

**МИНИСТЕРСТВО ЗДРАВООХРАНЕНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ**  
**УЧРЕЖДЕНИЕ ОБРАЗОВАНИЯ**  
**«ГОМЕЛЬСКИЙ ГОСУДАРСТВЕННЫЙ МЕДИЦИНСКИЙ УНИВЕРСИТЕТ»**

**Кафедра хирургических болезней № 1**

**В. АНДЖУМ, А. А. ПРИЗЕНЦОВ,**  
**Д. В. ХОХА**

# **АТИПИЧНЫЕ ФОРМЫ И ОСЛОЖНЕНИЯ ОСТРОГО АППЕНДИЦИТА**

**Учебно-методическое пособие  
для студентов 5 и 6 курсов  
факультета по подготовке специалистов для зарубежных стран  
медицинских вузов**

# **ATYPICAL FORMS AND COMPLICATIONS OF ACUTE APPENDICITIS**

**The educational methodical work  
for 5<sup>th</sup> and 6<sup>th</sup> year students  
of the Faculty of preparation of experts for foreign countries  
of medical higher educational institutions**

**Гомель  
ГомГМУ  
2013**

УДК 616.346.2-002.1-06(072) = 111

ББК 54.574.653.(2Англ.)я73

А 54

*Под общей редакцией профессора В. М. Лобанкова*

**Рецензенты:**

доктор медицинских наук,  
профессор кафедры хирургических болезней № 3  
Гомельского государственного медицинского университета

***В. В. Аничкин;***

кандидат медицинских наук,  
доцент кафедры хирургических болезней № 3  
Гомельского государственного медицинского университета

***В. Б. Богданович***

**Анджум, В.**

А 54 Атипичные формы и осложнения острого аппендицита: учеб.-метод. пособие для студентов 5 и 6 курсов факультета по подготовке специалистов для зарубежных стран медицинских вузов = Atypical forms and complications of acute appendicitis: the educational methodical work for 5th and 6th year students of the Faculty of preparation of experts for foreign countries of medical higher educational institutions / В. Анджум, А. А. Призенцов, Д. В. Хоха; под общ. ред. проф. В. М. Лобанкова. — Гомель: ГомГМУ, 2013. — 24 с. ISBN 978-985-506-532-7

Пособие содержит учебный материал по теме «Атипичные формы и осложнения острого аппендицита». Соответствует учебному плану и программе по хирургическим болезням для студентов высших медицинских учебных заведений Министерства здравоохранения Республики Беларусь.

Предназначено для студентов 5 и 6 курсов факультета по подготовке специалистов для зарубежных стран медицинских вузов.

Утверждено и рекомендовано к изданию Центральным учебным научно-методическим советом учреждения образования «Гомельский государственный медицинский университет» 27.12.2012 г., протокол № 9.

УДК 616.346.2-002.1-06(072) = 111

ББК 54.574.653.(2Англ.)я73

ISBN 978-985-506-532-7

© Учреждение образования  
«Гомельский государственный  
медицинский университет», 2013

## CONTENTS

History .....	4
Anatomy and embryology of the appendix .....	5
Appendiceal positions .....	6
Congenital abnormalities.....	6
Acute appendicitis .....	6
Epidemiology .....	7
Aetiology .....	7
Pathophysiology .....	8
Prognosis .....	9
Clinical features.....	9
Signs of acute appendicitis.....	10
Diagnosis .....	11
Stages of appendicitis.....	12
Differential diagnosis .....	13
Special features in atypical forms of acute appendicitis .....	13
Atypical forms according to age .....	15
Treatment.....	17
Preparation to appendectomy .....	18
Appendectomy.....	18
Post-procedure.....	20
Postoperative complications.....	20
Less common pathological conditions .....	21
Non-inflammatory conditions .....	22
Literature .....	23

## HISTORY

Appendicitis has been a common problem for centuries, in the early 19th century the appendix was recognized as an organ capable of causing disease. There was continued debate through the mid 1800s about the cause of right lower quadrant inflammation with terms such as perityphlitis and paratyphlitis. In 1827, Melier described several autopsy cases of appendicitis and undoubtedly stated the opinion that the appendix was the likely cause, including the presumed pathophysiology that is accepted today. However, a strongly opposing position by Dupuytren, the most prominent surgeon of the time, caused Melier's views to not gain widespread acceptance. Continued work in Britain and Germany pointed to the appendix as a potential source of disease, and in fact, the number of publications on diseases of the appendix began to increase considerably by 1860. By 1880, both Matterstock in Germany and With in Norway published papers that clearly point to the appendix as a significant cause of iliac fossa inflammation. In 1886, Reginald Fitz of Boston made a landmark contribution by discussing the appendix as the primary cause of right lower quadrant inflammation. He coined the term appendicitis and, importantly, recommended early surgical treatment of the disease. By 1886, the widespread availability of anesthesia and the growing acceptance of antisepsis set the stage for the rapid application of these recommendations, with several U.S. surgeons making important contributions.

Before 1886, a number of cases of intervention for appendicitis had been reported. However, most of these patients underwent surgery well after the disease was established, with the primary goal to drain the infection. Several papers of note were published in the ensuing years. In 1889, Chester McBurney described the migratory pain as well as the finger point localization of pain between 1.5 and 2 inches from the anterior iliac spine on an oblique line to the umbilicus. He incorrectly stated that this was an almost constant finding in patients with appendicitis. McBurney in New York and McArthur in Chicago described a right lower quadrant muscle splitting incision for surgical treatment in 1894. It is interesting to note that McBurney kept his patients on bed rest for at least 4 weeks after surgery! In 1905, Murphy clearly described the appropriate sequence of symptoms of pain followed by nausea and vomiting with fever and exaggerated local tenderness in the position occupied by the appendix. There continued to be significant improvements in survival, so by the time penicillin became routinely available in the late 1940s, the mortality rate for appendicitis was less than 2 %. Further advances in the management of appendicitis have included the recognition of the polymicrobial flora, improved diagnostic studies, and interventional radiologic procedures for treatment of abscesses. The mortality rate for appendicitis is well under 1 %. Appendicitis occurs infrequently in very young children and elderly persons. The disease has a maximal incidence in patients in their late teens and 20s. There is a slight increased prevalence in males versus females.

