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Research Article

Clinical Diagnosis of Acute Appendicitis – Clinical Score

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Abstract

The purpose of the work is to estimate, analysing epidemical, clinical and laboratory parameters, criteria that could more easily orientate for a correct diagnosis of acute appendicitis, selecting in this way some guide parameters.

Retrospectively a casuistry including 98 patients surgically treated, with diagnosis before the surgical operation of acute appendicitis, has been analysed. Before surgical operation, a correct diagnosis has been formulated for 92 patients.

The general symptoms have been estimated, such as nausea and vomit, associated to the painful symptomatology, the time from the first observation, to the moment of the surgical indication, the clinical objectivity, the corporeal temperature and leukocytosis count.

The Author considers the incidence of the main, clinical signs and symptoms in cases of their observation, they are confirmed by the intra and post-operative check, and they propose the use of a nosographic index assigning to every sign or symptom a different numerical value, in relation to clinical importance, in order to furmulate a correct diagnosis, and to avoid a late surgical treatment of gangrenous or perforated appendicitis, loaded with a larger morbidity, in vain treated with medical therapy. . The proposed scoring system, while further external evaluations remain necessary and useful, has the advantage, compared to other proposed and used scoring systems, such as the Alvarado score, of referring to a reduced number of elements to evaluate, among which only three objective signs, such as vomiting, closed bowel, positive Blumberg sign and two paraclinical signs, such as temperature and leukocytosis with neutrophilia. Finally, the patient's age is added. The minimum achievable score was indicated as highly suspicious of acute phlegmonous appendicitis and therefore sufficient to indicate surgery, that of 60 points.

Keywords

Acute appendicitis, Clinical diagnosis, Surgical indications, Medical treatment, Differential diagnosis

Introduction

Acute appendicitis, a disease that predominantly affects young people, is the surgical disease that most frequently requires emergency surgical treatment. With a diversified incidence, in relation to the decades of life and geographical characteristics, acute appendicitis presents an extremely variable clinical course and onset. Acute appendicitis is a pathological condition with a high incidence, but there are still active controversies about the diagnostic and therapeutic management. It is still under discussion which clinical, laboratory or instrumental tests are referenced to define the pharmacological or surgical therapeutic indication. Furthermore, the objective of significantly reducing appendectomies with very limited or almost absent inflammation and especially late appendectomies with very advanced inflammatory process is highlighted.

The clinical presentation,is not always typical and consequently, also with evidence of known clinical and laboratory parameters, there is no agreement among the Authors, beyond the acute forms evident from the beginning, on what should be the moment to indicate surgery, in the various evolutionary phases of the disease (1, 2, 3, 4).

Taking these issues as a starting point, we wanted to retrospectively analyze the clinical diagnostic criteria used to indicate surgical treatment for acute appendicitis, in patients surgically treated with this diagnosis at the General Surgery of the University of Foggia – Italy. All patients were evaluated and treated directly or under the supervision of the Author; all medical records were examined directly by the Author.

Clinical Features

Acute appendicitis has quite variable manifestations. It can take on the clinical manifestations of many other different acute abdominal pathologies, but conversely many other abdominal pathological conditions can simulate acute appendicitis. The progression of development of symptoms and signs generally occurs regularly, contrary to what happens in some other diseases that instead have variable course. The clinical manifestations of acute appendicitis do not present, in the initial stages, with very different characteristics in the various and typical pathological forms: catarrhal, phlegmonous or purulent.

The disease usually begins with a disturbance approximately localized in the periumbilical region, also accompanied by nausea and anorexia. The pain, localized in the periumbilical region, is continuous but not of severe intensity, at times slightly cramp-like; some episodes of vomiting may also be added. In the short span of a few hours the pain moves to the lower right abdominal quadrant, localizing itself quite stably. It is usually associated with difficulty in moving, walking or coughing and constipation.

