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USING ULTRASOUND DIAGNOSTICS AND MAGNETIC RESONANCE TOMOGRAPHY IN SURGICAL TREATMENT OF COMPLICATED FORMS OF ACUTE PARAPROCTITIS

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The results of surgical treatment of 134 patients with ischiorectal and pelviorectal acute paraproctitis were analyzed. Among them 81 (60.4 %) were men, 53 (39.6 %) were women aged 19 to 78 years. Ischiorectal acute paraproctitis was diagnosed in 71 (52.9 %), retrorectal – in 21 (15.8 %), pelviorectal – in 17 (12.7 %), horseshoe – in 16 (11.9 %), panparaproctitis (pelvic phlegmon) – in 9 (6.7 %) patients. The use of ultrasound and magnetic resonance imaging for the diagnosis of acute paraproctitis was analyzed in 67 (50.0 %) patients. Establishing the location of the abscess in the pararectal cell spaces, visualization of the primary purulent course and the affected crypt, permitted performing primary radical surgery in 79.1 % (53/67) of patients in the main group. In the comparison group, primary radical surgery was performed in 48 % (32/67) of patients. According to the Bayesian formula, the probability of complications during non-radical surgery in the main group of patients was 0.31, and in the comparison group – 0.43. The probability of no complications during non-radical surgery in the main group of patients was 0.69, and in the comparison group – 0.57, which confirmed the efficacy of ultrasound and magnetic resonance imaging in the diagnosis and treatment of patients with acute paraproctitis in the main group, relative to the comparison group.

Key words: acute paraproctitis, ultrasound examination, magnetic resonance imaging, surgical treatment, Bayesian formula.

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ЗАСТОСУВАННЯ УЛЬТРАЗВУКОВОЇ ДІАГНОСТИКИ І МАГНІТНО-РЕЗОНАНСНОЇ ТОМОГРАФІЇ У ХІРУРГІЧНОМУ ЛІКУВАННІ СКЛАДНИХ ФОРМ ГОСТРОГО ПАРАПРОКТИТУ

Проаналізовані результати хірургічного лікування 134 хворих ішіоректальним і пельвіоректальним гострим парапроктитом. Серед них 81 (60,4 %) чоловік, 53 (39,6 %) жінки, віком від 19 до 78 років. Ішіоректальний гострий парапроктит діагностований у 71 (52,9 %), ретроректальний – у 21 (15,8 %), пельвіоректальний – у 17 (12,7 %), підковоподібний – у 16 (11,9 %), панпарапроктит (флегмона тазу) – у 9 (6,7 %) хворих. Застосування ультразвукового дослідження та магнітно-резонансної томографії для діагностики гострого парапроктиту проаналізовано у 67 (50,0 %) хворих. Встановлення розташування гнійника в параректальних клітковинних просторах, візуалізація первинного гнійного ходу і ураженої крипти, дозволила виконати первинно-радикальні оперативні втручання у 79,1 % (53/67) пацієнтів основної групи. У групі порівняння первинно-радикальні оперативні втручання були виконані у 48 % (32/67) хворих. Згідно формули Байєса ймовірність розвитку ускладнень при нерадикальних оперативних втручаннях у основній групі пацієнтів становила 0,31, у групі порівняння – 0,43. Ймовірність відсутності розвитку ускладнень при нерадикальних оперативних втручаннях у основній групі пацієнтів становила 0,69, у групі порівняння – 0,57, що підтвердило ефективність проведення ультразвукового дослідження та магнітно-резонансної томографії при діагностиці та лікуванні пацієнтів з гострим парапроктитом основної групи, відносно групи порівняння.

Ключові слова: гострий парапроктит, ультразвукове дослідження, магнітно-резонансна томографія, хірургічне лікування, формула Байєса.

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Patients with acute paraproctitis (AP) make up 0.43–1 % of the total number of surgical patients and 24–50 % of the number of patients with rectal diseases. Diagnosis of AP by examination, palpation, digital rectal examination, or bimanual examination, not all forms of the disease are sufficiently informative. More often difficulties arise, in the so-called "deep forms" of a disease – ischiorectal and pelviorectal AP [3, 11]. Radical surgery for AP involves the opening of the abscess, leaks, elimination of the primary purulent passage and its internal opening in the affected crypt of the rectal mucosa.