## ANATOMY AND EMBRYOLOGY OF THE APPENDIX

The appendix is a wormlike extension of the caecum and, for this reason, has been called the vermiform appendix. It is a blind muscular tube with mucosal, submucosal, muscular and serosal layers. The appendix varies considerably in length, from 2 cm to 22 cm, and circumference. The average length is between 7.5 cm and 10 cm. Specimens of over 30 cm in length have been recorded. The appendix is a derivative of the midgut along with the ileum and ascending colon. The caecum is first visible during the fifth week of gestation, with the appendix first appearing around the eighth week of gestation as an out pouching of the caecum. The appendix initially projects from the apex of the caecum, but the base gradually rotates in a more medial location toward the ileocaecal valve. During development, the gut undergoes a series of rotations, with the caecum ending fixed in the right lower quadrant. Because the appendiceal orifice is always at the confluence of the caecal taenia, the final location of the appendix is determined by the location of the caecum. If the caecum does not migrate during development to its normal position in the right lower quadrant of the abdomen, the appendix can be found near the gallbladder. This can cause difficulties of diagnosis if an attack of appendicitis develops in a malpositioned appendix.

The appendix is contained within the visceral peritoneum that forms the serosa, and its exterior layer is longitudinal and derived from the taenia coli; the deeper, interior muscle layer is circular. Beneath these layers lies the submucosal layer, which contains lymphoepithelial tissue. The mucosa consists of columnar epithelium with few glandular elements and neuroendocrine argentaffin cells.

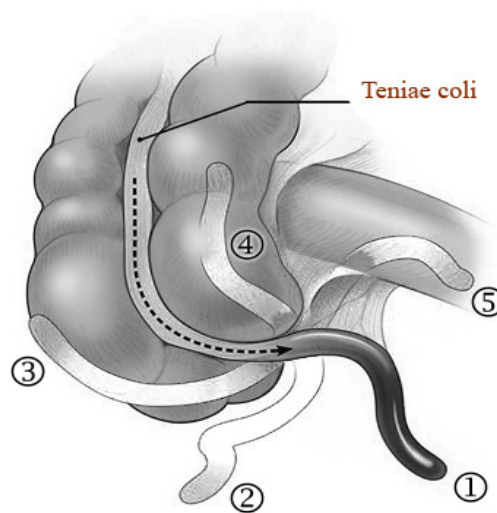
Taenia coli converge on the posteromedial area of the caecum, which is the site of the appendiceal base. The appendix runs into a serosal sheet of the peritoneum called the mesoappendix, within which courses the appendicular artery, which is derived from the ileocolic artery. Sometimes, an accessory appendicular artery (deriving from the posterior caecal artery) may be found.

The vasculature of the appendix must be addressed to avoid intraoperative hemorrhages. The appendicular artery is contained within the mesenteric fold that arises from a peritoneal extension from the terminal ileum to the medial aspect of the caecum and appendix; it is a terminal branch of the ileocolic artery and runs adjacent to the appendicular wall. Venous drainage is via the ileocolic veins and the right colic vein into the portal vein; lymphatic drainage occurs via the ileocolic nodes along the course of the superior mesenteric artery to the celiac nodes and cisterna chyli.

Histologic examination of the appendix shows a number of lymphoid follicles in the submucosa. Lymphoid nodules first appear in the seventh month of gestation. There is a gradual increase in lymphoid tissue through adolescence and then a decrease over time. The lumen of the appendix is often obliterated in elderly persons. As with the rest of the colon, there are mucus-producing goblet cells throughout the mucosa.

## APPENDICEAL POSITIONS

The appendix has no fixed position. It originates 1.7–2.5 cm below the terminal ileum, either in a dorsomedial location (most common) from the caecal fundus, directly beside the ileal orifice, or as a funnel-shaped opening (2-3% of patients). The most common location of appendix is retrocaecal. In fact, many individuals may have an appendix located in the retroperitoneal space, in the pelvis, or behind the terminal ileum, caecum, ascending colon and even in sub hepatic area. Thus, the course of the appendix, the position of its tip, and the difference in appendiceal position considerably changes clinical findings, accounting for the nonspecific signs and symptoms of appendicitis.



**Figure 1 — Variations of appendix position:**  
1. Pelvic — 21 %; 2. Subcaecal — 2 %; 3. Retrocaecal — 68 %;  
4. Paracaecal — 3 %; 5. Pre- and postileal — 6 %.

## CONGENITAL ABNORMALITIES

Appendiceal congenital disorders are extremely rare but occasionally reported. Agenesis: Once in 100 000 persons the vermiform appendix is absent. Duplication: A few cases of double appendix have been reported; in some instances one of the twin appendices has been found acutely inflamed and the other uninvolved. Left-sided appendix: Situs inversus viscerum, a congenital abnormality where there is complete transposition of thoracic and abdominal viscera, and is more common in males.

## ACUTE APPENDICITIS

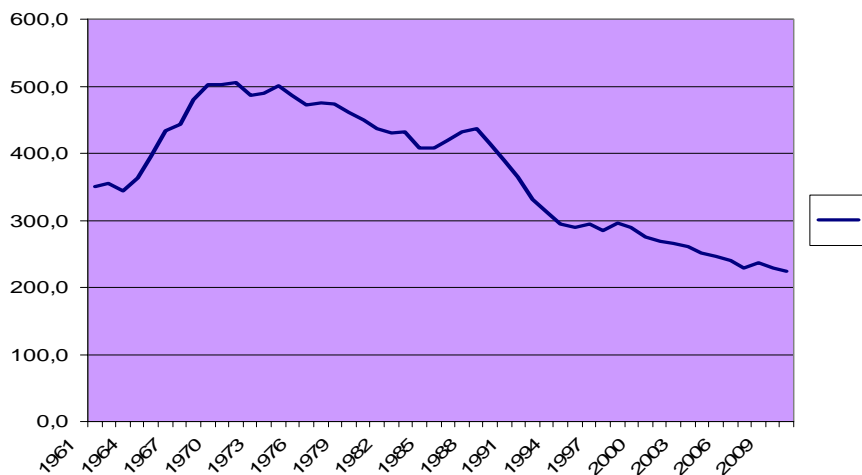
Appendicitis is defined as an inflammation of the inner lining of the vermiform appendix that spreads to its other parts. This condition is a common and

urgent surgical illness with variable manifestations, generous overlap with other clinical syndromes, and significant morbidity, which increases with diagnostic delay. In fact, despite diagnostic and therapeutic advancement in medicine, appendicitis remains a clinical emergency and is one of the more common causes of acute abdominal pain.

## EPIDEMIOLOGY

Appendicitis is one of the more common surgical emergencies, and it is one of the most common causes of abdominal pain. In the United States, 250,000 cases of appendicitis are reported annually, representing 1 million patient-days of admission. In Asian and African countries, the incidence of acute appendicitis is probably lower because of the dietary habits of the inhabitants of these geographic areas. The incidence of appendicitis is lower in cultures with a higher intake of dietary fiber. Dietary fiber is thought to decrease the viscosity of feces, decrease bowel transit time, and discourage formation of fecaliths, which predispose individuals to obstructions of the appendiceal lumen.

There is a slight male preponderance of 3:2 in teenagers and young adults; in adults, the incidence of appendicitis is approximately 1.4 times greater in men than in women. The incidence of primary appendectomy is approximately equal in both sexes. Population frequency of appendectomies in Belarus is given below: see figure 2.



