



Efficient Diagnosis and Management of Acute Appendicitis

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ABSTRACT

Appendicitis is a transmural inflammatory process and acute inflammation of appendix in adults and children with a lifetime risk of 8.6% in males and 6.7% in females. Abdominal rigidity, right lower quadrant pain and periumbilical pain radiating to the right lower quadrant are the best signs for acute appendicitis in adults. Appendectomy for acute appendicitis is an effective, universally accepted procedure the non-operative management of appendicitis remains largely unexplored. Alvarado scoring system (MANTRELS criteria) is a clinical scoring system used in diagnosis of appendicitis. The score has six clinical items and two laboratory measurements with total ten points. A clinical classification is used to stratify management based on non-perforated and perforated inflammation. Perforated appendicitis has significantly higher rates of morbidity and mortality. Ultrasound and CTscans are the most widely used imaging techniques. Intravenous antibiotics may be considered as first line therapy in selected patients. Pain control with opioids, NSAIDs and acetaminophen should be a priority and does not result in unnecessary intervention. Prolonged duration of symptoms before surgical intervention raises the risk.

Keywords: Appendicitis, appendectomy, diagnosis, pain management, antibiotic therapy.

INTRODUCTION

Appendicitis is a transmural inflammatory process and acute inflammation of appendix in adults and children with a lifetime risk of 8.6% in males and 6.7% in females¹. Appendicitis is thought to be caused by luminal obstruction from various etiology, leading to increased mucus production and bacterial overgrowth, resulting in wall tension and eventually, necrosis and potential perforation². It is the inflammation of vermiform appendix. This is the hollow organ located at the tip of cecum, usually in the right lower quadrant of the abdomen³. Several diagnostic scoring systems for acute appendicitis have been described⁴.

The most commonly used methods are the Alvarado score and appendicitis inflammatory response score both these methods increase the diagnostic accuracy⁵. CT is the more accurate for detecting inflammation of appendix especially in obese patient⁶. Ultrasound is useful to confirm appendicitis, particularly in patient with limited abdominal fat⁷. Laparoscopic appendectomy is the current "state of the art", used in up to 86%. Open appendectomy is safe and effective, showing higher rates in negative appendectomy and limitations in abdominal exploration⁸. Most treatment protocols include an initial course of intravenous antibiotics for 1-3 days followed by oral antibiotics for 7 days⁹. Approximately 90% of patients treated with antibiotics are able to avoid surgery during the initial admission¹⁰. The other 10% that fail to respond to antibiotics require a rescue appendectomy¹¹.

Objective

This review literature is a detailed study of appendicitis including their efficient diagnosis, treatment, pain management and prescribing pattern of antibiotics in appendicitis.

Epidemiology

Appendicitis is most frequently seen in the second decade of life and occurs slightly more often in males than in females^{12,13}. The rate of non-perforated appendicitis is much higher in men than in women¹³. In neonates and infants appendicitis is rare¹⁴. The overall lifetime risk of developing acute appendicitis is 8.6% for males and 6.7% for females; Life time risk of appendectomy is around 12% in males and 23% in females^{15,16}.

Clinical Evaluation

Diagnosing acute appendicitis accurately and efficiently can reduce morbidity and mortality from perforation and other complications. The presence of signs and symptoms may help to rule in a diagnosis of appendicitis, but the absence of clinical findings often does not exclude its possibilities¹⁷. The signs and symptoms that best rule in acute appendicitis in adults are right lower quadrant pain, abdominal rigidity, and radiation of periumbilical pain to the right lower quadrant¹⁸. In children, absent or decreased bowel sounds, a positive psoas sign, positive obturator sign and positive Rovsing sign are most reliable for ruling in acute appendicitis.¹⁹

