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Role of Ultrasound in Diagnosis of Acute Appendicitis

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Abstract

In this work the authors have tried a prospective study over 5 years to evaluate the role of ultrasound, in non selected groups of patients with lower abdominal pain & suspicion of acute appendicitis, all the ultrasound examinations done by two ultrasonographists.

Although ultrasound is a simple, cost-effective, non-invasive investigation with high acceptance by the patients, clinical examination remains a cornerstone of the diagnosis of acute appendicitis and it is superior to ultrasound examination in diagnosis of cases of acute appendicitis.

Keywords: Acute appendicitis, Ultrasound.

Introduction

Although the treatment options for acute appendicitis stood the test of time & remain the same, but continuously diagnostic techniques are emerging to improve clinical diagnosis. With this ever-changing sphere and new generations of diagnostic facilities, there are increasing number of papers in the current literature about the role of ultrasound in the diagnosis of acute appendicitis, with the value in the literature, suggesting that ultrasonic evaluation of appendicitis is not a diagnostic tool limited to few experienced *ultrasonographist* [1], & ultrasound is valuable in decreasing the unnecessary appendectomy operations [2]. As long as ultrasound is available in most hospitals, it could be done on an outpatient base, as a part of the routine evaluation of the suspected cases of acute appendicitis [3], specially when performed by concerned surgeons[4,5],& it helps in narrowing the list of the differential diagnosis of acute appendicitis[6]. In the contrary there are occasional papers suggesting that with clear-cut clinical diagnosis; ultrasound is not necessary [7], & the clinical decision remains the perfect tool in decision for operations in this suspected cases [8]. Ultrasound may also confuse the clinician in the final diagnosis [9, 10], & implementing of ultrasound examination will not decrease the incidence of the complications of acute appendicitis [11].

Patients & Method

In Sulaimani & Chwarback Teaching Hospitals with 380 beds, we started a prospective study including 480 patients,

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Every patient supposed to be suspicious of acute appendicitis was interviewed for detailed history, examined thoroughly by the surgeon, then sent for ultrasound examination of the abdomen, with a request to search for acute appendicitis. The *ultrasonographies* were done by two *ultrasonophists*, using 3.5 and / or 5 MHz sector and 7.5 linear ultrasound probes, depending on pointing the site of the maximal pain by the patient and procedure of graded compression of the probe.

Procedure;

Using high frequency linear transducer (Probe) over the point of maximal tenderness in the right iliac fossa, pressure gradually increased over the area in order to displace the bowel loops. The appendix may then be seen overlying the Psoas muscle and anterior to iliac vessels [12].

The results will not affect our clinical judgment or decision, on the bases of repeated clinical examination for surgical intervention. Intraoperatively, details of the site, pathological state of the appendices were recorded, those looking normal macroscopically were sent for histopathological examination and search was done for detection of any possible differential diagnosis.. At the end we evaluated and correlated all the clinical, sonographic, operative and histopathological results.

Results

Most of the patients were between the ages of 10 to 20 years. The ratio of male to female was 0.9-1.2. Most of them presented within 24 hours from the onset of pain (table 1). Pain was a constant symptom in all the patients. It was at onset, around the umbilicus in 300 patients, and shifted to right iliac fossa within 10 hours in 293 patients (table 2). Anorexia was present in 401 patients, vomiting after the onset of the pain in 68 patients, change of bowel motion in the form of constipation in 412 patients and diarrhea in 12 patients. There were associated respiratory features in 49 patients and urinary features in 187 patients.

History of attacks of similar pain was positive in 42 patients and a family history of appendectomy in 136 patients.

On clinical examination; temperature was elevated up to one degree centigrade in 234 patients, localized tenderness was present in 428 patients and rebound tenderness in 386 patients (table 3).

WBC count was within normal range in 390 patients, less than 4000 / mm^3 in 2 patients & more than 11.000 / mm^3 in 88 patients. On ultrasound (figure I) ,the appendix was labeled inflamed or suppurative in 368 patients & normal or not visualized in 112 patients , with false negative results in 32 patients (table 4).