**Figure 2 — Population frequency of appendectomies in Belarus, 1961–2010  
(1 : 100 thousand)**

## AETIOLOGY

The following aetiological factors are important, but most likely they are purely contributory.

**Age:** The peak incidence of acute appendicitis is in childhood, teenage and diminishes progressively with increasing age.

**Sex:** Males are affected more commonly than females; however, women are more likely to be «wasted or false» appendectomy, because of difficulties in diagnosis of gynecological pathologies.

**Race and diet:** Appendicitis is particularly common in highly advanced European, American and Australasian countries, while it is rare in African, Asians and Polynesians. Rendle Short showed that if individuals from the latter races migrate to countries where appendicitis is common, they soon acquire the local susceptibility to the disease.

**Social status:** In England and other European countries, acute appendicitis is more common among the upper and middle classes than in those belonging to the so-called working class.

**Familial susceptibility:** This unusual but generally accepted fact can be accounted for by a hereditary abnormality in the position of the organ, which predisposes to infection. Thus the whole family may have long retrocaecal appendices with comparatively poor blood supply.

**Obstruction of the lumen of appendix:** appendicitis is caused by obstruction of the appendiceal lumen. The most common causes of luminal obstruction include lymphoid hyperplasia secondary to inflammatory bowel disease (IBD) or infections (more common during childhood and in young adults), fecal stasis and fecaliths (more common in elderly patients), parasites (especially in Eastern countries), or, more rarely, foreign bodies and neoplasms.

## **PATHOPHYSIOLOGY**

It is of great importance to recognize two types of acute appendicitis: non-obstructive and obstructive.

**Non-obstructive acute appendicitis:** The inflammation usually commences in the mucous membrane, less often in the lymph follicles and can terminate in one of the following ways:

- resolution;
- ulceration;
- suppuration;
- fibrosis;
- gangrene.

Factors that encourage progression of the inflammation include:

- young or old age;
- immunosuppressive agents, e.g. steroids
- free-lying appendix;
- presence of faecolith;
- purgatives and enemas;
- impaired blood supply.

**Obstructive acute appendicitis:** about two out of every three cases of acute appendicitis belong to this group. Reportedly, appendicitis is caused by obstruc-



tion of the appendice lumen from a variety of causes. Independent of the etiology, obstruction is believed to cause an increase in pressure within the lumen. Such an increase is related to continuous secretion of fluids and mucus from the mucosa and the stagnation of this material. At the same time, intestinal bacteria within the appendix multiply, leading to the recruitment of white blood cells and the formation of pus and subsequent higher intraluminal pressure. If appendice obstruction persists, intraluminal pressure rises ultimately above that of the appendice veins, leading to venous outflow obstruction. As a consequence, appendice wall ischemia begins, resulting in a loss of epithelial integrity and allowing bacterial invasion of the appendice wall. Within a few hours, this localized condition may worsen because of thrombosis of the appendicular artery and veins, leading to perforation and gangrene of the appendix. As this process continues, a periappendicular abscess or peritonitis may occur.

## **PROGNOSIS**

Acute appendicitis is the most common reason for emergency abdominal surgery. Appendectomy carries a complication rate of 4–15 %, as well as associated costs and the discomfort of hospitalization and surgery. Therefore, the goal of the surgeon is to make an accurate diagnosis as early as possible. Delayed diagnosis and treatment account for much of the mortality and morbidity associated with appendicitis. The overall mortality rate of 0.2–0.8 % is attributable to complications of the disease rather than to surgical intervention. The mortality rate in children ranges from 0.1 to 1 %; in patients older than 70 years, the rate rises above 20 %, primarily because of diagnostic and therapeutic delay. Appendice perforation is associated with increased morbidity and mortality compared with non-perforating appendicitis about 10 times.

## **CLINICAL FEATURES**

Acute appendicitis is rare before the age of 2 years, becomes increasingly common during childhood; thereafter there is a gradual decline, but no age is exempt. Pain first, vomiting next and fever last has been described as classic presentation of acute appendicitis. Typically there are the following four specific features.

- Abdominal pain which shifts.
- Upset of gastric function.
- Localized tenderness at the side of the appendix.
- Rigidity in the right iliac fossa.

The typical history is one of an onset of generalized abdominal pain followed by anorexia and nausea. The pain then becomes most prominent in the epigastrium and gradually moves toward the umbilicus, finally localizing in the right lower quadrant. Vomiting may occur during this time. Examination of the abdomen usually shows diminished bowel sounds, with direct tenderness and

muscle spasm in the right lower quadrant. As the process continues, the amount of spasm increases, with the appearance of rebound tenderness. The temperature is usually mildly elevated (approximately 38 °C) and usually rises to higher levels in the event of perforation, although this is very variable. Direct tenderness is usually present in the right lower quadrant and may involve other parts of the abdomen, particularly if perforation has occurred. The appendix is usually situated at or around McBurney point. However, it must be emphasized that the exact anatomic location of the appendix can be at any point on a 360-degree circle surrounding the base of the caecum. This is the site at which the pain and tenderness are usually maximal, and the exact site can vary from patient to patient.

### **SIGNS OF ACUTE APPENDICITIS**

**Rovsing's sign:** Continuous deep palpation starting from the left iliac fossa upwards (counterclockwise along the colon) may cause pain in the right iliac fossa, by pushing bowel contents towards the ileocaecal valve and thus increasing pressure around the appendix.

**Psoas sign:** Psoas sign or «Obraztsova's sign» is right lower-quadrant pain that is produced with either the passive extension of the patient's right hip (patient lying on left side, with knee in flexion) or by the patient's active flexion of the right hip while supine. The pain elicited is due to inflammation of the peritoneum overlying the iliopsoas muscles and inflammation of the psoas muscles themselves. Straightening out the leg causes pain because it stretches these muscles, while flexing the hip activates the iliopsoas and therefore also causes pain.

**Obturator sign:** If an inflamed appendix is in contact with the obturator internus, spasm of the muscle can be demonstrated by flexing and internal rotation of the hip. This maneuver will cause pain in the hypogastrium.

**Dunphy's sign:** Increased pain in the right lower quadrant with coughing.

**Kocher's (Kosher's) sign:** From the history given, the appearance of pain in the epigastric region or around the stomach at the beginning of disease with a subsequent shift to the right iliac region.

**Sitkovskiy (Rosenstein's) sign:** Increased pain in the right iliac region as patient lies on his/her left side.

**Bartomier-Michelson's sign:** Increased pain on palpation at the right iliac region as patient lies on his/her left side compared to when patient was on supine position.

**Yaure-Rozanova's sign:** Increased pain on palpation with finger in right Petit triangle (can be a positive Shchetkin-Bloomberg's sign) — typical in retrocecal position of the appendix.

