

APPENDICULAR PERITONITIS – REVIEW ON THE TREATMENT ALGORITHM

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ABSTRACT:

BACKGROUND: TREATMENT OF APPENDICULAR PERITONITIS CONSISTS OF TWO MAIN ACTION TOOLS: SURGICAL THERAPY AND ANTIBIOTHERAPY. DECISION ON THE MOST APPROPRIATE ALGORITHM FOR COMBINING THE TWO IS NOT ALWAYS EASY TO DO, BUT IS ESSENTIAL FOR THE IMMEDIATE AND LATE RESULTS OF TREATMENT. THE PURPOSE OF THIS STUDY WAS TO EVALUATE THE TREATMENT ALGORITHMS APPLIED IN PRACTICE IN PATIENTS WITH APPENDICULAR PERITONITIS.

MATERIALS AND METHODS: A RETROSPECTIVE STUDY OF PATIENTS ADMITTED IN THE 1ST SURGERY CLINIC OF THE UNIVERSITY EMERGENCY HOSPITAL OF BUCHAREST WITH THE DIAGNOSIS OF ACUTE APPENDICITIS AND WHO UNDERWENT APPENDECTOMY, CONFIRMING COMPLICATED ACUTE APPENDICITIS, BETWEEN 2005 AND 2012; THE DATA COLLECTED INCLUDED LABORATORY AND HISTOLOGICAL RESULTS, LENGTH OF STAY, ANTIBIOTIC TREATMENT AND COMPLICATIONS ASSOCIATED WITH APPENDECTOMY.

RESULTS: 264 PATIENTS UNDERWENT APPENDECTOMY FOR COMPLICATED APPENDICITIS IN THE TIME INTERVAL OF THE STUDY. THE SURGICAL INTERVENTION CONSISTED OF APPENDECTOMY, MAINLY OPEN (OPEN 92%, LAPAROSCOPIC 8%), AND DRAINAGE IN MOST CASES. PREOPERATIVE ANTIBIOTHERAPY WAS ADMINISTERED IN 40.91% OF CASES, THE MOST FREQUENT ANTIBIOTIC REGIMEN INCLUDING CARBAPENEMS. POSTOPERATIVE ANTIBIOTHERAPY WAS ADMINISTERED TO ALL PATIENTS, THE MEAN LENGTH OF ANTIBIOTIC TREATMENT WAS 4.65 DAYS (RANGE 2 -25). POSTOPERATIVE COMPLICATIONS OCCURED IN 23.48% OF CASES, THE MOST FREQUENT BEING WOUND INFECTION (17%). THE MEAN HOSPITAL STAY WAS 6.9 DAYS (RANGE 3-38). MORTALITY IN THE STUDY GROUP WAS 2.65%. THE ALGORITHM OF PREOPERATIVE ANTIBIOTHERAPY – SURGICAL INTERVENTION HAS PROTECTIVE VALUE FOR WOUND-RELATED COMPLICATIONS: $p < 0.05$, $OR = 2.1463$, $RR = 1.90$, $RD = 10.04$, $\chi^2 = 4.55$, $p = 0.03288$.

CONCLUSIONS: PATIENTS WITH ACUTE APPENDICITIS AND HIGH RISK FOR POSTOPERATIVE INFECTIOUS COMPLICATIONS SHOULD BE ADMINISTERED PREOPERATIVE ANTIBIOTHERAPY AND UNDERGO SURGICAL INTERVENTION IN ORDER TO REDUCE POSTOPERATIVE MORBIDITY. OPEN APPENDECTOMY IS STILL PREFERRED BY MOST SURGEONS, BUT LAPAROSCOPIC APPENDECTOMY WILL PROBABILLY DOMINATE IN THE NEAR FUTURE, AS EXPERIENCE AND SKILLS ACCUMULATE.

KEY WORDS: APPENDICULAR PERITONITIS, PREOPERATIVE ANTIBIOTHERAPY, ACUTE APPENDICITIS, APPENDECTOMY.

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INTRODUCTION

Acute appendicitis remains to this day the most common cause of acute abdomen and appendectomy is the most frequently performed emergency surgical intervention. The frequency of the diagnosis is 1/50-60 persons in general population. Appendectomy has a frequency of 1-2% of all surgical interventions. ^(1,4,10)

Although numerous studies were conducted and guidelines issued for the treatment of acute appendicitis, in practice the treatment algorithm of acute appendicitis is heterogeneous, often depending on factors such as the preference and usage of the surgeon for the treatment options available.

