Non-Complicated Acute Appendicitis in Adults Treated Successfully by Conservative Treatment without Recurrences

Anestis Charalampopoulos, Ioannis Dimopoulos, Nikolaos Koliakos, Konstantinos Kopanakis, Theodoros Liakakos and Anastasios Machairas

3rd General Surgery Unit, "Attikon" University Hospital of Athens, Greece

Corresponding author:

Ioannis Dimopoulos, MD
6 Johansenstraße, 32423 Minden,
Germany
E-mail: dimopoulos.gia@gmail.com

Rezumat

Apendicită acută fără complicații la pacienți adulți, tratată conservator fără recidive

Introducere: Tratamentul chirurgical al apendicitei rămâne tratamentul standard, dar multe cazuri răspund la tratament conservator. Scopul nostru este de a clarifica caracteristicile clinice, de laborator și imagistice pentru cazurile fără complicații, tratate conservator fără recidive.

Metodă: 105 pacienți adulți (66 femei și 39 bărbați) cu apendicită acută fără complicații. S-a înregistrat durata simptomelor, examinarea clinică abdominală, temperatura, markerii inflamatori, rezultatele studiilor imagistice și tratamentul în timpul spitalizării. Nici unul din pacienți nu a avut episoade precedente de apendicită.

Rezultate: Durata simptomelor a fost între 2 ore - 3 zile. Examinarea abdominală a fost compatibilă cu apendicita și problemele au fost localizate în cadranul inferior drept. Majoritatea pacienților (85.7%) au fost afebrili sau cu febră joasă (<37.4°C). Toți pacienții au prezentat leucocitoză (între: 10.000-22.900 WBC/μL, în medie 14.370±2.900 WBC/μL), 3 pacienți >20.000 WBC/μL. Toți pacienții au avut CRP ≥3.36 mg/l (în medie 46.8±40.5 mg/l), și 3 >150 mg/l. S-a efectuat ecografie la 95 de pacienți (în combinație cu ecografie transvaginală la 19 femei), cu confirmarea apendicitei acute în 91 de cazuri (91/95, 95.7%). În cazul rezultatelor neconcludente s-a efectuat CT (13 pacienți) și RMN la o pacientă însărcinată. Tratamentul conservator intraspitalicesc a durat 1-10 zile (depășit cu 1-2 zile), și a fost urmat de regresia clinică și a rezultatelor de laborator. 27 de pacienți internați în ambulator au urmat un tratament cu antibiotic și au fost externați.

Concluzii: Pacienții tineri cu apendicită acută fără complicații și cu simptome de scurtă durată, fără boli rare, sunt candidați pentru tratament conservator. Diagnosticul apendicitei acute fără complicații se bazează pe combinarea semnelor clinice, markeri inflamatori pozitivi și examinare imagistică, excluzând cazurile cu complicații, peritonită generalizată și sepsis. Inflamația pare a fi autolimitată, în timp ce rolul antiinflamatoarelor rămâne neclar.

Abrevieri: WBC = globule albe, CRP = proteina C-Reactivă, CT = Tomografie computerizată, RMN = rezonanță magnetică

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Cuvinte cheie: apendicită, ecografie, CT, antibiotice, chirurgie

Abstract

Background: Surgical treatment of appendicitis remains the standard treatment, but many cases respond conservatively. Our purpose was the clarification of the clinical, laboratory and imaging characteristics of uncomplicated cases undergoing successful conservative treatment without recurrence.

Methods: 105 adult patients (66 female, 39 male) with non-complicated acute appendicitis. Symptom duration, clinical abdominal examination, body temperature, inflammatory markers, imaging studies results and in-hospital treatment were recorded. No patient had a previous episode of appendicitis.

