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A REVIEW ON APPENDICITIS: A SURGICAL EMERGENCY

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ABSTRACT

Appendicitis is an inflammation of the appendix. Appendicitis is treated conservatively or surgically. It may be affected due to bacterial infections, foreign body; obstruction of luminal wall etc. there is no single specific test for the diagnosis of appendicitis. Correct diagnosis is essential because, abdominal pain can also be due to gastroenteritis, cholecystitis, pneumonia, urinary tract infection (UTI), mesenteric adenitis, inflammatory bowel disease, ovarian cyst and hernia. A delay in diagnosis and treatment, may lead to complication, increases morbidity, length of hospital stay, and cost. Different types of antimicrobial agents (AMA) are used for its management. If AMAs are not used properly it will lead to antibiotic resistance. This article reveals the clinical presentations, different diagnostic methods and antimicrobial therapy of appendicitis.

KEYWORDS: Appendicitis, Antimicrobial agents, Appendectomy, Diagnosis.

INTRODUCTION

Appendicitis is inflammation of appendix, most likely due to obstruction of the lumen of the appendix. It is treated either conservatively or surgically. Inflammation leads to perforation associated with increased mortality or morbidity. Luminal obstruction is caused due to parasites, malignancy, and foreign body, and fibrosis, lymphoid hyperplasia, resulting from bacterial or viral infection. In some patients reason for the inflammation is unknown. Fecalith alone causes simple appendicitis in 40% cases, gangrenous non perforated appendicitis seen about 90%. The appendix can be complicated and uncomplicated. The uncomplicated will be appendix with secretion, but if an inflamed appendix becomes gangrenous or perforated, the condition is then named as complicated appendicitis. The choice of treatment depends upon the severity of the disease. It is treated surgically (appendectomy) or conservatively. Different types of antibiotics are used for its management.[1]

EPIDEMIOLOGY

Appendicitis is commonly seen in males than females. The risk of rupture is within first 36 hours of first onset of symptoms. In neonates and infants, appendicitis is rare. The life time risk of appendicitis and appendectomy rate is same. The number of perforated and gangrenous appendicitis and duration of hospital stay is more in elderly than in children. In children younger than 3 years, the rate of perforation is 80% to 100%. This is due to young child's lack of ability to understand the symptoms, or it may be due to change in diet. In elderly patients 41% of perforated appendicitis, post operative complication will be 21%. The people who are consuming high fiber diet have less chance to get appendicitis. This condition is commonly seen in patients aged between early teens and late forties.[2]

ETIOLOGY

The etiology of appendicitis is luminal obstruction by a fecalith also caused from parasites, malignancy, foreign bodies, and lymphoid hyperplasia, resulting from a viral or bacterial infection. The appendicitis is caused due to organisms like, Escherichia Coli, alpha-hemolytic streptococci and bacteroides.[3]

CLINICAL PRESENTATION

Appendicitis is characterized by pain in epigastric region, accompanied by anorexia nausea, vomiting, when disease progresses, the pain migrates towards the right lower quadrant (RLQ) and low grade fever, pain in right lower quadrant when left quadrant is pressed. The clinical presentation varies depending on the location of appendix, patient's response and age. The patients with symptoms such as dysuria, increased urinary frequency, and diarrhea may be due to the different location of appendix from actual position.[4]

In elderly patients they have more progressed the inflammation of appendix is more progressed compared to children. The patients of age above 60 commonly shows symptoms like right lower quadrant pain, tenderness, fever, leukocytosis. In children under the age of 2, vomiting, abdominal pain, fever, abdominal distension, diarrhea, irritability, right hip pain, and limp

are the most common symptoms. In preschool children between the age of 2 and 5 years, abdominal pain precedes vomiting and associated with fever and anorexia, right lower quadrant tenderness, fever, and involuntary guarding for 2 to 6 days. Infants commonly experience tenesmus that may be misdiagnosed for diarrhea. For School going children shows abdominal pain that is constant and worsens with movement or coughing. They also have localized right lower quadrant tenderness or diffuse guarding and rebound tenderness and in some children may show the feeling of hunger.[5]

DIAGNOSIS

There is no single specific test for diagnosis of appendicitis. The correct diagnosis is very essential because, abdominal pain can also be due to gastroenteritis, cholecystitis, pneumonia, urinary tract infection (UTI), mesenteric adenitis, inflammatory bowel disease, peritonitis and hernia. A delay in diagnosis and treatment, may lead to complications, increases morbidity, length of hospital stay and cost. Diagnosis is delayed more in children, and may misdiagnose as UTI, peritonitis, which result in perforation of appendix.[6]

Physical Examination

Physical examination is required in the diagnosis of appendicitis. The presence of right lower quadrant tenderness, fever is most useful sign among pediatric patients and its absence reduces the risk. Tachycardia and fever (> 38°C) is shown in patients who are at risk for rupture. The patient may experience tenderness on palpitation. Depending on the location of appendix, rectal examination is also done. The patient may experience tenderness on palpation. The rectal examination should be performed with care, especially in the younger patient. [7]

➢ Clinical scores

Several scoring systems like Alvarado score, pediatric appendicitis score (PAS) have been designed for adults and children for diagnosis. Alvarado scoring system was developed by Alvarado in 1986. These scoring systems are based on history, laboratory findings, and physical examination. It is a simple, fast technique and used in earlier diagnosis of appendicitis.