In the case of non-radical surgical intervention, 30 % of patients with AP have the most complicated form of chronic paraproctitis, which is most often aggravated by the deficiency of the external sphincter in 4.9–33 % of patients and cicatricial changes of muscles, which squeeze the anus.

Repeated operations for recurrence of rectal fistulas are often accompanied by the development of elements of neurogenic and motor incontinence due to severe trauma to the occlusal apparatus, which significantly impairs the quality of life of such patients.

Therefore, for the diagnosis of ischiorectal and pelviorectal AP, it is advisable to use ultrasound (ultrasound) and magnetic resonance imaging (MRI), which have high diagnostic values [6, 14].

The purpose of the study was to establish the diagnostic value of ultrasound and magnetic resonance imaging in the detection of purulent centers and primary purulent passage in patients with acute paraproctitis and assess the results of radical and non-radical surgery in ischiorectal and pelviorectal acute paraproctitis.

Materials and methods. The results of surgical treatment of 134 patients with ischio-, retro-, and pelviorectal AP who were treated in the proctology department at the Regional Clinical Hospital of Ivano-Frankivsk Regional Council from 2010 to 2020 have been analyzed. Among them 81 (60.4 %) were men, 53 (39.6 %) were women, aged 19 to 78 years.

90 (67.2 %) patients were hospitalized on days 3–6 of the disease, and 44 (32.8 %) patients sought specialized medical care on days 8–12. The main group included 67 (50 %), and the comparison group – 67 (50 %) patients with ischio-, retro-, and pelviorectal AP. Groups of patients are comparable by age, sex, depth of abscess.

Ischiorectal AP was diagnosed in 71 (52.9 %) patients, retrorectal AP in 21 (15.8 %), pelviorectal AP in 17 (12.7 %), horseshoe AP in 16 (11.9 %), panparaproctitis – in 9 (6.7 %) patients.

In the comparison group, preoperative diagnosis of AP was only performed using classical objective methods (examination and palpation of the perianal area, digital rectal examination, anoscopy/proctoscopy). Ultrasound and MRI of the pararectal tissue and rectum were additionally performed in the patients of the main group.

Ultrasound of pararectal tissue and rectum was performed with Siemens-Sonoline – "Elegra" device (percutaneous convex sensor 2.7–5.5 MHz, linear rectal sensor 3.5–5.5 MHz). For MRI, we used a device from Siemens (Germany) with a slice thickness of 4–5 mm, with a magnetic field strength of 1.0 T in standard projections for T_1–, PD + T2-weighted images and in STIR and FatSat modes.

We have improved the technique of MRI, which provided a contrast enhancement of the rectum [7]. In 14 (20.9 %) patients of the main group with the spread of the process to two or more pararectal cell spaces, the abscess was opened by a major crescentic incision in the perineum with its drainage, which was supplemented by two radial perineal incisions at the border of inflammatory perianal edema to prevent pelvic phlegmon in skin areas 4–7 cm long and isolated cryptectomy [4].

To analyze the immediate and long-term results of surgical treatment, classical objective methods were used, taking into account the number of recurrences, the frequency of transition to chronic form (pararectal fistula), and assessing the frequency and degree of anal sphincter insufficiency. Long-term results were analyzed after 2 years.

To statistically process the results and to evaluate the efficacy of ultrasound and MRI in patients with AP of the main group, relative to the comparison group, we used the Bayesian theorem, which describes in this paper the probability of complications and their absence in non-radical surgery in the study groups [9]. All examinations were performed with the informed consent of the patient.

Results of the study and their discussion. For the diagnosis of AP ultrasound was used in 100 % (67/67) of patients in the main group, of which by transcutaneous examination of the pelvic organs in the anterior abdominal wall in 67 % (45/67), endorectal examination – in 33 % (22/67) patients. At 57 % (38/67) of patients in the main group at the time of hospitalization there were no local manifestations of the inflammatory process in the area of the waste.