Results: Duration of symptoms was 2 hours-3 days. Abdominal examination was compatible with appendicitis and findings were localized in the lower right quadrat. The majority (85.7%) had no or low fever ($<37.4^{\circ}\text{C}$). All had leukocytosis (range: 10.000-22.900 WBC/ μL , mean 14.370 ± 2.900 WBC/ μL), 3 patients >20.000 WBC/ μL . All had CRP ≥ 3.36 mg/L (mean 46.8 ± 40.5 mg/L), and 3 >150 mg/L. U/S was performed on 95 patients (combined with transvaginal U/S in 19 females) with positive findings of acute appendicitis in 91 (91/95, 95.7%). When faced with inconclusive findings, CT was performed (13 patients) and MRI on one pregnant. In-hospital conservative treatment lasted 1-10 days, overstay was 1-2 days following clinic-laboratory regression. Outpatient, antibiotic treatment followed discharge in 27 patients.

Conclusions: Young patients with non-complicated acute appendicitis and short symptom duration, without rare etiologic pathologies, are candidates for conservative treatment. Diagnosis of non-complicated acute appendicitis is based on combining clinical signs, positive inflammatory markers and imaging studies, excluding complicated cases, generalized peritonitis and sepsis. The inflammation seems self-limited, while the role of anti-inflammatory drugs remains obscure.

Abbreviations: AA = Acute Appendicitis, un-AA = Uncomplicated AA, cAA = Complicated Acute Appendicitis, WBC = White Blood Cells, CRP = C-Reactive Protein, U/S = Ultrasound, CT = Computed Tomography, MRI = Magnetic Resonance Imaging, pts = Patients, NET = Neuroendocrine Tumor

Key words: appendicitis, ultrasound, CT, antibiotics, surgery

Aim of the study

Acute appendicitis (AA) is the commonest cause of "acute abdomen" in emergencies. At present time, a correct diagnosis and treatment is a challenge for surgeons and clinicians. A variety of anatomical positions of the appendix, and pathologies afflicting the appendix determine the clinical expression of the disease and may cause confusion in making a correct clinical diagnosis (1). Many clinical and epidemiologic studies help clarify the natural history of AA, and show that spontaneous resolution is a common phenomenon during inflammatory process in uncomplicated appendicitis (un-AA), a favorable evolution that could significantly reduce appendectomy rates and support a more conservative treatment (2). Perforation of the appendix seems to be a different and rarer entity of inflammatory process, and should be diagnosed correctly as soon as possible, in order to decide upon a correct management direction, either surgical, or, in some cases, conservative, while avoiding at the same time

septic conditions. The use of scoring systems, based on data from clinical and imaging studies, increases the diagnostic accuracy and may distinguish uncomplicated from complicated cases. It seems that the majority of patients with AA are uncomplicated cases, and scoring systems can be used in selecting of patients for non-operative management (3). The correct clinical diagnosis of AA can prove difficult and is based on clinic-laboratory and imaging studies parameters. When multiple markers are used and prove positive for inflammatory process of the appendix, the diagnostic accuracy is increased (4). Many novel markers are in use but their usefulness in diagnosis remains controversial.

The present study includes patients with Un-AA, treated successfully with conservative treatment, without surgery or any other minimal invasive technique. The goal of this study is to determine the main features and the characteristics of patients, who underwent successful conservative treatment, without any recurrence and readmission for conservative or surgical treatment.

Patients and Methods

Retrospective study, with 105 patients (66 women, 39 men, age range 15-87 years, mean age 30.1 ± 12.4 years) with un-AA, underwent in-hospital conservative treatment in the last 7.5 years (2008-Aug.2015), with a follow-up period of 6 months from the last registered case, up to 7.5 years. All parameters used in diagnosis and follow up of patients during hospitalization were common and easily available, therefore a first and correct diagnosis for the gravity of the case was obtained rapidly after hospital admission. All patients were examined by a specialist general surgeon and after the collection of parameters used, conservative treatment was decided. No patient had a previous episode of AA.