Intraoperatively (figure 2)we found appendicitis in 400 patients as acutely inflamed, suppurative or gangrenous, rupture, suspicious in 64 cases, & macroscopically normal in the rest (16 patients).Details of the operative findings with these normal appendices are giving in (table 5) .

All suspicious and normal appendices were sent for histopathological examination, 16 of suspicious turned to be acutely inflamed, microscopically (table 6). After data analysis we found different percentage of criteria of evaluation as shown in figure 3.

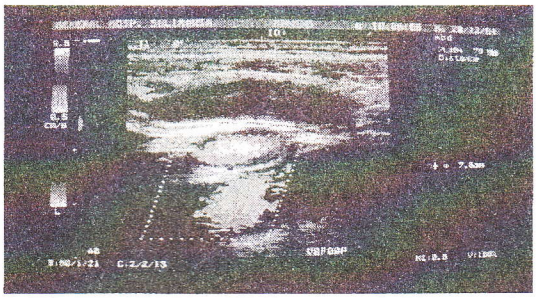

Figure 1: ultrasound finding of acute appendicitis

Figure 2; Intraoperative finding of acute appendicitis

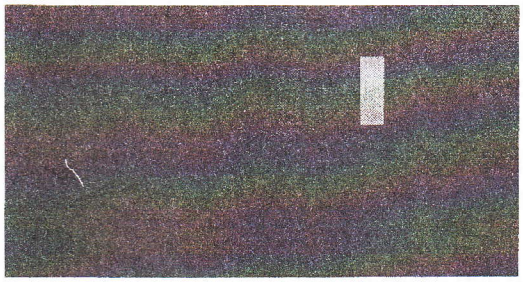

Figure 3: different percentage of criteria of evaluation

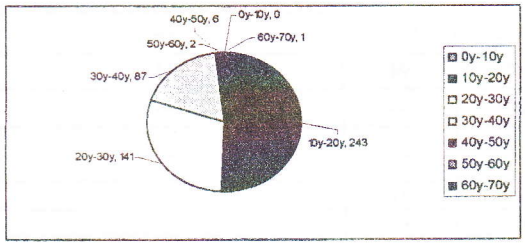

Figure 4 : different age groups with acute appendicitis

Table 1: time of the presentation of the patients, from the onset of the pain

Time from the onset of the pain	No. of patients
One hours	30
Two hours	80
Six hours	63
Twelve hours	86
Twenty four hours	150
Forty eight hours	15
More than forty eight hours	56

Table 2: The site of pain at the onset of the pain

Site	No. of patients
Around the umbilicus	300+shift in 293 patients
Right iliac fossa	90
Epigastrium	26
Hypogastrium	18
General abdominal pain	22
Right Hypochondrium	24

Table 3: Percentage No. of the positive physical signs

Positive physical sign	No. of patients
Localized deep tenderness in right iliac fossa	428
Rebound tenderness	389
Percussion tenderness	390
Cough sign	247
Rovsing's sign	130
Pointing sign	412
Psoas sign	73
Obturator sign	18

Discussion

in the present work we tried to evaluate the role of ultrasonic examination in diagnosis of acute appendicitis, we found that ultrasound is of little help in

Table 4: Number and Details of Operative Findings in Positive Cases.

Operative finding	No. of patients
Suppurative , retrocaecal	40
Inflamed, subcaecal	12
Inflamed, retrocaecal	18
Macroscopically norm al retrocaecal (3), subcaecal (7)microscopically turned out to be inflamed	10

Table 5: Operative findings with normal appendices

Operative finding	No. of patients
Mesenteric lymphadenitis	40
Ruptured graffian's follicles	30
Twisted ovarian cyst	3
Salpingio-oophoritis	4
Right tube abortion	3

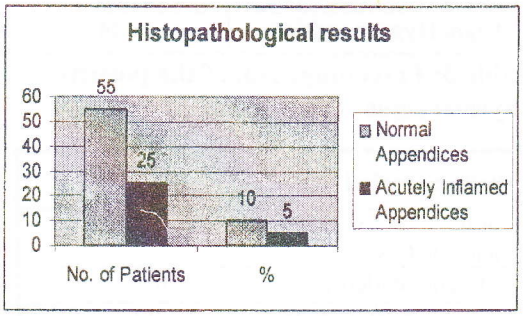

Figure5: Results of appendices sent for histopathological examination

increasing the accuracy of diagnosis of acute appendicitis, but it has a role in diagnosis of complicated appendicitis with unusual presentations.

