

Research Article

Acute Appendicitis: Approaches to Complex Surgical Treatment in Accordance with the Principles of Multimodal Surgical Strategy (Fast-Track Surgery)

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Abstract

The objective of the research was to develop approaches to complex surgical treatment of patients with acute appendicitis taking into consideration the type of surgical approach, perioperative antibiotic therapy, adequate pain relief, duration of inpatient treatment.

Materials and methods. The analysis of complex surgical treatment of the group of patients (31) with acute appendicitis, treated in the surgical departments of Lviv Emergency Hospital during 2017 was performed. The age of patients ranged from 18 to 77 years. There were 13 (41.9%) males and 18 (58.1%) females. Duration of hospital stay from the moment of hospitalization varied from 2 to 13 days. The level of pain sensation in patients was assessed on a 10-point visual analog scale of pain 6, 12 and 24 hours after surgery (with four-step stratification of the received data - absent (0-2), weak (3-4), moderate (5-8), strong (9-10 points). All the patients were divided into two groups using blind envelope technique: Group A included 18 patients, who underwent conventional appendectomy, and Group B comprised 13 patients who underwent diagnostic laparoscopy with the transition to laparoscopic appendectomy if the diagnosis of acute appendicitis was confirmed, or laparoscopic appendectomy was initially performed. The analysis of treatment efficacy was performed taking into account the dynamics of pain relief and the duration of inpatient treatment.

Results and discussion. As a result of the conducted research it was stated that among all the patients examined, catarrhal acute appendicitis was found in 1 (3.2%) case, acute phlegmonous appendicitis was detected in 20 (64.5%) cases, acute gangrenous appendicitis was seen in 7 (22.6%) cases, acute gangrenous appendicitis with perforation and local peritonitis was diagnosed in 3 (9.7%) cases. Conventional appendectomy was performed in 18 cases; laparoscopic appendectomy was used in 13 cases. All the patients received anti-bacterial treatment in the early perioperative period. According to the prospective analysis, pain syndrome at the site of postoperative wounds was found to be present in patients of both groups. The intensity of pain syndrome was significantly lower in patients who underwent laparoscopic appendectomy. The analysis of treating patients with acute appendicitis allows confirming that the introduction of laparoscopic appendectomy into the complex of surgical treatment of patients with acute appendicitis can significantly reduce the body's response to stress from surgical trauma and pain, speed up recovery due to early activation of the patient and maximally reduce the duration of hospital stay, which definitely corresponds to the modern principles of fast-track surgery.

Conclusions. The use of laparoscopic appendectomy makes it possible to significantly reduce the body's response to stress from pain and surgical trauma and is an important part of the formation of the patient's general condition. Complex surgical treatment of patients with acute appendicitis using non-invasive techniques allows shortening the duration of hospital stay (4.62 ± 0.77 days) and reducing the period of disablement. The method of minimally invasive surgical interventions can be considered a "gold standard" for providing medical care to the patients with urgent surgical diseases of the abdominal cavity, which provides an optimal approach to surgical treatment.

Keywords

acute appendicitis; antibacterial therapy; duration of inpatient treatment; laparoscopy

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Problem statement and analysis of the recent research

Acute appendicitis (AA) continues to be one of the most common surgical pathologies. Its incidence is in the range of 13.8 to 31.1 cases per 10,000 population, and appendectomy

is the most common surgery, which is performed in all the surgical hospitals (up to 20-30%). However, the issue of optimizing the diagnostic and treatment algorithms continues to be relevant [1, 2, 3]. The need for timely diagnosis and urgent surgery immediately after the onset of the disease,

prompts physicians to require a multifactorial clinical evaluation of the patient's condition [3, 4]. This applies to the pathogenesis of the disease (anatomical features, the presence of concomitant somatic diseases, rapid development of destructive changes in the appendix), and the right choice of surgical intervention. Recently, laparoscopic appendectomy has become an alternative to classical appendectomy with its numerous "disadvantages" (traumatic access, impossibility of complete revision of the abdominal cavity, development of the conglutination process, potential infection of a postoperative wound with prolonged period of disablement) [5, 6]. Laparoscopic appendectomy was first proposed in 1983 by K. Semm, it has been widely practiced for adults, and later for children as well [6, 7].

The objective of the research was to develop approaches to complex surgical treatment of patients with acute appendicitis taking into consideration the type of surgical intervention, perioperative antibiotic therapy, adequate pain relief, duration of inpatient treatment.