Physical examination of the abdomen reveals localized tenderness to superficial palpation or to palpation with a finger; and perhaps mild muscle contracture. Rebound tenderness (Blumberg's sign) is present. Peristalsis is normal or slightly reduced. Rectal and vaginal examinations, which are less commonly performed today, are often negative. Temperature is generally moderately elevated. The appendix can have different locations and in the case of inflammation the reference of the pain symptom may be indicated in quite different sites: in the case of retrocecal appendicitis it will present itself with less severity and will be felt higher than usual; in the case of pelvic appendix urinary tract symptoms may appear due to the adjacency to the ureter. Rarely, the cecum may also be in the left side and in this case the possible appendicitis may simulate sigmoid diverticulitis. People with uncomplicated early appendicitis often may not appear ill. However, in these cases the undefined clinical picture may be clarified by the relief of localized tenderness at the Mc Burney point. Finally, a diagnostic choice that will greatly help in cases with an uncertain or abnormal clinical picture is to consider the diagnosis of appendicitis among the possible diagnostic hypotheses for previously healthy

patients who present with acute abdominal pain. Possible evolutions of appendiceal inflammation include the formation of phlegmon of the appendiceal walls, the formation of a delimited purulent collection, then circumscribed peritonitis, which may be followed by intraperitoneal diffusion of the inflammation with diffuse peritonitis. Appendicular perforation may also give rise to circumscribed peritonitis, which may be followed by diffuse peritonitis. It is also possible, as with all septic foci, the development of systemic sepsis.

Patients and Method

The sample consisted of 98 patients who were referred for surgical treatment for suspected acute appendicitis, who came under observation. There were 52 males and 46 females with ages ranging from 14 to 80 years and 14 to 90 years, respectively. Distributing the sample by age group, the age group between 14 and 25 years was by far the most prevalent (64,28%) with 32 males and 31 females; lower percentages concerned the age group between 26 and 60 years (31,63%) with 18 males and 13 females, while the age group over 60 years was the lowest (4 cases with 4,08%) (**Tab. 1**)

ADMISSION DIAGNOSIS ACUTE APPENDICITIS 98 PATIENTS		
Males 52		Females 46
	Age groups	
14-25 years 64,28%	26-60 years 31,63%	over 60 years 4,08%
Males 32 Females 31	Males 18 Females 13	Males 3 Females 1

TABLE-1

A correctly formulated preoperative diagnosis involved 92 patients (93%). For 6 of the initial sample, at surgery, a diagnosis other than acute appendicitis was highlighted. It was a case of Crohn's disease, a nonspecific ileitis, a Kohlmeier-Degos disease, an actinomycosis of the cecum, an ileitis caused by ascaris and an acute cholecystitis; clinical and paraclinical evaluations associated with the topographical criterion clearly reported the indication for surgical treatment with a presumptive diagnosis of acute appendicitis (**Tab 2**).

SURGICALLY CONFIRMED DIAGNOSIS	
Acute Appendicitis	92
Crohn's Disease	1
Non-specifics ileitis	1
Kohlmeier-Degos Disease	1
Actinomicosis cecum	1
Ileitis by Ascaris	1
Acute Cholecystitis	1

TABLE-2

Once diagnostic errors were ruled out, the main signs and symptoms that led to the surgical indication were evaluated retrospectively, dividing the case history into two distinct groups of patients; a first group (group A) included patients for whom the surgical indication was made within 12 hours of the first clinical observation (61 cases) and a second group (group B) (31 patients), for whom the indication for surgical treatment matured later, however urgently, but after more than 12 hours from the first observation. All patients (92) presented abdominal pain; therefore, the onset of nausea and vomiting, the characteristics of the bowel (closed, normal, diarrhoeal), the presence of a feverish temperature higher than 37º, a leukocytosis higher than 11,000 wbc and neutrophilia greater than 80%, the positivity of the rebound sign (Blumberg) were analysed (**Tab.3**).

