DOI: 10.17816/KMJ2021-751

Complicated destructive appendicitis: finding the optimal treatment method

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Abstract

Aim. To analyze the current practice for the surgical treatment of destructive acute appendicitis complicated by typhlitis and periappendicular abscess.

Methods. This study analyzed the treatment outcomes in 84 patients with acute destructive appendicitis aged 18 to 79 years who were treated in the Department of Surgery No. 2 of the City Clinical Hospital No. 7 of Kazan between 2016 and 2021 years. According to the method for completion of surgical intervention, patients were divided into 2 groups, similar in age, duration of the disease and morphological changes in the appendix. In the comparison group, 54 patients had the surgical intervention completed by gauze-glove drainage of the appendix bed. In 30 patients of the main group, the appendix stump and the adjacent intestinal wall was covered with a Tachocomb plate. Then the VAC system with the Vivano device and supplies from "Hartmann Group" (Germany) was connected. The statistical significance of the differences between the indicators was assessed by using the Student's t-test.

Results. The analysis of the surgical techniques used showed that in the main group, postoperative wound complications decreased by 3 times (23.3% of patients, p=0.04), intra-abdominal fluid collections decreased by 2 times (6.7% of patients, p=0.02), the hospital lengths of stay decreased by 1.8 times (p=0.02) compared with the comparison group.

Conclusion. The use of ligature appendectomy in combination with plastic closure of the appendix stump with a TachoComb and the technology of local vacuum-assisted laparostomy in patients with destructive appendicitis complicated by periappendicular abscess contributes to a 3-fold reduction in wound postoperative complications and reduces the hospital lengths of stay in this group of patients by 1.8 times.

Keywords: acute appendicitis, typhlitis, periappendicular abscess, vacuum system, Vivano device, vacuum therapy.

For citation: Malkov I.S., Mamedov T.A., Shakirov M.I., Filippov V.A. Complicated destructive appendicitis: finding the optimal treatment method. *Kazan Medical Journal.* 2021; 102 (5): 751–756. DOI: 10.17816/KMJ2021-751.

Background. Acute appendicitis ranks first in the range of surgical diseases that require urgent surgical treatment. In Russia, the number of appendectomies has decreased by 1.8 times over the past 17 years, which led to a 2-fold decreased number of lethal outcomes; however, the mortality rate remained (0.13%) and did not significantly differ from that in other countries, as well as the incidence rate [1].

The last decades have been marked by the use in clinical practice of various methods of surgical treatment of acute complicated appendicitis, from minimally invasive (laparoscopic appendectomy for drainage of appendicular abscesses under radiation control) to open and rather traumatic (laparostomy for multiple revisions and sanitization of the abdominal cavity with generalized purulent peritonitis) [2, 3].

Appendectomy technique, stages, and details are sufficiently described in the relevant manuals [2, 4, 5]. However, the generally accepted ligature-invagination method of treating the vermiform process (appendix) stump may be unacceptable in conditions of infiltrative-destructive changes in the cecum wall and the base of the appendix, since a purse-string suture applied to rigid tissues erupts during tightening [6, 7]. The proposed alternative options for peritoneal autoplasty of the appendix stump in severe typhlitis vary widely from simple invaginating interrupted sutures, which is

For correspondence: vyacheslav_f@mail.ru Received 30.04.2021; accepted 19.07.2021; published 15.10.2021.

reinforced by suturing the greater omentum, to wedge-shaped excision of the cecal headwall with the base of the appendix followed by suturing the defect [8]. A glue method for processing the stump was proposed to prevent the suture failure of the appendix stump under pronounced cecal head infiltration [9].

For complex peritoneal autoplasty of the appendix stump, the ligature method of appendectomy is recommended for fewer traumas with pronounced cecum head infiltrative changes [5]. Ligature appendectomy is also included in the draft national clinical guidelines of "Acute appendicitis in adults" (2020) [10].

However, the long way search for rational methods of appendectomy for complicated acute appendicitis has not found a final solution and remains relevant.

Abdominal cavity drainage in acute appendicitis that is complicated by a periappendicular abscess was considered a fundamental truth in surgery. However, in the last decade, the attitude of surgeons toward installing drains has started to change due to its disadvantages, such as low efficiency due to the fibrination on their walls and the rapid separation from the free abdominal cavity.

Penrose cigarette drain, which is popular among surgeons, is saturated with purulent exudate, loses its drainage properties on day 3, and turns into a plug that prevents outflow. The problem of adequate drainage remains unsolved by active aspiration using modern multichannel drainages. As a reaction of an organism to a foreign body, fibrin loss delimits the actively functioning drainage from the surrounding tissues [11, 12].

