

Original Research

Acute Abdomen in Gynecology — Single University Centre Experiences

Dubravko Habek^{1,*}, Jadranka Ristić², Anis Cerovac^{3,4}¹Department of Gynecology and Obstetrics, School of Medicine, Clinical Hospital “Merkur” Zagreb, Catholic University of Croatia, 10000 Zagreb, Croatia²Department of Gynecology and Obstetrics, Clinical Hospital “Sveti Duh” Zagreb, 10000 Zagreb, Croatia³Department of Gynecology and Obstetrics, General Hospital Tešanj, 74260 Tešanj, Bosnia and Herzegovina⁴Department of Anatomy, School of Medicine, University of Tuzla, 75000 Tuzla, Bosnia and Herzegovina*Correspondence: dhabeck@unicath.hr (Dubravko Habek)

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Abstract

Background: Acute abdomen (AA) is a synonym for a condition caused by an acute disease of an intra-abdominal organ that requires urgent surgical intervention. The gynecological-obstetrical etiopathogenesis of AA is based on pathological events on the genital organs due to hemorrhagic, inflammatory, and ischemic/obstructive genesis, and is a significant reason for admission to emergency gynecological departments, and emergency surgery. **Methods:** A retrospective clinical research was performed from 2005 to 2021, from the surgical protocol of the University Department for Gynecology and Obstetrics, Clinical Hospital “Sveti Duh” in Zagreb. In the examined sixteen-year period, 703 patients (4.06%) had surgery with a diagnosis of AA. **Results:** The largest number of surgeries due to AA was performed in the age group of 21–45 years (74.40%), i.e., in the reproductive age, followed by 106 patients aged 46–52 years (15.07%), then 46 (6.54%) patients in children and adolescent age up to 20 years of age, then from 53–60 years 23 (3.27%) patients, and in the elderly >60 years old, with 5 (0.71%) patients. The etiopathogenetic factors of AA were: the most common intra-abdominal hemorrhage in 68.14%, followed by inflammation and the most common complications of pelvic inflammatory disease in 25.60%, ischemic-obstructive causes in 2.56% and other causes in 3.7%. Out of the total number of surgeries, 450 (64.01%) were due to ectopic tubal pregnancy. Out of the total number of surgeries, 549 (78.09%) were performed (completed) by laparoscopy procedures, and by laparotomy and/or relaparotomy in 154 cases (21.90%). Regarding laparoscopy, 93.48% was performed in the age group up to 20 years, 83.56% in the age group of 21–45 years, and 62.26% was performed in the age group of 46–52 years. Regarding laparotomy, 69.57% was performed in patients aged 53–60 years, and 100% in the age group of patients >60 years. A pathological substrate was found for all operated patients, which they undergo for surgery, and we had no cases in which we did not prove a perioperative or pathohistological reason for AA. There were no patients’ deaths in the current study, which had to undergo for surgery for AA. **Conclusions:** We emphasize the urgent need for proper and continuous education of hospital teams, as well as extra-hospital emergency teams in recognizing AA symptoms of gynecological genesis based on history, clinical palpation examination, and ultrasound examination as a fundamental triad in the diagnosis of this life-threatening condition that requires only surgical treatment.

Keywords: acute abdomen; gynecology; operative procedures

1. Introduction

Acute abdomen (AA) is a synonym for a condition caused by an acute disease of an intra-abdominal organ that requires urgent surgical intervention. It is most often manifested as a sudden strong and unrelenting abdominal/pelvic pain as the leading symptom with possibility peritonism (*french* defense musculaire), nausea and vomiting as signs of peritoneal irritation. In the small pelvis, the genital, urinary, gastrointestinal, vascular, nervous, and musculoskeletal systems are intertwined, so the clinical picture can be atypical, because AA can develop due to a genital or non-genital cause, but AA of genital origin is still the cause in >95% of cases [1–5].

