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DIAGNOSTICS OF THE INTESTINAL COMPOSITION USING COMPUTER TOMOGRAPHY

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Abstract: Computer tomography (CT) is a relatively new method for detecting intestinal obstruction. Some consider CT to be informative and safe for the patient, others prefer classic X-ray diagnostics and ultrasound as quick-action studies that do not involve significant radiation exposure, and X-ray and ultrasound CT are recommended as additional ones. Diagnostic method in case of unclear interpretation of data obtained during examination or in case of suspected strangulation. Analysis of modern literature shows that computed tomography is a highly informative and fast method of diagnosing this type of emergency pathology, however, there is no statistical confirmation of its effectiveness. This leads to the need for further study of the role of computed tomography in the diagnosis of intestinal obstruction and the development of an algorithm for using this research method.

Key words: ultrasound, X-ray diagnostics, MSCT, intestinal obstruction, CT, CT.

K intestinal obstruction is one of the most urgent and rapidly developing problems of world medicine. It is generally accepted that the results of treatment of intestinal obstruction depend on timely and accurate diagnostics of the extent and nature of the lesion [1-5]. In patients operated on within 24 hours from the onset of the disease, mortality is 30% or more [2, 3, 6]. Among the reasons for the delay in surgical care, imperfect clinical and objective diagnostics dominates [2, 3, 7]. In addition, in 8.5-24.4% of cases there are differences between the preoperative diagnosis and intraoperative data [2-4]. The leading role in the objective diagnostics of KI belongs to radiation research methods, the use of which allows in most cases to confirm or exclude its presence, determine the degree and nature of changes, and determine the cause of obstruction [1-3]. , 5, 6, 8]. Before the advent of new technologies (ultrasound, CT, spiral computed tomography), widely used in the diagnosis of CI, the main method for many decades remained radiological, according to some authors [2, 3], which has not lost its significance. Classical radiation methods for examining patients with suspected intestinal obstruction include fluoroscopy and radiography of the chest and abdominal organs, examination of the abdomen in the lateral position, dynamic observation, contrast study of the small and large intestine [5, 9]. If diagnostic radiography and radiological examination of the chest and abdominal organs have virtually no contraindications, then the use of dynamic monitoring and contrast agents requires strict justification, since it increases the time of examination of the patient [2, 3, 10]. In diagnosing intestinal obstruction, the information content of the classical version of the radiographic method is 60-70%, in 10-20% of cases, radiographic changes are not detected, and in another 10-20% of cases , the results are interpreted as suspicious [3, 7]. The method is not informative enough to determine the degree and nature of obstruction [3, 7, 9]. The accuracy of the radiographic method is increased by artificial contrasting of the intestine. The oldest method was oral contrasting of the intestine with an aqueous suspension of barium sulfate, proposed by G. Schwartz in 1911. Today , this method is rarely used due to

insufficient data, long duration, relatively high radiation load [3, 10] and the risk of blocking the narrowed section of the intestine with a hardened contrast agent [3, 11]. The most accurate method of radiocontrast diagnostics of small intestinal pathology is enterolysis ("small intestinal enema") [3, 9, 10] .