At the present stage, vacuum therapy is considered an innovative method for wound treatment of various etiologies, which accelerates the course of the wound process and combines the advantages of open and closed wound management [11–16].

Our study aimed to analyze the existing practice of surgical treatment of acute destructive appendicitis that is complicated by typhlitis and periappendicular abscess.

Materials and methods of research. Case analysis of patients operated on in the City Clinical Hospital No. 7 (CCH No. 7) in Kazan from 2016 to 2021 for acute appendicitis that is complicated by typhlitis and periappendicular abscess was performed.

The present study is based on the analysis of treatment results of 84 patients aged 18–79 years with acute destructive appendicitis, who were treated in the Department of Surgery No. 2 of CCH No. 7 in Kazan. Considering the pronounced cecal head infiltration, an open ligature appendectomy was performed in all cases. According to the complete method of the surgical intervention, two groups of patients were identified.

Table 1. Distribution of patients by age and the disease duration.

Indicator	Comparison group $n = 54$	Main group $n = 30$	p-value
Average age, years	43.0 ± 16.0	39.8 ± 14.4	0.16
Duration of the disease, days	2.1 ± 0.5	2.2 ± 0.3	0.49

Table 2. Distribution of patients by the nature of morphological changes in the appendix.

Group	Gangrenous appendicitis	Gangrenous-perforated appendicitis	Total
Comparison	41	13	54
Main	22	8	30
Total	63	21	84

The comparison group consisted of 54 patients, whom surgical intervention was completed with gauze-glove drainage of the appendix bed since a high probability of the appendix stump failure was found and delimiting the purulent process from the free abdominal cavity is necessary. The Penrose drain was inserted through the surgical wound. Additionally, the pelvis was drained through contraincision with tubular drainage. The average age in the comparison group was 43.0 ± 16.0 years, and 37 were males (68.5%) and 17 were females (31.5%). The average duration of the disease before hospital admission was 2.1 ± 0.5 days.

The main group consisted of 30 patients, whom the stump of the appendix with the adjacent intestinal wall was closed using a tachocomb, and then a vacuum system was connected using a Vivano apparatus and consumables from Hartman (Germany; a positive decision on the grant of a patent for an invention No. 2020136618/14 [067475]). The average age in the main group was 39.8 ± 14.4 years, and 16 were males (53.3%) and 14 were females (46.7%). The average duration of the disease before hospital admission was 2.2 ± 0.3 days.

Table 1 presents the distribution of patients by age and disease duration.

No significant differences were revealed between the groups in terms of age and disease duration (Table 1).

Histological examination of the surgical material was performed, which revealed that 41 (76%) patients had gangrenous appendicitis and 13 (24%) had gangrenous-perforated appendicitis in the comparison group, whereas 22 (73%) patients had

Table 3. Incidence and nature of postoperative complications in the compared groups.

Complication type	Main group (n = 30)	Comparison group (n = 54)	P-value
Suppuration of a postoperative wound	7 (23.3%)	38 (70.4%)	0.03
Abdominal infiltrates	2 (6.7%)	7 (13%)	0.02
Adhesive intestinal obstruction	—	3 (5.5%)	—
Intestinal fistulas	—	4 (7.4%)	—
Eventration	—	2(3.7%)	—
Total	9 (30%)	54 (100%)	0.04

Table 4. Assessment of the course of the postoperative period in the compared groups.

Main criteria	Time after surgery, days		P-value
	Main group	Comparison group	
Duration of pain syndrome	2.8 ± 0.6	4.9 ± 0.7	0.04
Restoration of intestinal motor activity	2.3 ± 0.5	3.6 ± 0.4	0.03
Independent getting up of the patient from bed	1.5 ± 0.4	6.2 ± 0.5	0.01
Hospitalization period	8.6±1.8	15.3±2.1	0.02

gangrenous appendicitis and 8 (27%) had gangrenous-perforated appendicitis in the main group. Table 2 presents the distribution of patients by the nature of morphological changes in the appendix.

Differences in the groups by morphological changes in the appendix were not statistically significant.

Our clinic used the technical parameters of the vacuum-assisted closure therapy that was proposed by Yu.V. Averyanova et al. (2016), with minor changes at a maximum pressure of 120 mmHg (on average 80 mm Hg) in a cyclic mode of 5 min of surgery with 2 min of break [16]. Dressings were performed once every 5 days under intravenous anesthesia. The average duration of vacuum therapy was 7.5 ± 1.1 days.