**Blumberg sign:** Also referred as rebound tenderness. Deep palpation of the viscera over the suspected inflamed appendix followed by sudden release of the pressure causes the severe pain on the site indicating positive Blumberg's sign and peritonitis.

## DIAGNOSIS

A diagnostic program for suspected acute appendicitis:

1. Carefully collect medical history.
2. By palpation, percussion, and repositioning the patient identify symptoms of acute appendicitis.
3. Blood and urine tests.
4. Perform a rectal examination, in women vaginal examination.
5. Perform a measurement of rectal and axillary temperatures (difference, greater than 1 C indicates inflammation in the abdominal cavity).
6. Exclude somatic diseases simulating acute abdominal pathology. This requires: a) examine the status of respiratory system (if necessary to make x-ray of the chest), and b) to investigate the function of the cardiovascular system (the definition of frequency and nature of the pulse measurement, blood pressure, and in the elderly an electrocardiogram) c) for suspected urological disease must perform ultrasound of the kidneys, urography, cystochromoscopy.
7. A plane radiograph of the abdomen.
8. Perform ultrasound of the abdomen (liver, gallbladder and extra hepatic bile ducts, pancreas, and in women — USG of the pelvic organs).
9. Diagnostic laparoscopy to rule out acute appendicitis.

Blood test: Blood tests commonly done: FBC (Full blood count) or CBC (Complete blood count). An abnormal rise in the number of white blood cells in the blood is a crude indicator of infection or inflammation going on in the body. Such rise is not specific to appendicitis alone.

C-reactive protein (CRP). It is an acute phase response protein produced by the liver in response to any infection or inflammatory process in the body. Again, like the FBC, it is not a specific test.

Urine Test: Urine test in appendicitis is usually normal. It may however show blood if the appendix is rubbing on the bladder, causing irritation.

Abdominal Radiographs: In 10 % of patients with appendicitis, plain abdominal x-ray may demonstrate hard formed feces in the lumen of the appendix (Fecolith). It is agreed that the finding of Fecolith in the appendix on X — ray alone is a reason to operate to remove the appendix, because of the potential to cause worsening symptoms.

Ultrasound: Ultrasonography is often used as the initial diagnostic imaging study in the majority of patients in whom the clinical diagnosis of appendicitis is equivocal. In some cases (15 % approximately), however, ultrasonography of the iliac fossa does not reveal any abnormalities despite the presence of appendicitis. This is especially true of early appendicitis before the appendix has become significantly distended and in adults where larger amounts of fat and bowel gas make actually seeing the appendix technically difficult. Despite these limitations, in experienced hands sonographic imaging can often distinguish between appendicitis and other diseases with very similar symptoms such as in-

flammation of lymph nodes near the appendix or pain originating from other pelvic organs such as the ovaries or fallopian tubes.

Computed tomography: In general, CT findings of appendicitis increase with the severity of the disease. The normal appendix appears as a thin tubular structure in the right lower quadrant that may or may not opacify with contrast. Appendicoliths appear as ring like homogeneous calcifications and are seen in approximately 25 % of the population. Classically, a CT diagnosis of acute appendicitis includes an abnormal appendix with periappendiceal inflammation.

### Diagnostic Scoring

Several investigators have created diagnostic scoring systems to predict the likelihood of acute appendicitis. The best known of these scoring systems is the MANTRELS (also known as Alvarado ) score. See table 1.

Table 1 — MANTRELS (Alvarado) Score

Characteristic	Score
M = Migration of pain to the RLQ	1
A = Anorexia	1
N = Nausea and vomiting	1
T = Tenderness in RLQ	2
R = Rebound pain	1
E = Elevated temperature	1
L = Leukocytosis	2
S = Shift of WBCs to the left	1
Total	10
Source: Alvarado	
RLQ = right lower quadrant; WBCs = white blood cells	

### STAGES OF APPENDICITIS

The stages of appendicitis can be divided into:

Acute appendicitis and Chronic appendicitis.

Acute appendicitis can be:

- Catarrhal appendicitis.
- Phlegmonous appendicitis (figure 3).
- Gangrenous appendicitis, with or without perforation.



Figure 3 — Appendectomy: Acute phlegmonous appendicitis (courtesy of Dr. Waqar Anjum)

## DIFFERENTIAL DIAGNOSIS

Appendicitis should be considered in the differential diagnosis of almost all patients with abdominal pain. As with other causes of abdominal pain, it is important to consider the patient's age and sex because the differential diagnosis is quite different depending on these factors.

In children: In preschool-age children, the differential diagnosis includes intussusception and acute gastroenteritis. Because the incidence of diarrhea in young children is fairly high, a delay in the appropriate diagnosis is quite common, as it may be difficult to differentiate appendicitis from gastroenteritis.

In school-age children, gastroenteritis is still high, functional pain and constipation are also very common. In black children, sickle cell disease can mimic appendicitis. Although not all-inclusive, there are some common diagnosis to consider in the differential of appendicitis:

Mesenteric adenitis, gastroenteritis, Meckel's diverticulitis, intussusception, Henoch-Schönlein purpura, lobar pneumonia, urinary tract infection (abdominal pain in the absence of other symptoms can occur in children with UTI), new-onset Crohn's disease or ulcerative colitis, pancreatitis, and abdominal trauma from child abuse, distal intestinal obstruction syndrome in children with cystic fibrosis, typhlitis in children with leukemia, orchitis, epididymitis, and torsion.

In girls: menarche, dysmenorrhea, severe menstrual cramps, Mittelschmerz («ovulation pain» or «midcycle pain») and pelvic inflammatory disease.

In adults: regional enteritis, renal colic, perforated peptic ulcer, pancreatitis, cholecystitis and biliary colic, rectus sheath hematoma; in men: testicular torsion, new-onset Crohn's disease or ulcerative colitis; in women: pelvic inflammatory disease, ectopic pregnancy, endometriosis, torsion/rupture of ovarian cyst, Mittelschmerz.

In elderly: diverticulitis, intestinal obstruction, colonic carcinoma, mesenteric ischemia, aortic aneurysm.

## SPECIAL FEATURES IN ATYPICAL FORMS OF ACUTE APPENDICITIS

Pelvic: The pelvic location of the appendix in women is up to 30 %, men — up to 16 %. Pain begins in epigastrium or throughout the abdomen, and after a few hours localizes above the vagina, or above the right inguinal ligament. Nausea and vomiting are as often as in a typical location of the appendix. Occasionally early diarrhea results from an inflamed appendix being in contact with the rectum. When the appendix lies entirely within the pelvis there is usually complete absence of abdominal rigidity, and often tenderness over McBurney's point is lacking as well. In some instances deep tenderness can be made out just above and to the right of the symphysis pubis. In either event a rectal examination reveals tenderness in the rectovesical pouch or the pouch of Douglas, especially on the right side. Psoas spasm may also be present when the appendix is in

this position: alternatively, spasm of the obturator internus is sometimes demonstrable when the hip is flexed and internally rotated. If an inflamed appendix is in contact with the obturator internus, this manoeuvre will cause pain in the hypogastrium ( Zachary Cope). An inflamed appendix in contact with the bladder may cause frequency micturition. A child sometimes postpones micturition as this cause pain (Mcfadden).

