

Review of evidence in confirmative diagnosis of appendicitis and complication management

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Abstract:

Acute appendicitis is one of the most common causes of acute abdominal pain, the most common condition that requires abdominal surgery. Our aim is discussing about diagnosis types, to highlight the complications and the management. We performed a search using electronic databases; MEDLINE, science-direct, and EMBASE, through October, 2017. Appendicitis is one of the most typical intra-abdominal illnesses encountered, the option to which is a fairly basic operation. Nevertheless, the medical diagnosis is usually difficult and also the choice to operate, observe or additional work-up a patient is usually uncertain. While CT is one of the most precise setting of imaging in suspected appendicitis. Ultrasound might assist in the medical diagnosis while reducing the requirement for CT in specific situations. Early medical diagnosis of appendicitis guarantees prompt therapy and also avoids difficulties. Since abdominal pain is an usual providing sign in outpatient care, family doctor serve an essential function in the diagnosis of appendicitis. Obvious cases of appendicitis need immediate referral, while equivocal situations require additional assessment and, often times, surgical assessment.

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Introduction:

Acute appendicitis takes place when the appendiceal lumen is obstructed, resulting in liquid collection, luminal enlargement, inflammation, and also, lastly, perforation [1], [2]. Traditional signs of appendicitis are well defined [3]. Nonetheless, approximately one third of patients with acute appendicitis have irregular presentations [4]. Additionally, patients with alternate stomach problems might present with medical findings indistinguishable from acute appendicitis [5]. Hence, although appendicitis commonly has actually been a medical diagnosis, several patients are discovered to have healthy appendixes at surgical treatment. The misdiagnosis of this acute problem has actually resulted in the unsuitable elimination of a normal appendix in 8 - 30% of patients [6]. A rate of unneeded elimination as high as 20% has actually been considered appropriate in the surgical treatment literature [7]. Nonetheless, negative laparotomy can be prevented in lots of patients if contemporary analysis techniques are applied to verify or exclude acute appendicitis.

As a matter of fact, appendectomy is one of the most usual non-elective operation done by general surgeons [8], [9]. Although it has actually more than 115 years because Reginald Heber Fitz initially showed the natural history and also pathophysiology of appendicitis and supported very early appendectomy in his landmark article [10] appendicitis continuously existing difficulties for the surgeon today.

There has actually been a dramatic decrease in the death rate associated with acute appendicitis over the past 50 years from virtually 26% to less than 1% [11]. Nevertheless, the morbidity rate, which has actually greatly affected healthcare expenses, has not experienced a comparable decrease [12]. Recognizing danger aspects that predict the probability of complications related to appendicitis is an important action in taking care of these patients [13]. This has actually generally been completed via retrospective testimonials, which are frequently flawed. Limitations of retrospective evaluations consist of irregular information celebration methods and also non-uniform meanings for the difficulties under examination. Likewise, such evaluations usually stand for the experience of a restricted variety of specialists at a solitary organization.

Acute appendicitis is one of the most common causes of acute abdominal pain, the most common condition that requires abdominal surgery. Our aim is discussing about diagnosis types, to highlight the complications and the management.

Methodology:

We performed a search using electronic databases; MEDLINE, science-direct, and EMBASE, through October, 2017. Search strategies used following MeSH terms in searching: “Acute appendicitis”, “appendectomy”, “surgical”, “diagnosis”, “management”. Moreover, we restricted our search to only English language studies published with human subjects.

Discussion:

Pathogenesis

The appendix is a long diverticulum that prolongs from the substandard tip of the cecum [14]. Its lining is interspersed with lymphoid follicles [15]. A lot of the moment, the appendix has an intraperitoneal location (either anterior or retrocecal) and also, therefore, might be found in contact with the anterior parietal peritoneum when it is inflamed. Approximately 30 percent of the moment, the appendix could be "concealed" from the anterior peritoneum by remaining in a pelvic, retroileal or retrocolic (retroperitoneal retrocecal) setting [16]. The "hidden" location of the appendix especially changes the medical manifestations of appendicitis.

