the nature of the injuries, ranges from 27% to 35%. In this regard, the authors reviewed the literature on surgical treatment tactics for these injuries.

The authors found that to date, the feasibility of various tactical concepts for correcting injuries in patients with combined abdominal injuries, the order of traditional and minimally invasive surgical interventions have not been determined, and a diagnostic and treatment algorithm for injuries to the hollow organs of the abdominal cavity during abdominal pain has not been developed. All these data serve as an objective basis for the need for further scientific research in this direction.

Key words : Abdominal trauma, video-assisted procedure, injury, patient.

ОПТИМИЗАЦИЯ ХИРУРГИЧЕСКОЙ ТАКТИКИ ЛЕЧЕНИЯ ЗАКРЫТЫХ ПОВРЕЖДЕНИЙ ЖИВОТА И ВОЗМОЖНОСТЬ МАЛОИНВАЗИВНЫХ ВМЕШАТЕЛЬСТВ.

Аннотация: Закрытые травмы живота при ранениях полых органов брюшной полости сопровождаются высокой летальностью, которая в зависимости от характера травм колеблется от 27% до 35%. В связи с этим авторы проанализировали литературу по тактике хирургического лечения данных повреждений.

Авторы установили, что к настоящему времени не определена целесообразность различных тактических концепций коррекции повреждений у больных с сочетанными повреждениями живота, порядок проведения традиционных и малоинвазивных оперативных вмешательств, а также алгоритм диагностики и лечения повреждений полых органов брюшной полости. Брюшная полость при болях в животе не развита. Все эти данные служат объективным основанием для необходимости дальнейших научных исследований в этом направлении.

Ключевые слова: травма живота, видеоассистированная процедура, травма, пациент.

INTRODUCTION

Abdominal injuries accompanied by damage to internal organs are extremely life-threatening situations requiring immediate assistance. In such cases, the high mortality rate is

between 27% and 35%, and it is remarkable that this rate remains stable over time, with no tendency to decrease [Malkov I.S. et al ., 2016; Lebedev A.G. et al ., 2019; Grundmann R. _ T. _ et al ., 2010].

Taking this into account, the treatment strategy for closed injuries of internal organs in abdominal injuries becomes one of the most difficult tasks in emergency medicine. Obviously, the outcome of treatment for victims with such injuries depends not only on the severity of the injury itself, but also on the speed with which decisions about emergency medical care are made, on the ability to quickly assess the nature of the injuries and complications, as well as on the choice of the correct surgical tactics [Ibadildin A.S., Kravtsov V.I., 2013; D opo in c ki x , G.N., V ac il e in A.Yu. , 2014; Minnullin M.M. et al ., 2016; Kubachev K. G. et al ., 2019; Ydyrysov I.T. et al ., 2019; Irarr á zaval M. _ M. _ J. _ et al ., 2020].

Determining the nature of damage to hollow and parenchymal organs, as well as assessing the severity of the patient's condition, play a decisive role in the successful implementation of emergency treatment, including resuscitation measures and surgical interventions. An analysis of mortality cases shows that approximately 15% of patients who died from closed abdominal injuries (including isolated and combined) did not have fatal injuries. Their death, unfortunately, occurred due to a delay in providing assistance, late diagnosis of injuries and shortcomings in the medical care provided [Agalaryan A. Kh., 2013; Bondarenko A.V. et al ., 2014; Kukharev D.I. et al ., 2015; Shchegolev A.A. et al ., 2020; Lin H. _ F. _ **et al ., 2018;** Kanlerd A. _ et al ., 2022].

Choosing the type of surgical intervention. It should be noted that the discussion of the strategy of surgical intervention for closed injuries of the abdominal cavity remains relevant and causes controversy today. These disputes concern, first of all, the choice of methods and sizes of surgical approaches. It is important to consider the words Th here . Kocher that "the size of the surgical access should be sufficient, but as small as possible." It makes sense to note that the open laparotomy approach is considered highly traumatic and, in some cases (ranging from 8.2% to 70.3%), can cause serious complications, mainly of an infectious nature. These complications may include infection of the surgical wound, abscess formation, development of postoperative hernias and pleuropneumonia. Modern research shows that the thoughtless use of this method can cause great harm to patients, exceeding the benefit it brings from the operation itself [Ermolov A.S. et al ., 2010; Zavada N.V., Volkov O.E., 2014; Inozemtsev E.O. et al ., 2017; Zatevakhin I.I. et al ., 2018; Biffle W. _ L. , Leppaniemi A. , 2014; Abouelazayem M. _ et al ., 2021].

