

Role of ultrasound in Evaluation of Fever of Unknown Origin

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Abstract:

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Background: Abdominal ultrasonography is a valuable tool for evaluating patients with FUO. A skilled ultrasonographer can examine most abdominal organs and often detect lesions that are not demonstrated by radiography. **Aim of the work:** The aim of this study is to demonstrate the diagnostic value of a complete standardized ultrasound examination of patients with fever of unknown origin. **Patient and methods:** We evaluate 60 patients by (ultrasound and colour Doppler) with infection in 32 patients and non-infection in 28 patients. The ultrasound and color Doppler diagnosis was confirmed by histological examination and others images. **Results:** In this study the US diagnosis were correlated with the final diagnosis based on laboratory examination in 44(73.3%) of the cases, US diagnosis did not correlate with final diagnosis in 16(26.7%) of the cases. **Conclusion:** Ultrasound is a valuable non-invasive tool in diagnosis of fever of unknown origin patients.

Keywords: FUO, abdominal organs, Ultrasound, Colour Doppler.

Introduction

Fever of Unknown Origin (FUO) was originally defined as an illness of more than 3 weeks' duration with a fever higher than 101°F (38.4°C) on several occasions and an uncertain diagnosis after 1 week of hospital

investigation (1). It is a necessary to develop a diagnostic approach to patients with FUO that allows the detection of both common and uncommon causes of fever. The goal in investigating FUO in a patient is to convert

the problem of FUO into a definitive diagnosis while minimizing expensive, invasiveness of testing, and patient discomfort. This article provides a framework for the development of a logical diagnostic plan (2).

Abdominal ultrasonography is a valuable tool for evaluating patients with FUO. A skilled ultrasonographer can examine most abdominal organs and often detect lesions that are not demonstrated by radiography. Ultrasonography of the thoracic cavity may be useful when effusions or masses are present. Ultrasonography can also be used to investigate the retrobulbar area or any other large mass or swelling that is not confined to a body cavity. This technique can facilitate the acquisition of fine-needle aspirates or biopsies from many sites (3).

FUO is a syndrome that has long tested the skills of physicians to achieve a diagnosis in affected patients. It is a grouping of many unrelated medical conditions that share the feature of persistent unexplained fever despite basic investigation. Patients included in this syndrome will be more difficult to diagnose as they have already resisted classification during baseline investigations (4).

Patients and method

This prospective study was conducted between December 2018 to February 2020 on sixty patients having fever. US was performed for assessment the cause of fever referred from outpatient clinics to the radiology department of Tropical Hospital and gave their informed consent

The study was approved by the ethical committee of Benha faculty of Medicine. An informed written consent in Arabic language was obtained from all participants. It includes all details about the study (title, objectives, methods, expected benefits and confidentiality data). Transabdominal ultrasound examination (TRAUS) was carried out by Ultrasound machine using 3.5- 5Mhz convex probe and 7-10 Mhz linear probe.

Firstly, the use of low frequency probe is recommended in order to obtain a panoramic view of the abdomen which could help to localize pathological conditions. Then the standard examination should be followed by high frequency probe which provides detailed information about bowel wall layers and the surrounding tissues. Doppler US is useful for estimating the presence, the density or absence of vascular signals in the large blood vessels, but it is not sensitive

enough to detect slow and low –volume flow of smaller vessels of the gastrointestinal organs.

All patients will be fasted for at least 6 hours before ultrasound examination

Statistical Analysis:-

The statistical analysis was performed using Excel program (2010)of windows(10).

Statistical analysis was performed using MedCalc-version 17.9.7(MedCalc Software bib, Ostend, Belgium).Normally distributed numerical variables were presented as mean ±SD.Categorical variables were presented as number (%).

The level of significance was calculated as:

p>0.05 nonsignificant

p<0.05 significant

p<0.01 highly significant

Results

Sixty patients (28 females and 32 males) were included in this study. Their age ranged from 5 to 70 years with a median age

30 years, (figure 1). The diagnosis was confirmed by ultrasound and laboratory procedures. Most patients were included in age group between (20-30years) then between (30-40 years). (table 1). All patient presented by fever accompanied by abdominal pain (32 cases), 12 patients presented by vomiting, 6 patients presented by diarrhea, and10 patients presented by chill (table 2), (figure 2). From the studied cases, ultrasound finding show focal lesions (in liver, spleen, renal, adnexa and subcutaneous) in 18 cases, hepatosplenomegaly in 14 cases, bowel wall thickness in 8 cases, ascites in 10 cases, gall stones in 4 cases, dilated portal vein in 4 cases, and dilated common bile duct in 2 cases (table 3),(figure 3).

From this study, 60 patients distributed according to ultrasound diagnosis and final diagnosis confirmed by laboratory and surgical procedure (table 4).