With transcutaneous ultrasound in 67 % (45/67), patients purulent centers were visualized in 67 % (30/45) of patients, and primary purulent passage – in 8 of 45 patients. In the case of uninformativeness of transcutaneous ultrasound, the endorectal examination was used.

At endorectal examination in 33 % (22/67) patients the location of the abscess was found in 17 of 22 patients, the primary purulent passage – in 7 of 22 patients. In some patients, the study caused discomfort and a significant increase in pain, which required additional use of painkillers, and was sometimes uninformative in 15 of 67 patients in the main group.

In 5 patients of AP with widespread phlegmon of pararectal tissue in the main group ultrasound was permitted to assess of the extent of the purulent process to neighbouring or contralateral pararectal

spaces in horseshoe AP, to detect purulent inflows into the interfascial spaces of the root of the scrotum and thigh.

The diagnostic value of transcutaneous ultrasound was 66.7 %, in the diagnosis of primary purulent passage – 17.8 %. The diagnostic value of ultrasound using an endorectal sensor in the detection of abscesses was 77.3 %, the primary purulent passage – 31.8 %. Ultrasound results in 78 % (52/67) of patients in the main group were confirmed intraoperatively and corresponded to the final diagnosis.

MRI with additional rectal contrast was used in 15 of 67 patients of the main group in whom ultrasound was uninformative (fig. 1).

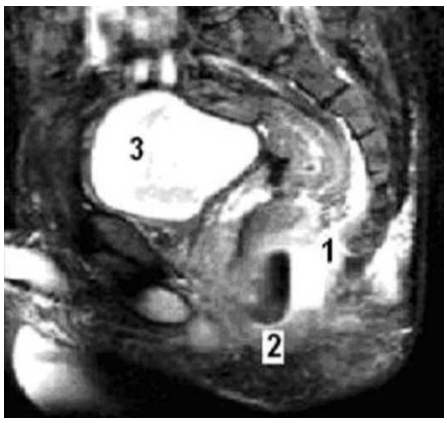

Fig. 1. MRI with contrast enhancement of the rectum. Acute ischiorectal paraproctitis: 1 – abscess cavity; 2 – primary purulent passage; 3 – bladder (indicated by numbers).

According to the results of MRI, the purulent focus in the pararectal tissue was visualized in 14 out of 15, the primary purulent passage – in 13 of 15 patients. Diagnostic informativeness of MRI in the diagnosis of AP was 93 %, in the diagnosis of primary purulent passage – 86 %. The MRI results were completely consistent with intraoperative data.

Surgery in patients of both groups was performed under neuroaxial (subarachnoid) anesthesia at the level of L_4–L_5. In patients with panparaproctitis (pelvic phlegmon) with a probable risk of septic shock, hypotension, general anesthesia with tracheal intubation and mechanical lungs ventilation was preferred.

Tactics of surgical AP treatment involved full disclosure of the main abscess and inflows in the pararectal fiber and their rational drainage (stage I). During stage II, the location of the affected crypt on the rectum mucous membrane, the nature of the primary purulent passage and its relationship to the portions of the external rectal sphincter muscle were determined to eliminate them and perform radical surgery.

When performing the surgery in patients of both groups at the first stage, an arcuate (crescent-shaped) incision over the site of the greatest fluctuation within the inflammatory infiltrate on the perineum was more often used. Pus was collected in order to verify the pathogenic microflora and its sensitivity to antibacterial drugs. Dosed necrectomy was performed, and the abscess cavity was rehabilitated with a 1 % solution of Dioksidin (hydroxymethyl quinoxylin dioxide, manufactured by Farmak JSC, Kyiv, Ukraine), purulent pockets and inflows in the pararectal cells were separated in a blunt and partially acute way.