1. Materials and methods

The analysis of complex surgical treatment of the group of patients (31) with acute appendicitis, treated in the 1st and 3rd surgical departments of Lviv Emergency Hospital during 2017 was performed. The age of patients ranged from 18 to 77 years. There were 13 (41.9%) males and 18 (58.1%) females. Duration of hospital stay from the moment of hospitalization varied from 2 to 13 days.

The patients' general condition was assessed on the basis of the analysis of physical examinations in combination with the laboratory data, instrumental and mechanical methods of dynamic monitoring.

Prevention of purulent-septic complications was carried out by intravenous administration of antibacterial drugs prior to surgery in accordance with the clinical protocol of medical care for patients with acute appendicitis [1].

The level of pain sensation in patients was assessed on a 10-point visual analog scale of pain (VAS) 6, 12 and 24 hours after surgery (with four-step stratification of the received data - absent (0-2), weak (3-4), moderate (5-8), strong (9-10 points).

All the patients were divided into two groups using blind envelope technique: Group A included 18 patients, who underwent open appendectomy, and Group B comprised 13 patients who underwent diagnostic laparoscopy with the transition to laparoscopic appendectomy if the diagnosis of acute appendicitis was confirmed, or laparoscopic appendectomy was initially performed.

The analysis of treatment efficacy was performed taking into account the dynamics of pain relief and the duration of inpatient treatment.

The research was conducted in accordance with the requirements of the Ethics Committee. The statistical processing of the results was carried out using the MS Excel 2010 program package. The data are presented in the form of $M \pm$

m. The statistically significant value of $p < 0.05$ was considered.

2. Results

As a result of the conducted research it was stated that among all the patients examined, catarrhal acute appendicitis was found in 1 (3.2%) case, acute phlegmonous appendicitis was detected in 20 (64.5%) cases, acute gangrenous appendicitis was seen in 7 (22.6%) cases, acute gangrenous appendicitis with perforation and local peritonitis was diagnosed in 3 (9.7%) cases. Taking into account the aforementioned data, we can state that both groups of patients were absolutely comparable and statistically significant. Distribution of patients according to the nosological form is presented in Table 1.

According to Table 1, patients with acute phlegmonous appendicitis prevailed.

AA verified on the basis of the data of physical, laboratory and instrumental methods of dynamic patient's monitoring was an indication for surgery.

Surgical method (open appendectomy/laparoscopic technique) was chosen according to expressed clinical manifestations of the disease at the time of the patient's examination, the surgeon's technical skills and the patient's individual wishes.

Distribution of patients according to the type of surgical intervention and gender-based characteristics is shown in Table 2.

In the early perioperative period, all the patients received antibiotic treatment according to the protocols. Among the main drugs used for patients with AA, antibiotics of the fluoroquinolones group (levofloxacin) and cephalosporins (cefuroxime) predominated. They were used as monotherapy - fluoroquinolones (6; 19.4%), cephalosporins (4; 12.9%), and in combination with metronidazole - fluoroquinolones (13; 41.93%), cephalosporins (6; 19%). The proportion of other antibacterial drugs, namely ampicillin (1, 3.22%) and the combination of fluoroquinolone + cephalosporin (1, 3.22%) was not statistically significant. Special attention should be given to the severity of pain syndrome (PS) in patients in the early perioperative period. According to the recommendations of the European Society of Regional Anesthesia & Pain Therapy (ESRA), to provide relief from PS of light, medium and high intensity, it is recommended to use non-narcotic analgesics, mainly non-steroidal anti-inflammatory drugs [8, 9]. We used intravenous infusion of Ketonal to eliminate PS in patients with AA in the early postoperative period.

According to the prospective analysis, PS at the site of postoperative wounds was found to be present in patients of both groups. PS intensity was significantly lower in patients who underwent laparoscopic appendectomy. In addition, in patients of Group A, pain persisted for 4.3 ± 1.12 days, while in patients of Group B, it persisted for 1.8 ± 0.6 days.

The reduction in pain intensity (VRS scale) in patients of Group B, both in the early perioperative period and throughout the observation period (2 days), was more clinically proven

Table 1. Distribution of patients according to the nosological form

Nosological form	Open appendectomy, (n=18)	Laparoscopic appendectomy, (n=13)
Acute catarrhal appendicitis	1 (5.6%)	-
Acute phlegmonous appendicitis	11 (61.1%)	9 (69.23%)
Acute gangrenous appendicitis	4 (22.2%)	3 (23.08%)
Acute gangrenous appendicitis with perforation and local peritonitis	2 (11.1%)	1 (7.69%)

Notes: $\chi^2=0.023$; $p=0.88$

Table 2. Distribution of patients by gender

Group	Male (age; $M \pm m$) (n=13)	Female (age; $M \pm m$) (n=18)	All patients (age; $M \pm m$) (n=31)
Open appendectomy (n=18)	38.1 \pm 5.9 (n=9)	31.3 \pm 4.2 (n=9)	34.7 \pm 3.6 (n=18)
Laparoscopic appendectomy (n=13)	26 \pm 6.04 (n=4)	27.2 \pm 3.4 (n=9)	26.8 \pm 2.83 (n=13)

Notes: $\chi^2=1.557$; $p=0.21$

and statistically significant ($p < 0.05$) than in patients of Group A.