In current studies sensitivity of around 90% has been claimed [13], we found ultrasound to have 92% sensitivity, 76.66 % accuracy, 100 % specificity and 100% predictive value of positive results. Accuracy of ultrasound in our study is comparable with the results of Dreuw-B and Goudet-P; while it is less than other studies. We studied non-selected group of patients, while in other papers; selected group of patients were studied. During statistical analysis of the data, using Chi-Square to test the hypothesis test, to determine whether the ultrasound is superior to clinical examination in the diagnoses of acute appendicitis, According to our results the P-value is less than 0.01, so we can say that clinical examination is still superior to ultrasonography for the time being the diagnoses of cases of Acute Appendicitis, as shown in Figure (3) and table [7].

Table 6: Histopathological results of clinically normal appendices

Authors	No. of patients in the study	Accuracy of sonography	Sensitivity	Specificity	No. of negative laparotomies
Tarjan-Z et. al. [14]	298	96.3	94.9	97.9	---
Niebuhr-H et. al.[15]	---	---	90	94	11
Dreuw-B et. al. [16]	---	64	100	---	---
Goudet-P et. al.[17]	---	76	---	---	---
Crady -SK et. al. [18]	---	91.8	85	94	---
Zielke-A et. al.	---	84.2	55.3	94.6	---
Chesbaugh-RM [19]	236	86	---	---	---
Present Work	480	76.66	92	100	24 for Acute Appendicitis

Table 7: the statistical analysis of the accuracy of ultrasound & clinical examination

Type of Examination	Positive	False Negative	True Negative	Chi-Square	P-Value
Clinical Examination	400	0	80	33.33	0.0000
Ultrasound Examination	368	32	80		

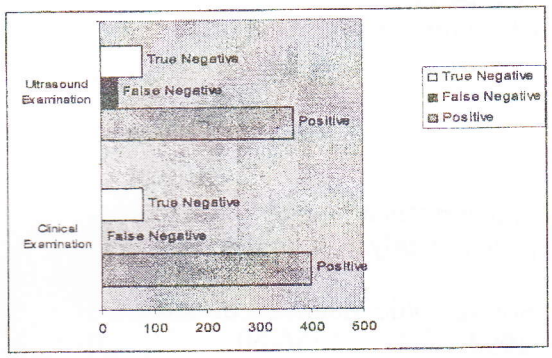

Figure 6: The accuracy of both clinical examination and ultrasound in the diagnoses of acute appendicitis

In other words ultrasound has moderate accuracy (76.66) in assisting the diagnosis of acute appendicitis although it gave no any false positive result (0%), but it gave (6.66%) false negative results (table4). We may deduce that there is possibility of missing cases of acute appendicitis if the surgeon depends only on ultrasound results in the decision for operation. So it is not safe to rely only on Ultrasound results for decision of operation in cases of suspected appendicitis. Initial and repeated clinical examination remains to be the most accurate tool in the diagnosis of acute appendicitis.

In the present work, it is clear that ultrasound is helpful in the diagnosis of some dangerous differential diagnosis of acute appendicitis, i.e.; twisted ovarian cyst , right tube abortion and to rule out retained gall stones with features of acute appendicitis which requires further operative treatment[20]. It also helps in diagnosis of pregnancy in ladies with features of acute appendicitis, as one of the recommendations of the last report on confidential enquiries into Maternal deaths in united kingdom was that when a woman presents with unexplained abdominal pain with or without vaginal bleeding, it is essential to exclude an ectopic pregnancy [21], by all means, especially by ultrasound examination.

These conditions have high morbidity and mortality without early diagnosis and surgical intervention, ultrasound was helpful in early diagnosis, directing the surgeon to early intervention.

Also it is clear that Ultrasound is helpful in the diagnosis of some complicated cases of appendicitis (perforated appendices 14 patients) which clinically were simulating colitis or gastroenteritis, without early diagnosis and early surgery these perforated appendices have high mortality and morbidity.

