Review Article

Computed tomography and ultrasonography in the diagnosis of equivocal acute appendicitis

A meta-analysis

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ABSTRACT

Acute appendicitis is the most common acute surgical condition of the abdomen. Computed tomography (CT) and Ultrasonography (US) can reduce the rate of complications and unnecessary appendectomies, in addition, they can establish an alternative diagnosis. We carried out a systematic review to evaluate the evidence relating radiological imaging (US and CT scan) and early detection of acute appendicitis in patients presenting with equivocal findings, and to provide recommendations to use radiological imaging (US and CT scan) in diagnosing acute appendicitis as part of the initial clinical assessment of the patients presenting with equivocal findings to reduce complications and unnecessary appendectomies. We used the MEDLINE to search for articles published from 1966 to December 2005 that related to radiological imaging of acute appendicitis; additional articles were identified from the bibliographies of review articles. Selection criteria were used to limit the analysis to prospective studies with more than 100 patients involved in each study as a study group. Forty-five studies fulfilling our inclusion and exclusion criteria were extracted, and 13,046 patients were included. Although the CT scan was more sensitive than US in diagnosing patients with equivocal appendicitis (93.4% [95% CI 92.1-94.6] versus 83.7% [95% CI 82.3-85.0]), either diagnostic study should be used as part of the initial assessment of the patients presenting with equivocal findings.

Saudi Med J 2007; Vol. 28 (2): 173-180

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Acute appendicitis is the most common acute surgical condition of the abdomen.[1] Approximately 7% of the population will have appendicitis,[2] with the peak incidence occurring between the ages of 10-30 years.[3] Treatment of acute appendicitis has remained the same since the introduction of surgical removal of the inflamed appendix as the curative therapy in 1886.[4] Newer techniques for removal, including laparoscopy, have been developed, but most advances in the management of appendicitis have come in the form of diagnostic techniques.[5] The surgical goal is to operate early before appendiceal perforation, which increases the risk of postoperative complications to 39%, as compared with 8% for simple appendicitis.[6,7] An accurate diagnosis can be established in most patients on the basis of history, physical examination, and simple laboratory tests. Unfortunately, the presenting features of appendicitis are protean in nature. Diagnostic difficulty is greatest in 20-33% of patients who present with atypical clinical findings, which are defined as poorly localized lower abdominal pain, and tenderness without either classical pain migration, nausea or vomiting, low-grade fever, or leukocytosis.[8] This difficulty has resulted in an average negative laparotomy rate of approximately 20%, ranging from 15-40%.[7,9] Also, the removal of a normal appendix carries a post operative complication rate of 4-15%.[10] Surgeons have traditionally accepted higher rates of unnecessary appendectomies to avoid the increased morbidity and mortality of appendiceal perforation. However, the medical and economic consequences of this approach are difficult to justify in the current cost-effective health care environment and have led to a resurgence of clinical investigation directed toward noninvasive imaging of patients with suspected appendicitis.[8] Continuous improvements in technology, technique, and interpretation achieved over the last 15 years have substantially increased the accuracy of imaging methods to diagnose acute appendicitis. Many techniques have been used and currently ultrasonography (US) and computed tomography (CT scan) are the primary imaging methods to diagnose acute appendicitis. The primary objective of this systematic review is to evaluate the diagnostic accuracy of US and CT scan in the early detection of acute appendicitis in patients presenting with equivocal findings and the strength of the evidence supporting their use. To be included in this meta-analysis, studies had to be prospective studies of patients with suspected appendicitis investigating the role of CT scan, US, or both and each study had enrolled a minimum of 100 patients. Studies were excluded if pregnant patients were the major study group (in US studies) and the numbers used to calculate sensitivity and specificity (namely, no brake down of the numbers) were not reported. The main outcome was to assess the diagnostic accuracy of CT scan and US.