In this case, the radiopaque agent is introduced into the medicinally relaxed jejunum through an intestinal tube, which ensures uniform filling of all loops of the small intestine, and then their morphological features are studied. The use of this method allows us to confirm the presence of obstruction in 100% of cases, its absence in 88%, the degree of obstruction in 89% and its cause in 86% of cases [3, 10]. However, if strangulation, volvulus or compression of intestinal loops at the entrance to the hernia is suspected, the introduction of barium sulfate into the intestinal lumen is contraindicated; moreover, the method does not allow us to determine the closure of the intestinal loop [3, 9]. Replacing the barium sulfate suspension with a water-soluble contrast agent is not justified in this case, since barium sulfate provides good contrast of the small intestine, especially its distal sections [9, 10]. If intestinal obstruction is suspected, a contrast enema (irrigoscopy) with an aqueous suspension of barium sulfate can be performed [2, 3, 5, 6, 9]. The diagnostic efficiency of this method for acute colonic obstruction is within 40-60% [3, 10], which is explained by the impossibility of a multiposition study, as well as the difficulties associated with the lack of preliminary bowel preparation. If the patient's condition is satisfactory and stable, the study is carried out using the generally accepted method of bilateral contrasting (traditional irrigoscopy) or simultaneous bilateral contrast. Contrast treatment after adequate bowel preparation [1]. Under conditions of artificial intestinal hypotension, the information content of primary bilateral contrast increases and colon obstruction is 89.6-98% [4, 10]. Contraindications to these radiocontrast studies are the patient's severe condition, intestinal perforation or suspicion of its presence; In addition, in case of colonic obstruction, the introduction of a barium sulfate suspension proximal to the obstruction site can accelerate the progression of the pathological process [3, 11]. It should be borne in mind that a barium sulfate suspension in the intestine can distort the results of ultrasound and CT [3, 7, 12]. Only air can be used as a contrast agent (pneumocolonography), but there is insufficient information [2, 3, 6]. According to some authors, the use of intestinal contrast in X-ray diagnostics is often not justified, it only increases the examination time and the radiation load on the patient [3, 7, 11]. X-ray contrast methods are recommended to be used selectively and according to special instructions, and not routinely [3, 7, 10, 11, 13]. When examining patients with suspected intestinal obstruction, ultrasound is widely used as a simple, inexpensive, minimally invasive, effective, non-radiation method that allows real- time assessment of mobile structures [12, 14-16]. The sensitivity of the method varies from 69 to 98% depending on the type of CI and is maximum in acute mechanical obstruction of the small and right half of the large intestine. Interpretation of ultrasound images is often complicated by intestinal hyperpneumatization , which is usually accompanied by intestinal obstruction [14, 16] and prevents high-quality visualization of the left half of the colon and rectum, as well as obesity and scarring from previous operations [14, 15]. Due to the small difference in echogenicity of the tumor and the intestinal wall, ultrasound rarely allows detecting neoplasms with a diameter of less than 3-4 cm [15]. Tumors with a diameter of less than 3 cm, affecting less than ½ of the circumference of the colon, can be diagnosed in 86% of cases using ultrasound with special diagnostic mixtures in the colon [3, 12, 14]. At the same time, ultrasound examination with diagnostic mixtures is a labor-intensive, lengthy and poorly tolerated study [3]. When localizing pathological changes, ultrasound examination of the left half of the colon, including the rectum, is very difficult and in most cases uninformative due to the presence of gas in the intestinal rings located proximal to the level of obstruction [3, 16].] . The advantage of ultrasound over classical X-ray methods is the ability to study blood flow in the intestinal wall using duplex scanning and color Doppler mapping. The sensitivity of the method in acute small intestinal obstruction reaches 92.7% [16], but other authors refer to many cases. (18.7%) How both false positive and false negative results [3, 12, 14]. In some cases, ultrasound can detect metastases in the retroperitoneal and visceral lymph nodes, parenchymatous organs [12, 16]. Transabdominal, transrectal , transvaginal and endoscopic ultrasound

