Original Article

Negative Appendectomy Rate: Can It Be Reduced?

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ABSTRACT

OBJECTIVE: The objectives of this study were to calculate the current negative appendectomy rate and to determine the predictive value of ultrasonography in patients having suspicion of acute appendicitis.

DESIGN: This is a prospective analytical study of patients admitted with suspicion of acute appendicitis and underwent appendectomy.

PLACE & DURATION OF STUDY: This study was conducted at Isra University Hospital, Hyderabad from January 2003 to December 2006.

PATIENTS & METHODS: The data of all adult patients (above 14 years of age) admitted from emergency room with suspected acute appendicitis and underwent appendectomy were collected prospectively. These data were analyzed to calculate the negative appendectomy rate as well as the positive and negative predictive values of ultrasonography.

RESULTS: In all, 195 patients fulfilled the inclusion criteria during the above mentioned period. The overall negative appendectomy rate was 12.3%. The positive and negative predictive values of ultrasonography for appendicitis were 100% and 85.7% respectively. The sensitivity and specificity of ultrasonography for appendicitis were 97.6% and 100% respectively.

CONCLUSION: The negative appendectomy rate at Isra university Hospital Hyderabad is comparable to the rates reported in the local as well as international literature. The preoperative ultrasonography is an essential tool for reduction of negative appendectomy rate.

KEY WORDS: Negative appendectomy, ultrasonography, acute appendicitis.

INTRODUCTION

Acute appendicitis is the most common surgical condition encountered in emergency room. The diagnosis of acute appendicitis in many patients especially in young females is difficult to establish. Although it is one of the most common surgical emergencies; the preoperative clinical diagnosis of appendicitis is reported to be correct in only 60-80% of the cases.[1] So, even in this era of technological advancements, the appendicitis continues to be a clinical diagnosis. The diagnosis of acute appendicitis is usually made by surgeons in training and the potential morbidity of delayed diagnosis of appendicitis with perforation has encouraged surgeons to accept a high rate of negative laparotomies for suspected appendicitis. Negative appendectomy rates in the literature range from 2-41% and several authors consider higher negative appendectomy rates acceptable in order to minimize the incidence of perforation.[2-5] The objectives of this study were to calculate the current negative appendectomy rate at Isra University Hospital, Hyderabad and to determine the predictive value of ultrasonography in patients having suspicion of acute appendicitis.

PATIENTS AND METHODS

This prospective analytical study was carried out at Isra University Hospital, Hyderabad from January 2003 to December 2006. The study included all adult patients (above 14 years of age) who were admitted from emergency room with suspected acute appendicitis and underwent appendectomy. Patients undergoing incidental or interval appendectomy were excluded. These patients were assessed and evaluated by detailed history and clinical examination as well as with the help of ultrasonography. Ultrasonography results were coded into normal, non-specific suggestive of other pathology or suggestive of appendicitis. Non specific ultrasonography results included those reported as having dilated loops of bowel, free fluid or ileus. Ultrasonography was suggestive of appendicitis where there was a non-compressible or poorly compressible blind ending loop of bowel located in right iliac fossa or where the ultrasonography report included a statement that examination was suspicious for appendicitis. The status of appendix at the time of operation was noted in operative notes and all resected appendices were sent for histopathological examination. Other peroperative findings were also noted. Histopathology results were categorized into simple appendicitis, complicated appendicitis, and normal appendix. Simple appendicitis was defined as presence of mucosal or mural inflammation. Advanced appendicitis was defined as the presence of transmural necrosis and perforation of the appendix as well as the gangrenous appendix and appendicular abscess.

The data were analyzed to calculate negative appendectomy rate as well as positive and negative predictive values of ultrasonography for the diagnosis of appendicitis. Following equations were used for positive & negative predictive values:
Positive predictive value = [True positives ÷ (True positives + False Positives)] x 100
Negative predictive value = [True negatives ÷ (True negatives + False negatives)] x 100
(True Positives = Ultrasonographically & histopathologically diagnosed appendicitis,
False positives = Ultrasonographically diagnosed but histopathologically excluded appendicitis,
True negatives = Ultrasonographically & histopathologically excluded appendicitis,
False positives = Ultrasonographically excluded but histopathologically proven appendicitis)

RESULTS

A total of 195 appendectomies fulfilling the predetermined selection criteria were performed during the above mentioned period. These include 120 male and 75 female patients with a median age of 28 years (range of 15 to 65 years). All procedures were performed by open surgery. No laparoscopic appendectomy was done. There was no significant difference in the demographic profile between the positive and negative appendectomy groups. Out of these 195 patients, 171 (87.6%) were confirmed on histopathological examination while 24 (12.3%) were found to have normal appendices. Among the 24 patients in negative appendectomy group, eleven patients had other surgical problems including Meckle's diverticulitis (4), tuberculosis (4) and mesenteric lymphadenitis (3). In remaining 13 patients no diagnosis could be established at operation and were considered to have non specific abdominal pain. The negative appendectomy rates among male and female patients were 11% (14/120) and 13% (10/75) respectively whereas the over all negative appendectomy rate was 12.3%. The ultrasonography was suggestive of appendicitis in 167 patients (97.6%). The ultrasonography was reported to be normal in all patients having negative appendectomy. The decision for operation in these patients was made on clinical findings and laboratory investigations (raised total leukocytes count) despite normal ultrasonography. The relationship of ultrasonography and histopathological findings is mentioned in **Table I**. The positive and negative predictive values of ultrasonography for the diagnosis of appendicitis were 100% and 85.7% respectively. The sensitivity and specificity of ultrasonography for the diagnosis of appendicitis were 97.6% and 100% respectively.