According to 2013 World Society of Emergency Surgery guidelines for management of intra-abdominal infections, the recommendations for the treatment of acute appendicitis are:

- The appendectomy remains the treatment of choice for acute appendicitis.
- Antibiotic therapy is a safe means of primary treatment for patients with uncomplicated acute appendicitis, but this conservative approach is less effective in the long-term due to significant recurrence rates. Non-operative antibiotic treatment may be used as an alternative treatment for specific patients for whom surgery is contraindicated.
- Both open and laparoscopic appendectomies are viable approaches to surgical treatment of acute appendicitis.
- Patients with periappendiceal abscesses should be treated with percutaneous image-guided drainage.
- Routine use of intraoperative irrigation for appendectomies does not prevent intra-abdominal abscess formation, adds extra costs, and may be avoided.
- Current evidence demonstrates that an interval appendectomy is not routinely necessary following initial non-operative treatment of complicated appendicitis. However, interval appendectomies should always be performed for patients with recurrent symptoms.⁽¹¹⁾

Based on the lack of application of standard algorithms on the treatment of acute appendicular peritonitis in practice, we tried to review these practices in a retrospective study.

MATERIALS AND METHODS

We conducted a retrospective analytical study of a homogenous group of 264 cases of acute appendicitis complicated by acute peritonitis in adults over 18 years of age, operated in the 1st Surgery Clinic of the University Emergency Hospital Bucharest, over a period of 8 years (Jan 2005-Dec 2012).

Data were collected from the file records of surgical interventions and from the patients' charts, the main selection criteria being the presence of acute peritonitis confirmed during surgical intervention.

For the selected cases we collected the following data:

- identification and time frame data: name, gender, age, date of admission and discharge, date of surgical intervention
- diagnosis: admission diagnosis, discharge diagnosis, complications, particular forms of acute appendicitis or peritonitis
- clinical data: history, physical exam, other symptoms
- laboratory findings and imagistic studies: white blood cell count, abdominal ultrasound or CT-scan (if done), histology results and microbiological studies of

peritoneal fluid

- treatment: surgical intervention, type of antibiotic used and interval of administration
- outcome of treatment – clinical evolution locally and generally, complications (postoperative hemorrhage, wound infection, intraabdominal infections, sepsis, incisional hernia, surgical reinterventions), length of stay, mortality.
 - o Collected data were analyzed using Microsoft Office Excel 2000 9.0 (Microsoft Corporation) and Epi Info 7.1.1.14 (Centers for Disease Control and Prevention). Confidentiality index (CI) was set at 95%.

RESULTS

The main features and data of the studied group are shown in table (1):

Table 1: Main characteristics of the study group

Total number= 264				
Characteristic		n*	% **	95 %
CI***				
Gender	Male	161	61.0	54.8 – 66.9
	Female	103	39.0	33.1 – 45.2
Age interval	under 20 years of age	17	6.44	3.80 – 10.11
	20 – 29 years of age	76	28.79	23.40 – 34.66
	30 - 39 years of age	73	27.65	22.34 – 33.47
	40 - 49 years of age	28	10.61	7.16 – 14.96
	50 - 59 years of age	35	13.26	9.41 – 17.95
	60 - 69 years of age	22	8.33	9.41 – 17.95
	70 - 79 years of age	9	3.41	1.57 – 6.37
	over 80 years of age	4	1.52	0.41 – 3.83
White blood cell count	< 3.99	4	1.5	0.4 – 3.8
	4.0 – 8.9	14	5.3	2.9 – 8.7
	9.0 – 10.9	26	9.9	6.2 – 15.8
	11.0 – 14.9	85	32.2	24.1 – 39.9
	≥ 15.0	135	51.1	44.9 – 57.3
Associated pathology	Yes	52	19.7	15.1 – 25.0
	No	212	80.3	75.0 – 84.9
Postoperative diagnosis	Phlegmonous acute appendicitis	48	18.2	13.7 – 23.4
	Gangrenous acute appendicitis	145	54.9	48.7 – 61.0
	Perforated acute appendicitis	71	26.9	21.6 – 32.7
Postoperative peritonitis - type	Localized	154	58.3	52.1 – 64.3
	Generalized	54	20.5	15.8 – 25.8
	Appendiceal abscess	41	15.5	11.4 – 20.5
	Retroperitoneal appendiceal abscess	15	5.7	3.2 – 9.2
Position of the appendix	Upper right quadrant	3	1.1	0.2 – 3.3
	Pelvic	6	2.3	0.8 – 4.9
	Pre- or postileal	15	5.7	3.2 – 9.2
	Paracolic	24	9.1	5.9 – 13.2
	Retrocaecal	44	16.7	12.4 – 21.7
	Descending	172	65.2	59.1 – 70.9

*number of cases

**percentage

***Confidentiality Index of 95%

Surgical treatment consisted of appendectomy: open (92%, by McBurney approach or median laparotomy) or laparoscopic approach (8%), and in most cases drainage was also

performed. Aside the 21 laparoscopic appendectomies performed, 18 more cases which initially were approached laparoscopically were converted to open surgery due to the advanced appendiceal and peritoneal lesions. The median laparotomy was considered necessary in some cases of generalized peritonitis which required extensive irrigation and drainage and was performed from the beginning in cases of misdiagnosis (bowel obstruction presumed). In some cases it was necessary to dissect peritoneal adhesions or mobilize the caecum and right colon, or to irrigate the peritoneal cavity – especially when purulent peritonitis was present. The usage of the surgical techniques in the study group is illustrated in table 2.