In clinical examination were registered: The duration of symptoms before admission, meticulous examination of the abdomen and body temperature. Conservative treatment included: nothing by mouth, antibiotic treatment, non-steroidal anti-inflammatory agents, daily laboratory examinations, and, certainly, daily clinical re-estimations of the abdominal cavity. Immunosuppressed patients were excluded from the study. Patients with prolonged duration of symptoms, more than 3 days before hospital admission, or with unclear past history of symptoms were also excluded from the study. During clinical examination of the abdomen, all patients had clinical signs localized in lower right quadrat of the abdomen, compatible with clinical signs of AA. Patients with generalized peritonitis, findings in whole abdominal area and high body temperature $>39^\circ\text{C}$ were excluded from this study. All patients, after admission, were informed of their options and they accepted conservative treatment as main treatment, and that, in case of relapse of the disease, surgery would be the final treatment. Before discharge, the possibility of recurrence and main symptoms were explained to all patients. A telephonic help-line and re-examination by a specialist was available for all patients. The conservative treatment duration and medication as outpatient after discharge were registered in all patients. All patients were discharged after clinic-laboratory improvement. The hospital overstay was 1-2 days, after total clinical and laboratory marker improvement for all patients. During this period conservative treatment was continued. Medication as outpatient was received only by patients with residual and attenuated symptoms in the lower right quadrat of the abdomen.

The laboratory markers registered were White

Blood Cell (WBC) count and C-Reactive Protein (CRP) value. Patients with normal values of WBC or CRP were excluded from analysis.

Imaging studies data was collected from 95 patients with abdominal U/S (combined with trans-vaginal U/S in 19 women), 13 patients with Computed Tomography (CT) and with Magnetic Resonance Imaging (MRI) in one pregnant woman. All patients had imaging data compatible with an inflammation of the appendix. Patients without signs of inflammation in imaging studies were excluded from this study. Patients with sings of perforation of the appendix were also excluded from material studied.

Results

The duration of symptoms before admission, was 2 hours - 3 days (mean 1.3 ± 1.2 days). Clinical examination of the abdomen was compatible with AA, with findings localized in the lower right quadrat. 14 patients had moderate fever from 37.5 to 38.5°C (14/105, 13.3%), and one had $>38.5^\circ\text{C}$ (38.8°C) at admission. The remaining 90 patients (90/105, 85.7%) had no fever or temperatures lower than 37.4°C . All patients were of middle and young age (mean 30.1 ± 12.4 years) and only 7 were more than 50 years old (7/105, 6.6%).

WBC abnormal values were registered, ranging from 10.000-22.900 WBC/ μL with a mean leukocytosis of 14.370 ± 2.900 WBC/ μL . 23 patients (23/105, 22%) had no leukocytosis at admission, but subsequently developed increased levels of WBC the next day of admission.

Abnormal CRP values were found ranging from 3.7 to 240 mg/L with a mean value of 39 ± 10 mg/L. 22 patients (22/105, 21%) had normal values at the time of admission, and elevated one day after admission.

Abdominal U/S (combined with trans-vaginal U/S in 19 females) was performed on 95 patients with positive findings of appendicitis in 91 (91/95, 95.8%). CT was performed on 13 patients when U/S findings were inconclusive (4 pts), in obese (6 pts) and in 3 pts. with appendicitis secondary to special pathologic entities of the appendix or caecum (appendicular-caecum adenocarcinoma, NET tumor of appendicular tip, metastatic mucinous adenocarcinoma of appendicular tip). The thickness of appendix ranged from 6 to 15 mm with a mean thickness of 8.8 ± 1.9 mm. Appendicular faecoliths were detected in 7 patients (7/105, 6.6%).

The hospital stay had duration of 1 to 10 days, with a mean period of 4.58 ± 1.57 days. Imaging

studies detected special entities of AA in 3 patients: one 18 year old girl had a neuroendocrine tumor of the appendicular tip of 1.4 cm. After successful conservative treatment, she underwent elective appendectomy in 2 months. One 87 years old man presented with AA, secondary to obstructing carcinoma of caecum. After successful conservative treatment, he had total colonoscopy and positive biopsies at one month, and underwent an elective right hemicolectomy. The last case was a 49 years old woman with AA, with a mucinous-cystic lesion, in an 8 cm long appendix of 15 mm thickness, she had also a 3 cm metastatic cystic-mucinous lesion on ileocolic vascular pedicle. This woman responded promptly to conservative treatment, she was discharged and after 20 days had a right radical hemi-colectomy. Pathology report showed an adenocystic mucinous carcinoma of appendix. Ileocolic cystic lesion was a metastasis, en-block removed in final surgical specimen of the right hemi-colectomy.