The gynecological-obstetrical etiopathogenesis of AA is based on pathological events on the genital organs due to hemorrhagic, inflammatory, ischemic/obstructive genesis, and is a significant reason for admission to emergency

gynecological departments and emergency surgery [1–3]. Also, AA can be directly or indirectly related to pregnancy, childbirth, and puerperium, so we distinguish between non-obstetrics and obstetrics AA. AA can be conditioned by a spontaneous cause (e.g., rupture of an ectopic pregnancy), traumatic (due to penetrating or non-penetrating injury to the pelvic organ), due to comorbidity or therapy, as well as postoperative AA as a complication after the procedure (ileus, organ lesions) [1–6]. Thus, primary and/or secondary AA can be distinguished as a complication after surgically resolved primary AA of genital and extragenital genesis. However, clinical examples and daily work indicate not rare mimicry cases that are connected with other organs in the pelvis or cause the image of the so-called pseudo-acute abdomen, such as pelvic ureteral colic or hematometrocolpos [1–3,6,7]. Possible genital and extragenital causes of AA are presented in overview Table 1, Ref. [3,5].



Table 1. Possible cause for AA syndrome [3,5].

Etiology	Gynaecologic-obstetrics	Other abdominal extragenital causes
Inflammation	acute pelvic inflammation disease ruptured pyosalpinx ruptured pyoovarium perforated tuboovarian abscess parametritis pelveoperitonitis	acute appendicitis perforated appendicitis perityphlitis local or diffuse peritonitis different etiology acute cholecystitis perforated gastric or duodenal ulcers
	Amnioinfection syndrome	acute pancreatitis inflamed or perforated colon diverticulitis MecKel's diverticulitis ruptured hepatic or splenic abscess acute or perforated Morbus (Mb) Crohn diseases intestine perforated because carcinoma intestine perforation because tuberculosis acute or perforated proctosigmoiditis
Obstructive-ischemic	ovarian cysts torsion tubal torsion peduncular myoma torsion paraovarian cysts torsion	incarcerated hernia ileus adhesion intestine strangulation intestine volvulus
	adnexal torsion	intestine invagination intestine obstruction with parasites, tumors or foreign body mesenterial infarct mesenterial thrombosis/embolism angina abdominalis pelvic thrombophlebitis pelvic congestive syndrome omentum major torsion acute gastric dilatation diaphragm rupture biliary colic nephrocolica, uretherocolica urinary retention pelvic pyelonephritis
Intraabdominal hemorrhage (intraperitoneal and retroperitoneal)	follicle rupture tubal ectopic pregnancy rupture tubal abortion rudimentary corneal ectopic pregnancy rupture ovarian cyst rupture	spleen rupture liver rupture mesenterial rupture abdominal aneurysm rupture kidney rupture abdominal or thoracal aneurysm dissection
	subserous myoma blood vessels rupture ovarian ectopic pregnancy rupture interstitial ectopic pregnancy rupture uterine rupture/perforation	intestinal angiodysplasia rupture

AA, acute abdomen.

Considering the constant actuality of this eternal gynecological emergence and in fact few systematic and meta-analytical clinical and review papers from gynecological AA despite constant and numerous instructive case reports, our original clinical research paper is a contribution to that problem and highlights the everyday problem of AA.

2. Material and Methods

The retrospective clinical research covered the period from 2005 to 2021. For research purposes, surgical protocols of the University Department for Gynecology and Obstetrics, Clinical Hospital "Sveti Duh" were used. The data of patients who were admitted and had a surgery in the clinic due to AA were collected (inclusion criteria as

an emergency situation). The inclusion criteria were acute abdomen as an admission diagnosis as an urgent surgical emergency, regardless of the patient's age and her comorbidity. All patients signed an informed consent for urgent and unscheduled surgery, general anesthesia and possible transfusion after clarifying the necessary need for surgery and anesthesia. Due to the vital indication for surgery, there were no exclusion criteria, so there were no absolute contraindications for surgery and therefore exclusion from the study. The following were investigated: age of the patient with regard to life periods (childhood and adolescence 0–20 years; generative 21–45 years; pre and perimenopause 46–52 years; postmenopause 53–60 years; and senior >61 years), the number of surgeries for AA out of the total number of gynecological surgeries per year, diagnosis with indication for surgery with division into etiopathogenetic factors (hemorrhagic, inflammatory, ischemic-obstructive and other (e.g., iatrogenic) genesis), and surgical procedures performed by laparotomy or laparoendoscopic (LPSC) approach. The research was approved by the Ethics Committee of the Clinical Hospital (number: 012-433). Data was collected by one researcher. Categorical variables were expressed in absolute numbers and percentages.

