



The Role of Imaging Modalities in Assessment of Gynaecologic Causes of Acute Pelvic Pain

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Abstract

Objective: To evaluate the role of imaging modalities in assessment of gynaecologic causes of acute pelvic pain.

Materials and methods: The current study included thirty cases presented to Radiology department in Alexandria University Hospitals complaining of acute pelvic pain.

All patients were subjected to full history taking and clinical examination, laboratory investigations including urine analysis, white blood count and B-HCG.

All patients underwent radiological investigations starting with ultrasound (transabdominal or transvaginal) as a primary imaging modality in all cases, followed by computed tomography (CT) or magnetic resonance imaging (MRI) as indicated and feedback (operative data, pathological and/or radiological follow up) whenever possible.

Results: The patients were distributed according to the final diagnosis into: 5 patients with PID (16.7%) were three of them were complicated by tubo-ovarian abscesses. 4 patients were diagnosed as post caesarean section complications (13.3%). 4 patients with ovarian dermoid cyst (13.3%). 3 patients were diagnosed as Mullerian duct anomalies (10%). 3 with ectopic pregnancy (10%). 2 patients with haemorrhagic cysts (6.7%) were one of them was complicated by rupture. 2 were diagnosed with endometriosis (6.7%). 2 with ovarian hyperstimulation syndrome (6.7%). 2 with anticoagulant therapy toxicity (6.7%) and 1 with degenerating fibroid (3.3%).

Conclusion: Ultrasonography (US) is the imaging modality of choice in the initial evaluation of acute pelvic pain in females as it helps reaching the most accurate diagnosis using the least amount of radiation. CT is performed if US is inconclusive or non-diagnostic, or if the abnormality extends beyond the field of view achievable with the probe and further characterization of pelvic disease is required.

Keywords: Gynaecologic; Acute Pelvic Pain; Therapy; Fibroid

Introduction

Acute pelvic pain is defined as intense pain characterized by sudden onset lasting for less than 3 months [1]. It frequently poses a diagnostic dilemma, as these patients may exhibit nonspecific signs and symptoms such as nausea, vomiting and leucocytosis [2]. The possible gynaecologic causes include those arising in the uterus, such as fibroids (leiomyomas), adenomyosis, and mispositioned intrauterine devices, and those affecting the ovary, such as ovarian torsion, ruptured or non-ruptured haemorrhagic cysts, endometriosis, ovarian hyperstimulation syndrome [3], idiopathic pelvic pain, pelvic inflammatory disease, and ectopic pregnancy [4].

The selection of imaging modality is determined by the clinically suspected differential diagnosis. Thus, a careful evaluation of such a patient should be performed and diagnostic considerations should be narrowed before a modality is chosen [2]. For the initial diagnostic imaging evaluation, ultrasonography is the modality of choice. High frequency endovaginal transducers allow excellent anatomic depiction and pathologic characterization [5]. It allows a detailed evaluation of the pelvic anatomy, including vascular components. In addition, it may decrease or eliminate the need for imaging studies that involve radiation exposure, while allowing direct correlation of the region of pain with the imaging findings

[3]. Further imaging such as CT and MRI may also be needed. CT may be performed if US findings are equivocal, or if the abnormality extends beyond the field of view and further characterization of pelvic disease is required [6].

Magnetic resonance imaging (MRI) is an extremely useful second-line modality for problem solving after US or CT has been performed [7]. It also has the benefit that it lacks the ionizing radiation and provides excellent soft-tissue contrast [2]. Furthermore, MR has been shown to reduce the need for diagnostic laparoscopy as well as the need for follow-up imaging by providing definitive characterization of lesions [8].

Patients and methods

Thirty patients were included in the study. All of them complained of acute pelvic pain. Twenty eight were during the reproductive age (93%): 23 of them were married (76.7%) and 5 were unmarried (16.7%). Two of the 30 studied patients were pre-pupertal (6.7%) and none were post-menopausal. All the studied thirty patients were examined by ultrasound as an initial imaging tool (100%), 15 of them used computed tomography (50%) and 7 of them used MRI (23.3%).