All patients had 1-2 days hospital overstay after clinic-laboratory improvement of AA, for continued conservative treatment. During hospital stay conservative treatment included: nothing by mouth with restart after clinic-laboratory improvement and restart of bowel movements. During stay as antibiotic therapy, an amoxicillin+clavulanic acid, double antibiotic scheme for Gram- and anaerobes, or pan-antibiotic of large spectrum was used. The treatment was empiric, with the main goal to cover anaerobic and Gram- microbial flora. After discharge, antibiotic and mild analgesic drugs were given to 27 patients (27/105, 25.7%). Despite their clinic-laboratory improvement, added therapy was due to remnant and attenuated symptoms, such as occasional crampy pain at the lower right quadrat. All patients were informed about the possibility of recurrence. Help telephonic line was used by 18 pts (18/105, 17%), mostly the first 15 days after discharge, and clinical re-assessment of the abdomen was done in only 8 cases (8/105, 7.6%). None of these patients was referred to our unit for readmission, due to recurrence.

Discussion

The surgical treatment of AA seems to dominate worldwide, while conservative treatment with emphasis given in the use of antibiotics is a new option. At present time there are no guidelines for the management of the disease, and ultimately the treatment seems to depend on the conceptions of the surgeon and his traditional knowledge of AA.

In international medical literature the many

publications and reviews for surgery and the conservative treatment of AA, the enormous heterogeneity in cases and data, and the different treatment from institution to institution result to confusion regarding the optimum management of the disease. Based on the fact that AA can be self-limited with spontaneous resolution (2), one is faced with a great challenge: There are many cases that should not be operated upon, and that do not benefit from surgery. On the other hand, other inflammatory diseases of the abdomen, such as acute cholecystitis, and uncomplicated acute diverticulitis, can resolve spontaneously and be treated as outpatients, increasingly foregoing antibiotic use (5,6). If the principle stands for AA, then how important, and what is the benefit from the use of antibiotics, that is mentioned as the main and principal factor of successful conservative treatment?

Before managing the disease, one should know that there are several etiologic factors; infection, obstruction, trauma, ischemia, diet, genetic factors, foreign bodies, hygiene and type I hypersensitivity that lead to a variety of pathological findings, and finally to the invasion of the appendicular wall by intraluminal bacterial. Therefore minimal and not essential pathological findings are present in a large number of appendectomies, termed negative appendectomies (7-20% in men, up to 45% in female), with the patients undergoing them probably not benefiting from surgery (7).

In the present study, we try to select patients, based on their main characteristics, who underwent successful conservative treatment of AA, without any recurrence. In different reports, it seems that non operative management of un-AA is safe, with treatment failure at 5.9%, recurrence rate at 4.4-15%, and risk of perforation at approximately 3% (8). Furthermore, conservative management may be performed in selected cases with complicated appendicitis (c-AA), resulting to a decrease in complication and reoperation rate, when compared to acute appendectomy, with a similar duration of hospital stay (9,10).

Patients in this study, were of young age (mean 30 years old) and only 7 pts were >50 years. They had a short-lasting history of symptoms (mean 1.3 days), before admission, and so conservative intervention began at the start of inflammatory appendicular process.