Search strategy for identification of studies. A systematic literature search of MEDLINE from 1966 through December 2005 was conducted to identify articles related to the radiological imaging of acute appendicitis. The search strategy was conducted using the Medical Subject Heading terms and text key word: "appendicitis", "tomography, x-ray computed", "tomography scanners-ray computed", "tomography, spiral computed", ultrasonography". These terms were used in various combinations. All searches were limited to articles on humans and were published in English. Additional studies identified and included where relevant by searching the bibliographies of review articles and eligible studies.

Assessment of methodological quality. Both reviewers determined the methodological quality of each study independently, and any disagreement was resolved by consensus with provision of arbitration of the third reviewer. The same 2 reviewers assessed the methodological quality of each trial according to whether all patients included in the study underwent the reference standard (surgical pathology or clinical follow-up), adequacy of blinding the radiologist to the standard reference (the radiologist who reported the test finding was not aware of the surgical pathology or the clinical

Table 1 - Summary of evidence for ultrasonography test characteristics in detecting acute appendicitis.

Study	Location of study	No. of patients	Quality of the study						Grade
			Compared with GS	Blinding of radiologist	Blinding of surgeon	Can permit replication	Data necessary for calculation is present	All patients available for final analysis	
Schwerk et al[21]	Europe	532	yes	yes	yes	yes	yes	yes	good
Rubin and Martin et al[22]	NA	134	yes	yes	no	yes	yes	yes	good
Skaane et al[23]	Europe	240	yes	yes	no	yes	yes	yes	good
Schwerk et al[24]	Europe	857	yes	yes	yes	no	yes	yes	fair
Rioux[25]	NA	170	yes	yes	cannot tell	yes	yes	yes	good
Sivit et al[26]	NA	180	yes	yes	cannot tell	yes	yes	yes	good
Chesbrough et al[27]	NA	236	yes	yes	cannot tell	yes	yes	yes	good
Balthazar et al[14*]	NA	100	yes	yes	yes	yes	yes	yes	good
Jahn et al[28]	Europe	193	yes	no	yes	yes	yes	no[†]	fair
Zielke et al[29]	Europe	504	yes	yes	yes	yes	yes	yes	good
Galindo et al[30]	Europe	192	yes	yes	cannot tell	yes	yes	yes	good
Schulte et al[31]	Europe	1285	yes	yes	cannot tell	yes	yes	yes	good
Zielke et al[32]	Europe	669	yes	yes	yes	no	yes	yes	fair
Allemann et al[33]	Europe	496	yes	yes	yes	yes	yes	yes	good
Franke et al[34]	Europe	817	yes	yes	cannot tell	no	yes	no[‡]	fair
Garcia pena et al[15*]	NA	139	yes	yes	yes	yes	yes	yes	good
Rice et al[35]	NA	103	yes	yes	yes	yes	yes	yes	good
Garcia-Aguayo and Gil[36]	Europe	360	yes	yes	yes	yes	yes	no[§]	fair
Pickuth et al[16*]	Europe	120	yes	yes	cannot tell	yes	yes	yes	good
Rettenbacher et al[37]	Europe	218	yes	yes	no	yes	yes	no[‖]	good
Sivit et al[17*]	NA	315	yes	yes	cannot tell	yes	yes	yes	good
Kaiser et al[38]	Europe	283	yes	yes	no	yes	yes	no[¶]	good
Poortman et al[18*]	Europe	199	yes	yes	no	yes	yes	no**	good
Kessler et al[39]	Europe	104	yes	no	yes	yes	yes	no[††]	fair
Lee et al[40]	Asia	675	yes	yes	yes	yes	yes	yes	good

* Studies comparing the role of ultrasonography and computed tomography in the diagnosis of patients with equivocal appendicitis, GS - gold standard. NA = North America, [†]=29 patients excluded, [‡]= 53 patients excluded, [§]=14 patients excluded, [‖]=45 patients excluded, [¶]=317 patients excluded, **=27 patients excluded, [††]=21 patients excluded.