Dynamics of PS severity in patients with AA (Group A and Group B) is presented in Table 3.

Considering the data presented in Table 3, we can assert that the use of laparoscopic surgical technique in patients with AA allows us to reliably diagnose the disease as well as to conduct minimally traumatic (PS severity) surgery.

3. Discussion

It should be noted that the technique of minimally invasive surgical interventions has a pronounced correlation with the patient's gender characteristics. Thus, pronounced PS (6-7 points) was observed in most women (89%) of Group A who underwent open appendectomy as opposed to women who underwent laparoscopic appendectomy, which clearly indicated that laparoscopic appendectomy was less traumatic as compared to open appendectomy. It is also worth noting that 78% of women of Group A assessed the state of the postoperative scar as extremely unsatisfactory.

The analysis of the duration of hospital stay showed that patients of Group A were treated as inpatients for 9.5 \pm 0.57 days (women - 9.77 \pm 0.44 days; men - 9.22 \pm 0.9 days), while patients of Group B were treated as inpatients for 4.62 \pm 0.77 days only (women - 4.0 \pm 0.44 days, men - 7.0 \pm 3.05 days).

The analysis of treating patients with AA allows confirming that the introduction of laparoscopic appendectomy into the complex of surgical treatment of patients with AA can significantly reduce the body's response to stress from surgical trauma and pain, speed up recovery due to early activation of the patient and maximally reduce the duration of hospital

stay, which definitely corresponds to the modern principles of fast-track surgery.

4. Conclusions

1. The use of laparoscopic appendectomy makes it possible to significantly reduce the body's response to stress from pain and surgical trauma and is an important part of the formation of the patient's general condition.
2. Complex surgical treatment of patients with AA using minimally invasive techniques allows shortening the duration of hospital stay (4.62 \pm 0.77 days) and reducing the period of disablement.
3. The method of minimally invasive surgical interventions can be considered a "gold standard" for providing medical care to the patients with urgent surgical diseases of the abdominal cavity, which provides an optimal approach to surgical treatment.

5. Prospects for further research

The widespread use of fast-track technique in urgent surgery, the introduction of diagnostic and therapeutic single-port interventions are promising areas for further research.

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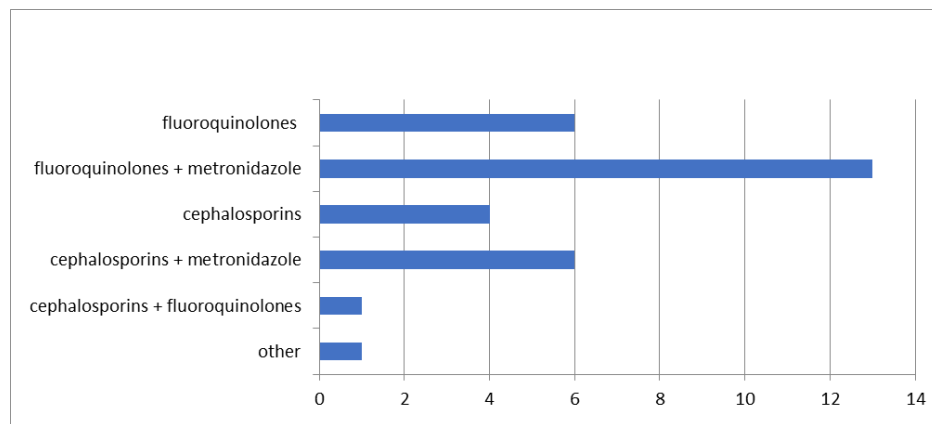


Figure 1. Combinations of used antibiotics

Table 3. My caption

Groups	PS intensity, points		
	After 6 hours	After 12 hours	After 24 hours
Open appendectomy, (n=18)	7.6±1.8	5.6±1.6	4.3±1.3
Laparoscopic appendectomy, (n=13)	6.4±1.3*	3.4±1.4	2.3±1.2*

Notes: * - $p < 0.05$

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