3. Results

In the examined sixteen-year period, out of a total 17,311 patients who had a gynecological surgery, 703 patients (4.06%) had surgery with a diagnosis of AA, with a range from 1.71% in 2020 to 6.21% in 2008. The largest number of surgeries due to AA was performed in the age group of 21–45 years (74.40%), i.e., in the reproductive age. This was followed by 106 patients aged 46–52 years (15.07%), then 46 (6.54%) patients in children and adolescent age (up to 20 years of age), 23 (3.27%) patients from 53–60 years, and 5 (0.71%) patients in the elderly group (>60 years old).

The etiopathogenetic factors of AA gynecological genesis were: the most common intra-abdominal hemorrhage in 68.14%, followed by inflammation which included the most common complications of pelvic inflammatory disease in 25.60%, ischemic-obstructive causes in 2.56%, and other causes in 3.7%. Out of the total number of surgeries, 450 (64.01%) were due to ectopic pregnancy all completed by LPSC (Table 2).

Out of the total number of surgeries, 549 (78.09%) were performed (completed) by LPSC, and by laparotomy and/or relaparotomy in 154 cases (21.90%). In 22 cases, conversion from laparoscopy to laparotomy was performed due to the extent of the procedure, hemorrhagic shock, adiposity, and comorbidities. Hematoperitoneum as the cause of AA was operated LPSC in 96% of cases (salpingectomy, salpingostomy, ovarian sutures, uterine sutures), inflammatory genesis in 70% (adnexectomy, salpingectomy), obstructive/ischemic in 90% (detorquation, salpingectomy, adnexectomy, myomectomy). From the group of other

causes of AA, all were operated on with a laparotomy approach, considering the diagnoses.

LPSC was performed in 93.48% in the age group up to 20 years, 83.56% in the group of 21–45 years, and 62.26% in the age group of 46–52 years. In patients aged 53–60 years, laparotomy was performed in 69.57%, and 100% in the age group of patients >60 years. 35 hysterectomies (4.97%) were performed, of which 1 was performed by laparoscopic assisted vaginal hysterectomy (LAVH) and 34 by laparotomy: 5 due to ruptured myomatous vessels and torquated giant uterine myoma, 15 due to tuboovarian abscess with peritonitis and 10 due to ruptured uterus and invasive (morbid) malplacenta with AA. 9 hysterectomies were performed at the age of 21–45 years (5 due to AA due to invasive malplacenta, 4 due to suppurative peritonitis and pelvic inflammatory diseases) and the rest at the age >45 years.

In all operated patients, a pathological substrate was found for which the patients had to undergo surgery. Furthermore, we had no cases in which we did not prove a perioperative or pathohistological reason for AA. There were no patients' deaths that had to undergo surgery for AA in the current study.

4. Discussion

The PubMed database currently contains over 21,000 papers on the subject of AA, over 750 in gynecology and obstetrics from 1947–2023. However, in numerous journals at the end of the 19th century there are reports on the causes of death due to acute bleeding in the abdomen or peritonitis of genital genesis, which unfortunately was only proven at autopsy, and so many gynecological AA ended fatally and were only proven at autopsy.

From our own clinical practice, we have published over 20 case reports from AA gynecological-obstetrical genesis, as well as a review paper on AA in gynecology, with a discussion and citations from the literature [3]. AA is classified as one of the most urgent conditions in surgery and gynecology, often accompanied by the development of hemorrhagic, traumatic, or septic shock conditions with various outcomes, so we distinguish between nonfatal and fatal AA [1–4]. In particular, ruptured ectopic pregnancies with massive hematoperitoneum or septic shock due to peritonitis of gynecological-obstetric origin were the causes of fatal AA. Young called these conditions by the proper name abdominal catastrophes [1–4].