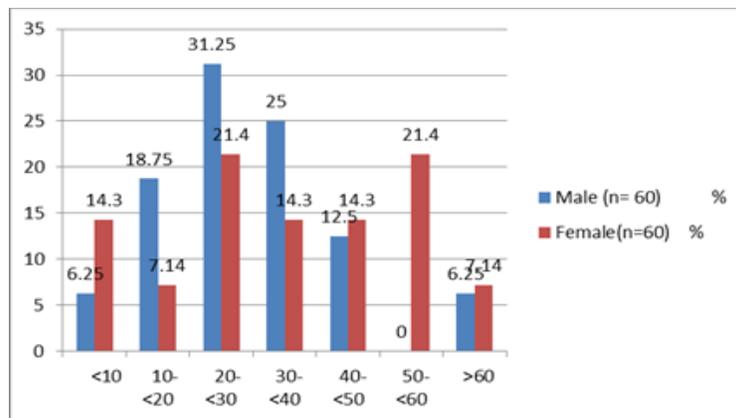


fig.1: Distribution of the studied cases according to demographic data

Table (1): Distribution of the studied cases according to demographic data.

Age (years)	Male (n=60)		Female (n=60)		Total (n=60)	
	No	%	No	%	No	%
<10	2	6.25	4	14.30	6	10.00
10-<20	6	18.75	2	7.14	8	13.30
20-<30	10	31.25	6	21.40	16	26.70
30-<40	8	25.00	4	14.30	12	20.00
40-<50	4	12.50	4	14.30	8	13.30
50-<60	0	0.00	6	21.40	6	10.00
>60	2	6.25	2	7.14	4	6.70
	32		28		60	

Table (2) : Distribution of the studied cases according to symptomatology (n=60).

Symptoms	NO	%
Abdominal pain	32	53.3
Vomiting	12	20
Chills	10	16.7
diarrhea	6	10

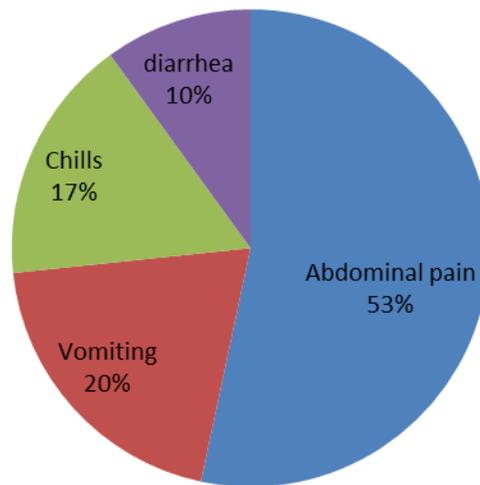


Figure (2): Distribution of the studied cases according to symptomatology (n=60).

Table (3): Distribution of the studied cases according to their US finding.

Ultrasound finding	No	%
Focal lesions(liver ,spleen ,renal , adnexa and subcutaneous)	18	30
Hepatosplenomegaly	14	23.3
Bowel wall thickness	8	13.3
Ascites	10	16.7
Gall stones	4	6.7
Dilated portal vein	4	6.7
Dilated CBD	2	3.3

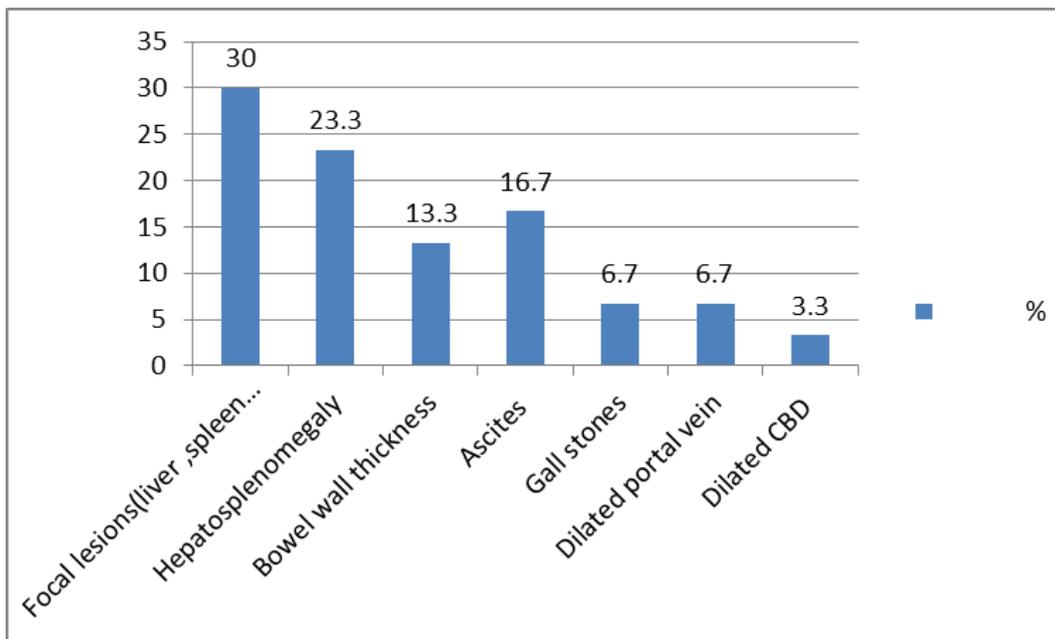


Figure (3): Distribution of the studied cases according to their US finding (n=60)