Taking this into account, the desire of the authors of literature for two important aspects seems completely justified. Firstly, it is the development of clear criteria for determining the need to perform a wide laparotomy for injuries to the abdominal cavity. Secondly, it is the consideration of alternative, less invasive methods of correction of intra-abdominal pathology, such as video laparoscopic surgery (VLS), as an independent method or as a video-assisted procedure. These steps can help reduce the risk of severe complications associated with surgical access and improve treatment outcomes for patients with abdominal injuries [Lebedev A.G. et al ., 2019; Isakov M.N. et al ., 2020; Isakov N.Z. et al ., 2022; **Chia DKA . et al ., 2015;** De Martino C. _ **et al ., 2021**].

According to most authors, it is believed that the absolute indications for performing open laparotomy are unstable hemodynamics, which is manifested by signs of extensive intra-abdominal bleeding or widespread peritonitis [Musailov V.A., 2010; Minnullin M.M. et al ., 2016; Grundmann R. _ T. _ **et al ., 2010;** Dodiyi - Manuel A. _ **et al ., 2015**] . Regarding the use of video laparoscopy (VLS) in the diagnosis of injuries to the abdominal cavity, supporters and opponents of this method reasonably support their points of view. Some experts claim that VLS

has a high resolution ability, which makes it possible to promptly identify the need for surgical intervention and carry it out in patients with serious injuries [Pankratov A.A. et al ., 2015; Pankratov A.A., 2018; Maskin S.S. et al ., 2022; Justin V. _ **et al ., 2017**] , while others focus on the need for special equipment and specialists, as well as the possibility of its use only in patients with stable hemodynamics [Ermolov A.S. et al ., 2011; Zavada N.V., Volkov O.E., 2012; Koto M. _ Z. _ **et al ., 2017;** Koganti D. _ **et al ., 2020**].

The experience of using video endoscopic methods clearly confirms that the use of VLS (video laparoscopic surgery) significantly improves the timely and accurate diagnosis of injuries to the abdominal organs in combined closed abdominal trauma. Unlike traditional laparotomies, which can be traumatic and unacceptable for victims in case of severe trauma, VLS is less traumatic with high efficiency and in many cases can serve as an alternative [Puzanov S.Yu., 2014; Pankratov A.A., 2018; Nicolau A. _ E. , 2011 **;** Lin H. _ F. _ **et al ., 2015**].

The use of VLS (video laparoscopic surgery) for closed injuries of the abdominal organs provides the opportunity to quickly and clearly determine the nature of the damage, the source of bleeding and peritonitis, as well as develop a strategy for further treatment. This allows you to stop the bleeding and repair the defect of the hollow organs. The use of VLS is especially important for diagnosing pathological changes in organs located retroperitoneally , where damage may be poorly defined. These organs include the pancreas, duodenum, as well as the ascending and descending colon in victims [Umarov O.M. et al ., 2012; Styazhkina S.N. et al ., 2017; Khadzhibaev A.M. et al ., 2022; El - Bendary Y. _ B. _ **et al ., 2016;** Di Buono G. _ **et al ., 2020**].

Summarizing the data presented in the above context, we can conclude that most literary authors recommend the following treatment and diagnostic algorithm at the inpatient stage for combined closed abdominal trauma. If there are no clinical, radiological and ultrasound signs of damage to internal organs, then the patient is recommended to undergo dynamic observation in a specialized department [Akilov Kh.A., Primov F.Sh., 2014; Samokhvalov I.M. et al ., 2018; Golbreich V.A. et al ., 2019; Shchegolev A.A. et al ., 2020; Farrath S. _ **et al ., 2012;** Gross T. , Amsler F. , 2016].