Table 1

ALVARADO SCORING SYSTEM [8]	
Symptoms	**Score**
Migratory RIF pain	1
Anorexia	1
Nausea/vomiting	1
Signs	
Tenderness in RIF	2
Rebound tenderness	1
Elevated temperature	1
Laboratory findings	
Leukocytosis	2
Neutrophilia	1
	Total score 10

1 – 4: unlikely 5 – 6: appendicitis possible.
7-10 : highly probable. Above 7 need appendectomy and others are managed conservatively.

Table 2.

PEDIATRIC APPENDICITIS SCORE[9]	
Findings	**Score**
Migration of pain	1
Anorexia	1
Nausea/ vomiting	1
Right lower quadrant tenderness	2
Coughing/hopping/percussion pain	2
Fever	1
Leukocytosis	1
Neutrophilia	1
	Total score 10

Appendicitis unlikely: <5
Appendicitis possible: 5
Appendicitis likely: >6

➢ Laboratory Tests

The laboratory tests are significant in diagnosis of appendicitis. WBC or Neutrophil counts are checked for both children and adults. The laboratory values vary according to the age.WBC counts shows 79% of sensitivity and 80% specificity. Elevations are also seen in gastroenteritis, mesenteric adenitis, and pelvic inflammatory disease. The WBC or neutrophil counts do not differentiates between perforated and non perforated appendicitis. The C-reactive protein (CRP) value is also a diagnostic marker in appendicitis. Their value is elevated in appendicitis patient. The count has 80% sensitivity and specificity 97%. The WBC and CRP test are used for both adults and children. [10]

➢ Imaging Studies

There are many imaging studies but they are not required for every patient. They are used to differentiate appendicitis to perforated, non perforated, inflamed, gangrenous appendicitis, and to confirm appendicitis.

Ultrasonography (USG): it is essential and first line diagnostic technique in appendicitis. It is useful for both children and adults. USG is used to confirm and to detect the severity of the disease. It has sensitivity of 88% and specificity 92%. This technique is useful to reduce negative appendectomy rate. The accuracy also depends on the visualization of appendix.

Computed Tomography (CT): It is widely used tool for diagnosis of appendicitis. They are accurate, fast, sensitive and specific in diagnosing appendicitis. CT has sensitivity of 88% and specificity of 85%. They are used when USG fails. It is also used to reduce negative appendectomy rate, but the ionizing radiations from it is very dangerous and will lead to many diseases.[11]

MANAGEMENT

Appendicitis is a condition of surgical emergency. It is treated surgically or conservatively depends on the condition of the patient. The patients who are diagnosed

with appendicitis are not given anything orally, intra venous (I V) fluids are provided to avoid dehydration. Analgesics and antiemetic are given for the patients who have severe pain and vomiting. Broad spectrum of I V antibiotics should be administered immediately to all patients with perforation.[12]

Appendectomy

Appendectomy is only standard treatment for appendicitis, either laparoscopic or open appendectomy. Children with early appendectomy results in some adverse effects and it will delays the time of recovery, when compared with delayed surgery.

The postoperative wound infections can be controlled by giving preoperative antibiotics. Accurate dose and duration of antibiotics should be followed. Before surgery the first dose should be given within 60 minutes, and it should be stopped 24 hours after the appendectomy. Among elderly patients the treatment of choice is laparoscopic appendectomy hence there will be lower mortality rate and postoperative complication and reduced hospital stay.[13]

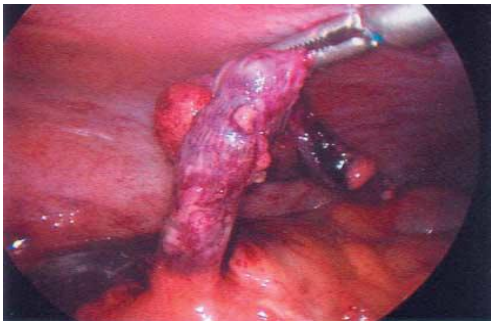

Figure 1: Laproscopic Appendectomy.