As pathological report was not available, due to conservative treatment, we have three reasons for believing that the majority of our cases was some type of uncomplicated AA:

1. Clinical examination, and repeated assessment of the disease, with signs in the lower right quadrat, were compatible with those of AA. Body temperature was not increased in the majority of cases, or was at low levels $<37.4^{\circ}\text{C}$. Daily assessment at intervals was the best criterion of inflammatory remission.
2. All had elevated inflammatory markers. Although many patients presented normal values at the time of admission, probable due to early presence in clinic outpatient, all had abnormal and elevated values after admission. These markers were used to increase diagnostic accuracy for AA, and were not used as criteria for conservative or surgical management. Patients with normal values were excluded from study to increase diagnostic accuracy for appendicitis, despite the normal values that may be observed in AA. On the other hand, high levels, usually observed in complicated and septic cases, $>20.000\text{ WBC}/\mu\text{L}$, and $\text{CRP} >150\text{ mg/L}$, were found only in 3 pts for WBC, and in another 3 patients for CRP (11-12). Many other novel inflammatory markers, can be used in the diagnosis of AA, but they do not further increase the diagnostic accuracy (13).
3. All patients had positive imaging data, collected by U/S, CT and MRI in one pregnant woman. Abdominal U/S was the most useful tool: it was performed on 95 pts and was combined with trans-vaginal U/S in 19 women, offering a diagnostic accuracy for AA of 96%. Diagnosis in females is more difficult than in men, and this strategy of combining abdominal with trans-vaginal U/S, increases the diagnostic accuracy for AA and decreases the need for CT. Only 4 patients had inconclusive imaging data from their U/S, and diagnosis was based on CT scan. Furthermore, in 6 obese patients and 3 special appendicular-caecum pathologies found in U/S, imaging data was ensured by CT. The diagnosis in a pregnant woman was done by MRI.

The most important imaging finding was the abnormal thickness of the appendix, from 6-15 mm, with a mean value 8.8 mm ($<10\text{ mm}$). The maximum diameter at 15 mm was only found in a 49 old woman, with a metastatic mucinous adenocarcinoma of the appendix. In this case too, the inflammation responded promptly to conservative treatment. A diameter of $<10\text{ mm}$, is an excellent parameter for conservative management (14).

Other imaging data: appendicular thickened

wall $>2\text{ mm}$, presence of a faecolith, signs of peri-appendicitis, signs of perforation and presence of a phlegmon or abscess, are important in diagnosis of un-AA or c-AA and CT data can help significantly reduce negative appendectomies (15).

At the present study a faecolith was found in only 7 pts (6.6%). Their implication in non-complicated AA is unproven, as they can be found in higher percentages in negative appendectomies, complicated cases and children than adults and uncomplicated cases, where an acceptable percentage is approximately 14% (16). Initial abdominal U/S can be as effective as CT in patients with suspected AA when the results are definite. Supplementary CT should only be performed when abdominal U/S is inconclusive (17). In the present study there was no patient with negative U/S findings who was referred for CT.

Abdominal MRI is the imaging examination of choice in pregnant women although U/S provides significant information, but only at the 1st and 2nd trimester, in contrast to the 3rd due to changes in abdominal anatomy. Diagnostic accuracy is at maximum level and can differentiate from other sources of pain that are common findings in pregnancy, such as: gastro-intestinal, hepatobiliary, gynecologic or urinary origin pain (18,19)

In the present study all markers used were obtained early at admission, following clinical examination in the emergency clinic, with conservative management being thereafter decided. No patient had signs of perforation, although many complicated cases with phlegmon or abscess can be treated conservatively, with excellent outcomes (20), despite surgery remaining the main treatment. It seems that necrotic or gangrenous appendicitis (the dread of the surgeon fearing sepsis) is a different pathologic finding, and not a simple inflammation of the appendix, more often found in the elderly and children than in adults (21).

In selected patients, delay until the diagnostic data has been collected and studied, does not influence the pathological aspect appendicitis (21). Furthermore, it does not significantly increase the rate of perforations, operative time (should surgery be decided upon), or length of stay (22). Some delay followed by a correct diagnosis, seems to be more important than an early decided-upon management towards conservative or surgical treatment.