If the patient does not have free fluid in the abdominal cavity, but there are signs of a restless abdomen, then an ultrasound and dynamic radiography of the abdomen are performed in the intensive care unit. If the patient’s condition is stable and there is a small amount of fluid in the abdominal cavity, it is recommended to consider performing VLS (video laparoscopic surgery) or VALS (video-assisted laparotomy) for more accurate diagnosis and treatment [Pankratov A.A. et al ., 2015; Gonzá lez - Robledo _ J. _ et al ., 2015].

video-assisted laparotomy with mini-laparotomy) can also be considered . These methods are characterized by high efficiency and minimal trauma and are often used for combined abdominal injuries. However, in the case of a serious condition of the victim with absolute indications, such as generalized peritonitis or intra-abdominal bleeding, it may be necessary to perform a laparotomy, a more invasive surgical procedure, in order to immediately intervene and provide the necessary treatment [Khadzhibaev A.M. et al ., 2011; Golbreich V.A. et al ., 2019; Zhu T.N. et al ., 2018].

Questions of tactics of surgical treatment. An important aspect of the therapeutic surgical strategy in the case of closed injuries of the abdominal organs with combined abdominal injuries is the determination of the volume and timing of surgical interventions. In this case, it is necessary to take into account both the severity of injuries to the abdominal organs and

concomitant injuries, the general condition of the patient and the nature of the dominant injury. To ensure a favorable outcome in the surgical treatment of severe combined abdominal injuries, the choice of time for surgical intervention, the sequence of operations and the volume of each of them are critical, that is, the development of the correct tactics of surgical treatment [Zavada N.V., Volkov O.E., 2014 ; Dosmagambetov S.P. et al ., 2020; Maskin S.S. et al ., 2021; **Hyun Suk Cho . et al ., 2013;** Hanna K. _ et al ., 2021].

However, it should be taken into account that in 10-15% of patients suffering from combined closed abdominal injuries, in the early stages it can be difficult to unambiguously determine the dominant injury. Moreover, during the treatment process, a change in the leading lesion often occurs. In the case of serious combined abdominal injuries, the surgical team has to decide whether to apply conservative treatment or perform surgical intervention, which, given time pressure, is an extremely difficult task [Stebunov S.S., Voloshenyuk A.N., 2012; Minnullin M.M. et al ., 2016; P a n p a t o in A . A. _ et al ., 2017; Knepel S. _ et al ., 2010; Johnston K. , et al ., 2021].

In the 1980s, the concept of immediate total care (ETC) was proposed and is important in the treatment of associated abdominal injuries. A striking example of such a concept is the strategy developed by E.K. Gumanenko and A.V. Nikiforenko [2011], which consists in providing the full scope of specialized surgical care to victims in the first 6 hours after injury, in the acute period of a traumatic illness. The basis for this strategy was to reduce the overall inflammatory response of the body, prevent many complications and infections by gradually eliminating the life-threatening consequences of injuries, foci of endotoxicosis and excessive antigenemia [Golbreikh V.A. et al ., 2019; Alberdi F. _ et al ., 2013; Pape H. _ C. _ et al ., 2014].

The strategy was based on surgical tactics that adhered to two main principles. The first principle was the sequential performance of surgical interventions of different durations (emergency, urgent and delayed) within the same anesthesia. The second principle was to reduce the risk of operations by reducing their duration and morbidity , using the tactics of programmed multi-stage surgical treatment. According to the authors, the use of this strategy led to a decrease in mortality from SAT by 8% and a reduction in the number of bed days by almost half [Shapkin Yu.G., Seliverstvov P.A., 2016; Golbreich V.A. et al ., 2019].

Additional research revealed that while the concept was attractive, it had its drawbacks. Firstly, it was accompanied by the risk of developing various complications associated with vital organs and systems. Secondly, it limited the possibilities of surgical care in cases of severe and extremely severe borderline conditions in patients due to severe hemodynamic disturbances [Gumanenko , E.K., Nikiforenko A.V., 2011; Khubutia M.Sh. et al ., 2015].

Damage control surgery. control surgery – DCS). This tactic includes dividing treatment into three stages and using programmed relaparotomies (PRLT). According to G. Taeger and his colleagues [Arumugam S. et al., 2015], this approach reduces surgical blood loss and the risk of developing peritonitis by 10 times, while the operation is less traumatic, and the level of postoperative complications is significantly reduced. As M. Shine [2005] said, “it is better to be treated at several stages and undergo several operations than to die after one.”