ACUTE APPENDICITIS – SURGICAL TREATMENT	
61 Patients treated whitin 12 hours Group A	31 Patients treated after 12 hours Group B
EVALUATED SIGNS – SYMPTOMS	
ABDOMINAL PAIN - NAUSEA AND VOMITING	
CLOSED BOWEL - TEMPERATURE > 37°	
LEUKOCYTOSIS > 11,000/NEUTROPHILIA>80%	
BLUMBERG'S SIGN + AGE (14 - 25 years)	

TABLE-3

Subsequently, the pathological characteristics of the removed appendix were analyzed, in relation to the inflammation (catarrhal, phlegmonous and gangrenous), the surgical access used, the complications that occurred in the postoperative course and the hospitalization times. Finally, after analyzing the incidences of the signs and symptoms reported in both groups, a classification scale of the same was formulated, to which a numerical value was attributed: therefore, a method of grouping the signs and symptoms was proposed aimed at obtaining a score whose value is capable of orienting towards the surgical indication with correct preoperative diagnosis of acute appendicitis.

Results

All diagnostic errors were made in patients over 25 years of age; the average age was in fact 58 years, with a range between 31 and 90 years, confirming that age represents an important criterion for guiding towards the diagnosis of appendiceal inflammation. In patients undergoing surgical treatment within 12 hours of the first observation **(group A**), 37% presented nausea and vomiting, 59% had a bowel closed to feces and gas, 59% had a temperature above 37° and 77% had a leukocytosis above 11,000 with

neutrophilia greater than 80%. Clear preference was given to surgical access with pararectal cut (44 cases) compared to Mc Burney (15 cases), almost exclusive to females, and to median umbelical-pubic (2 cases). In the group, 11 catarrhal, 41 phlegmonous and 9 gangrenous appendicitis were reported. Hospitalization ranged from 5.9 days in the catarrhal forms to 7.7 days for the gangrenous forms. Seven cases of suppuration of the surgical wound were found (11%). Analyzing in detail the leukocytosis/neutrophilia, temperature and the positivity of the Blumberg sign, these elements were prominent (88%) in the gangrenous forms, less striking in the phlegmonous (82%, 53%, 65%) and catarrhal (54%, 45%, 54%) appendicitis.

Table 4 reports the percentages of evidence of the main signs and symptoms found in the sample examined, group A, which at the same time represented the guiding criteria for establishing the surgical indication.

INCIDENCE OF SIGNS AND SYMPTOMS IN PATIENTS OF GROUP A
NAUSEA AND VOMITING 37%
CLOSED BOWEL 59%
TEMPERATURE > 37° 59%
LEUKOCYTOSIS > 11,000/NEUTROPHILIA>80% 77%
BLUMBERG'S SIGN + 67%
AGE (14 - 25 years) 64%

TABLE 4

Group B consisted of 31 patients who were indicated for surgical treatment of acute appendicitis after an observation period of more than 12 hours; 51% presented nausea and vomiting, 64% gas and feces obstructed bowel movements, 35% temperature higher than 37°, 51% leukocytosis greater than 11,000 with neutrophilia greater than 80% and 41% positive Blumberg's sign. Also for them, the pararectal surgical access was preferred (17cases) compared to the Mc. Burney cut (12cases) and the median umbilical-pubic (2cases); all Mc Burney accesses were used in females. The removed appendices were in the grip of catarrhal inflammation in 15 cases, phlegmonous in 13 and gangrenous in 3. The lower presence of particularly virulent forms explains the reason for the delay in making the surgical indication. The presence of some gangrenous forms in the group could justify the longer hospital stay which, however, varies between 6.7 days for catarrhal and 11.3 days for gangrenous; in this group 3 complications identifiable as flogosis of the surgical wound were reported. Analyzing in detail the presence of leukocytosis, temperature greater than 37° and a positive Blumberg sign, in relation to the inflammation, the highest incidences inexplicably concerned the phlegmonous forms, rather than the gangrenous ones.

Table 5 shows the percentages of presentation of the above mentioned signs and symptoms, highlighted in group B, criteria used in establishing the surgical indication.

INCIDENCE OF SIGNS AND SYMPTOMS IN PATIENTS OF GROUP B
NAUSEA AND VOMITING 51%
CLOSED BOWEL 64%
TEMPERATURE > 37° 35%
LEUKOCYTOSIS > 11,000/NEUTROPHILIA>80% 51%
BLUMBERG'S SIGN + 41%
AGE (14 - 25 years) 64%

TABLE 5

From the comparison with the values of group A, it is clear how much more nuanced and subtle the symptoms presented by the patients of group B may have been, confirming the difficulty in grasping the exact moment in which to place the surgical indication, observing the evolution of clinical and laboratory parameters over time.

