

## Case Report

# A Life Threatening Case of Perforated Gangrenous Appendicitis: When the Open Abdomen Technique Can be Safe and Effective In Acute Peritonitis. A Case Report

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## Keywords

- Acute appendicitis
- Perforated appendicitis
- Gangrenous appendicitis
- Peritonitis
- Open abdomen
- Laparostomy

**Abstract**

**Background:** Acute appendicitis is one of the most common abdominal urgent/emergent conditions worldwide and can occur at every age. It can be simple, in many cases treated conservatively, or complicated which require a surgical intervention. Sometimes is present peritonitis or abscesses which can lead to the creation of laparostomy (in order to oversee bowel inflammation). Diagnosis can be difficult because of a great variety of clinical presentations but many Scores (such as Alvarado Score) can help Surgeons to adopt a correct approach.

**Objectives:** This work aims to describe a possible treatment of complicated perforated appendicitis with diffuse peritonitis and multiple abscesses with the use of the Open Abdomen technique.

**Case Report:** We present a case of perforated gangrenous appendicitis occurred in a young man associated to diffuse peritonitis and septic shock. We also discuss contemporary methods in diagnosis and management of the condition.

**Conclusions:** Appendicitis must never be undervalued because of a large possible series of complications, and, even death. In selected cases, when bowel conditions require, it is possible to use the Open Abdomen technique, in way to resolve intestinal inflammation and help patient in septic resolution.

**INTRODUCTION**

Acute appendicitis is one of the most common abdominal urgent/emergent conditions worldwide. It can occur at every age, especially between 10 and 20 years old but it is frequent even among adults. There is a male prevalence with an Odd Ratio M:F 1,4:1 [1-3]. The overall life time risk, as referred in [1,4] is 6.7% for females and 8,6% for males in the USA. Acute appendicitis can be classified either as simple, in absence of perforation, gangrene or peritoneal abscess or as complicated, when these manifestations are present [1,2] and it requires a surgical intervention. Diagnosis may be difficult in many cases, because of a large set of conditions mimicking this situation. In order to avoid misunderstanding many authors described scoring systems which have been validated in adult surgical

practice: the most adopted are the Alvarado Score [5-8] and those based on Alvarado Scores [9], such as MAS [10] and RIPASA [11] or AIR (Andersson's) Score [12] which has a good sensitivity and specificity [13]. Many studies have observed that the risk of appendix perforation is time-dependent, hence delaying surgery treatments results in a poor outcome with a higher risk of post surgical complications [14-16]. On the other hand, other studies emphasize the idea of a possible spontaneous resolution in non-complicated conditions [17,18] with only antibiotic treatment at the first attack [19-22]. However, complicated appendicitis can cause acute secondary peritonitis [23] and, in infrequent cases, death [24]. Treatment of complicated appendicitis is nowadays debated. Open appendectomy is the most frequent choice for acute complicated peritonitis worldwide. It was first described in 1894 [25] and it has been applied successfully

until 1983, when Semm introduced the use of laparoscopy [26]. This procedure have become of foremost importance, but today a large number of controversies still remain in literature for the most appropriated therapy, especially when appendix is perforated or complicated with abscesses and many authors agree on the need to use the open technique, especially in case of limited experience and complex situation [27-30]. Sometimes, when appendix inflammation is associated to abscess or local/widespread peritonitis, intervention can also require abscess drainage, caecectomy or colectomy [24,31] and, in sporadic case, the temporary creation of laparostomy [32]. This treatment is complex and worsens by an high morbidity and mortality rate (about 25%) [33,34]. In this paper, we report a case of perforated gangrenous appendicitis causing diffuse peritonitis and multiple abscesses treated with the open abdomen technique in an adult man and discuss contemporary methods in diagnosis and management of the condition.

## CASE PRESENTATION

A thirty-eight years old man was admitted to Ferrara Emergency Surgery Department with an history of ten days of abdominal pain, localized at the beginning in the right iliac fossa and associated with anorexia (with a weight loss of about ten Kgs.), vomiting, diarrhea and fever up to 39°C treated at home without benefit with antibiotics and analgesics. His past history was completely negative. At admission, temperature was 38°C, pulse rate was 105 beats/min and blood pressure 130/80 mmHg. His blood exams revealed hemoglobin of 8 g/dl, there was no leukocytosis and neutrophils were  $4.29 \times 10^3$ /mcl. CRP was 22.84 mg/dl. Physical examination revealed signs of sepsis (with an increased pulse rate, anorexia, fever, pallor and sweating), diffuses abdominal pain at the inferior quadrants, with a positive Blumberg sign and unclear peristalsis. Lungs were clean at auscultations. Abdomen X-Ray done at the triage revealed peritoneal free air in the right side below the diaphragm, as an intestinal perforation. CT scan revealed a voluminous collection in the pelvis, without solution of continuity, which approached the rectum, the sigmoid colon and the small intestine. Furthermore moved anteriorly the bladder. In right iliac fossa was detected further smaller collection, referred as abscess. Numerous other collections were evidenced above the lower side of the liver. The small intestine showed the presence of air-fluid levels, as a sign of occlusion (Figures 1,2,3). We decided to perform an explorative midline laparotomy which revealed important peritoneal adhesions, diffuse peritonitis with purulent multiple collections and intestinal paralytic ileus with signs of diffuse ischemia (Figures 4). After accurate lavage, a necrotic, inflammatory and multiple perforated appendix was identified and removed together with caecum and the three last ileum loops, without making any bowel anastomosis. We decided to approach a laparostomy because of the massive inflammatory status and the ischemic intestinal suffering, keeping the abdomen open with two intestinal Bags (Me-Tec Esa Farma™), resulting in a Bogotà-bag like medication. After two days we reviewed laparostomy and re-connected ileum and ascending colon with an ileo-colic anastomosis. Intestine appeared aedematous but lively so we decided to not remove other parts of bowel nor create an ostomy; at the same time we decided to approach ileo-ascending colon anastomosis, maintaining laparostomy in order

