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Review on Appendix and its management

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Abstract

The diagnosis of acute appendicitis is predominantly a clinical one; many patients present with a typical history and examination findings. The cause of acute appendicitis is unknown but is probably multifactorial; luminal obstruction and dietary and familial factors have all been suggested. Appendicectomy is the treatment of choice and is increasingly done as a laparoscopic procedure. This article reviews the presentation, investigation, treatment, and complications of acute appendicitis and appendicectomy.

Keywords: Appendix, Pain, Pathology, Inflamed, Laparoscopic.

1. Introduction

Appendicitis is inflammation of the appendix. Symptoms commonly include right lower abdominal pain, nausea, vomiting, and decreased appetite. However, approximately 40% of people do not have these typical symptoms. Severe complications of a ruptured appendix include widespread, painful inflammation of the inner lining of the abdominal wall and sepsis.

Appendicitis is caused by a blockage of the hollow portion of the appendix. This is most commonly due to a calcified "stone" made of feces. Inflamed lymphoid tissue from a viral infection, parasites, gallstone, or tumors may also cause the blockage. This blockage leads to increased pressures in the appendix, decreased blood flow to the tissues of the appendix, and bacterial growth inside the appendix causing inflammation. The combination of inflammation, reduced blood flow to the appendix and distention of the appendix causes tissue injury and tissue death. If this process is left untreated, the appendix may burst, releasing bacteria into the abdominal cavity, leading to severe abdominal pain and increased complications.

2. Causes

The causative agents include bezoars, foreign bodies, trauma, intestinal worms, lymphadenitis and, most commonly, calcified fecal deposits that are known as appendicoliths or fecaliths.The occurrence of obstructing fecaliths has attracted attention since their presence in people with appendicitis is higher in developed than in developing countries.In addition an appendiceal fecalith is commonly associated with complicated appendicitis. Fecal stasis and arrest may play a role, as demonstrated by people with acute appendicitis having fewer bowel movements per week compared with healthy controls.

The occurrence of a fecalith in the appendix was thought to be attributed to a right-sided fecal retention reservoir in the colon and a prolonged transit time. However, a prolonged transit time was not observed in subsequent studies.From epidemiological data, it has been stated that diverticular disease and adenomatous polyps were unknown and colon cancer exceedingly rare in communities exempt from appendicitis. And acute appendicitis has been shown to occur antecedent to

cancer in the colon and rectum. Several studies offer evidence that a low fiber intake is involved in the pathogenesis of appendicitis. This low intake of dietary fiber is in accordance with the occurrence of a right-sided fecal reservoir and the fact that dietary fiber reduces transit time.

Pathology

Acute appendicitis seems to be the end result of a primary obstruction of the appendix. Once this obstruction occurs, the appendix becomes filled with mucus and swells. This continued production of mucus leads to increased pressures within the lumen and the walls of the appendix. The increased pressure results in thrombosis and occlusion of the small vessels, and stasis of lymphatic flow.

At this point spontaneous recovery rarely occurs. As the occlusion of blood vessels progresses, the appendix becomes ischemic and then necrotic. As bacteria begin to leak out through the dying walls, pus forms within and around the appendix (suppuration). The end result is appendiceal rupture (a 'burst appendix') causing peritonitis, which may lead to sepsis and eventually death. These events are responsible for the slowly evolving abdominal pain and other commonly associated symptoms.

Signs and symptoms

The presentation of acute appendicitis includes abdominal pain, nausea, vomiting, and fever. As the appendix becomes more swollen and inflamed, it begins to irritate the adjoining abdominal wall. This leads to the localization of the pain to the right lower quadrant. This classic migration of pain may not be seen in children under three years. This pain can be elicited through signs and can be severe. Signs include localized findings in the right iliac fossa.

The abdominal wall becomes very sensitive to gentle pressure (palpation). There is severe pain on sudden release of deep pressure in the lower abdomen (rebound tenderness). If the appendix is retrocecal (localized behind the cecum), even deep pressure in the right lower quadrant may fail to elicit tenderness (silent appendix).