Table 2: Distribution of surgical technique

Surgical intervention	Frequency	Percent	Cumulative percent
Open appendectomy - Mc Burney incision	187	70.83%	70.83%
Open appendectomy – median laparotomy	56	21.21%	92.05%
Laparoscopic appendectomy	21	7.95%	100.00%
TOTAL	264	100.00%	100.00%

Antibiotic therapy was used for all cases in the study group after the surgical intervention and for 40.91% of cases before surgery. Used postoperative antibiotic regimens and length of treatment are summarized in table (3). Preoperative administration of one dose of antibiotic used the same regimens. The frequency of administration and dosage were standard ones.

Table 2: Antibiotic regimens used

Postoperative antibiotic regimen	Frequency	Percent	Mean length of treatment (days)
Aminopenicillins/BLI	7	2.65%	3.85
Carbapenems	129	48.86%	4.49
Carbapenems + Metronidazole	12	4.55%	13.33
Cephalosporins + Aminoglycosid	25	9.47%	3.8
Cephalosporins	43	16.29%	3.46
Broad spectrum Penicillins	20	7.58%	5.4
Aminopenicillins/BLI + Aminoglycosid	28	10.61%	3.85
TOTAL	264	100.00%	

Complications occurred in 23.48% of cases and were represented by early bleeding (0.75%), wound infection (17%), intraabdominal abscess (3.44%), sepsis (4.17%) and incisional hernia (7.58%).

Wound infection occurred in a greater extent in the case of median laparotomy than McBurney incision: 23.21% to 17.11%, and no case of wound infection occurred after laparoscopic approach. The use of preoperative antibiotherapy reduced the incidence of the wound infection to 11.11% for this subgroup, as it was 21.15% in the subgroup that underwent surgery as a first step. The difference is significant – OR = 2.14, RR = 1.90, RD = 10.04, $\chi^2 = 4.55$, $p = 0.03$.

All of intraabdominal abscesses complicated cases that were operated using median laparotomy, primarily or after an initial McBurney or laparoscopic approach. There were no significant differences between patients who received preoperative antibiotherapy and those who did not regarding the incidence of intraabdominal postoperative abscesses. Sepsis was present from admission in all 11 cases thus diagnosed and progressed to death in 7 of these cases. The accuracy of reporting the frequency of incisional hernia was altered by the lack of sustained follow-up of patients after initial hospitalization, due to the retrospective nature of this study. Overall mortality in the study group was 2.65%, all of them presenting with severe sepsis that responded poorly to treatment, most of them being elderly patients with prior serious pathologies.

Mean length of hospital stay was 6.9 days, range between 3 days and 38 days, with median of the group 6 days. The main factors that influenced the length of hospital stay were the extension of initial appendicular and peritoneal lesions and the presence of complications. There were no re-admissions in the first 30 days after discharge.

DISCUSSION

There are many controversies surrounding the “golden standard” for surgery of acute appendicitis, many studies trying to demonstrate the superiority of one or the other – open or laparoscopic appendectomy.^(2,3,5,6,7,8,9) Up to this point, the obese patient and female patients with lower right abdominal pain remain the only demonstrated situations that benefit clearly from the laparoscopic approach.^(5,6,8,9) For the rest, studies have found no difference between open and laparoscopic appendectomy, thus the choice remains to the preference of surgeon.^(5,6) In our study, most appendectomies were performed in the open fashion, reflecting the limited experience of surgeons with the laparoscopic approach, although most of the laparoscopic appendectomies were performed during the last 2 years of the study period, comprising 32% of appendectomies performed during this time. As skills and experience of the surgeons evolve, the percentage might turn around.

The choice of the treatment algorithm in appendicular peritonitis was determined also by the experience and habit of each surgeon. The initiation of antibiotic treatment as a first step of treatment, followed by surgery was influenced mainly by the value of white blood cell count, but this factor did not reflect accurately the extent of the lesions. The preoperative antibiotic therapy had in our study protective value for the wound infection (risk difference of 10), but no significant influence on the occurrence of intraabdominal abscess. The risk factors for the occurrence of wound infection are the perforation of the appendix or the gangrenous form and the open approach, according to other studies^(1,2,4,10). In these cases, preoperative antibiotic administration is necessary for it reduces the incidence of surgical-site complications, as wound infection and late incisional hernia, and by this reduces hospital stay and costs and the need for further surgical interventions.

A limitation of our study is its retrospective nature. It does take into account the long-term complications, except those that presented to our clinic for their cure. The bias on the choice of treatment is minimized by the fact that the operating surgeons are different and the choice of treatment did not occur according to the characteristics of the patient but mainly to surgeon's preference and habit for the treatment algorithms and surgical technique.

CONCLUSIONS

Patients with acute appendicitis and high risk for postoperative infectious complications should be administered preoperative antibiotherapy and undergo surgical intervention in order to reduce postoperative morbidity.

Open appendectomy is still preferred by most surgeons, but laparoscopic appendectomy will probably dominate in the near future, as experience and skills accumulate.

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