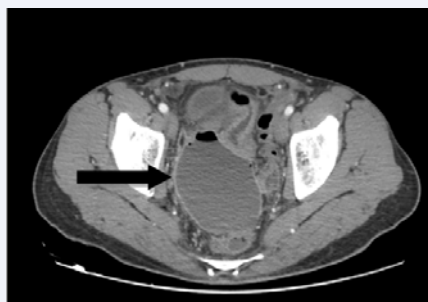


Figure 1 CT scan pelvic collection.



Figure 2 CT scan right iliac fossa collection.

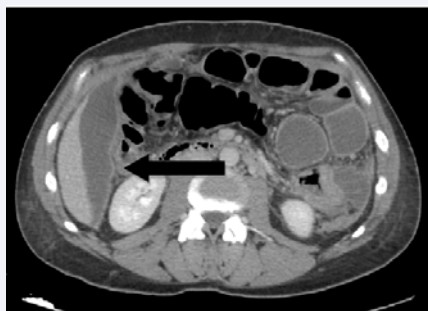


Figure 3 CT scan collections under the liver.



Figure 4 Purulent collections.

to check the vitality and the status of connection 48 hours later and control the inflammatory frame. Laparostomy was reviewed other two times in order to control the sealing of the anastomosis and the intestinal vitality. The definitive abdominal closure was carried out in ninth post-operative day (Figure 5). It was a direct abdominal closure and did not necessitate the use of any

kind of prosthesis. During this period patient's conditions were characterized by septic shock which required multiple antibiotic therapies. The therapy was initially empiric, successively was targeted against E. Coli, B. Fragilis and SHMR, and finally against Candida Albicans too. Three days after abdominal closure, the patient was moved from ICU to Emergency Surgery Department and five days later was discharged in good clinical conditions. Now, after six months, patient is still in good clinical conditions without signs of abdominal wall hernia or post operatory complications.

**DISCUSSION**

Acute appendicitis is nowadays an open issue. If non complicated ones can be treated without surgical intervention [20,21,34,35], complicated appendicitis must be treated surgically even though type of intervention is still debated [34]. Many authors [20,21,35,36,37] have tried to treat acute uncomplicated appendicitis with antibiotic therapy solely and some trials, just like NOTA Study [20,21] or APPAC [37], treated uncomplicated patients with the single use of Amoxicilline and Clavulanic Acid or Levofloxacin but results are still controversial. Regarding the choice of surgery, has asserted in [28], we are convinced that it should be guided by both the general and local conditions of

patients and the surgeons experience in laparoscopic techniques and the habit in treating urgent and emergent surgical situations. We also agree with [28] on the need of open technique for the treatment of complicated and perforated appendicitis, especially when surgeons ability in urgent laparoscopy is limited. The main problem is the presence of post-operatory intra-abdominal abscess which could delay discharge or cause an hospital early re-admission and re-intervention, which is more frequent in laparoscopy [28,34]. Diagnosis is possible following clinical scores and helped by imaging. In our specific case it would be done because all Alvarado Score points were present [9] (Figure 6) but abdominal perforation gave the prevailing symptomatology. Classically the first imaging approach to make appendicitis diagnosis is ultrasonography, followed by CT scan and/or MRI as seen in Dutch Guidelines [1,34,39]. However, our situation was atypical and necessitated an immediate CT scan approach in order to understand the possible source of infection and decide best intervention for the specific case. Furthermore the presentation was at first atypical and it was immediately clear that it would be not clever to approach that situation with laparoscopic technique, because we decided before the procedure to do anyway a laparostomy. The choice of keeping the abdomen open was due to the necessity of treat the patient's sepsis condition. In fact, as reported in [40], mortality rates increase dramatically in patients with severe sepsis and septic shock, as in our case, and aggressive treatment of these patients may improve outcomes. The 2014 CIAOW study (Complicated intra-abdominal infections worldwide observational study) evidenced an overall mortality rate of 10,5% until 36,5% in patients admitted in hospital with a sepsis or septic shock frame [41]. Mortality rates have stabilized due to advances in treatment options that manage the underlying infection and supports failing organs, however they remain high. Open Abdomen procedure consists of leaving the abdomen fascial edges un-approximated, while protecting internal organs for future close controls. Many authors agree with the importance of this technique in treating abdominal sepsis but the effective role in acute peritonitis is still debated [42,43,44]. In 2009, a classification system for Open Abdomen was introduced in order to categorize patients conditions. This first Classification was followed by an Amend, actually in use [40,45] (Figure 7). We used this Classification for our evaluations, identifying and treating a 2B Grade. What must be pointed out is that open abdomen must be protected with a Temporary Abdominal Closure system. There are different techniques used to cover internal organs [40,46,47], such as Bogotà-Bag, a temporary plastic bag, changed every 24-48 hours during abdominal revision. We first decided to use this option because, in our opinion, it was able to effectively contain the IAH (Intra Abdominal Hypertension), which often represents the first step towards the ACS (Abdominal Compartment Syndrome) [40,45,46,51,52]. The collateral effects of these techniques are: not prevention of fascial edges retraction when laparostomy is kept for long time and incapacity of internal fluids removal [39]. The followed timing in reviewing laparostomy, such as the decision of delaying the intestinal anastomosis, is supported by literature [40,47,48]. Primary fascial closure can be achieved in many cases within few days from the initial operation without technical difficulties. As referred in [50], patients with a septic condition are less likely an early fascial closure but this should be done as soon as possible when sepsis is controlled [46,50], in