Conclusions

This work looks at the role & benefits of ultrasound in diagnosis of the cases of acute appendicitis.

Although ultrasound is a simple, cost-effective, non-invasive investigation with high acceptance by the patients,

clinical examination remains a cornerstone of the diagnosis of acute appendicitis and it is superior to ultrasound examination in diagnosis of cases of acute appendicitis. But it is helpful in diagnosis of complicated appendicitis with unusual presentation & other causes of acute abdomen which may simulate features of acute appendicitis.

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رۆڵی سۆنەر لە دەستنیشانکردنی ریخۆڵەکوێرەدا

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پوختە

تا دێت، لێکۆڵینەوەی زیاتر دەربارەی رۆڵی سۆنەر لە دەستنیشانکردنی ریخۆڵە کوێرەدا لە بڵاوکراوە پزیشکییەکاندا دەبینرێت.
هەموو ئەم لێکۆڵینەوانە لە سەر گروپە نەخۆشی هەڵبژێراو کە ژانە سکیان هەبووە کراومو سۆنەرەکەش لە لایەن نەشتەرگەرەکەوە نە نجام دراوە، نەك پزیشکی تایبە تمەندی سۆنەر.
هەندێك لەم لێکۆڵینەوانە نەڵێن، کە پشکنین بە سۆنەر بۆ دەستنیشانکردنی ریخۆڵە کوێرە، کارێك نیە تەهیا سۆنەرزانێکی کارامە بیکەن، و لەگەڵ شارەزایدا، یارمەتی زیاتر و زیاتری دەستنیشانکردنی ریخۆڵە کوێرە نەدات، ژمارەی نەشتەرگەریە نا پێویستەکان کەم نەکاتەوە هەندێکی تریان وا داوە نەکەن کە ئەم پشکنینە ببێتە رۆژانە لە کارە نەشتەرگەریەکاندا، هەندێکی تر بە پێچەوانەوە نەڵێن کە هیچ رۆڵکی بەرچاوی لە زیادکردنی توانای دەستنیشانکردنی ریخۆڵە کوێرەدا نیەو یارمەتی زوو دەستنیشانکردن و کەم کردنەوەی ماکەکانی.
ئێمە لەم لێکۆڵینەوەیەدا لەماوەی ٦ ساڵدا لە ٤٨٠ خۆش بکۆڵینەوە کە هەموویان ژانە سکیان هەبووە. گومانی ریخۆڵە کوێرەیان لێ کراوە، هەرهەموویان لە لایەن ٢ پزیشکی سۆنەرەوە پشکێنراون.
دەرئە نجام نەتوانین بڵێین گەرچی سۆنەر پشکنینێکی ئاسان، هەرزان، بێئەی، بەڵای نەخۆشەوە پەسەندە بەڵام توانایەکی مام ناوەنجی هەیە لە هاوکاری دەستنیشانکردنی ریخۆڵەکوێرەدا. پشکنینی سەرجێی لە سۆنەر باشترە و بەبەردی بناغەی دەستنیشانکردنی ریخۆڵەکوێرە دانەنرێت.

مدى قابلية الامواج فوق الصوتية في تشخيص التهاب الزائدة الدودية الحادة

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الخلاصة

هنالك عدد متزايد من الابحاث الطبية حول استعمال الامواج فوق الصوتية في تشخيص التهاب الزائدة الدودية الحادة ، تم اجراء هذه ابحاث على مجاميع مختارة من المرضى، و بالرغم من وجود اطباء السونار قام الجراحون باجراء فحص الامواج فوق الصوتية.
بعض هذه البحوث تشير ان التشخيص بالسونار تؤدي الى تقليل عمليات استئصال الزائدة الدودية الغير الضرورية،ولكن البعض الاخر بالعكس يرى انها لا تساعد على تشخيص المبكر و تقليل المضاعفات المحتملة .
حاولنا خلال ست سنوات دراسة(٤٨٠) حالة غير مختارة من المرضى مع الام البطن الحادة لتقيم قابلية التشخيص للامواج فوق الصوتية للالتهاب الزائدة الدودية زوقاما طبيبا سونار باجراء الفحص على الحالات.
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