Results

Among the studied 30 cases, some of them needed more than one imaging tool to reach a diagnosis either because the ultrasound didn't reveal the full picture due to gaseous distension, patient's body habitus, uncooperative behaviour, or refusal of transvaginal ultrasound, where in 11 of them we only used ultrasound as an initial imaging tool and it was sufficient to reach a diagnosis (36.7%). In 12 patients ultrasound and CT were both used (40%). 4 of them used MRI with the ultrasound (13.3%) and 3 of them used ultrasound, CT and MRI (10%). Demonstrated in table 1.

Imaging tools used	No.	%
Ultrasound	11	36.7
Ultrasound + CT	12	40.0
Ultrasound + MRI	4	13.3
Ultrasound + CT + MRI	3	10.0

Table 1: Distribution of the patients needed more than one imaging modality to reach a diagnosis (n = 30).

The patients were distributed according to the final diagnosis into: 5 patients with PID (16.7%) were three of them were complicated by tubo-ovarian abscess and one was associated with pel-

vic congestion. 4 patients were diagnosed as post caesarean section complications (13.3%). 4 patients with ovarian dermoid cyst (13.3%) were one of them was associated with endometriosis and ipsilateral haemorrhagic ovarian cyst and one was complicated by ovarian torsion. 3 patients were diagnosed as Mullerian duct anomalies (10%). 3 with ectopic pregnancy (10%). 2 patients with haemorrhagic cysts (6.7%) were one of them was complicated by rupture. 2 were diagnosed with endometriosis (6.7%). 2 with ovarian hyperstimulation syndrome (6.7%). 2 with anticoagulant therapy toxicity (6.7%) and 1 with degenerating fibroid (3.3%). Demonstrated in table 2.

Final diagnosis	No.	%
PID	5	16.7
Only	1	3.3
With pelvic congestion	1	3.3
Complicated by tuboovarian abscess	3	10.0
Post C.S complications	4	13.3
Ovarian dermoid cyst	4	13.3
Only	2	6.7
+ endometriosis + Ipsilateral haemorrhagic cyst	1	3.3
+ ovarian torsion	1	3.3
Mullerian duct anomalies	3	10.0
Ectopic pregnancy	3	10.0
Haemorrhagic cyst	3	10.0
Ruptured	1	3.3
+ Ipsilateral distal right ureteric stone	1	3.3
+ Ipsilateral ovarian dermoid cyst + endometriosis	1	3.3
Ovarian torsion	3	10.0
Only	2	6.7
On top of ovarian dermoid cyst	1	3.3
Ovarian hyperstimulation syndrome	2	6.7
Anticoagulant therapy toxicity	2	6.7
Endometriosis	2	6.7
+ ovarian dermoid cyst + Haemorrhagic cyst	1	3.3
With pelvic congestion	1	3.3
IUD perforation	1	3.3
Degenerating fibroid	1	3.3

Table 2: Distribution of the studied cases according to final diagnosis putting into consideration that some patients may have more than one pathology (n = 30).

Lastly we found that among the 15 cases in whom we used CT as an adjunct imaging modality after ultrasound as a usual primary

imaging tool used, we found that ultrasound had reached the final diagnosis in 14 of the patients (93.33%), among the 7 patients who used MRI, ultrasound succeeded in reaching the diagnosis in 5 of them (71.43%), and in 11 cases we didn't need an additional imaging modality in order to reach the diagnosis.

Concluding that in 27 out of 30 studied patients, ultrasound was sufficient to reach the diagnosis according to clinical, pathological or radiological follow up data...Representing (90%) sensitivity value. Demonstrated in table 3.

Five representative cases are demonstrated

Case 1

A 32 year old married female complaining of pelvic pain, leucorrhoea, fever and history of recurrent urinary tract infection.