This is because the cecum, distended with gas, protects the inflamed appendix from pressure. Similarly, if the appendix lies entirely within the pelvis, there is usually complete absence of abdominal rigidity. In such cases, a digital rectal examination elicits tenderness in the rectovesical pouch. Coughing causes point tenderness in this area (McBurney's point).

Some signs to determine Appendix

- Rovsing's sign: Pain in the lower right abdominal quadrant with continuous deep palpation starting from the left iliac fossa upwards (counterclockwise along the colon). The thought is there will be increased pressure around the appendix by pushing bowel contents and air toward the ileocaecal valve provoking right-sided abdominal pain
- Hamburger sign: The patient refuses to eat (anorexia is 80% specific for appendicitis)
- Kocher's (Kosher's) sign: From the person's medical history, the start of pain in the umbilical region with a subsequent shift to the right iliac region.
- Dunphy's sign: Increased pain in the right lower quadrant with coughing.
- Sitkovskiy (Rosenstein)'s sign: Increased pain in the right iliac region as the person is being examined lies on his/her left side.

3. Diagnostic Methods

The diagnosis of appendicitis is largely based on the person's signs and symptoms. The two most common imaging tests used are an ultrasound and computed tomography (CT scan). CT scan has been shown to be more accurate than ultrasound in detecting acute appendicitis. However, ultrasound may be preferred as the first imaging test in children and pregnant women because of the risks associated with radiation exposure from CT scans.

The standard treatment for acute appendicitis is surgical removal of the appendix. This may be done by an open incision in the abdomen (laparotomy) or through a few smaller incisions with the help of cameras (laparoscopy). Surgery decreases the risk of side effects or death associated with rupture of the appendix. Antibiotics may be equally effective in certain cases of non-ruptured appendicitis.

Scoring systems

Alvarado score	
Migratory right iliac fossa pain	1 point
Anorexia	1 point
Nausea and vomiting	1 point
Right iliac fossa tenderness	2 points
Rebound abdominal tenderness	1 point
Fever	1 point
High white blood cell count (leukocytosis)	2 points
Shift to left (segmented neutrophils)	1 point
Total score	**10 Points**

No excellent scoring system exists to determine if a child has appendicitis. The Alvarado score and pediatric appendicitis score are useful but not definitive.

The Alvarado score is the most widely used scoring system. A score below 5 suggests against a diagnosis of appendicitis, whereas a score of 7 or more is predictive of acute appendicitis. In a person with an equivocal score of 5 or 6, a CT scan or ultrasound exam may be used to reduce the rate of negative appendectomy.

Investigations

While there is no laboratory test specific for appendicitis, a complete blood count (CBC) is done to check for signs of infection. A urinalysis generally does not show infection, but it is important for determining pregnancy status, especially the possibility of an ectopic pregnancy in women of childbearing age. The urinalysis is also important for ruling out a urinary tract infection as the cause of abdominal pain.

Differential diagnosis

Children: Gastroenteritis, mesenteric adenitis, 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.

Women: A pregnancy test is important for all women of childbearing age since an ectopic pregnancy can have signs and symptoms similar to those of appendicitis. Other obstetrical/gynecological causes of similar abdominal pain in women include pelvic inflammatory disease, ovarian torsion, menarche, dysmenorrhea, endometriosis, and Mittelschmerz (the passing of an egg in the ovaries approximately two weeks before menstruation)

Men: Testicular Torsion

Adults: new-onset Crohn's disease, ulcerative colitis, regional enteritis, renal colic, perforated peptic ulcer, pancreatitis, rectus sheath hematoma and epiploic appendagitis.

Elderly: diverticulitis, intestinal obstruction, colonic carcinoma, mesenteric ischemia, leaking aortic aneurysm.

The term "pseudoappendicitis" is used to describe a condition mimicking appendicitis. It can be associated with Yersinia enterocolitica

4. Management

Acute appendicitis is typically managed by surgery. However, in uncomplicated cases, antibiotics are effective and safe. While antibiotics are effective for treating uncomplicated appendicitis, 26% of people had a recurrence within a year and required eventual appendectomy.