Pain syndrome duration and intensity in the postoperative period were assessed using a visual analog pain scale [17].

The statistical significance of the differences between the indicators was assessed by calculating the arithmetic mean values (M), standard error (m), and range of changes (min-max). The parametric Student's t-test was used for assessing the difference in indicators for statistical data processing. This criterion was calculated using the software package MS Statistica 10.0 and Microsoft Excel version 5.0 for Windows.

Results and discussion. Wound granulations and size reduction were noted, like other authors, within the first 7 days of using the vacuum therapy [16]. In the comparison group, the emergence of wound granulations and reduction occurred on average 3.2 ± 1.1 days later. Complications were recorded, as a rule, on the days 4–5 after the surgery.

In the main group, the comparative study of the surgical techniques revealed 3 times less frequent wound postoperative complications that amounted to 23.3%, 2 times less frequent abdominal infiltrates formation, and 1.8 times decreased hospitalization period. The difference was statistically significant. Table 3 presents the incidence and nature of postoperative complications.

In 4 cases of the comparison group, the treatment was accompanied by the formation of internal incomplete fecal fistulas in the postoperative period, which open into the wound and require long-term treatment (14 days to 2.5 months). This complication was not registered in the main group. Early adhesive intestinal obstruction and eventration were also not detected.

Table 4 shows a comparative characteristic of the rehabilitation of patients in the early postoperative period based on the treatment method.

Table 4 shows that the developed method has qualitatively changed the problem of early postoperative rehabilitation of patients, which was confirmed by a clinical case.

Patient F. arrived on 02/10/2021 via ambulance at the reception and diagnostic department of CCH No. 7 in Kazan with a clinical presentation of acute appendicitis, 2 days after the onset of the disease. The surgery was performed 1 hour after the admission under general anesthesia.

A laparoscopic appendectomy was initially planned. However, the laparoscopy revealed up to 40 ml of turbid serous exudate in the right iliac fossa. The cecal head was covered with a greater omentum with fibrin coating in a dense infiltrate and isolation to the appendix was considered inappropriate. This case registered a grade II periappendicular abscess.

The abdominal cavity was opened in layers with an oblique incision in the right iliac region. Upon

isolation, the periappendicular abscess was opened. Liquid pus (50 ml) was released, which was aspirated. A gangrenous altered appendix was found in the abscess cavity, with a perforated hole of 3 mm in diameter in its wall.

The mesenteric vessels are ligated and transected. A non-absorbable ligature was applied to the base of the appendix. An appendectomy was performed. A TachoComb plate was applied to the appendix stump with the capture of the adjacent wall of the cecum by 2 cm. Hemostasis was monitored, and a local vacuum-assisted laparostomy was placed through the surgical wound.

During the first 4 days postoperative, 30–40 ml of serous-purulent exudate was aspirated through the vacuum system. The patient got up independently 1 day postoperative and started self-care. With antibiotic therapy, the body temperature returned to normal on day 3 postoperative, and laboratory test results returned to normal on day 4. At this time, analgesic medications were unnecessary. On day 7 postoperative, the gas composition of the abdominal cavity was analyzed, which revealed a methane concentration within the acceptable range.

Under premedication, the vacuum system was removed and secondary sutures were applied through all layers of the surgical wound to the subcutaneous fatty tissue. The skin was sutured with sparse sutures. On day 8 postoperative, the patient was discharged in satisfactory condition under the outpatient supervision of a surgeon.

CONCLUSIONS

1. The use of the ligature method of appendectomy in combination with plastic closure of the appendix stump using a TachoComb and the technology of local vacuum-assisted laparostomy in patients with destructive appendicitis that are complicated by periappendicular abscess reduced the postoperative complications wound by 3 times compared with the classical gauze-glove drainage of the appendix bed complications ($p = 0.04$).

2. The technology of local vacuum-assisted laparostomy reduces the hospitalization period in patients with acute appendicitis complicated by typhlitis and periappendicular abscess by 1.8 times compared with classical gauze-glove drainage of the appendix bed ($p = 0.02$).

3. Therapeutic efficacy of the vacuum therapy method in patients with acute appendicitis complicated by typhlitis and periappendicular abscess enables its recommendation for complicated forms of acute appendicitis.

Author contributions. I.S.M. was the work supervisor; T.A.M. and M.I.Sh. conducted the study; T.A.M. and V.A.F. were responsible for collection and analysis of the results.

Funding. The study had no external funding.

Conflict of interest. The authors declare no conflict of interest.

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