Blockage of the narrow appendiceal lumen starts the medical disease of acute appendicitis. Blockage has numerous reasons, consisting of lymphoid hyperplasia (pertaining to viral diseases, consisting of upper respiratory infection, mononucleosis, gastroenteritis), fecaliths, parasites, foreign bodies, Crohn's illness, primary or metastatic cancer and also carcinoid syndrome. Lymphoid hyperplasia is much more typical in kids and also young people, representing the raised occurrence of appendicitis in these age groups [14].

TABLE 1. Common Symptoms of Appendicitis [14], [15].

| COMMON SYMPTOMS* | FREQUENCY (%) |
|------------------|---------------|
| Abdominal pain | ~100 |
| Anorexia | ~100 |
| Nausea | 90 |
| Vomiting | 75 |
| Pain migration | 50 |

| | |
|---|----|
| Classic symptom sequence (vague periumbilical pain to anorexia/nausea/unsustained vomiting to migration of pain to right lower quadrant to low-grade fever) | 50 |
|---|----|

Abdominal discomfort is one of the most usual signs and symptom of appendicitis [15]. In numerous researches [14], [15] details features of the abdominal discomfort and also various other connected signs have confirmed to be reliable indications of acute appendicitis (Table 1). An extensive evaluation of the background of the abdominal discomfort and also of the patient's current genitourinary, gynecologic and lung background needs to be obtained. Anorexia, nausea and throwing up are signs that are typically connected with acute appendicitis. The timeless background of pain start in the periumbilical area and also moving to the right reduced quadrant takes place in just 50 percent of patients. Period of signs surpassing 24 to 36 hrs is unusual in nonperforated appendicitis.

· **Laboratory and Radiologic Evaluation**

If the patient's history and the health examination do not clear up the medical diagnosis, lab and also radiologic examinations could be useful. A clear medical diagnosis of appendicitis prevents the requirement for more screening as well as ought to prompt instant medical reference.

Laboratory test

The leukocyte (WBC) matter rises (higher than 10,000 each mm³ [100 × 10⁹ each L] in 80 percent of all situations of acute appendicitis [17]. Sadly, the WBC rises in as much as 70 percent of patients with various other root causes of right reduced quadrant discomfort [18]. Therefore, a raised WBC has a reduced anticipating worth. Serial WBC dimensions (over 4 to 8 hrs) in presumed instances might boost the uniqueness, as the WBC matter typically raises in acute appendicitis (other than in cases of perforation, where it might originally drop) [14].

Furthermore, 95 percent of patients have neutrophilia¹ and, in the senior, a raised band matter higher than 6 percent has actually been revealed to have a high anticipating worth of appendicitis [17]. As a whole, nevertheless, the WBC matter and also differential is just reasonably valuable in validating the medical diagnosis of appendicitis due to their reduced uniqueness.

A more recently recommended clinical analysis is the decision of the C-reactive protein level. A raised C-reactive protein level (higher than 0.8 mg each dL) prevails in appendicitis, however, researches differ on its level of sensitivity and also uniqueness. A raised C-reactive protein degree in the mix with a raised WBC matter as well as neutrophilia are very delicate (97 to 100 percent). For that reason, if all 3 of these searchings for are missing, the opportunity of appendicitis is reduced [14].

In patients with appendicitis, a urinalysis could show modifications such as mild pyuria, proteinuria and also hematuria, however, the examination offers even more to exclude urinary system reasons for abdominal discomfort than to diagnose appendicitis.

Radiological evaluation

The alternatives for radiologic examination of patients with presumed appendicitis have actually increased over the last few years, improving and in some cases changing formerly applied radiologic researches.

Simple radiographs, while frequently exposing irregularities in acute appendicitis, do not have uniqueness and are more useful in identifying various other reasons for abdominal pain. Similarly, barium enema is currently utilized occasionally as a result of the developments in abdominal imaging [14].