TABLE I:
ACCURACY OF ULTRASONOGRAPHY FOR THE DIAGNOSIS OF ACUTE APPENDICITS (n = 195)

Histopathology	Ultrasonography suggestive of appendicitis (n =167)	Ultrasonography not suggestive of appendicitis (n = 28)
Histopathologically proven appendicitis (n = 171)	167	4
Histopathologically normal appendix (n = 24)	0	24

Sensititivity	= 97.66%
Specificity	= 100%
Positive predictive value	= 100%
Negative Predictive value	= 85.71%

DISCUSSION

Appendectomy is the most common operation performed in emergency services. Because of common occurrence of symptoms mimicking acute appendicitis, the diagnosis of acute appendicitis is a dilemma for surgeons. Between 15% and 30% of all these patients who are suspected of having acute appendicitis undergo surgery that demonstrates neither appendicitis nor any other surgically correctable disease.[6] Per umbilical abdominal pain eventually localizing to right iliac fossa (RIF) with peritoneal signs, low grade fever, anorexia and elevated white blood count is the typical textbook presentation of a patient with acute appendicitis. However not every patient has a typical clinical presentation and not every patient with typical presentation has acute appendicitis. Thirty percent of the patients with documented appendicitis have an atypical presentation and 30% of patients with probable appendicitis will have an alternative diagnosis.[7] Paulson et al agreed that although history taking and physical examination remains the diagnostic cornerstone in patients presenting with RIF pain, not all patients will have a classical presentation and further diagnostic investigations are indicated.[8] Because of increasing reliance on diagnostic tests, there is a pressing need to investigate their clinical utility and to establish criteria for optimum selection of patients who are to undergo such investigations.[9] The negative appendectomy rate in our study was 12.3% and is consistent with local and international studies. Local studies have reported a negative appendectomy rate ranging from 10% to 15%.[10-12] A 12.3% rate of negative exploration represents good clinical performance, be-

cause a rate of 15% is still considered acceptable in literature. Despite many trials to improve these results it has become apparent that, in most units the rate of normal appendix removal remains around 15%.[13- 15] Among the imaging modalities, ultrasonography is very useful for the diagnosis of acute appendicitis and has a significant association with positive appendectomy.[16] In our study, the ultrasonography was found to be having sensitivity of 97.6% and specificity of 100%. These values are comparable to a study of 239 patients showing ultrasonographic sensitivity of 82% and specificity of 97%.[4] Ultrasonography is a rapid and easy way of investigating patients with suspected appendicitis. This is more important in childbearing age women because abdominal pain in these is associated with very broad spectrum of causes including ovulation, diseases of ovaries, fallopian tubes & uterus and urinary tract infection. Non-visualization of appendix does not completely exclude appendicitis specially in patients having obesity, excessive overlying intestinal gas shadows and retrocaecal appendix. As appendectomy is always related to some morbidity and mortality, especially in cases of perforated appendicitis, an extended investigation especially ultrasonography should be performed to prevent unnecessary surgery; the risk is small but can not be neglected. It is therefore important to investigate the patient before making decision for surgery.[17] Preoperative ultrasonography is essential for the reduction of negative appendectomy rate especially when performed by highly trained and experienced sonologists with a close rapport between surgeons and sonologists. Unnecessary delay in surgery should be prevented by prompt preparation and performance of preoperative ultrasonography, so as to further reduce the perforation rate.[16] Ultrasonography has a short learning curve where a high accuracy can be reached after only 20 patients.[18] It is inexpensive, has no ionizing radiations, easily available round the clock and can be performed with little or no preparation. There has been, and still is a great interest in literature in the accuracy of CT scan to diagnose acute appendicitis to prevent unnecessary negative laparotomies. There are mainly two schools of thought. One is supporting its routine use[19, 20] and other is against it[8, 15, 21] reserving it for selected cases and so there is absence of an accepted standard of care in this regard. The supporters of routine use of CT scan argue that the CT scan is highly sensitive (92-99%) and specific (88-100%). With the advent of CT scan, the negative appendectomy rate may be reduced to as low as 2%.[20] On the other hand, there are studies in the literature showing no significant change in the negative appendectomy rate even with the liberal use of CT scan.[14, 15, 21] The anti CT scan group further argues that the use of the CT scan for diagnosing acute appendicitis significantly increases the emergency room and hospital stay, delays the interval before surgical intervention and increases the cost, while not helping to reduce the negative appendectomy rate; thus its routine use is not warranted.[14, 15, 21] However all these studies are from North America and Europe, there is no such local study regarding the use of CT scan in diagnosis of suspected cases of acute appendicitis. As CT scan is expensive and not available in most of the health care facilities of our country, its routine use becomes much more debatable in this part of the world. During recent years, there has been a trend to examine the patients' laparscopically and then proceeding to laparoscopic appendectomy. Earlier small studies showed some advantages with laparoscopic appendectomy but later randomized studies have failed to do so.[22] A normal laparoscopy is not without risk with an associated mortality of 0.14% and morbidity of up to 13%. Often ignored is the financial burden to both the patient and health care services.[7] In conclusion, the proper history taking and clinical examination by an experienced surgeon supported by ultrasonography is the best way to establish the diagnosis of acute appendicitis. Despite the improvements in various imaging modalities, still a negative appendectomy rate of 15% to 20% has been considered an acceptable standard to minimize the risks of diagnostic delay and perforation. Preoperative ultrasonography in especial circumstances is essential for reduction of negative appendectomy rate especially when performed by highly trained and experienced sonologists with close rapport between surgeons and sonologists.

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