Retrocaecal: The location of the appendix behind the caecum, an average of 10–12 %, out of which retroperitoneal is 1–2 %. Following are the different retrocaecal locations of the appendix:

1. Intraperitoneal (behind the caecum, in the free abdominal cavity).
2. Mezoperitoneal (partially located in retro peritoneum).
3. Retroperitoneal (completely located in retro peritoneum).
4. Intramural (in the thickness of the wall of the caecum).

The disease onset is most often typical of a pain in the epigastric region or throughout the abdomen, which later localizes in the right lateral canal or right lumbar region. Nausea and vomiting are less frequent. Rigidity is often absent and even on deep pressure tenderness may be lacking (silent appendix), the reason being that the caecum, distended with gas, prevents the pressure exerted by the hand from reaching the inflamed structure, and gurgling may even be elicited. However, deep tenderness is often present in the loin, and rigidity of the quadratuslumborum may be in evidence. Psoas spasm, due to the inflamed appendix being in contact with that muscle, may be sufficient to cause flexion of the hip joint; to extend the joint causes abdominal pain.

Postileal: Although this is rare, it accounts for some of the cases of «missed appendix». Here the inflamed appendix lies behind the terminal ileum. It presents the greatest difficulty in diagnosis because the pain may not shift, diarrhea is a feature, marked retching may occur and tenderness, if any, is ill-defined, though it may be present immediately to the right of the umbilicus. As the appendix irritates the lower ileum, the patient usually passes small loose stools soon after eating or drinking.

Maldescended (subhepatic): Frequency — 0,4–1,9 %. Vermiform appendix can be positioned freely in the abdominal cavity, retrocaecal (including retroperitoneal) in the seam, be soldered to the bottom surface of the liver or the gall bladder. This clinical form of acute appendicitis is manifested by pain in the right upper quadrant varying intensity, giving rise to the idea of an acute cholecystitis. However, in this case, a typical attack of acute appendicitis, history of the starting of pain is important and you can identify the symptoms of pain, starting from epigastrium and moving into the right upper quadrant. Often the pain is accompanied by nausea and vomiting.

Left-sided appendix: Localization of the appendix in the left half of the abdomen may be caused by several factors: the inter positioning of the internal organs — Situs inversus viscerum (1:15000 people), the presence of elongated

mesocaecum positioning at the place of the sigmoid colon and other anomalies of the small and large intestines. In the reverse arrangement of internal organs develop typical clinical symptoms of acute appendicitis on the left side. Diagnostic question in favour of acute appendicitis is allowed when there is evidence about the inter positioning of the internal organs. In this case, heart is on the right side and liver — on the left. In case of partial reverse arrangement of the abdominal cavity creates additional difficulties in diagnosis, because in the left can be located just upstream section of the colon with the appendix.

### **ATYPICAL FORMS ACCORDING TO AGE**

**Infants:** In infants under 3 years of age the incidence of perforation is over 80 % (Fields), and the mortality is considerably higher than the general mortality; indeed, when acute appendicitis occurs during the first year of life, only 50 % of the patients reach their 1<sup>st</sup> birthday. One of the reasons for the rapid onset of diffuse peritonitis is that the greater omentum, being comparatively short and undeveloped, is unable to give much assistance in localizing the infection. (The omentum is an apron of fat in the adult, but there is a mere bib in children.) Even more important is the difficulty in arriving at an early diagnosis, and particularly in differentiating the condition from enteritis; also acute appendicitis can complicate enteritis. In addition, acute appendicitis may be associated with acute respiratory infection or one of the exanthemas.

**Children:** It is rare to find a child with appendicitis who has not vomited and they usually have complete aversion to food. In addition, they do not sleep during the attack and very often bowel sounds are completely absent in the early stages. Among the urgent surgeries for children in first place is surgery for appendicitis (73.5 %). With age, the incidence of acute appendicitis increases and reaches a maximum value of 6–8 years. The most difficult diagnosis of appendicitis in children aged 5–6 years. Clinical manifestations in older children closer to the typical clinical features in adults. The clinical course of acute appendicitis in children is predetermined by the anatomical and physiological characteristics of the child's body. This is primarily high standing and anatomical variability in the location of the caecum. In addition, the appendix is relatively longer and wider than in adults, it is weakly expressed in the lymph follicles. nervous apparatus of the appendix in children is incomplete, the properties of the peritoneum are not sufficiently developed, and its resistance to infection is low. Immunity in children is not perfect. Inflammation of the appendix in children of the first years of life are developing much faster than in older age and having more chances of severe destructive forms of appendicitis. Mortality is 20–30 times higher than among older children. The clinical picture is dominated by general symptoms due to a generalized reaction of the child's body in the inflammatory process. However, many of the common symptoms are found not only in acute appendicitis, but a number of other diseases. Nevertheless, one can identify a

number of symptoms, which although not specific for acute appendicitis, but there are in this disease with the greatest regularity. These include pain, fever, and vomiting. The most important among the children of the early years are changes of the child's behavior, sleep disturbance. Encountered in the stomach pains are often cramping in nature and do not have the precise dynamics, which is characteristic of acute appendicitis in adults. A typical position of a sick child is that child lies on his right side or back, bringing his legs to his stomach, his hand on the right iliac region, protects it from the medical examination. With careful Palpation is often possible to identify hyperesthesia, muscle tension and tenderness. Identify the location of the pain and its true character in the troubled child's behavior without any additional action is impossible. The best time to palpate the abdomen of baby during sleep, including medical.

**The aged:** The frequency of acute appendicitis in the age of 60 from 1.1 to 8.9 %. Mortality rate among elderly patients is 3 times higher and up to 3 %. Gangrene and perforation occur much more frequently in elderly patients. Elderly patients with lax abdominal walls or obesity may harbor a gangrenous appendix with little evidence of it and old people are prone to self medication with laxatives. In addition, the picture may simulate sub acute intestinal obstruction and if enemas are given, peritonitis may be spread more widely. The immune system becomes weaker in old age. For all these reasons, acute appendicitis in older age groups carries a high mortality.