At the II stage the volume of surgical intervention differed in patients of the main group and comparison group. In 37 % (25/67) of patients of the main group with intrasphincteric and superficial transsphincteric location of the primary purulent passage, the abscess cavity was opened and drained with excision of the purulent passage into the lumen of the rectum (type of Gabriel's operation). In 15 of 67 patients with the spread of the purulent process on two or more pararectal cell spaces opening of AP was performed with the main arcuate incision and two additional radial incisions in the perineum and isolated cryptectomy, according to the developed method.

In 13 of 67 patients of the main group with deep transsphincteric and extrasphincteric location of the primary purulent passage and its internal opening on the rectal mucosa was detected, abscess was opened and drained in combination with isolated cryptectomy. In 9 of 67 patients of the main group, when the internal opening of the primary purulent passage on the crypt of the rectal mucosa could not be detected whether its location at a distance of less than 2 cm from the rectal wall, opened the abscess and drainage of the purulent cavity. In 5 of 67 patients of the main group with panparaproctitis, the opening of the abscess was limited to several incisions, dosed necrectomy and rational wound drainage.

In 46 % (31/67) of patients in the comparison group, when the internal opening in the crypt of the rectal mucosa could not be detected or its location at a distance of less than 2 cm from the rectal wall – opening and drainage of the abscess was performed. In 19 of 67 patients in the comparison group, who managed to be detected intraoperative and superficial transsphincteric location of the primary purulent passage, an abscess was opened and drained with excision of the purulent passage into the lumen of the rectum (by Gabriel's operation).

In 13 of 67 patients of the comparison group with deep transsphincteric or extrasphincteric location of the primary purulent passage and its detected internal opening, the abscess was opened and drained and the ligature was ligated through the primary purulent passage and the affected crypt of the rectal mucosa. In 4 patients of the comparison groups with pelvic phlegmon we were limited to the opening of the abscess and scrotum in several incisions, dosed necrectomy and drainage.

Thus, in the main group of patients with ultrasound and MRI primary radical surgery was performed in 79.1 % (53/67) of patients. In the comparison group, primary radical surgery was performed in 48 % (32/67) of patients.

Long-term results of surgical treatment were analyzed after 2 years. In 63 % (85/134) of patients of both groups who underwent primary radical surgery, recurrence of the disease was not observed. Among 37 % (49/134) of patients with non-radical surgery, the results were different (table 1).

Table 1

Long-term results of surgical treatment of patients with acute paraproctitis with non-radical surgery

Nature of complication	Main group n=14	Comparison group n=35
Recurrence of the disease	1	5
Formation of pararectal fistula	4	9
Deficiency of the anal sphincter of the II degree	-	2
Deficiency of the anal sphincter of the III degree	-	1
Total	5	17

After non-radical surgery, complications were diagnosed in 45 % (22/49) of patients, including 5 of 14 patients in the main group and 17 of 35 patients in the comparison group. The formation of the pararectal fistula was observed in 13 of 22 patients, of which in the main group – in 4, in the comparison group – in 9 patients. Recurrence of AP occurred in 6 of 22 patients, of which in the main group – in 1, in the comparison group – in 5 patients.

Bayes' formula for determining the likelihood of complications in non-radical surgery (UNOV) in the main group (MG) of patients, had the form:

$$P(UNOV/Or) = P(Or/UNOV)*P(UNOV)/P(Or), (1),$$

where P (Or/UNOV) – the probability that the patient is from the main group and has complications of non-radical surgery, according to table 1(P(Or/UNOV)=5/14);

P(UNOV) – the probability that the patient is from the main group or comparison group and has complications of non-radical surgery (P(UNOV)=22/49);

P(Or) – the probability that the patient is from the main group.

Probability that the patient from the main group was determined by the formula of total probability:

$$(Or)=P(Or/UNOV)*P(UNOV)+P(Or/VUNOV)*P(VUNOV), (2)$$

where P (Or/VUNOV) – the probability that the patient from the main group has no complications of non-radical surgery (P(Og/VUNOV)=9/14);

P(VUNOV) – the probability that the patient is from the main group and has complications of non-radical surgery (P(VUNOV)=27/49).