follow-up), adequacy of blinding the surgeon to the test results (the surgeon was not aware of the test results in order to avoid possible risk of radiological results delaying surgery), whether the methods for performing the test were described in sufficient detail to permit replication, whether likelihood ratio for the test presented or data necessary for their calculation was included, and whether all the patients were accounted for in the final analysis. Each feature of the above was given a point and a study was considered: Good if scored 5-6 points, Fair if scored 3-4 points and Poor if scored <3 points. The quality assessment of the included articles was based on the Users' Guide to Evidence-based Medicine from the Journal of the American Medical Association.[11,12] Data were independently extracted by the same reviewers and cross-checked. Any discrepancies were discussed by consensus with provision of arbitration of the third reviewer. From each included study true positive (TP) results, true negative (TN) results, false positive (FP) results, false negative (FN) results were obtained, and for each study, we calculated sensitivity as TP/(TP+FN), specificity as TN/(TN+FP), positive predictive value (PPV) as TP/(TP+FP), negative predictive value (NPV) as TN/(TN+FN), likelihood ratio for a positive test result (LR+) as (TP/[TP+FN])/(FP/[FP+TN]), likelihood ratio for a negative test result (LR-) as (FN/[TP+FN])/(TN/[FP+TN]), and overall accuracy as (TP+TN)/(TP+TN+FP+FN). The heterogeneity of sensitivity and specificity between different studies was assessed by comparing the confidence intervals of individual study findings with the summary estimates, as suggested by Deeks.[13] The summary sensitivity, specificity, PPV, NPV, LR+, LR-, and overall accuracy were calculated by pooling the TPs, TNs, FPs, and FNs from the included studies using the previous formulas regardless of heterogeneity. A pre planned subgroup analysis was performed to include only the good quality studies. In addition, another subgroup analysis was performed for the studies that investigated the role of CT scan and US on the same study population. Forty-five studies fulfilling our inclusion and exclusion criteria were extracted, and 13,046 patients were included. Details of the included studies along with their methodological quality are provided in **Tables 1 & 2**. The included studies look homogenous since their confidence intervals are overlapping as shown in **Tables 3 & 4**.

Table 2 - Summary of evidence for computed tomography test characteristics in detecting acute appendicitis.

Study	Location of study	No. of patients	Quality of the study						Grade
			Compared with GS	Blinding of radiologist	Blinding of surgeon	Can permit replication	Data necessary for calculation is present	All patients available for final analysis	
Balthazar et al[41]	NA	100	yes	yes	yes	yes	yes	yes	good
Malone et al[42]	NA	211	yes	yes	yes	yes	yes	yes	good
Balthazar et al[14*]	NA	100	yes	yes	yes	yes	yes	yes	good
Lane et al[43]	NA	109	yes	yes	cannot tell	yes	yes	yes	good
Rao et al[44]	NA	100	yes	yes	cannot tell	yes	yes	yes	good
Rao et al[45]	NA	100	yes	yes	cannot tell	yes	yes	yes	good
Choi et al[46]	NA	140	yes	yes	cannot tell	yes	yes	yes	good
Funaki et al[47]	NA	100	yes	yes	cannot tell	yes	yes	yes	good
Rao et al[48]	NA	100	yes	yes	yes	no	yes	yes	fair
Garcia Pena et al[15*]	NA	108	yes	yes	yes	yes	yes	yes	good
Lane et al[49]	NA	300	yes	yes	cannot tell	yes	yes	yes	good
Rao et al[50]	NA	100	yes	yes	yes	yes	yes	yes	good
Stroman et al[51]	NA	107	yes	yes	cannot tell	yes	yes	yes	good
Pickuth et al[16*]	Europe	120	yes	yes	cannot tell	yes	yes	yes	good
Sivit et al[17*]	NA	153	yes	yes	cannot tell	yes	yes	yes	good
Weltman et al[52]	NA	100	yes	yes	yes	yes	yes	no[†]	fair
Maluccio et al[53]	NA	104	yes	yes	yes	yes	yes	yes	good
Wijetunga et al[54]	Australia	100	yes	yes	cannot tell	yes	yes	yes	good
Christopher et al[55]	NA	101	yes	yes	yes	yes	yes	no[‡]	fair
Holloway et al[56]	NA	423	yes	yes	no	yes	yes	yes	good
Poortman et al[18*]	Europe	199	yes	yes	no	yes	yes	no[§]	good
Torbati et al[57]	NA	222	yes	no	yes	yes	yes	yes	fair
Giuliano et al[58]	NA	100	yes	yes	yes	yes	yes	no[‖]	fair
Int' Hof et al[59]	Europe	103	yes	yes	no	yes	yes	yes	good
Giuliano et al[60]	NA	525	yes	yes	yes	yes	yes	no[¶]	fair