**Pregnancy:** Appendicitis and cholecystitis are the most frequent causes of abdominal pain during pregnancy. Abdominal tenderness is the most important finding in appendicitis, but the location of point tenderness varies during gestation. After the fifth month of gestation, the appendiceal position is shifted superiorly above the iliac crest, and the appendix tip is rotated medially by the gravid uterus, thus favouring peritonitis: the nearer the term the, the greater the danger, even in cases without perforation. After the 6-th month there is a maternal mortality of 20 per cent — 10 times greater than in the first 3 months (Parker). The pregnant patient with acute perforated appendicitis aborts or goes into premature labour in 50 per cent of cases, while in acute nonperforated appendicitis this figure is reduced to 30 per cent.

The white blood cell count may not be helpful because it is frequently elevated during pregnancy. Common symptoms such as nausea, vomiting, or anorexia are also common during pregnancy and thus of limited diagnostic value. Ultrasound may be of help if a thickened or dilated appendix is identified. Suspicion of appendicitis should lead to early surgical intervention in all trimesters. Negative laparotomy results in minimal fetal loss, whereas a delay in diagnosis and perforation may result in a high incidence of fetal death and a relatively high incidence of maternal death. A laparoscopic approach has been used and does not appear to increase maternal or fetal morbidity or mortality rates. Occasionally, patients will have had a walled-off gangrenous or ruptured appendix that presents with acute abdominal pain immediately after delivery. The contraction



and return toward normal size of the uterus may disrupt the walling-off process and lead to a generalized peritonitis.

## TREATMENT

### *Surgical tactics*

Surgical tactics in acute appendicitis is now one and determined by the decisions of III All-Russian Conference of Surgeons (Voronezh, 1967). The most important points are as follows:

1. If you suspect the presence of acute appendicitis, the patient must be sent or transferred to an emergency or surgical department of the hospital.

An example. When at OPD a physician suspects a patient with acute appendicitis, patient must be referred to hospital in the department of surgery.

Patients under treatment in any other department with suspected acute appendicitis should be transferred to the surgical department no later than two hours after consulting the surgeon, if the diagnosis of acute appendicitis at the time not removed.

2. Duration of observation and examination of the patient, who is suspected the presence of acute appendicitis in the emergency room(department) of hospital shall not exceed two hours. During this period, the diagnose of acute appendicitis should be removed; otherwise the patient should be hospitalized.

3. Refusal of hospitalization by patient with a diagnosis of «acute appendicitis» must be strictly justified, and allow only after careful examination of the patient and conduct the necessary analysis.

4. Once the diagnosis of «acute appendicitis» is made, an urgent operation should be performed, regardless of the stage of acute appendicitis, the patient's age and the time elapsed from the onset. The exception to this rule may be only the patients with the presence of a dense, well-delimited, fixed infiltrate.

5. In uncertain clinical manifestations, patient should be observed in hospital and if patient's condition allows within 6 hours additional investigation methods (X-ray, laboratory, Urology, colour thermography, the measurement of electrodermal resistance, electric thermometry, electromyography, laparocentesis, laparoscopy) should be used. If for some reason, these methods cannot be applied, or they give ambiguous results, and the diagnosis of appendicitis cannot be excluded, shows an operation for diagnostic purposes (diagnostic laparoscopy).

6. Frequent cause of errors in acute appendicitis is lack of the entire arsenal of diagnostic methods and techniques, and hence the delay in diagnosis.

The treatment of acute appendicitis is appendicectomy. If the diagnosis is made at an early stage in the attack, and particularly in the absence of a localized mass, all are agreed that the appendix should be removed urgently. The mortality for acute appendicitis treated by early operation is under 1 per cent but rises sharply if perforation occurs.

The treatment begins by keeping the patient from eating or drinking in preparation for surgery. An intravenous drip is used to hydrate the patient. Anti-

biotics given intravenously such as cefuroxime and metronidazole may be administered early to help kill bacteria and thus reduce the spread of infection in the abdomen and postoperative complications in the abdomen or wound. Equivocal cases may become more difficult to assess with antibiotic treatment and benefit from serial examinations. If the stomach is empty (no food in the past six hours) general anaesthesia is usually used. Otherwise, spinal anaesthesia may be used.

## **PREPARATION TO APPENDECTOMY**

### ***Anesthesia***

Appendectomy requires general anesthesia. Before the start of the surgical procedure, the anesthesiologist performs endotracheal intubation to administer volatile anesthetics and to assist respiration. Even appendectomy can be performed under local anesthesia, except in children.

### ***Preoperative Medications***

Because they may mask the underlying disease, do not administer analgesics and antipyretics to patients with suspected appendicitis who have not been evaluated by the surgeon.

### ***Venous Access***

Venous access must be obtained in all patients diagnosed with appendicitis. Venous access allows administration of isotonic fluids and broad-spectrum intravenous antibiotics before the operation.

## **APPENDECTOMY**

There are two approaches to removal of the appendix:

### **Open Appendectomy**

Before incision, the surgeon should carefully perform a physical examination of the abdomen to detect any mass and to determine the site of the incision. Through an open incision, usually a transverse right lower quadrant skin incision (Davis-Rockey) or an oblique version (McArthur-McBurney or Volkovich-Djakanove) with separation of the muscles in the direction of their fibers, or a paramedian incision, but this is not routinely done. The incision is centered on the midclavicular line. Occasionally, where the diagnosis is uncertain, a periumbilical midline incision can be used. Once the peritoneum is entered, the appendix is delivered into the field. This can usually be accomplished with careful digital manipulation of the appendix and caecum. It is important to avoid too extensive of a blind dissection. In difficult cases, extending the incision 1 to 2 cm can greatly simplify the procedure. Once the appendix is delivered into the wound, the mesoappendix is sacrificed between clamps and ties. There are several ways to handle the actual removal of the appendix. Some surgeons simply suture ligate the base of the appendix and excise it. Others place a purse string or Z-stitch in the caecum, excise the appendix, and invert the stump into the cecum.

Once the appendix is removed, the caecum is returned to the abdomen, and the peritoneum is closed. The wound is closed primarily in most patients with non-perforated appendicitis because the risk of infection is less than 5 %.

Indications for drainage of abdominal cavity(plugging):

- incomplete hemostasis;
- «amputation» of apex of appendix with retrograde appendectomy;
- retroperitoneal abscess;
- appendicular infiltrate or abscess.

#### Laparoscopic Appendectomy

The surgeon typically stands on the left of the patient, and the assistant stands on the right. The anesthesiologist and the anesthesia equipment are placed at the patient's head, and the video monitor and the instrument table are placed at the feet.

Although some variations are possible, the standard approach is to place 3 trocars during the procedure. Two of these have a fixed position (i.e. umbilical, suprapubic); the position of the third, which is placed in the right periumbilical region, may vary greatly depending on the patient's anatomy.