Particular importance was given to the closure of the bowel by gas and feces, with the appearance of vomiting and leukocytosis. From the analysis of the percentages of occurrence of both groups, a nosographic numerical index was obtained for the individual elements examined, clinical and paraclinical, assigning a different score to each of them. The sum of these numerical indices was reported to 100.

In **Table 6** the assigned values are reported.

ASSIGNED VALUES TO SIGNS AND SYMPTOMS
NAUSEA AND VOMITING 12 points
CLOSED BOWEL 15 points
TEMPERATURE > 37° 15 points
LEUKOCYTOSIS > 11,000/NEUTROPHILIA>80% 19 points
BLUMBERG'S SIGN + 20 points
AGE (14 - 25 years) 19 points

TABLE 6

This proposed scoring system for the clinical diagnosis of acute appendicitis has proven to be valid in our experience, while further external evaluations remain necessary and useful, given the great variability of the clinical picture. This scoring system has the advantage, compared to other proposed and used scoring systems, such as the Alvarado score (5), of referring to a reduced number of elements to evaluate, among which only three objective signs, such as vomiting, closed bowel, positive Blumberg sign and two paraclinical signs, such as temperature and leukocytosis with neutrophilia. Finally, the patient's age is added. The minimum achievable score was indicated as highly suspicious of acute phlegmonous appendicitis and therefore sufficient to indicate surgery, that of 60 points.

Discussion

In current healthcare practice it would seem appropriate to distinguish between the diagnosis of acute appendicitis and choice on therapeutic indication in its possible developments: conservative medical therapy, such as antibiotic therapy, or surgical therapy, and in particular the appropriate time of its application; therefore in emergency, deferred emergency or elective. In fact, the simple diagnosis, so to speak, of acute appendicitis can be formulated without particular difficulty, but the therapeutic indication is certainly more complex because the different choices, that can be proposed, are based on the evaluation of clinical-instrumental factors, certainly quite complex. By unanimous consensus, timely diagnosis has been considered the fundamental objective to reduce the mortality rates related to acute appendicitis. Therefore, the factors that can contribute to increasing the correctness of the clinical diagnosis of acute appendicitis have been studied and developed.

The objective that the surgeon must set himself in front of a patient with suspected acute appendicitis is to formulate the diagnosis as promptly as possible in order to operate as few unnecessary appendicitis as possible and to delay the diagnosis as little as possible in the acute forms, at higher risk of gangrenous and perforative evolution, burdened by greater morbidity. This objective is not always achievable, considering the great variability of clinical presentation and the protean natural history of acute appendicitis, strongly correlated with the decades of life (6). Instrumental examinations, blood tests and imaging are now firmly placed alongside clinical examination, anamnestic collection and objective examination of the abdomen, however their effects on increasing diagnostic efficacy have not proven to be decisive; therefore, clinical evaluation is still the basis of diagnosis. Consequently, the current practical management of acute appendicitis applies the

simple clinical criterion that divides the cases examined and referred for surgical treatment, based on simple inflammation (non-perforated) and advanced inflammation (gangrenous or perforated). However, these two classes do not include cases that respond promptly to antibiotic therapy or that evolve favorably without treatment and cases with the onset of a serious inflammatory process that require emergency surgical treatment. This subdivision of acute appendicitis, in practice a confirmation of the clinical evidence and the subsequent, postoperative, pathological evaluation, highlights appendicitis with phlegmonous inflammation, for which there is a surgical indication, but, in its evolution perspective, a further worsening of the inflammation in gangrene and perforation is not found, but on the contrary it can present, if not subjected to surgery, a spontaneous resolutive evolution or with antibiotic therapy. A second clinico-pathological form of acute appendicitis presents the most serious inflammatory process with rapid evolution in necrosis and perforation and the absolute indication for surgical treatment (7,8).

In confirmation of the validity of this clinico-pathological subdivision, the Livingston study, not more recent, reports in the population evaluated the reduction of appendicitis with moderate inflammation and non-perforated, thus revealing a concrete separation between the two forms of appendicitis (9).