* Studies comparing the role of ultrasonography and computed tomography in the diagnosis of patients with equivocal appendicitis.
NA = North America, GS - gold standard, [†]=7 patients excluded, [‡]=60 patients had no CT scan and 15 patients lost follow up, [§]= 27 patients excluded, [‖]=2 patients lost their follow up, [¶]=18 patients excluded.

Table 3 - Summary of individual ultrasonography studies' sensitivities and specificities with their 95% confidence intervals.

Study	TP	TN	FP	FN	Sensitivity (95% CI)	Specificity (95 % CI)
Schwerk et al[21]	115	394	8	15	88.46 (81.83- 92.88)	98.01 (96.12-98.99)
Rubin and Martin et al[22]	40	84	5	5	88.89 (76.50-95.16)	94.38 (87.51-97.58)
Skaane et al[23]	67	141	13	19	77.91 (68.05-85.38)	91.56 (86.09-95.00)
Schwerk et al[24]	174	651	12	20	89.69 (84.61-93.23)	98.19 (96.86- 98.96)
Rioux[25]	42	118	7	3	93.33 (82.14-97.71)	94.40 (88.89-97.26)
Sivit et al[26]	46	123	5	6	88.46 (77.03-94.60)	96.09 (91.18-98.32)
Chesbrough et al[27]	128	84	10	14	90.14 (84.13-94.04)	89.36 (81.51-94.12)
Balthazar et al[14*]	41	42	4	13	75.93 (63.05-85.36)	91.30 (79.68-96.57)
Jahn et al[28]	38	101	14	40	48.72 (37.95-59.61)	87.83 (80.60-92.61)
Zielke et al[29]	94	378	13	19	83.19 (75.23-88.960	96.68 (94.40-98.05)
Galindo et al[30]	83	87	4	18	82.18 (73.58-88.42)	95.60 (89.24-98.28)
Schulte et al[31]	110	1154	12	9	92.44 (86.25-95.97)	98.97 (98.21-99.41)
Zielke et al[32]	114	509	17	29	79.72 (72.39-85.49)	96.77 (94.89-97.97)
Allemann et al[33]	89	399	2	6	93.68 (86.90-97.07)	99.50 (98.20-99.86)
Franke et al[34]	120	571	29	97	55.30 (48.65-61.77)	95.17 (93.14-96.61)
Garcia Pena et al[15*]	22	83	6	28	44.00 (31.16-57.69)	93.26 (86.06-96.87)
Rice et al[35]	36	55	7	5	87.80 (74.46-94.68)	88.71 (78.48-94.42)
Garcia-Aguayo and Gil[36]	150	185	12	13	92.02 (86.83-95.28)	93.91 (89.66-96.48)
Pickuth et al[16**]	81	20	7	12	87.10 (78.79-92.46)	74.07 (55.32-86.83)
Rettenbacher et al[37]	68	109	29	12	85.00 (75.59-91.21)	78.99 (71.45-84.95)
Sivit et al[17*]	65	215	17	18	78.31 (68.30-85.82)	92.67 (88.58-95.37)
Kaiser et al[38]	94	165	9	15	86.24 (78.53-91.48)	94.83 (90.46-97.26)
Poortman et al[18*]	104	52	15	28	78.79 (71.05-84.90)	77.61 (66.29-85.94)
Kessler et al[39]	54	48	1	1	98.18 (90.39-99.68)	97.96 (89.31-99.64)
Lee et al[40]	319	350	4	2	99.38 (97.76-99.83)	98.87 (97.13-99.56)
Summary	**2294**	**6118**	**262**	**447**	83.69 (82.26-85.03)	95.89 (95.38-96.35)