After establishing the Pneumoperitoneum (10–14 mm Hg) a laparoscope is inserted to view the entire abdomen cavity. A 12-mm trocar is inserted above the pubic symphysis to allow the introduction of instruments (e.g. incisors, forceps, stapler). Another 5-mm trocar is placed in the right periumbilical region, usually between the right costal margin and the umbilicus, to allow the insertion of an atraumatic grasper to expose the appendix.

The appendix is grasped and retracted upward to expose the mesoappendix. The mesoappendix is divided using a dissector inserted through the suprapubic trocar. Then, a linear endostapler, endoclip, or suture ligature is passed through the suprapubic cannula to ligate the mesoappendix. The mesoappendix is transected using a scissor or electrocautery; to avoid perforation of the appendix and iatrogenic peritonitis, the tip of the appendix should not be grasped.

The appendix may now be transected with a linear endostapler, or, alternately, the base of the appendix may be suture ligated in a similar manner to that in an open procedure. The appendix is now free and may be removed through the umbilical or the suprapubic cannula using a laparoscopic pouch to prevent wound contamination. Peritoneal irrigation is performed with antibiotic or saline solution. Completely aspirate the irrigant. The trocars are then removed and the pneumoperitoneum is reduced. The fascial layers at the trocar sites are closed with absorbable suture. The cutaneous incisions are closed with interrupted subcuticular sutures or sterile adhesive strips.

#### Interval Appendectomy

There is general consensus that a localized appendiceal abscess from perforated appendicitis can be initially managed with CT-guided percutaneous drainage or limited surgical drainage. When combined with adequate antibiotic and fluid administration, the majority of patients will respond to this conservative

management and can be discharged without fever or abdominal pain. It is highly important to explain to the patient that drainage of an appendix abscess is no safeguard against future attacks of appendicitis. Arrangements should be made for the patient to return for appendectomy 3 months after the wound has healed. Sometimes carcinoma of the caecum may coexist. In the carcinoma age group all patient should have barium studies or colonoscopy to exclude this as soon as it is safe to do them.

## **POST-PROCEDURE**

**Outcome** The prognosis is excellent, and outcome is good, whether appendicitis is simple or complicated (ie, with gangrene or perforation). In fact, no mortality has been reported in patients with a nonperforated appendix. The mortality rate is less than 1 % if appendiceal perforation exists. **Postoperative Medication** Administer intravenous antibiotics postoperatively. The length of administration is based on the operative findings and the recovery of the patient; in complicated appendicitis, antibiotics may be required for many days or weeks. Antiemetics and analgesics are administered to patients experiencing nausea and wound pain.

### ***Diet***

When appendicitis is not complicated, the diet may be advanced quickly postoperatively and the patient is discharged from the hospital once a diet is tolerated. In patients with complicated appendicitis, a clear liquid diet may be started when bowel function returns.

## **POSTOPERATIVE COMPLICATIONS**

Wound complications: seroma, abscess, hematoma.

Abdominal complications: abscesses, bleeding, obstruction, peritonitis, failure of the stump, intestinal fistula, pylephlebitis and somatic (pulmonary, cardiac, thromboembolic).

### ***Infection***

Infection remains the most common complication after the operative treatment of appendicitis. Although infection can occur in a number of locations, surgical site infection predominates. The two sites at which infections can occur are the subcutaneous wound and within the abdominal cavity. Patients with postoperative infections usually present with a mild fever, abdominal pain, and disorders of bowel transit (ie, diarrhea, constipation). Persistent nausea, vomiting, difficulty with micturition and persistent pain in the lower limbs may also occur. The incidence of wound infection and intra-abdominal sepsis in patients with complicated appendicitis is higher than that in patients with nonperforated appendicitis. There have been several reports of a much higher incidence of abscess formation in patients with complicated appendicitis who have undergone

laparoscopic appendectomy. The mechanism is unclear at this time. The treatment of intra-abdominal abscess is usually percutaneous drainage and intravenous antibiotics with good results.

### ***Bowel obstruction***

Intestinal obstruction can occur after laparotomy for appendicitis. The true long-term incidence is unknown, but it is likely similar to the risk of patients undergoing laparotomy for other reasons. The incidence in one large series was approximately 1 %, with most patients presenting in the first 6 months after surgery.

### ***Miscellaneous***

As with any operation, a number of other problems may occur. Urinary tract infections, pneumonia, and other complications of hospitalization can occur in patients with appendicitis. Occasionally, a patient may develop a fecal fistula after operation. This almost always occurs in patients with perforated appendicitis. The majority will close, but in a few patients, surgical closure may be required.

### ***Stump appendicitis***

A rare complication after appendectomy, stump appendicitis, is a special concern. This condition is an acute inflammation of the residual appendix and may occur from a few months to up to 20 years after the appendix resection.

The causes of postoperative complications in acute appendicitis are:

- Late surgical intervention due to late diagnosis;
- Poor surgical technique;
- Unforeseen reasons.

## **LESS COMMON PATHOLOGICAL CONDITIONS**

Mucocele of the appendix may occur when the proximal end of the lumen slowly becomes completely occluded, usually by a fibrous stricture and the pent-up secretion remains sterile. The appendix is greatly enlarged; sometimes it contains several ounces of mucus. The symptoms produced are those of mild subacute appendicitis unless infection supervenes, when the mucocele is converted into an empyema. Rupture of a mucocele of the appendix is a cause of pseudomyxoma — peritonei.

Diverticula of the appendix: Diverticulosis occurs once in about 200 appendices removed by operation. These diverticula are not merely extensions of diverticulosis of the colon; some are congenital (all coats), most are acquired (no muscularis layer).

Intussusceptions of the appendix is rare and occurs only in childhood. It can be diagnosed only at operation. The symptoms usually are not acute.

Endometriosis and primary Crohn's disease of the appendix are very rare and some cases have been reported.

## NON-INFLAMMATORY CONDITIONS

### *Neoplasms*

Appendiceal neoplasms are extremely rare and are infrequently diagnosed preoperatively. In general, mucinous carcinoma or adenocarcinoma of the appendix is seen in older patients thought to have acute appendicitis. Occasionally, the diagnosis is recognized intraoperatively but frequently not until the specimen is reviewed histologically. Right hemicolectomy is indicated for (1) invasive adenocarcinoma, (2) tumors close to the cecum, (3) mucin-producing tumors, (4) invasion of lymphatics, serosa, or mesoappendix, and (5) cellular pleomorphism with a high mitotic rate.