Antimicrobial therapy

Different types of antimicrobial agents are used in the management of appendicitis. They are considered to be an essential in its treatment. The antibiotics given should be effective against E- Coli and bacteroides. The preoperative antibiotic therapy should be given to prevent postoperative infection when surgery is done. Therapy is continued for 24 to 72 hours if the appendicitis is complicated. The oral antibiotics are only given if the patient is subjected to discharge.

Different types of antimicrobial agents are used in the management of appendicitis. They are considered to be an important in its treatment. The antibiotics given should be effective against E coli and bacteroides. The preoperative antibiotics therapy should be given to prevent postoperative infections when surgery is suggested. This therapy is continued if the appendicitis is complicated for 24 to 72 hours. The oral antibiotics are only given if the patient is subjected.

To be discharged.

For non perforated appendicitis single antibiotic regimen is needed. Cephalosporin (second and third generation) are used for uncomplicated appendicitis. Broad spectrum antibiotics are also used like piperacillin-tazobactum, Ampicillin- sulbactum, imipenum-cilastatin etc. Ampicillin, Metronidazole and gentamicin in combinations are used for perforated appendicitis. The postoperative care includes pain control measures, advancement in diet, reduction of complications like infection, adhesion, obstruction. [14]

Table 3: Initial intravenous pediatric dose of antibiotics.[15]

Antibiotic	Dose	Frequency
Amikacin	15-22.5 mg/kg/day	Every 8-24 h
Ampicillin-sodium	200mg/kg/day	Every 6 h
Ampicillin-sulbactum	200mg/kg/day of Ampicillin content	Every 6 h
Aztreonam	90-120mg/kg/day	Every 6-8 h
Cefepime	100mg/kg/day	Every 12 h
Cefotaxime	150-200mg/kg/day	Every 6-8 h
Cefotetan	40-80mg/kg/day	Every 12 h
Cefoxitin	160mg/kg/day	Every 4-6 h
Ceftazidime	150mg/kg/day	Every 8 h
Ceftriaxone	50-75mg/kg/day	Every 12-24 h
Cefuroxime	150mg/kg/day	Every 6-8 h
Ciprofloxacin	20-30mg/kg/day	Every 12 h
Clindamycin	20-40mg/kg/day	Every 6-8 h
Ertapenem		
3 months to 12 years	15 mg/kg twice daily (not exceed 1 g/day)	Every 12 h
≥13 years	1 g/day	Every 24 h
Gentamicin	3-7.5mg/kg/day	Every 2-4 h
Imipenum-cilastin	60-100mg/kg/day	Every 6 h
Meropenem	60mg/kg/day	Every 8h
Metronidazole	30-40mg/kg/day	Every 8 h
Piperacillin-tazobactum	200-300mg/kg/day of piperacillin component	Every 6-8 h

Ticarcillin- clavulanate	200-300mg/kg/day of Ticarcillin component	Every 4-6 h
Tobramycin	3-7.5 mg/kg/day	Every 8-24 h
Vancomycin	40mg/kg/day as I h infusion	Every 6-8 h

Table 4: Initial intravenous adult dose of antibiotics.[15]

Antibiotic	**Adult dose**
Beta lactum/beta lactamase inhibitor combination	
Piperacillin-tazobactum	3.375 g every 6 h
Ticracillin-clavulanic acid	3.1 g every 6 h
Carbapenems	
Doripenem	500 mg every 8 h
Ertapenem	1g every 24 h
Imipenum/cilastatin	500 mg every 6 h or 1g every 8 h
Meropenem	1 g every 8 h
Cephalosporins	
Cefazolin	1-2g every 8 h
Cefepime	2g every 8-12 h
Cefotaxime	1-2 g every 6-8 h
Cefoxitin	2g every 6 h
Ceftazidime	2g every 8 h
Ceftriaxone	1-2g every 12-24 h
Cefuroxime	1.5 g every 8 h
Fluoroquinolones	
Ciprofloxacin	400 mg every 12 h
Levofloxacin	750 mg every 24 h
Moxifloxacin	400 mg every 24 h
Metronidazole	500 mg every 8-12 h or 1500 mg every 24 h
Aminoglycosides	
Gentamicin/tobramycin	5-7 mg/kg every 24 h
Amikacin	15-20mg/kg every 24 h
Aztreonam	1-2 g every 6-8 h
Vancomycin	15-20mg/kg every 8-12 h

CONCLUSION

Appendicitis is a condition of surgical emergency, which require early diagnosis and treatment. The correct diagnosis of the patients suspected with appendicitis should be done like, physical examinations, laboratory studies and imaging studies. There is no specific test for the diagnosis of appendicitis, so the rate of misdiagnosis is more. Antimicrobial agents are used for its treatment if correct dose and duration is not followed resistance to antimicrobial agents will be caused and hence it increases the hospital stay, cost, and mortality. The development of new diagnostic techniques and treatment guidelines will reduce the complications.

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