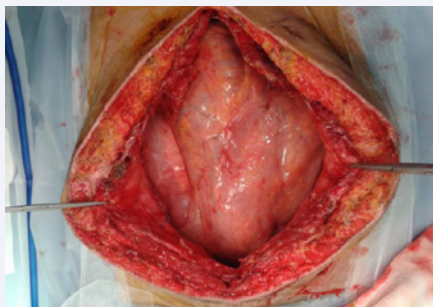


Figure 5 Intestine at 9th day.

Symptoms	Migration of abdominal pain to the right lower quadrant (RLQ)	1
	Anorexia (or acetone in the urine)	1
	Nausea/vomiting	1
Signs	Tenderness in RLQ	2
	Rebound pain	1
	Increase of temperature ( $\geq 37.3$ °C)	1
Laboratory	Leukocytosis ( $>10,000$ )	2
	Shift to the left (in a differentiated WBC count) (eg, neutrophilia $>75\%$ )	1
<b>Cumulative score</b>		
5-6 compatible with acute appendicitis		
7-8 probable for acute appendicitis		
9-10 very probable for acute appendicitis.		

Figure 6 Alvarado Score. Alvarado A. A practical score for the early diagnosis of acute appendicitis. Ann Emerg Med 1986; 15: 557-564.

2009 classification system		Amended classification system	
IA	Clean OA without adherence between bowel and abdominal wall or fixity (lateralization of the abdominal wall)	1A	Clean, no fixation
IB	Contaminated OA without adherence/fixity	1B	Contaminated, no fixation
2A	Clean OA developing adherence/fixity	1C	Enteric leak, no fixation
2B	Contaminated OA developing adherence/fixity	2A	Clean, developing fixation
3	OA complicated by fistula formation	2B	Contaminated, developing fixation
4	Frozen OA with adherent/fixed bowel, unable to close surgically, with or without fistula	2C	Enteric leak, developing fixation
		3A	Clean, frozen abdomen
		3B	Contaminated, frozen abdomen
		4	Established enteroatmospheric fistula, frozen abdomen

**Figure 7** OA Classification system and amended Classification (Björck M., Kirkpatrick A.W, Cheatham M, Kaplan M, Leppäniemi A, De Waele J.J (2015): Amended Classification of the open Abdomen. World Journal of Emergency Surgery 10:35)..

our case just nine days later. In many cases of delayed closure a Vacuum medication is needed to reach the desired objective [32,46].

## CONCLUSIONS

Treatment of acute perforated gangrenous appendicitis can reserve many bad surprises. Our approach in acute appendicitis is mainly based on the use of laparoscopic technique, even in complicated ones. Especially in women we think that Laparoscopy represents an absolute indication because appendicitis is often associated with pelvic or gynecological diseases. Furthermore this case is quite unusual for the delayed presentation, somewhat atypical in a young adult patient. The extension of peritonitis, the diffuse abscesses and the inflammatory state of the entire bowel, are more likely typical for the appendicitis in the older patient that often presents a subclinical evolution until "blowing up" in a septic shock [16,40,47]. In this patient, the indication for intervention was dictated by peritonitis and septic shock, for which immediately we thought to the need of a laparostomy, which led us to the choice of the open rather than laparoscopic way. Our patient was young and with a negative past history and any co-morbidities, which probably were part of the reasons of a so rapid recovery, despite the diffuse sepsis. However, acute appendicitis must never be underestimated. In selected cases, the open abdomen technique, in our opinion, is a life saving procedure in patients with sepsis and diffuse peritonitis, even those due to appendicitis.

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