Table (4): Distribution of the US diagnosis and final diagnosis in this study.

No.	Age	Sex	Ultrasound Diagnosis	Final diagnosis
1	18	male	Suspected diffuse liver disease	Typhoid fever
2	35	female	Suspected diffuse liver disease	Typhoid fever
3	27	female	Suspicion complicated adnexal cyst	Complicated left adnexal cyst
4	19	female	Suspicion complicated adnexal cyst	complicated right adnexal cyst
5	41	Male	Suspicion abdominal subcutaneous abscess	Abdominal subcutaneous abscess
6	25	Male	suspicion renal mass	Left renal abscess
7	22	Male	suspicion appendicitis	Acute appendicitis.
8	20	Male	Suspicion appendicitis	Acute appendicitis.
9	35	Female	Suspicion Cholangitis.	Acute Cholangitis.
10	50	Female	Suspicion splenic mass	Splenic abscess
11	45	Female	Suspicion hepatic mass.	Hepatic abscess
12	39	Male	Calculus Cholecystitis	Acute Calculus Cholecystitis
13	32	Male	Calculus cholecystitis	Acute calculus cholecystitis
14	8	Female	Suspected non calculus cholecystitis	Acute hepatitis A virus
15	10	Male	Suspicion non calculus cholecystitis	Hepatitis A virus
16	30	Male	Portal vein thrombosis	Portal vein thrombosis
17	29	Female	Suspected diffuse liver disease	Malta fever
18	52	Female	Suspicion pyelonephritis	Diffuse acute pyelonephritis
19	26	Male	Cystitis	Acute cystitis
20	22	Female	Suspicion colitis	Acute ulcerative colitis
21	19	Male	Colitis	Acute ileocecal crohns disease
22	42	Female	Suspicion pancreatitis	Acute pancreatitis
23	26	Male	Suspicion diffuse liver disease	Acute malaria infection
24	33	Male	Retroperitoneal lymphoma	Retroperitoneal lymphoma
25	52	Female	Liver cirrhosis	Liver cirrhosis
26	63	Male	Hepatic focal lesion	Hepatocellular carcinoma
27	40	Male	Hepatic mass	Hepatocellular carcinoma
28	61	Female	Renal mass	Renal cell carcinoma
30	9	male	Suspicion diffuse liver disease	Typhoid fever
31	17	Male	suspected diffuse liver disease	Typhoid fever
32	34	Female	Suspicion diffuse liver disease	Typhoid fever
33	28	Female	Complicated adnexal cyst	Complicated adnexal cyst
34	16	Female	Complicated abdominal cyst	Complicated ovarian cyst
35	42	Male	Subcutaneous abscess	Subcutaneous abscess
36	24	Male	Renal focal lesion	Right renal abscess
37	23	Male	Appendicitis	Acute appendicitis
38	21	Male	Appendicitis	Acute appendicitis
39	33	Female	cholangitis	Acute cholangitis
40	51	Female	Splenic focal lesion	Splenic abscess
41	44	female	Hepatic focal lesion	Hepatic abscess
42	38	Male	Acute Calculus cholecystitis	Acute calculus cholecystitis
43	31	Male	Calculus cholecystitis	Acute calculus cholecystitis
44	7	Female	non calculus cholecystitis	Acute hepatitis A virus
45	11	Male	Suspicion non calculus cholecystitis	Hepatitis A virus
46	32	Male	Portal vein thrombosis	Portal vein thrombosis
47	27	Female	Suspicion hepatitis	Malta fever
48	50	Female	Pyelonephritis	Acute pyelonephritis
49	25	Male	cystitis	Acute cystitis
50	21	Female	colitis	Acute ulcerative colitis
51	18	Male	Suspicion colitis	Acute ileocecal crohns disease
52	41	Female	Pancreatitis	Acute pancreatitis
53	24	Male	Diffuse liver disease	Acute malaria infection
54	36	Male	Retroperitoneal lymphoma	Retroperitoneal lymphoma
55	52	Female	Liver cirrhosis	Liver cirrhosis
56	62	Male	Suspicion hepatic mass	Hepatocellular carcinoma
57	43	Male	Hepatic mass	Hepatocellular carcinoma
58	64	Female	Renal focal lesion	Renal cell carcinoma
59	6	Female	Superior mesenteric arteritis	Superior mesenteric arteritis
60	8	male	Suspicion diffuse liver disease	Typhoid fever