* Studies comparing the role of ultrasonography and computed tomography in the diagnosis of patients with equivocal appendicitis.
TP=true positive result, TN=true negative result, FP=false positive result, FN=false negative result.

Table 4 - Summary of individual computed tomography studies' sensitivities and specificities with their 95% confidence intervals.

Study	TP	TN	FP	FN	Sensitivity (95% CI)	Specificity (95% CI)
Balthazar et al[41]	63	30	6	1	98.44 (91.67-99.72)	83.33 (68.11-92.13)
Malone et al[42]	65	132	4	10	86.67 (77.17-92.59)	97.06 (92.68-98.85)
Balthazar et al[14*]	52	41	5	2	96.30 (87.46-98.98)	89.13 (76.96-95.27)
Lane et al[43]	37	66	2	4	90.24 (77.45-96.14)	97.06 (89.90-99.19)
Rao et al[44]	57	41	2	0	100 (93.69-100.00)	95.35 (84.54-98.72)
Rao et al[45]	52	46	1	1	98.11 (90.06-99.67)	97.87 (88.89-99.62)
Choi et al[46]	125	12	3	0	100 (97.02-100)	80 (54.81-92.95)
Funaki et al[47]	29	66	4	1	96.67 (83.33-99.41)	94.29 (86.21-97.76)
Rao et al[48]	53	45	1	1	98.15 (90.23-99.67)	97.83 (88.66- 99.62)
Garcia Pena et al[15*]	28	74	5	1	96.55 (82.82-99.39)	93.67 (86.03-97.27)
Lane et al[49]	110	181	4	5	95.65 (90.22-98.13)	97.84 (94.57-99.16)
Rao et al[50]	32	66	2	0	100 (89.82-100)	97.06 (89.90-99.19)
Stroman et al[51]	33	60	11	3	91.67 (78.17-97.13)	84.51 (74.35-91.12)
Pickuth et al[16*]	88	24	3	5	94.62 (88.03-97.68)	88.89 (71.94-96.15)
Sivit et al[17*]	58	86	6	3	95.08 (86.51-98.31)	93.48 (86.49-96.98)
Weltman et al[52]	47	51	1	1	97.92 (89.10-99.63)	98.08 (89.88-99.66)
Maluccio et al[53]	28	63	6	7	80.00 (64.11-89.96)	91.30 (82.30-95.95)
Wijetunga et al[54]	28	68	2	2	93.33 (78.68-98.15)	97.14 (90.17-99.21)
Christopher et al[55]	27	61	9	4	87.10 (71.15-94.87)	87.14 (77.34-93.09)
Holloway et al[56]	188	226	6	3	98.43 (95.48-99.46)	97.41 (94.47-98.81)
Poortman et al[18*]	100	56	11	32	75.76 (67.79-82.27)	83.58 (72.94-90.58)
Torbati et al[57]	47	166	5	4	92.16 (81.50-96.91)	97.08 (93.34-98.74)
Giuliano et al[58]	16	75	0	9	64 (44.52-79.75)	100 (95.13-100)
Int' Hof et al[59]	83	16	0	4	95.40 (88.77-98.200	100 (80.64-100)
Giuliano et al[60]	21	446	58	0	100 (84.54-100)	88.49 (85.41-90.99)
Summary	**1467**	**2198**	**157**	**103**	93.44 (92.11-94.56)	93.33 (92.25-94.56)

*Studies comparing the role of ultrasonography and computed tomography in the diagnosis of patients with equivocal appendicitis.
TP=true positive result, TN=true negative result, FP=false positive result, FN=false negative result.