After the decision for conservative treatment, in-hospital care included:

1. Active observation and repeated clinical examination of the abdomen, searching for

- local signs of inflammation remission or relapse of inflammation.
2. Daily biochemical markers levels, continued until a fall towards lower values, within normal limits is observed.
3. Nothing by mouth, until coming large bowel movements
4. The use of analgesic, non-steroidal anti-inflammatory drugs; a field with lack of information in literature. New studies must determine the usefulness of such drugs. Empiric observation in patients studied, that suggests that many patients can benefit from the above drugs instead of antibiotics, is not enough to determine the kind and the time of use. All patients were under active observation and the risk for a covered peritonitis was minimal. A combination of paracetamol and lornoxicam was the most used regiment, also often used in postoperative patients, operated on for other surgical diseases.
5. The use of antibiotics is the base of non-operative management for un-AA. There are major benefits in patients treated with antibiotics compared to those treated surgically, with the exception of the possibility of recurrence (23). The implication of microbial agents during inflammatory process, seems to be a late phenomenon (7), and microbial flora is aerobic or mixed aerobic and anaerobic (24). Most patients randomized to antibiotic treatment for un-AA, did not require appendectomy during the 1-year follow up period, and those who required appendectomy did not experience significant complications (25). Recent data shows that antibiotic treatment is non-inferior to emergency appendectomy for treatment of AA (26). Antibiotics for appendicitis are safe and effective, avoiding unnecessary appendectomies, reducing operation rate, surgical complications and overall costs, with low recurrences at 14% in 2 years, which can be treated by further administration of antibiotics (27). Antibiotic only treatment could be extended in more severe and complicated cases of AA (28).

In the present study 3 regiments were administered during in-hospital stay; mono-therapy with amoxicillin+clavulanic acid, double therapy with metronidazole+ciprofloxacin or monotherapy with a wide spectrum panantibiotic, such as piperacillin + tazobactam or tigecycline. As outpatient treatment following conservative in-hospital treatment, per-os antibiotics were given only in 25% of

patients with minimal and residual signs in the lower right quadrat.

At present time, duration of treatment remains empiric, but the clinic-laboratory improvement of the patient is key. After then, short or long time antimicrobial therapy can be administered, as recommended in severe intra-abdominal infections (29). Due to increased microbial resistance, after resolution of appendicitis, a short-lasting antimicrobial therapy of 4-5 days is recommended (30).

The mean stay in hospital for conservative treatment was at 4.5 days. While this time can be considered long, all patients had optimal control of local inflammation and excellent outcomes without recurrences. Regarding the cost and efficiency of conservative treatment, we report that in the above patients, the mean in-hospital stay for conservative treatment of 4.5 days. This time can be considered long, but on the other hand, there was optimal response to conservative treatment, reducing medication as outpatient after discharge, the need of help-line use, while a well-treated inflammation is linked to a low or null recurrence index.

Economical markers and total cost do not participate in the scientific decision-making for surgical or conservative treatment. Conservative treatment should not be viewed as an antagonist of surgical treatment: After the careful study of each patient, a wise management is to determine patients who benefit from conservative treatment and those who benefit from surgery. Finally, at present time, the treatment in most hospitals depends on the individualized opinion the surgeon holds for AA, so we have "fans" of conservative treatment versus "fans" of surgical treatment. However, the results of conservative treatment could be compared with the results of surgical treatment despite the heterogeneity of patients, and this issue will be the subject of our next study. AT current time, we consider it unethical to operate on all patients with AA, knowing that the majority, will not benefit from surgical operation.

The majority of AA cases are uncomplicated and therefore candidates for conservative treatment. Criteria of patient-selection are referred to in our conclusions. The surgeon must be suspicious of special entities of appendicitis and incorporate imaging studies in the clinical decision making for the estimation of the local disease. If carcinomas or neuroendocrine tumors are found, these pathological entities should be taken into account and treated accordingly. In these cases, too, a first line conservative treatment is the optimal manage-

ment, with a timely surgical treatment after staging of the malignant disease as well as improvement and estimation of the general status of the patient. This allows for operation in an inflammation-free environment, which is connected to less postoperative complications. Other special entities as appendicitis in pregnancy or immunocompromised patients, represent a strong challenge for the optimal management, conservative or surgical.