methods are used for these purposes. The sensitivity of ultrasound for detecting liver metastases is 66-80% [12, 16], although when diagnosing metastases in the lymph nodes and other parenchymatous organs, according to some data, does not exceed 32% [16]. According to EJ Baltazar et al., detection of the etiology of CI using ultrasound occurs Very rarely, Not more than in 35.7% of cases [17]. Finally, ultrasound is called an operator-dependent research method, where the result and its interpretation are influenced by the researcher's experience and a number of other factors that cannot be standardized [3, 12, 14, 16]. Thus, the information obtained by various ultrasound methods allows us to suspect or confirm the presence of CN, in some cases determine its level and assess the nature of the lesion, identify secondary damage to the lymph nodes and parenchymal cells. However, they require confirmation by other research methods, in particular, radiological methods [2, 3, 5]. Despite the undoubted diagnostic value of radiological and ultrasound methods, their 100% reliability, especially in the early stages of the disease, forces us to look for new ways to solve the problem. In this regard, some Russian authors have developed algorithms for the integrated use of radiological and ultrasound studies in CN, in which the choice of the main method depends on the time elapsed since the onset of the disease [2-4]. In the diagnostic search algorithm developed by N.A. Kuznetsov and his co-authors (2007) [4], when observing 97 patients with suspected [4], at the first stage of the examination, it was proposed to conduct a general radiography of the abdominal organs and chest organs, at the second stage - regardless of the results obtained at the first stage, and finally - a standard ultrasound examination of the abdominal organs, supplemented if necessary by the Doppler method. In the diagnostic search algorithm proposed by E.A. Demerchan (2003) (127 observations), focused on various radiocontrast methods, and the ultrasound method was used as a diagnostic method [11]. The program for the use of radiation research methods in the clinical picture of acute abdomen, developed by E.A. Berseneva and E.Ya. Dubrov (1991) (375 observations) is based on the combined use of radiography of the abdominal organs and ultrasound of the abdominal organs at the first stage of the diagnostic search, followed by dynamic delayed radiographic examination and/or ultrasound at the second stage, and then at the second stage . o the lack of reliable data in favor of a specific pathology when using radiocontrast methods, as well as with the help of a computer. tomography [2]. V. Z. Totikov (2006) suggests using diagnostic methods in the following sequence: radiography, ultrasound and colonoscopy [13]. According to E. G. Topuzov (1990), patients with a clear clinical picture of acute renal failure, confirmed by radiographic studies of the abdominal organs, do not need additional examination and should be operated on urgently [6]. According to the authors, the diagnostic accuracy of the complex research methods described above is on average 90-98.8%. However, in most cases, the conclusion about the effectiveness of a particular technique is based on a relatively small number of observations, and therefore an attempt to determine statistically reliable diagnostic criteria is based on a generalization of the relevant data, the specificity and individuality of the method. various manifestations are significantly limited by the difficulty of detection material. A number of studies also do not provide clear criteria for the selection and sequence of various examination methods at the preoperative stage when CT is suspected. As experience was accumulated in performing RCT of the gastrointestinal tract, the first methods began to reveal its shortcomings, for example, blurred vision of individual organ structures, the presence of artifacts from gases and movement, and the duration of the study. examination (more than 30 minutes) [3, 22]. In this regard, the use of the RCT method in case of suspected CI due to the lack of diagnostic data and the length of time was considered unjustified. Only in the mid-1980s were devices developed that performed shear scanning for 1 second, allowing the examination of organs regardless of the presence of peristalsis. The introduction of a new CT method into medical practice in 1989 - spiral computed tomography (CT) was the greatest achievement of its existence and opened up radically new possibilities in the diagnosis of gastrointestinal tract pathology [3, 20, 22]. In spiral tomographs, rapid rotation of the radiation tube and the absence of intervals between irradiation cycles to move the table to the next position significantly reduce the examination time. High scanning speed allows obtaining significantly higher quality and more accurate images with fewer artifacts from physiological movements, with the possibility of three-dimensional or multidimensional scanning.