Quantitative data synthesis. Twenty-five studies investigated the role of US in detecting acute appendicitis in patients presenting with atypical findings were included (**Tables 3 & 5**). Sub-analyzing the results for good quality studies only revealed 19 good quality studies with overall sensitivity of 87% and specificity of 96% (**Table 6**). The role of CT in detecting acute appendicitis in patients presenting with atypical findings were investigated in 25 studies (**Tables 4 & 5**). The sensitivity of CT scan appeared to improve with the use of enteric contrast medium (ranging from 93.3-100%) when compared with unenhanced CT examination (ranging from 75.8-97%). Sub-analyzing our results based on the assessment of the quality revealed 19 good studies with overall sensitivity of 93.7% and specificity of 94% (**Table 6**).

Five good quality studies compared the role of CT and US in detecting acute appendicitis in the same patients presenting with atypical findings.[14-18] In Balthazar et al's study,[14] all 100 patients underwent both CT scan with enteric contrast and US, the results were independently reported by an attending Radiologist, and correlated with surgical pathology or clinical follow up. The sensitivity for CT was 96% versus 75% for US. However, specificity was almost the same. In Garcia Pena et al's study,[15] not all the patients received both tests. Only patients with difficulty in visualizing the appendix by US or if the US result was equivocal, were eligible for CT scan with rectal contrast. This however, affected the study design and introduced bias toward CT scan. The sensitivity for CT was 97% and 44% for US, but specificity was almost the same. In Poortman et al's study,[18] there was little difference in the sensitivity of US and CT, 79% versus 75%. The other 2 studies[16,17] showed that CT was more sensitive than US in the diagnosis of patients with equivocal appendicitis, the sensitivity was 95% and 94.6% versus 78.3% and 87.1%. **Table 7** summarizes the overall results.

Table 5 - Overall diagnostic values (and 95% confidence interval) of ultrasonography and computed tomography in the diagnosis of equivocal acute appendicitis in all included studies.

Diagnostic values	Ultrasonography	Computed tomography
Sensitivity	83.69 (82.26-85.03)	93.44 (92.11-94.56)
Specificity	95.89 (95.38-96.35)	93.33 (92.25-94.27)
Accuracy	92.23 (91.70-92.80)	93.38 (92.60-94.20)
Positive predictive value (PPV)	89.75 (88.60-90.90)	90.33 (88.90-91.80)
Negative predictive value (NPV)	93.20 (92.20-94.20)	95.50 (94.50-96-50)
Positive likelihood ratio (+ LR)	20.38 (18.08-22.97)	14.02 (12.04-16.31)
Negative likelihood ratio (- LR)	0.17 (0.156-0.185)	0.07 (0.058-0.085)

Table 6 - Diagnostic values (and 95% confidence interval) of ultrasonography and computed tomography in the diagnosis of equivocal acute appendicitis in good quality studies.

Diagnostic values	Ultrasonography	Computed tomography
Sensitivity	86.94 (85.34-88.38)	93.73 (92.30-94.91)
Specificity	95.82 (95.17-96.38)	94.22 (92.90-95.32)
Accuracy	93.00 (92.40-93.70)	94.00 (93.10-94.90)
Positive predictive value (PPV)	90.30 (88.90-91.60)	93.80 (92.50-95.10)
Negative predictive value (NPV)	94.30 (93.20-95.30)	94.20 (92.90-95.40)
Positive likelihood ratio (+ LR)	20.78 (17.97-24.03)	16.29 (13.16-20.01)
Negative likelihood ratio (- LR)	0.136 (0.121-0.153)	0.067 (0.054-0.082)

Table 7 - Diagnostic values (and 95% confidence interval) of ultrasonography and computed tomography in the diagnosis of equivocal acute appendicitis in studies comparing the 2 methods on the same population.