Between the patients presented in this study, patients who underwent conservative treatment and resorting to surgical treatment after some days were not included. The thought process behind the exclusion of such patient which according to international literature amounts 5-6% of patients, was the building of a concrete clinic-laboratory profile for successful conservative treatment. After admission and unsuccessful conservative treatment, an operation can be an option after some days, but this condition seems to be a rare exception and not the rule. The resort to surgical treatment may be due to: a) failure of the conservative treatment, which is to be expected in 5-6% of cases, or b) wrong estimation in diagnosis at admission and severe septic condition that should be treated initially by surgery and not by conservative treatment. Another special and rare entity is gangrenous-septic appendicitis, a condition candidate rather for surgery and not for conservative treatment. Finally, in the daily surgical practice, special entities of AA, gangrenous cases and severe septic conditions, where the implication of surgery should be prioritized, represent a small minority of acute appendicitis, and hence the conservative treatment should be performed in most cases.

The goal of study is not to discover a new "protocol" scheme for the conservative treatment of AA, due to vast diversity in etiopathogenic and pathological factors of the disease. When asked for an excluding factor for the conservative scheme, one could support that a perforation of appendicular wall with generalized peritonitis and septic parameters, are the only conditions that lead to surgery and not to conservative scheme.

Concerning the risks of the conservative treatment of appendicitis patients, they are next to zero, when the following factors exist: a) As the most difficult parameter for this clinical decision making is the correct diagnosis, after admission and clinical estimation, we collect as many positive for uncomplicated AA parameters as possible. Having these parameters in our disposal within short time, we then decide for or against conservative treat-

ment. b) During the hospital stay of the patient, an improvement in clinical factors and laboratory tests indicates a successful treatment, otherwise surgical treatment must be performed. In the case of a patient failing to improve, without signs of sepsis or generalized peritonitis, the delay of operative treatment in the hospital seems to be without negative influence to morbidity or mortality outcomes. Thus, the benefit of conservative and successful treatment is maximum, low-risk and avoids many unnecessary surgical operations.

Regarding the recurrence rate, in the patients studied there were no recurrences in a long-time follow-up. A recurrence index of 4-15% after conservative treatment is reported from international literature and is to be expected. In the present study, cases with recurrences were excluded from analysis and we are looking for patients with successful conservative treatment, without recurrences. These patients represent the best material to determine their clinic-laboratory profile for a successful conservative treatment. Indeed, in patients studied we focus our interest in two factors that we consider important for the eradication of recurrence: a) the long in-hospital stay period for active conservative treatment and complete remission of inflammation and b) The role of non-steroidal anti-inflammatory drugs used. This is a novel application of non-steroidal anti-inflammatory and follows the trend of treating of various other intraabdominal inflammations with said drugs. Therefore, further studies must determine their role time of use and usefulness. During active observation of the patient, analgesic drugs, improve promptly clinical signs and mostly the abdominal pain, while simultaneously 'covering' of clinical symptoms and should be accompanied with an effort to detect signs of sepsis as soon as possible through clinic or laboratory tests. Therefore, we recommend the in-hospital use of analgesic drugs during conservative treatment accompanied from close patient observation.

Conclusion

Young, recently symptomatic patients with positive combined findings in clinical abdominal examination, inflammatory markers and imaging study data for AA, are candidates for in-hospital conservative treatment, excluding complicated cases, generalized peritonitis and sepsis. Conservative treatment included, in addition to antibiotics, the use of anti-inflammatory drugs. Further studies are needed to determine the usefulness of such drugs. The conservative over-treatment for 1-2 days, after

remission of local inflammation, secured the optimal local control and probable the lack of recurrences in patients studied.

Conflict of interest

Anestis Charalampopoulos, Ioannis Dimopoulos, Nikolaos Koliakos, Konstantinos Kopanakis, Theodoros Liakakos and Anastasios Machairas declare no conflict of interest.

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