Reconstruction of a flat image [21]. Reducing the exposure time makes the CT method safer for patients [3, 22, 23]. The next step in the development of this direction is the emergence of multispiral (multifaceted) RC T (MSCT), which allows reading data from several layers of the body simultaneously using special detectors. In 2004-2005, MSCT with 32 and 64 sections were presented. The advantages of MSCT compared to traditional SCT are improved temporal, spatial and contrast resolution, increased scanning speed (less than 500 ms with a layer thickness of (0.5-0.3 mm)) and reduced image quality. Radiation exposure to the patient is reduced by about 30%. All these factors significantly increase the speed of examination and information content. The possibility of 3D image reconstruction allows examining the intestine along its entire length (virtual colonoscopy, enteroscopy, etc.) non-invasively, without the use of contrast agents. Unlike conventional colonoscopy, which lasts from 20 minutes to 1 hour, virtual computer colonoscopy is performed within 5 minutes and has virtually no contraindications [3, 22]. opinion many authors , including According to E.J. Balthazar , modern computed tomography is one of the most effective ways to achieve this goal . o one of the most effective methods of medical endoscopy, the greatest achievement of which is the ability to obtain the necessary information about the patient in a few seconds, which in turn allows you to quickly begin the treatment process [17, 19]. According to other authors, despite the obvious advantages of computed tomography, its use in emergency situations is unreasonable, since reducing the time of scanning and data collection does not reduce the time spent on labor-intensive image processing, which in turn reduces the radiologist [2, 4, 10]. Sh.Sh. According to Shotmore (2001) and other authors, the issue of its rational use is very acute [5]. A. A. Tikhonov (1991) believes that the use of CT in diagnostics CT is still not justified due to the same information content of radiation research methods that are widely used in this situation [8]. Even in the practical work of large clinics equipped with the necessary equipment, diagnostic computed tomography is gradually gaining recognition among the general population and government surgeons. The widespread use of CT in emergency surgery, in addition to economic conditions, low efficiency, harmful consequences and the idea of unjustified loss of time on local diagnostics with its help, including contrast gray, has taken root in the minds of some diagnosticians and doctors. for clinicians, studies not related to CT are difficult [3, 4]. However, recently a different point of view has begun to be recognized, based mainly on many years of experience of foreign colleagues, whose studies have shown the high efficiency of using CT in preoperative examination of patients with intestinal obstruction. D.D. Maglinte et al. (2008), E.J. Baltazar et al. (1988), the advantage of this method is the ability to get answers to all important questions, confirm the presence or absence of obstruction, distinguish between small and large intestinal obstruction, and determine its possible cause [17, 19, 24] . In addition, in most cases, various forms of Xin can be distinguished with a sensitivity of 90-94% and a specificity of 96.7-99.8% [3, 17, 19]. The specificity of CT in determining the cause K n in some cases approaches 85% [19,]. Studies of Cn are typical breeding surveys by the contrast limit EJ Baltazar et al. (1994), in more than 80% of cases this is not required, but if water or air is needed (most often a negative contrast agent is used), an additional injection is made [17, 19]. In some cases, for example, if ischemia is suspected, oral and/or intravenous administration of special contrast agents is positively indicated [3, 27, 28]. However, for example, A. Furukawa et al. (2009) use positive contrast for the oral cavity due to the increase in examination time, as well as the complexity of qualitative interpretation of the state of the intestinal wall when used in combination with intravenous administration. contrast agents are considered inappropriate [26]. The typical CT image of acute obstructive small bowel obstruction is the presence of dilated proximal and flat distal segments of the intestine. The level of obstruction is characterized by a transitional (transitional) zone between the two specified areas, the immediate cause of which is K n can be assessed by its type. The symptom of small intestinal feces is characterized by the presence of enlarged prestenotic cells in the lumen. with the contents of the small intestine mixed with gas and similar to feces. The undoubted advantage of CT compared to CT used in classical radiology is the ability to determine proximal or distal changes in the level of obstruction, accurately localize the pathological process in and outside the intestine, assess the condition of the mesentery and adjacent organs, as well as the condition of the parenchymatous