Therefore, early, and primary diagnosis of AA as a life-threatening condition, i.e., early recognition of this syndrome, is extremely important. Anamnesis, clinical examination, and ultrasound diagnosis is a superior, proven, and simple tool in emergency gynecology for AA of pelvic etiology, and laboratory diagnosis of hemogram and inflammatory markers and multi-slice computed tomography (MSCT) or magnetic resonance imaging (MRI) diagnosis completes the diagnosis. In the past, frequent laparocente-

Table 2. Number of acute abdomen with etiopathogenesis and verified diagnosis.

Acute abdomen (etiopathogenesis)	Verified diagnosis	Number (%)
Hemorrhage (haemascos/haemathoperitoneum)	Ectopic pregnancy (ruptured and non-ruptured) and/or tubal abortion (450)	479 (68.14%)
	Hemorrhagic corpus rubrum (18)	
	Rupture of the ovarian cysts with hemorrhage (1)	
	Hemorrhage from the ruptured myomatous vessels (2)	
	Uterine perforation with hemorrhage (after application of intrauterine devices, during hysteroscopy, during curettage, after conisation with uterine perforation) (8)	
Inflammation/infection	Tuboovarian abscess with/without acute diffuse peritonitis (118)	180 (25.60%)
	Abscessus cavi Douglasi (4)	
	Acute suppurative pelvic inflammatory diseases/suppurative pelveoperitonitis (57)	
	Acute gangrenous perforative appendicitis (1)	
Obstructive/ischemic	Adnexal torsion (4)	18 (2.56%)
	Torsion of the ovarian cysts (8)	
	Torsion of the sactosalpinx (2)	
	Torsion of the uterine myoma (4)	
Other	Uterine rupture/invasive malplacentation (5)	26 (3.7%)
	Urinary bladder rupture (3)	
	Intestinal perforation (jatrogenic) (17)	

sis/culdocentesis was recommended, but it can still be recommended in unexplained cases as a diagnostic method of obtaining blood or pus from the abdomen, as confirmation of an acute intraabdominal event that requires surgical intervention [2,4,8,9]. As AA is a set of mostly typical but also rarer and bizarre, atypical symptoms, given the clinical picture and age of the patient, it is often called AA syndrome, which can range from gynecological etiology to neonatological (e.g., described torsion of the adnexa or ovarian cyst), to geriatric age, neoobstetric and obstetric, and genital and extragenital genesis, as mentioned [10–13]. However, as is evident from the existing literature, and as confirmed by our research, the most frequently operated patients are from the reproductive age group, which is gynecologically logical considering an active sex life as the main prerequisite for ectopic pregnancy, as well as sexually transmitted diseases such as risk factors for pelvic inflammatory disease and its complications in AA syndrome [10–13].

Intraabdominal bleeding as the most common cause of AA occurs most often due to rupture of an ectopic pregnancy in the fallopian tube or tubal abortion, which we confirmed in a high percentage in our research in as many as 64% of all AAs, followed by bleeding from the corpus rubrum, rupture of an ovarian cyst or coronary blood vessels of myoma and of iatrogenic complications with bleeding during surgical procedures, most often after uterine perforation, which is confirmed by other case reports [11,12,14–16]. Acute pelveoperitonitis as a primary, or secondary complication of the most common pelvic inflammatory disease ranging from purulent salpingitis to tuboovarian abscess and Douglas space abscess is a significant factor in the cause of AA that requires surgery and depends on the patient's age. LPSC salpingectomy will most often be performed at a younger age, or adnexectomy, which we con-

firmed in our research with a high percentage of LPSC operations in the treatment of AA genital genesis, mostly of inflammatory etiology [2,10,13,17]. Torsion of the adnexa, ovarian cyst, sactosalpinx or pedicle of a subserous pendulous myoma is the cause of ischemia and the development of AA syndrome and can occur at any age, as there are data in the literature [2,10,13,17]. Other causes of AA in which emergency surgery was performed in 3.7% include rupture of the uterus and lesions of adjacent pelvic organs as iatrogenic silent unrecognized injuries of the bladder [18] or intestines during LPSC, laparotomy or caesarean section, which are based on clinical images of AA were the reason for repeated operations due to urinary or stercoral peritonitis, more often with a laparotomy approach. The laparoscopic approach to solving AA in our clinic was high in 78.09% of cases, with a slight tendency to reduce LPSC procedures in favor of laparotomy according to age, which corresponds to the doctrines of current operative techniques and faster recovery of patients [2,10,13,17].