According to formula (2) the probability that the selected patient from the main group was determined:

$$P(Or)=5/14*22/49+9/14*27/49=0.51.$$

The probability of complication of non-radical surgery was determined in the main group of patients, according to formula (1), taking into account the actual numerical values:

$$P(UNOV/Or)=(5/14*22/49)/.51=0.31.$$

It is known that the probability of complications of non-radical surgical interventions in the main group of patients P(UNOV/Or) and the probability of no complications in non-radical surgical interventions in the main group of patients P(UNOV/Or) form a complete group of events, i.e. their sum is equal to one.

$$P(UNOV/Or)+P(VUNOV/Or)=1 (3)$$

Using formula (3) the probability was determined of no complications in non-radical surgery in the main group of patients P(VUNOV/Or):

$$P(VUNOV/Or)=1–P (UNOV/Or)=1–0.31=0.69.$$

Similarly, the probability of complications of non-radical surgical interventions in the comparison group P(UNOV/AP) was determined, which was 0.43. The probability of no complications in non-radical surgical interventions in the comparison group was P(VUNOV/AP)=1–0.43=0.57.

We compared the probabilities of complications in non-radical surgical interventions in the main group of patients and the comparison group. The probability of developing complications of non-radical surgery in the main group of patients was 0.31, which is less than the probability in the comparison group,

which was equal to 0.43. Therefore, according to the accepted notation in the article P(UNOV/Or) <P(UNOV/Gp), because 0.31<0.43.

The comparison of no complications probability of non-radical surgical interventions in the main group of patients was 0.69, which is more than the probability in the comparison group, which was 0.57. According to the probability notations P(VUNOV/Or)>P(VUNOV/Gp) accepted in the article because 0.69> 0.57.

The expediency of using ultrasound and MRI for the diagnosis of AP is also pointed out by other authors [12]. When using ultrasound with an endorectal sensor can more accurately assess the degree of involvement in the pathological process of the rectal wall and the location of deep abscesses. The diagnostic value of ultrasound using an endorectal sensor, according to our study, in the detection of purulent focuses in pararectal fiber was 77.3 %, the primary purulent passage – 31.8 %. Our data are comparable with the results of other authors [5]. However, this examination has limitations in patients with significant pain.

At MRI it is possible to visualize more precisely the direction of the primary purulent passage in relation to the sphincter apparatus and localization of its internal opening on the affected crypt of a rectum mucous membrane. According to our data, the diagnostic informativeness of MRI in the diagnosis of AP was 93 %, and the primary purulent course – was 86 %. The high diagnostic value of ultrasound and MRI is also indicated in [8, 10, 13]. The use of ultrasound and MRI to diagnose AP permitted to perform primary radical surgery in 79.1 % (53/67) of patients.

Analysis of long-term surgical outcomes using the Bayesian formula showed a greater likelihood of no complications with non-radical surgery and a lower probability of complications in non-radical surgery with the main group of patients compared to the comparison group, which additionally confirms the efficacy of ultrasound and MRI.

Conclusions

1. For the diagnosis of ischiorectal and pelviorectal AP, along with clinical data and objective examination, it is advisable to use ultrasound and MRI. The diagnostic value of transcutaneous ultrasound in the visualization of the purulent focus was 67 % (30/45), the primary purulent passage – 17.8 %. The diagnostic value of ultrasound using an endorectal sensor in the detection of purulent focuses was 77.3 %, and the primary purulent passage – was 31.8 %. Diagnostic informativeness of MRI in the diagnosis of primary purulent lesions was 93 %, and in the diagnosis of primary purulent course – 86 %.

2. Due to the use of ultrasound and MRI in the perioperative diagnosis of complex forms of AP, it was possible to perform primary radical surgery in 79.1 % (53/67) of patients in the main group. In the comparison group, primary radical surgery was only performed in 48 % (32/67) of patients.

3. According to the Bayesian formula, the probability of complications with non-radical surgery in the main group of patients was 0.31, and in the comparison group – 0.43. The probability of no complications with non-radical surgery in the main group of patients was 0.69, in the comparison group – 0.57, which confirms the efficacy of ultrasound and MRI in the diagnosis of AP.

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