### *Carcinoid Tumors*

Carcinoid tumors represent the most common malignancy of the appendix. They are derived from midgut argentaffin cells, possibly of neural crest origin. The appendix or the small bowel has been reported to be the most frequent site for carcinoid tumors. In one review of 1570 appendiceal carcinoids, the average age at presentation was 42.2 years, with a female predominance. These appendiceal carcinoids represented 18.9 % of all carcinoid tumors reviewed. Most appendiceal carcinoid tumors in adults are asymptomatic or found incidentally and are less than 1 cm. Simple appendectomy is adequate treatment. Treatment for tumors between 1 and 2 cm is decided best by location. If the tumor is located at the base of the appendix or invading the mesentery, a right hemicolectomy is recommended. If the tumor can be adequately resected by appendectomy alone, this should be adequate therapy because distant metastases are rare for tumors less than 1.5 to 2 cm. Lesions greater than 2 cm have a higher incidence of distant metastases and should be treated by right hemicolectomy with the hope of decreasing local-regional recurrence. At the time of diagnosis, 35 % are non-localized. The current overall 5-year survival rate is 94 % for localized lesions, 85 % for regional invasion, and 34 % for distant metastases. Almost 15 % of patients have synchronous non-carcinoid tumors at other sites as well. Carcinoid tumors of the appendix represent one of the most common gastrointestinal malignancies in children (figure 4).



**Figure 4 — Carcinoid tumour of appendix in a 68 years old lady (Gomel clinical emergency hospital, 2007). (courtesy of Dr. Waqar Anjum)**

## LITERATURE

1. Surgical Diseases: Manual. / M. I. Cousins [et al.], ed. M. I. Kuzina. — 3<sup>rd</sup> ed., revised. add. — M.: Medicine, 2005. — 784 p.
2. Surgical Diseases: Manual. In 2 t. / V. S. Saveliev [et al.]; under Society. Ed. V. S. Saveliev, A. Kiriyenko. — M.: GEOTAR Media, 2005.
3. *Schott, A. V.* Lectures on surgery / V. A. Schott. — Minsk: Asar, 2004. — 525 p.
4. Propaedeutics surgical pathology / A. I. Kovalev [et al.]; under Society. Ed. A. I. Kovalev, A. P. Chadaeva. — M.: Medical Book, 2006. — 640 p.
5. Lectures on surgical diseases.
6. Complications in surgery of the abdomen: A Guide for Physicians / V. V. Zhebrovsky [et al.]. — M.: Medical Information Agency, 2006. — 448 p.
7. *Zavada, N. V.* Emergency surgery of the abdominal cavity (the standards of diagnosis and treatment) / N. V. Zavada. — Minsk: BelMAPO, 2006. — 117 p.
8. *Greenberg, A. A.* Emergency abdominal surgery / A. A. Greenberg. — M., 2000. — 456 p.
9. *Vojno-Yasenetsky, V. F.* Sketches of purulent surgery / V. F. Vojno-Yasenetsky. — M. — St. Petersburg: Publishing House BINOM, Nevsky Dialect, 2000. — 704 p.
10. Ioskevich, N.N. Practical Guide to Clinical Surgery: Diseases of the digestive tract, abdominal wall and peritoneum / N.N. Ioskevich, ed. PV Garelik. — Mn.: Vysh. shk., 2001. — 685 p.
11. *Ioskevich, N.* Practical Guide to Clinical Surgery: Diseases of the chest, blood vessels, spleen, and endocrine / N. N. Ioskevich, ed. P. V. Garelik. — Mn.: Vysh. shk., 2002. — 479 p.
12. *Itala, E.* Atlas of abdominal surgery: the first from English: at 3 t. / E. Itala. — M. Med. Lit, 2007.
13. *Kolesov, V. I.* The symptoms and treatment of acute appendicitis / V. I. Kolesov. — L., 1972.
14. *Rothko, I. L.* Diagnostic and tactical mistakes in acute appendicitis / I. L. Rothko. — M., 1980.
15. *Maslov, V.* Minor surgery / V. Maslov. — M., 1988.
16. Clinical Surgery / R. Condo [et al.]; under Society. Ed. R. Kondo, L. Nayhusa; English. — M., Practice, 1998. — 716 p.
17. *Kovalev, A. I.* School emergency surgical practice / A. I. Kovalev, Y. T. Tsukanov. — M., 2004. — 911 p.
18. Lectures on surgery / V. S. Saveliev [et al.]; under Society. Ed. V. S. Saveliev. — M.: Publishing House of the «Triad-X», 2004. — 752 p.
19. *Savelyev, V. S.* Guidelines for emergency surgery of the abdomen / Ed V. S. Saveliev. — M.: Triada-X, 2005. — 640 p.
20. Guide to Surgery / S. Schwartz [ed al.]; under Society. Ed. S. Schwartz, J. Shayersa, F. Spencer; English. — St.: Petersburg Press, 1999. — 880 p.

21. *Petrov, S. V.* General Surgery / S. V. Petrov. — St.: Publishing House «Lan», 1999. — 672 p.
22. *Forrest, A. P. M.* Principles and practice of surgery / A. P. M. Forrest, D. C. Carter, J. B. Macleod. — Churchill Livingstone, 1989. — 672 p.
23. *Mann, Ch. V.* Bailey and Love's short practice of surgery / Ch. V. Mann, R. C. G. Russel. — 22-nd ed. — Chapman and Hall Medical, 1995. — 828 p.
24. *Sabiston, D. L.* Textbook of surgery. The biological basis of modern surgical practice / D. L. Sabiston. — Churchill Livingstone, 2001. — 2158 p.
25. *Skandalakis, J. E.* Surgical anatomy and technique. A pocket manual / J. E. Skandalakis, P. N. Skandalakis, L. J. Skandalakis. — Springen-Verlag, 1995. — 674 p.
26. *Stillman, R. M.* General surgery. Review and Assessment / R. M. Stillman. — 3rd ed. — Appleton and Lange, 1988. — 438 p.
27. *Way, L. W.* Current surgical diagnosis and treatment / L. W. Way. — Lange med book. — 9th Ed. — 1991.



Учебное издание

Анджум Вакар  
Призенцов Антон Александрович  
Хоха Денис Владимирович

**АТИПИЧНЫЕ ФОРМЫ  
И ОСЛОЖНЕНИЯ  
ОСТРОГО АППЕНДИЦИТА  
(на английском языке)**

**Учебно-методическое пособие  
для студентов 5 и 6 курсов  
факультета по подготовке специалистов для зарубежных стран  
медицинских вузов**

**Редактор *Т. Ф. Рулинская*  
Компьютерная верстка *С. Н. Козлович***

Подписано в печать 02.04.2013.  
Формат 60×84<sup>1</sup>/<sub>16</sub>. Бумага офсетная 65 г/м<sup>2</sup>. Гарнитура «Таймс».  
Усл. печ. л. 1,40. Уч.-изд. л. 1,53 Тираж 50 экз. Заказ № 98.

Издатель и полиграфическое исполнение  
Учреждение образования  
«Гомельский государственный медицинский университет»  
ЛИ № 02330/0549419 от 08.04.2009.  
Ул. Ланге, 5, 246000, Гомель.