In people with inflammatory bowel disease such as Crohn's disease or ulcerative colitis who present with appendicitis, surgical intervention is contraindicated, as the normal healing response following surgery is impaired by the underlying disease process, and the patients form non-healing fistulas, sinus tracts and enteric leakage.

In such scenarios, the underlying disease process must be treated medically with DMARDs, as opposed to surgically.

Pain

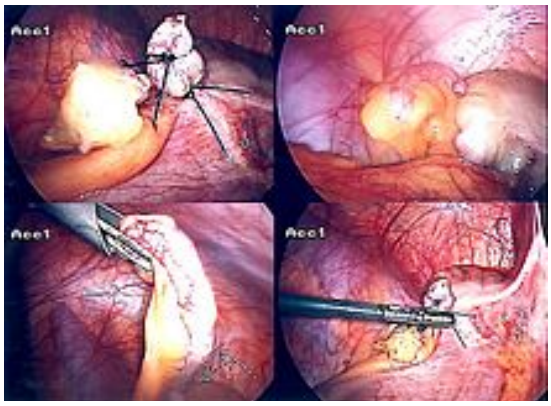
Pain medications (such as morphine) do not appear to affect the accuracy of the clinical diagnosis of appendicitis and therefore should be given early in the patient's care.

Historically there were concerns among some general surgeons that analgesics would affect the clinical exam in children, and some recommended that they not be given until the surgeon was able to examine the person.

Surgery

1. Inflamed appendix removal by open surgery

2. Laparoscopic appendectomy.



Appendectomy

The surgical procedure for the removal of the appendix is called an appendectomy. Appendectomy can be performed through open or laparoscopic surgery. Laparoscopic appendectomy has several advantages over open appendectomy as an intervention for acute appendicitis

Open appendectomy

During an open appendectomy, the person with suspected appendicitis is placed under general anesthesia to keep the muscles completely relaxed and to keep the person unconscious. The incision is two to three inches (76 mm) long and it is made in the right lower abdomen, several inches above the hip bone.

Once the incision opens the abdomen cavity and the appendix is identified, the surgeon removes the infected tissue and cuts the appendix from the surrounding tissue. After careful and close inspection of the infected area, and ensuring there are no signs that surrounding tissues are damaged or infected, the surgeon will start closing the incision. This means sewing the muscles and using surgical staples or stitches to close the skin up. To prevent infections, the incision is covered with a sterile bandage.

Laparoscopic appendectomy

Laparoscopic appendectomy has become an increasingly prevalent intervention for acute appendicitis since its introduction in 1983.[1]This surgical procedure consists of making three to four incisions in the abdomen, each 0.25 to 0.5 inches (6.4 to 12.7 mm) long. This type of appendectomy is made by inserting a special surgical tool called laparoscope into one of the incisions. The laparoscope is connected to a monitor outside the person's body and it is designed to help the surgeon to inspect the infected area in the abdomen.

The other two incisions are made for the specific removal of the appendix by using surgical instruments. Laparoscopic surgery requires general anesthesia, and it can last up to two hours. Laparoscopic appendectomy has several advantages over open appendectomy, including a shorter post-operative recovery, less post-operative pain, and lower superficial

surgical site infection rate. However, the occurrence of intra-abdominal abscess is almost three times more prevalent in laparoscopic appendectomy than open appendectomy.

Prognosis

Most people with appendicitis recover easily after surgical treatment, but complications can occur if treatment is delayed or if peritonitis occurs. Recovery time depends on age, condition, complications, and other circumstances, including the amount of alcohol consumption, but usually is between 10 and 28 days. For young children (around 10 years old), the recovery takes three weeks.

The possibility of peritonitis is the reason why acute appendicitis warrants speedy evaluation and treatment. People with suspected appendicitis may have to undergo a medical evacuation. Mortality and severe complications are unusual but do occur, especially if peritonitis persists and is untreated.

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