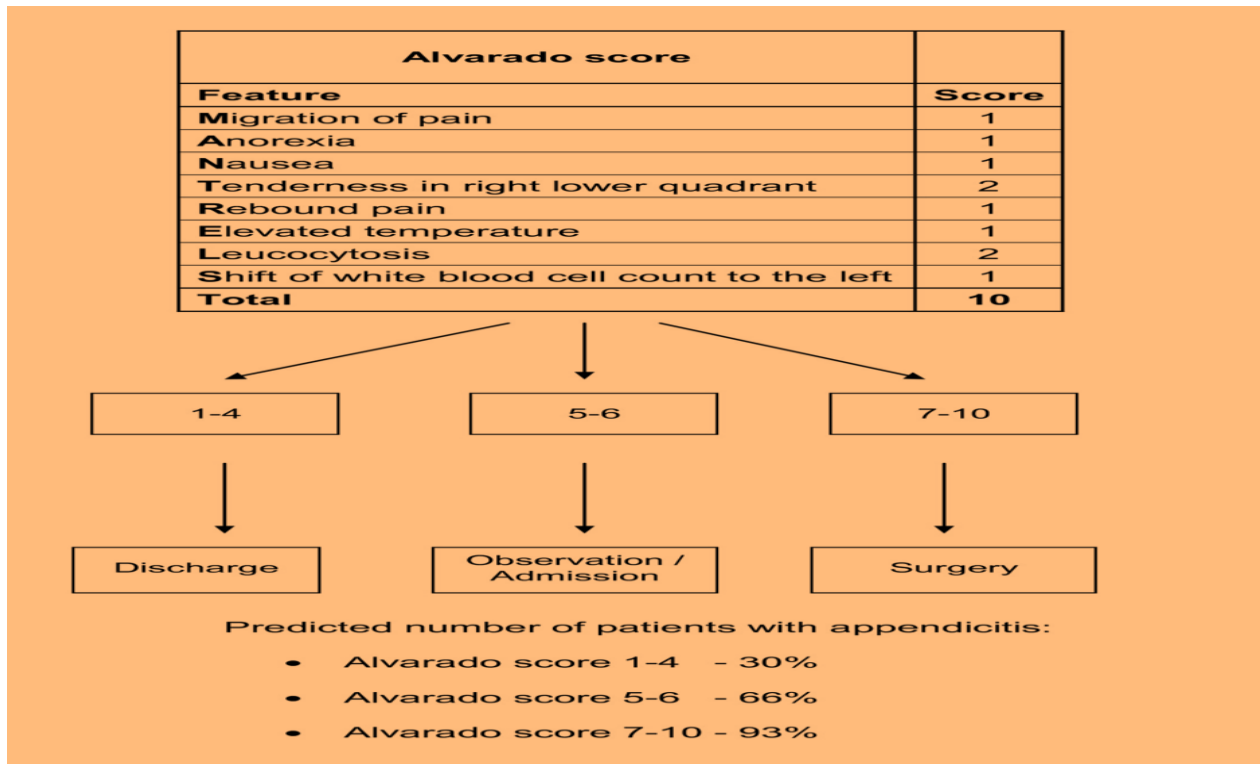
Alvarado scoring system (MANTRELS criteria) is a clinical scoring system used in diagnosis of appendicitis. The score has six clinical items and two laboratory measurements



with total ten points, based on signs, symptoms and diagnostic test in patient with suspected acute appendicitis (Table 1). The Alvarado score enables risk stratification in patients presenting with abdominal pain,

linking the probability of appendicitis to recommendations' regarding discharge, observation or surgical intervention²⁰.

Table 1: Probability of appendicitis by the Alvarado score 20 risk strata and subsequent clinical management strategy



Laboratory Testing

Patient history and physical exam findings, certain laboratory and imaging studies can be useful in conforming the diagnosis of appendicitis. A WBC count with differential is helpful in both diagnosis and exclusion of appendicitis. Appendicitis often leads to moderate leucocytosis with neutrophilia²¹. A C-reactive protein (CRP) level was much greater in patients with ruptured appendicitis compared with that in patients with normal appendix²². Abnormal laboratory findings cannot reliably deliver a diagnosis of acute appendicitis²³.

Imaging Technique

Ultrasonography, computed tomography and magnetic resonance imaging are options for the evaluation of patients with suspected acute appendicitis. Positive results on CT or ultrasound that is, inflammation and distension of the appendix or free fluid in the abdomen are associated with confirmed appendicitis more than 90% of the time¹³. Overweight or obese patient more likely to undergo CT initially because ultrasonography is more likely to be non diagnostic in these groups^{24,25}. Additionally the cost, availability, length of the test and radiation exposure associated with CT has raised concern about this imaging choice. Ultrasound is useful to confirm appendicitis,

particularly in patients with limited abdominal fat, but it has limitations in ruling out the conditions⁷.

These include its operator-dependent nature, limited availability to allow visualisation of the appendix in obese patients and lack of sensitivity in cases in which the appendix is perforated²⁶. Imaging studies can be helpful when differentiating between complicated versus uncomplicated appendicitis and ruling out other cause of the acute appendicitis. Alternatively, observation is essential until the diagnosis becomes clearer or laparoscopic surgeries have been used to evaluate the acute abdomen²⁷.

In atypical cases ultrasonography and CT may help lower the rate of false-negative appendicitis diagnosis, reduce morbidity from perforation, and lower hospital expense, the accuracy rate of CT scan is 93%-98%²⁸.

MANAGEMENT

Antibiotic therapy

Antibiotic therapy may be considered a first line and possibly sole therapy in selected patients with uncomplicated appendicitis.