Discussion:

Sixty patients with FUO were included in this study. The number of female patients was 28, the number of male patients was 32 and the patients' mean age was 30 years. The median age was 26 years, ranging from 5 to 64 years. These results near the results of (5) study in which FUO in 71 patients was investigated. The patients' mean age was 41.5 years. The median age was 39 years, ranging from 16 to 80 years. And comparable to (6) study the mean ages was 49 in a study lead to a final diagnosis in 67 patients.

The commonest cause of FUO in this study was infection in 14 (23.3%) patients including 6 (10%) of typhoid fever, 4 (6.7%) of acute hepatitis, 2 cases (3.3%) of malaria infection, 2 cases (3.3%) of Malta fever. These results comparable with the results of (7) who stated that the commonest cause of FUO were infection in 21 (45.65%) patients including 13 (28.26%) of TB.

In this study, the main symptoms were abdominal pain (n=32, 53.3%), vomiting (n=12, 20%), chills (n=10, 16.7%), diarrhea (n=6, 10%), fever with abdominal pain were (53.3%), and fever without abdominal pain were (46.7%). This

did not match with the study done in 2016 (8) where the main complaint was pyrexia of unknown origin (PUO) for more than 1 month (N = 10), followed by distended abdomen (N = 4), epigastric pain (N = 4), and jaundice (N = 3).

In this study ultrasound (US) finding, 18 cases (30%) were focal lesions (in liver, spleen, renal, adnexa and subcutaneous), 14 cases (32.3%) were hepatosplenomegaly, 10 cases (16.7%) were ascites, 8 cases (13.3%) were bowel wall thickness, 4 cases (6.7%) were gall bladder stones, 4 cases (6.7%) were dilated portal vein, 2 cases (3.3%) were dilated CBD. Very near to our results are those reported in another study done in 2018 (9) where US findings were (n: 35) gall bladder wall edema in 31 (88.6%), hepatomegaly in 14 cases (40%), ascites in 12 cases (34.3%), splenomegaly in 9 cases (25.7%), right pleural effusion in 13 cases (37.1%), left pleural effusion in 5 cases (14.3%) and bilateral pleural effusion in 5 (14.3%) cases.

In this study the origin of fever is known in 44 (73%) patients and unknown in 16 (26%) patients. US did not result in a diagnosis in 22 (37%) patients. A pathological finding

was detected in 26(43%) patients as the origin of the fever. The most common diagnoses (26%) in this subgroup were abscesses and infectious fever. These results near the results of (10) study, the origin of fever was known in 124 of 200 patients (62%) and unknown in 76 of 200 patients (38%). US did not result in a diagnosis in 86 of 200 patients (43%).

A pathological finding was detected in 114 of 200 cases (57%) as the origin of the fever. New causes for fever were found in 24 of 200 patients (12%) by means of ultrasound. The most common diagnoses (67%) in this subgroup were abscesses and splenic infarcts. From the 60 cases of fever, 10 cases were systemic fever, 12 cases were complicated cysts in abdomen, 8 cases were malignant tumor, 26 cases were inflammation in situ, 2 cases were PV thrombosis, 2 cases were liver cirrhosis.

This comparable to (11) who stated that the role of diagnostic ultrasonography in Hepatobiliary disorders on 130 patients with FUO were studied, 34 were diagnosed as having hepatobiliary disorders: amoebic liver abscess 11, pyogenic liver abscess 4, hepatic hydatid cysts 2, hepatic fascioliasis 2, tuberculous hepatic granulomas 1, chronic calcular cholecystitis with recurrent

cholangitis 2, chronic active hepatitis 2, hepatocellular carcinoma 3, lymphoma involving the liver 4 and hepatic metastasis in 3 cases. Hepatobiliary disorders were the cause in 27% of FUO seen during 4 years.

Abdominal sonographic signs of typhoid fever, such as thickening of the ileal and colonic walls and lymph node enlargement. Secondary wall thickening of the ileum and cecum sometimes can be seen in acute appendicitis. If the inflamed appendix is overlooked and only the thickened ileum and cecum are seen, an erroneous diagnosis of infectious ileocystitis leading to a serious surgical delay could be made, match with another study (12).

From this study, it became clear that abdominal ultrasound is a valuable tool for evaluating patients with FUO.

Conclusion:

Ultrasound is valuable non-invasive tool in diagnosis of fever of unknown origin patients. A skilled ultrasonographer can examine most abdominal organs and often detect lesions that are not demonstrated by radiography.

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