Ultrasonography and computed tomographic (CT) scans are useful in assessing patients with presumed appendicitis [19]. Ultrasonography is appropriate in patients where the medical diagnosis

is ambiguous by background and also physical exam. It is specifically well matched in examining right reduced quadrant or pelvic discomfort in pediatric as well as women patients. A typical appendix (6 mm or much less in size) have to be recognized to eliminate appendicitis. An inflamed appendix generally determines higher than 6 mm in size, is noncompressible as well as tender with focal compression. Various other right lower quadrant problems such as inflammatory bowel illness, cecal diverticulitis, Meckel's diverticulum, endometriosis as well as pelvic inflammatory illness could trigger false-positive ultrasonography outcomes.

CT, particularly the method of appendiceal CT, is more precise than ultrasonography (Table 2). Appendiceal CT contains a concentrated, helical, appendiceal CT after a Gastrografen-saline enema (with or without oral comparison) and also can be done and also analyzed within one hr. Intravenous comparison is unneeded [20]. The precision of CT schedules partially to its capability to determine a regular appendix better compared to ultrasonography. An inflamed appendix is higher than 6 mm in size, yet the CT additionally shows periappendiceal inflammatory modifications [21]. If appendiceal CT is not available, common abdominal/pelvic CT with comparison stays very helpful and also might be more precise compared to ultrasonography [20].

TABLE 2. Comparison of Ultrasound and Appendiceal CT Evaluation of Suspected Appendicitis [19], [22].

| | <i>COMPARISON ULTRASOUND</i> | <i>GRADED APPENDICEAL TOMOGRAPHIC SCAN</i> |
|-------------|--|--|
| Sensitivity | 85% | 90 to 100% |
| Specificity | 92% | 95 to 97% |
| Use | Evaluate patients with equivocal diagnosis of appendicitis | Evaluate patients with equivocal diagnosis of appendicitis |
| Advantages | Safe | More accurate |

| | | |
|---------------|---|--|
| | Relatively inexpensive | Better identifies phlegmon and abscess |
| | Can rule out pelvic disease in females | Better identifies normal appendix |
| | Better for children | |
| Disadvantages | Operator dependent | Cost |
| | Technically inadequate studies due to gas | Ionizing radiation |
| | Pain | Contrast |

• Treatment

The requirement for management of nonperforated appendicitis stays appendectomy. Since timely therapy of appendicitis is necessary in avoiding more morbidity and also death, a margin of mistake in over-diagnosis serves. Presently, the nationwide rate of adverse appendectomies is around 20 percent [23]. Some research studies have actually explored nonoperative management with parenteral antibiotic therapy, however 40 percent of these patients ultimately called for appendectomy [15].

Appendectomy could be done by laparotomy (normally with a restricted right lower quadrant laceration) or laparoscopy. Diagnostic laparoscopy might be useful in ambiguous situations or in females of childbearing age, while restorative laparoscopy might be chosen in particular subsets of patients (e.g., females, overweight patients, professional athletes) [24].

While laparoscopic treatment has the advantages of reduced postoperative pain, earlier go back to regular activity and also much better aesthetic outcomes, its disadvantages consist of higher price

and also longer surgical time. Open up appendectomy might stay the primary method to therapy up until more price and also advantage evaluations are performed.

· **Complications**

Perforation

If appendicitis is permitted to advance, sections of the appendiceal wall ultimately come to be ischemic or lethal [25] and also the appendix perforates. On CT, perforation is recommended by the visibility of local periappendiceal inflammation, although this is a nonspecific result. Remarkably, visualization of appendicoliths on CT raises the possibility of appendiceal perforation [25], [26], potentially since appendicoliths speed up the rate at which perforation happens. Hence, the existence of several appendicoliths in association with periappendiceal inflammation is basically analysis of perforation [27]. Also in the lack of periappendiceal modifications, a CT result of a thick appendix and also several appendicoliths is suspicious for perforation or approaching perforation. In a retrospective research, Horrow et al. [28] revealed that a devoted look for 5 particular CT results-extraluminal air, extraluminal appendicolith, abscess, phlegmon, and also a problem in the boosting appendiceal wall surface-- permits great level of sensitivity (95%) and also uniqueness (95%) for perforation in patients with well-known appendicitis that went through preoperative CT. Because research, the specific searching for with highest possible level of sensitivity was a mural improvement flaw (64%).