Selected Antibiotics and Dosage for Surgical Prophylaxis and Antibiotic Therapy of Complicated Appendicitis ⁶²⁻⁶⁵			
	Medication	Pediatric dosing	Adult dosing
Prophylaxis	Cefoxitin	20 – 40 mg/kg	1 – 2 g IV
	Cefotetan	—	1 – 2 g IV
	Cefotaxime	25 – 50 mg/kg	—
	Ampicillin/sulbactam	—	3 g IV
Penicillin-allergic:	Metronidazole	10 mg/kg/d	500 mg IV
	plus gentamicin	2 mg/kg/d	2 mg/kg
Treatment	Piperacillin/tazobactam	200 – 300 mg/kg/d divided for administration every 6 – 8 h	3.375 g/6 h
	Ceftriaxone	50 – 75 mg/kg/d, divided for administration every 12 – 24 h	1 – 2 g/12 to 24 h
	plus metronidazole	30 – 40 mg/kg/d, divided for administration every 8 h	500 mg/8 to 12 h or 1500 mg/24 h
	Penicillin-allergic:	Metronidazole	30 – 40 mg/kg/d, divided for administration every 8 h
	plus gentamicin	3 – 7.5 mg/kg/d, divided for administration every 2 – 4 h	5 – 7 mg/kg/24 h

(Table 2)

Sources: Bucher et al. *Curr Opin Pediatr.* 2011³⁰; American Society of Health-Systems Pharmacists. *Am J Health Syst Pharm.* 1999³¹; *Treat Guidel Med Lett.* 2009³²; Solomkin et al. *Clin Infect Dis.* 2010.³³

Antibiotic treatment resulted in a decreased the rate of complication, disability and less need for pain medication. The first dose should be given within 60minutes before the incision is made to achieve adequate antibiotic serum and tissue levels. The antibiotic should be discontinued 24 hours after the surgery has been completed^{29,30}. After intravenous antibiotic therapy, an interval appendectomy can be performed 4-6week later. In patient with uncomplicated appendicitis, the antibiotic of choice should be effective against the gram negative- bacilli³⁰. A single dose of ceftazidime, cefotetan, cefotaxime or ampicillin is typically prescribed to prevent post surgical site infection in patient with uncomplicated appendicitis (Table 2)^{31,32}. For betalactom allergic patients, an alternative antibiotic regimen is metronidazole with an aminoglycoside³³.

Surgery

Laparoscopic appendectomy is more widely used than open appendectomy. Appendectomy, the inflamed appendix is surgically removed. The traditional surgical approach involves a small incision in the right lower abdominal wall³⁴. Laparoscopic appendectomy requires three very small incisions. The surgeon then introduces a camera and some instruments in to the abdomen and removes the appendix as in the convectional operation³⁵. Compared with open appendectomy, laparoscopic appendectomy resulted in lower risk of wound infection, fewer post operative complication, shorter length of stay, and a faster return to activity, but a longer operation time³⁶.

Pain management

The post operative study showed that the use of opioids did not significantly increase the risk of delayed or unnecessary surgery in children and adults with acute abdominal pain³⁷. NSAIDs and acetaminophen should be considered for pain management in patients with suspected acute appendicitis, especially in those with contraindications to opioids³⁸.

Complication

Perforation is the most concerning complication of acute appendicitis may lead to abscesses, peritonitis, bowel obstructions, fertility issues and sepsis³⁹. Appendiceal perforation was more common in male patients⁴⁰. Surgical site infection, wound dehiscence and pelvic abscess where the most common complication⁴¹. The incidence of perforated appendicitis is higher in the extreme of ages⁴². Perforation rates among adults ranges from 17%-32%³⁹. A prospective observational study show that 6% of children with perforated appendicitis where treated with antibiotics for suspected sepsis, even after surgery⁴³. Based on the study risk factors for perforation includes fever vomiting, longer duration of symptoms, elevated WBC count⁴⁰.

Post-Operative Care

The severity of the patients pains needs to be assessed with the use of pain scale. Appropriate pain relief can then be administered. In most cases the patient will be discharged when their temperature is normal and their bowels have started to function again. Adequate pain control, advancement of diet and monitoring for development of complication constitute typical postoperative care.

CONCLUSION

Appendicitis that is prevalent in the developed world and have minimal complications. The diagnosis of appendicitis has been based on clinical finding, diagnostic imaging. cause by reducing the delay in diagnosis of appendicitis and its associated. The standard of care is appendectomy; there for a surgical consult is needed. Recent evidence suggests that a non-surgical, antibiotic approach in the treat of uncomplicated appendicitis may be beneficial.

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