While admitting that perhaps acute appendicitis is one of the diseases whose diagnosis requires, more than others, high clinical acumen and experience, certainly the disease presents incidences of development strongly diversified in relation to age, privileging the young ages and developing in pediatric age and in the elderly, with a subtle, insidious and sometimes dangerous modality (6.10). Direct confirmation of the difficult diagnosis comes from the our experience presented, where a preoperative diagnosis of acute appendicitis did not find an operative confirmation in 6 patients whose average age, however, was 58 years, higher than the average of the sample, with a correct diagnosis. The greatest diagnostic difficulties, however, are found in patients over 60 years of age where, among other things, in the case history, the greatest diagnostic errors occurred.

The presence of associated pathologies, if any, chronic, such as bronchopathies, diabetes, heart disease, diverticular disease, presents a distracting element in the diagnosis of appendicitis and sometimes, capable of modifying the actual prevalence of the classic symptomatic set: fever, vomiting, pain in the right iliac fossa are not adequately interpreted. Organic characteristics, typical of appendicitis in the elderly, such as the reduction of lymphoid tissue, reduced blood flow with thinning of the mucosa, associated with reduced resistance to inflammation and, at times, a delay in presentation for diagnostic testing, all represent elements capable of rapidly causing appendiceal inflammation to evolve into gangrene or perforation, increasing morbidity and mortality.

As previously stated, it is not always easy to grasp the exact moment in which acute appendicitis requires surgery as the unique and exclusive treatment: the diagnostic accuracy of the disease, with the evaluation of clinical and paraclinical parameters, varies between 59% and 97% with the possibility of diagnostic errors from 7% to 38% (11,12).

Even admitting that the natural history, in its variability linked to numerous parameters, first records the appearance of epigastric, periumbilical and subsequently localized pain, fever, then nausea, vomiting, the positivity of the rebound sign and finally leukocytosis, with bowel movements not always closed to gas and feces, from the reported case studies, and from what has been recorded in the literature, it is agreed that these parameters cannot in any way be expected and found overall, to place the surgical indication (13,14). The possibility of finding the association of pain, fever, positivity of the Blumberg sign, vomiting and leukocytosis, is reported possible, in various case studies, in a quarter of the cases observed; in our experience, this symptomatic set was reported only in a third of the cases that then, actually at the operational check, had acute appendicitis.

From this observation arose the orientation to not necessarily wait for the semiological enrichment, perhaps risking the appearance of an acute abdomen, but rather to select guiding parameters, which could play an orienting role in guiding the surgeon in establishing the time to be able to place the surgical indication.

Also for this purpose, the original sample of the case study was divided into two groups; the closure of the bowel and leukocytosis/neutrophilia had, in the group operated later, the role of symptoms guiding to the surgical indication. In particular, the sequential count of leukocytes/neutrophilia represented the most valid guideline criterion (13,15). Also from the analysis of the scores assigned to the various parameters considered, it is clear that leukocytosis represents the highest and most significant index, followed immediately after, by age and the appearance of the Blumberg sign electively localized in the right iliac fossa. The prospective use of such indices with numerically different meaning, obtained retrospectively, will represent the object of further study, aimed at evaluating the significance of the selected signs and symptoms. This evaluation, however, must always take into account the age criterion, considering that, in formulating a judgment on the indication for surgery, the incidence of complications that a late intervention may cause in an adolescent and in an elderly patient will be highly diversified.
Furthermore it would be possible to evaluate the degree of promptness of emergency surgery indication, based on the number of perforated appendicitis cases found.

Ultimately, we believe we can rightly affirm that acute appendicitis perhaps represents one of the surgical diseases that more than others contributes positively to the growth of the experience and above all of the clinical competence of the surgeon.

Conclusion

Acute appendicitis is the abdominal inflammatory disease that very frequently requires surgical treatment. The clinical manifestation presents great variability. Our study, in the sole perspective of the clinical examination and the control of leukocytosis, has identified, with the retrospective examination of the case history, clinical signs, organized in scoring system, valid in the formulation of the surgical indication of acute appendicitis.

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