Periappendiceal Abscess

The abscess is one of the most regular difficulties of perforation. The abscess stays local if periappendiceal fibrinous attachments create prior to tear. CT reveals a loculated, rim-enhancing liquid collection that could have mass result on nearby bowel loopholes [29]. If the abscess is big (> 4 centimeters), percutaneous drainage complied with by postponed appendectomy is the

recommended therapy [30]. A periappendiceal abscess could be dealt with promptly by surgical treatment or by nonoperative management. Nonoperative management contains parenteral prescription antibiotics with monitoring or CT-guided drainage, complied with by interval appendectomy 6 weeks to 3 months later on.

Peritonitis

Bacterial peritonitis, a harmful difficulty, results from very early appendiceal tear prior to development of inflammatory adhesions. This complication is more usual in kids since development to perforation has the tendency to be fast [30]. CT and sonography reveal interloop liquid and free-fluid monitoring along the peritoneal representations, occasionally much from the appendix. Usual areas are the pelvis; the paracolic gutters; and also the subhepatic, subphrenic, and hepatorenal areas. Liquid in the smaller cavity recommends various other medical diagnoses, such as pancreatitis or perforated peptic ulcer. Contrast-enhanced CT aids distinguish bacterial peritonitis from ascites by revealing improvement and also enlarging of peritoneal representations, inflammatory modifications in the mesentery and omentum, engorgement of local mesenteric vessels, and also hyperemic modifications in adjoining bowel sections.

Bowel Obstruction

Unusually, patients with acute appendicitis existing with mechanical blockage, most likely additional to entrapment of the distal ileum in a periappendiceal inflammatory mass. More frequently, small-bowel blockage is a late difficulty of appendectomy and also is triggered by postoperative fibrous adhesions in the peritoneal cavity.

Septic Seeding of Mesenteric Vessels

Appendicitis can be complexed by pylephlebitis, pylethrombosis, or hepatic abscess triggered by rising infection along the draining mesenteric-portal venous system. Sometimes, patients with

cryptogenic portal hypertension because of pylethrombosis have a current or remote background of appendicitis

Gangrenous Appendicitis

Gangrenous appendicitis is the outcome of intramural and arterial thromboses. CT results consist of pneumatosis, shaggy appendiceal wall surface, and also irregular places of mural nonperfusion.

· Special Considerations

While appendicitis is unusual in kids, it postures unique problems in this age group. Kids are incapable to associate a background, usually have abdominal discomfort from various other reasons and also might have more nonspecific symptoms and signs. These aspects add to a perforation rate as high as 50 percent in this team [31].

In maternity, the area of the appendix starts to move considerably by the 4th to 5th months of pregnancy. Usual signs of maternity could imitate appendicitis, and also the leukocytosis of maternity makes the WBC matter much less helpful. While the mother's death rate is reduced, the general fetal death rate is 2 to 8.5 percent, rising to as high as 35 percent in perforation with generalised peritonitis. As in nonpregnant patients, appendectomy is the standard for therapy [15].

Elderly patients have the greatest death rates. The typical symptoms and signs of appendicitis might be decreased, irregular or lacking in the elderly, which results in a greater rate of perforation. Much more constant perforation integrated with a greater occurrence of various other clinical troubles and also much less book to eliminate infection add to a death rate of as much as 5 percent or even more [31].

Conclusion:

Appendicitis is one of the most typical intra-abdominal illnesses encountered, the option to which is a fairly basic operation. Nevertheless, the medical diagnosis is usually difficult and also the choice to operate, observe or additional work-up a patient is usually uncertain. While CT is one of the most precise setting of imaging in suspected appendicitis. Ultrasound might assist in the medical diagnosis while reducing the requirement for CT in specific situations. Early medical diagnosis of appendicitis guarantees prompt therapy and also avoids difficulties. Since abdominal pain is an usual providing sign in outpatient care, family doctor serve an essential function in the diagnosis of appendicitis. Obvious cases of appendicitis need immediate referral, while equivocal situations require additional assessment and, often times, surgical assessment.

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