Diagnostic values	Ultrasonography	Computed tomography
Sensitivity	75.97 (71.62-79.84)	88.35 (84.67-91.23)
Specificity	89.37 (86.22-91.87)	90.35 (86.56-93.16)
Accuracy	83.05 (80.60-85.50)	89.26 (86.90-91.60)
Positive predictive value (PPV)	86.46 (82.90-90.00)	91.57 (88.70-94.50)
Negative predictive value (NPV)	80.60 (76.60-84.70)	86.70 (83.20-90.30)
Positive likelihood ratio (+ LR)	7.15 (5.46-9.37)	9.16 (6.51-12.90)

These findings suggest that CT scan is little more sensitive and more helpful in detecting or ruling out appendicitis early in patients presenting with equivocal findings compared with US. In the evaluation of these findings, several potential limitations should be considered. First, the inclusion of studies published in English only may affect the conclusion of overall accuracy. However, only a small number of studies published in the non-English literature were encountered during the search. Secondly, studies that were evaluating pregnant women as the major study group were excluded therefore; our results cannot be directly applied unless pregnancy is excluded. Thirdly, the cost of performing these different diagnostic tests and their impact on the complication rate and unnecessary surgeries in acute appendicitis were not addressed, which can be a major determinant factor in their use, however, the primary objective of this review was to determine the accuracy of the diagnostic technique rather than the cost and the impact in preventing complications. To address the impact of CT scan and US on the complication rate and unnecessary surgeries in acute appendicitis, many studies have examined this impact. However, most of them were retrospective studies, which weakens the evidence from the quality of the study point of view. Rao et al[19] showed that the overall negative appendectomy rate was lowered from 20-7% in all patients who had CT scan preoperatively, and to only 3% in patients who had a positive appendiceal CT scan before surgery. Also, the appendiceal perforation rate was lowered from 22-14%. These results were supported by Balthazar et al,[20] who showed an overall negative appendectomy rate of 4% after the use of CT scan, but the perforation rate did not change much, and was 22.1%.[20] This high rate may be secondary to the inclusion of patients who had microperforation in the surgical pathology reports, or the patients might have had perforation before the test was performed. Schwerk et al[21] showed that US has reduced the negative appendectomy rate from 22.9-13.2%, but the perforation rate was not affected much, and was 20.8%.

In conclusion, both US and CT scan can improve the health outcome in patients with equivocal appendicitis compared with clinical evaluation alone. However, CT scan is specific and less prone to operator bias (usually more sensitive) resulting in overall greater accuracy than US. We strongly recommend CT scan in diagnosing acute appendicitis as part of the initial assessment of the patients presenting with equivocal findings, unless there is contraindication to radiation as in pregnancy or to contrast media as in allergic patients if enhanced CT is going to be used. There is good evidence supporting the high accuracy of CT scan in detecting acute appendicitis and large effect in reducing rates of perforation and unnecessary appendectomy. However, US is recommended in diagnosing acute appendicitis as part of the initial assessment of the patients presenting with equivocal findings, if CT scan is unavailable or contraindicated. There is good evidence supporting its accuracy in detecting acute appendicitis and moderate effect in reducing the rate of unnecessary appendectomy.

Acknowledgment. *Dr. Abdullah Alkhenizan, Department of Family Medicine and Polyclinic, King Faisal Specialist Hospital and Research Centre, Riyadh, Saudi Arabia for reviewing and editing the final manuscript and his work as a third reviewer for arbitration purposes. Dr. Omar Al-Obaid, Dr. Badr Aljabri, and Dr. Turki Alfuhaid, Department of Surgery, King Khalid University Hospital, Riyadh, Saudi Arabia for their work as a third reviewer for arbitration purposes.*

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Related topics

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