The first stage of the Early Trauma Treatment Program (ETT) is aimed at providing immediate and prompt care to stop intra-abdominal bleeding and prevent infection of the abdominal cavity, which prevents the development of peritonitis. If necessary, at this stage, drainage of the pleural cavity is also performed in the presence of hemo- or pneumothorax and external fixation devices are applied. The second stage includes comprehensive treatment of shock

in order to restore normal physiological processes in the body as quickly as possible. The third phase of the Early Trauma Management Program typically occurs 24 to 48 hours after the patient has been hemodynamically stabilized and includes definitive surgery with careful debridement of the abdomen and measures to prevent the development of early intra-abdominal complications. [Gumanenko , E.K., Nikiforenko A.V., 2011 ; Firsov CA et al ., 2016; Samokhvalov I.M. et al ., 2018; Maskin S.S. et al ., 2021].

According to the authors, key pathophysiological factors that determine the use of DCS in patients with severe associated abdominal injuries include metabolic acidosis, hypothermia, and coagulation disorders. These factors together create critical physiological conditions for the body. This concept is based on an analysis of the severity of the initial injury (the first hit), the physical condition of the patient and the number of surgical interventions, taking into account their duration and potential blood loss. (thesecondhit) [Sokolov V.A., 2005; Sokolov V.A. et al ., 2011; Pope H. _ C. _ et al ., 2001].

In accordance with international recommendations, the " damage " tactic control "becomes necessary in the following cases: with severe injuries that score more than 35 points on the ISS system; when the pH of the blood level drops below or equal to 7.2; when the level of bicarbonate in the blood plasma decreases to less than or equal to 15 mEq / L; when the volume of blood transfusion red blood cells (RBCs) greater than or equal to 4,000 ml; blood volume replacement greater than 5,000 ml; and fluid transfusion equal to or greater than 12,000 ml. Application of "damage" tactics control " helps reduce the frequency of diagnostic and exploratory laparotomies by 38.7% and reduce mortality to 25.5% [Samokhvalov I.M. et al . , 2018; Maskin S.S. et al ., 2021; Alberdi F. _ et al ., 2013; Pape H. _ C. _ et al ., 2014; Zhu T.N. et al ., 2018].

Therefore, the " damage " tactic control "provides the opportunity to widely use minimally invasive endovisual methods, such as video laparoscopy (VLS) and video-assisted laparoscopic surgery (VALS), using minilaparotomy for the correction of abdominal injuries in combined closed abdominal injuries. For example, in patients with serious combined abdominal injuries, a programmed technique has been proposed relaparoscopy (PRLS) as an alternative to traditional open laparotomies. This reduces the risk and morbidity of operations and, if necessary, provides the opportunity to carry out adequate sanitation and drainage of the abdominal cavity [Shapkin Yu.G., Seliverstvov P.A., 2016; Pankratov A. .A., 2018; Poznansky S.V., Gagua A.K., 2018; Khadzhibaev A.M. et al ., 2022; Cleanthis A. , et al ., 2017; Koganti D. _ et al ., 2021].

CONCLUSIONS

Summarizing the analysis of literature studies, it should be noted that closed traumatic abdominal injuries (CTI) are a complex and serious pathology, characterized by significant disturbances in pathophysiological processes and high mortality.

An analysis of the literature shows that most studies focused on the diagnosis and treatment of TZH using traditional clinical, laboratory and instrumental methods. However, these methods cannot always accurately assess the severity of injury and the likelihood of intra-abdominal complications.

Unfortunately, the tactical aspects of treating abdominal injuries during TTG still remain unclear. For example, the optimal strategy for injury management in patients with associated abdominal injuries has not been determined. It is also unclear what role minimally invasive methods, such as video laparoscopy (VLS) or video- assisted laparoscopic (VALS) with mini-laparotomy, should play in the treatment of TTG. There is no clear algorithm for diagnosing and treating abdominal injuries in TTG, as well as standards of action for specific clinical cases.

Based on the analysis of literature data, it seems possible to solve this problem by creating a clear diagnostic algorithm for diagnosing TAD, standardizing its use, expanding the use of modern imaging methods in emergency surgery of traumatic abdominal injuries and developing an integral scale for assessing the severity of TAD based on objective indicators.

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