Of course, comorbidity or previous abdominal surgeries can mimic the clinical picture of AA, and can delay the primary surgery and worsen the condition overall. Also, AA can be the first sign of another disease that is mimicked, for example ovarian cyst rupture in leukemia, or ovarian tumor granulosis, as the first sign of this disease, as well as AA in women on anticoagulant therapy [15,19,20]. The pandemic of endometriosis in recent decades brought new etiopathogenetic causes of AA: torsion, bleeding due to perforation or inflammation of the endometrioma [21,22].

Foreign bodies in the abdomen (retained gauzes, intrauterine device) can also be the cause of the development of peritonitis and AA, especially after secondary inflammation, however, we did not have such a case in our study. Clinically, as well as medico-legislatively, it is interesting to mention primary operated AA (e.g., rupture of tuboovar-

ian abscess) and the occurrence of secondary AA (e.g., adhesive ileus with interstitial abscesses after a previously operated ruptured tuboovarian abscess), which again requires reoperation due to repeated development of AA [5].

Giannini *et al.* [23] in a review paper critically pointed out the current state of hysterectomies, their necessity, and their performance with a minimal surgical approach. In our material, we had 4.97% of hysterectomies performed due to AA, of which we performed one LAVH, and the rest of which were hysterectomies due to surgical findings (giant tumor, peritonitis) performed by laparotomy approach. However globally, we had a high percentage of LPSC surgeries (78%), mostly at a younger age.

Although appendicitis in pregnancy is described as the most common cause of nongenital genesis of AA, in our clinic we did not perform appendectomy in pregnant women, which were operated on in the surgical clinic [24–26]. It is interesting and instructive to mention that in pregnancy, due to its atypical clinical picture caused by changes during pregnancy, AA is a frequent cause of high maternal and fetal morbidity and mortality, and delayed or even unnecessary surgical procedures in about 50% of unconfirmed preoperative diagnoses for which surgical procedures were performed. Thus, one study describes 545 pregnant women who underwent appendectomy due to AA and suspected acute appendicitis, but in 73% the diagnosis of appendicitis was confirmed pathohistologically, in 21% there was a normal appendix, and in 6% other diagnoses [3,25,26].

We emphasize the urgent need for proper and continuous education of hospital teams, as well as extra-hospital emergency teams in recognizing AA symptoms of gynecological genesis based on history, clinical palpation examination, and ultrasound examination as a fundamental triad in the diagnosis of this life-threatening condition that requires only surgical treatment.

5. Conclusions

Furthermore, we consider it important to emphasize the need for education and training of surgical skills in dealing with typical and atypical clinical AA syndromes, because each AA syndrome requires urgent surgery regardless of possible doubts as to which system in the pelvis the pathological substrate belongs to. From our results, we confirm the above, because through clinical practice and numerous case reports, we wanted to prove that the clinical consideration of the diagnosis and treatment of AA, whether atypical or of nongenital genesis, directly correlates with the final outcome. AA as a syndrome of medical exactness, indeed confirms the definition of AA as a state of “abdominal catastrophes” that requires urgent surgical intervention, but also inaccuracies and individual assessments, which is evident from hundreds of published cases of AA in the literature that surprise with the rarity of such life-threatening conditions.

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Author Contributions

DH: designed the study, manuscript writing/editing. JR: data collection, statistical analysis, manuscript writing. AC: formal analysis, manuscript writing/editing. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

The research was approved by the Ethical board of the Clinical Hospital Sveti Duh Zagreb on 9 February 2022 (approval number: 012-433), and the authors of the paper respected the foundations of the Helsinki Convention. Informed consent was not required for this research, as there is approval from the Ethics Committee.

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Conflict of Interest

The authors declare no conflict of interest. Dubravko Habek is serving as one of the Editorial Board members and Guest editors of this journal. We declare that Dubravko Habek had no involvement in the peer review of this article and has no access to information regarding its peer review. Full responsibility for the editorial process for this article was delegated to Michael H. Dahan.

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