organs. and abdominal lymph nodes in general [3, 17, 19, 20, 21, 24, 27, 29]. In case of small intestinal ischemia, i.e. mesenteric embolism or volvulus, CT reveals abnormal direction of vessels, distinct thickening of intestinal glomeruli with edema of the submucosa (objective symptom), absence of accumulation of contrast agent in the wall, and beak sign. and abdominal cavity accumulation of a large amount of free fluid in the cavity. A. Furukawa et al. (2009), the use of intravenous contrast analysis allows to determine intestinal wall ischemia with an accuracy of 95% [26]. Strangulation with contrast on CT is characterized by a sign of intestinal torsion, in which the superior mesenteric artery and its branches twist around the superior mesenteric vessel. The affected rings almost do not accumulate a contrast agent and have a U- or C-configuration, characteristic of strangulation [20, 26, 28]. With intussusception of both the small and large intestine, CT usually reveals a detachment of the wall with high densitometric indices of the intestine and a low proportion of intussusceptible mesenteric tissue [17, 19, 28]. Many studies have shown an increase in the diagnostic capabilities of computed tomography in combination with the introduction of a contrast agent into the small intestine through an enteral tube. This method improves the diagnostic accuracy of the method in low-level diagnostics. when determining the causes of obstruction, the diagnostic accuracy of the method reaches 96-99% [21, 30]. According to M.V. Chiorean et al. (2007), probe enterography is the best diagnostic method in patients with Crohn's disease and partial obstruction, as it allows for an accurate determination of the degree of stenosis [30]. According to JD Rea et al. (2007), contrast-enhanced computed tomography in patients with transient intestinal obstruction of adhesive genesis can in some cases lead to false-negative results [21]. A number of publications, including a comprehensive study by N. N. Bulatov (2003), preoperative examination of patients with tumor genesis in order to determine resectability , surgical method, joint complications (perforation, abscess, obstructive ischemia) showed the high efficiency of computed tomography in the study of . etap. [3]. Many studies analyze the capabilities of computed tomography in examining patients with suspected cancer. Colon obstruction is caused by the presence of a tumor, and some authors define CT as a diagnostic rather than a primary method [2, 10]. There are conflicting data on the capabilities of computed tomography in assessing local tumor spread. Some authors [2, 5] believe that CT is indicated only for widespread forms of damage, while others [3, 17, 20, 21, 24, 25] provide information on the high efficiency of this method. An analysis of literary sources revealed a significant range of computed tomography efficiency in assessing local colon cancer spread: sensitivity from 55 to 91%, specificity from 52 to 98%, accuracy from 57 to 57-95% [3, 17, 28]. The authors are more than unanimous in their assessment of the informativeness of computed tomography for diagnosing metastatic lesions of the lymph nodes. High specificity (up to 98%) and low sensitivity (up to 48%) of the method were noted [3, 17, 20, 25]. EJ Baltazar (1994) believes that computed tomography can be useful in detecting lymph nodes larger than 5 mm, but cannot clearly differentiate their metastatic lesions from reactive hyperplasia [17]. Although, according to AJ Megibow et al. (1991), in this case the assessment of the condition of the lymph nodes is within the competence of computed tomography [20]. These authors attempted to develop CT semiotics of their changes, identifying the characteristic features of metastatic lesions (unevenness, blurring of contours, tendency to form conglomerates) [17, 20]. According to many literary sources, computed tomography is a highly informative method for accurate diagnosis of distant metastases of colon cancer using contrast enhancement of 95-99% [3, 17, 25]. The use of CT arteriography and CT portography (methods of selective study of pathological foci with the introduction of dynamic scanning) increases the sensitivity of the method to 100% [26-28]. E.J. Bilan Balthazar, A.J. Megibu The CT method is used not only for colon cancer. and plays a leading role in drawing up a treatment plan for patients, as well as in obtaining information about the criteria for the well-being of such patients during and after treatment [17, 24].

The latter method, virtual computed tomography colonoscopy, is increasingly described as the most objective method for detecting any lesion of the colon [24, 25, 28]. Thus, today the physician has a variety of radiation methods for diagnosing acute intestinal obstruction, but many aspects of diagnostic measures

cause controversy among specialists. In particular, the role of intestinal obstruction in CT diagnostics has not been fully determined, clear recommendations for conducting this study have not been determined, and an algorithm for the use of individual methods in a specific clinical situation in patients with suspected intestinal obstruction has not been developed. about obstruction at the preoperative stage from the point of view of evidence-based medicine.

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