Imaging tools used	Sensitivity
Provisional diagnosis by ultrasound prior to CT (14/15)	93.33
Provisional diagnosis by ultrasound prior to MRI (5/7)	71.43
Provisional diagnosis by ultrasound (27/30)	90.0

Table 3: Sensitivity for imaging tools used.

Ultrasound revealed: Figure a. Shows heavily turbid pelvic fluid and echogenic surrounding fat planes. Figure b and c. Show relatively echogenic stroma of both ovaries with peripherally located follicles. Figure d and e. Show increased vascularity of the adjacent tubal walls.Features reflecting pelvic inflammatory disease (PID).

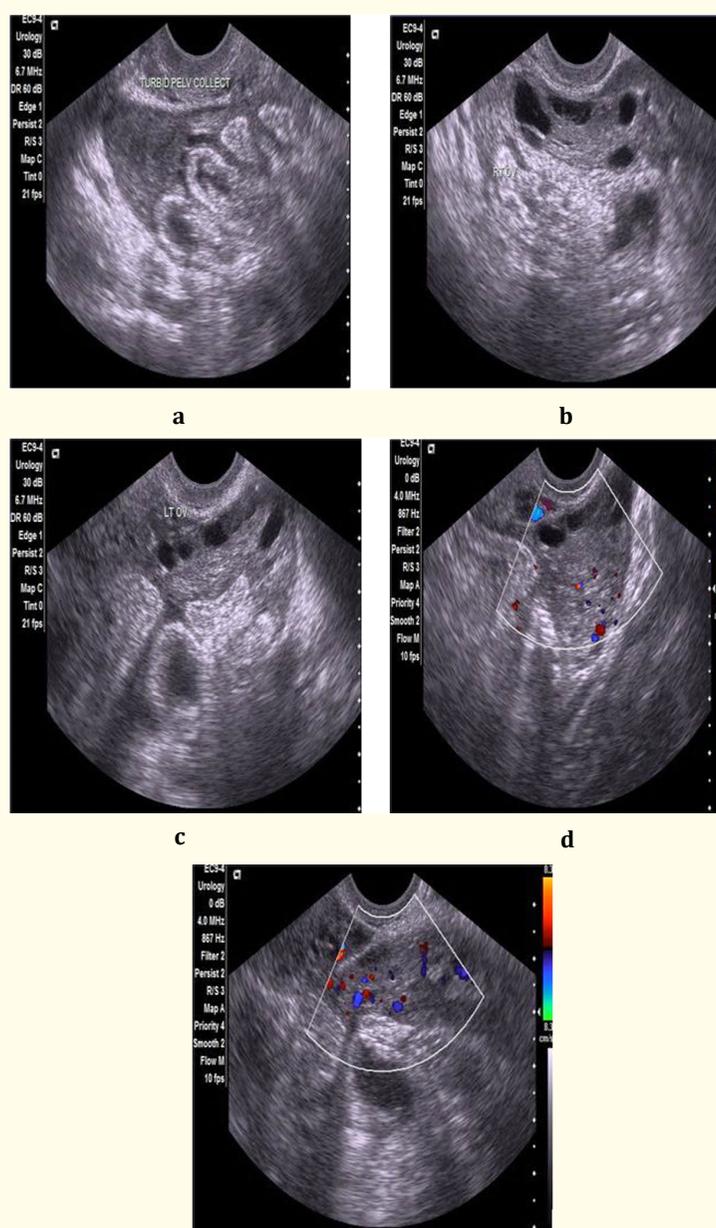


Figure 1

Case 2

A 15 years unmarried female with history of regular menses, coming with acute pelvic pain and urine retention.

Ultrasound was firstly done which revealed marked urine retention and two uterine horns (figure a). Figure b shows markedly ballooned vagina. Figure c shows the left kidney while no right kidney was found in the right renal fossa (figure d).

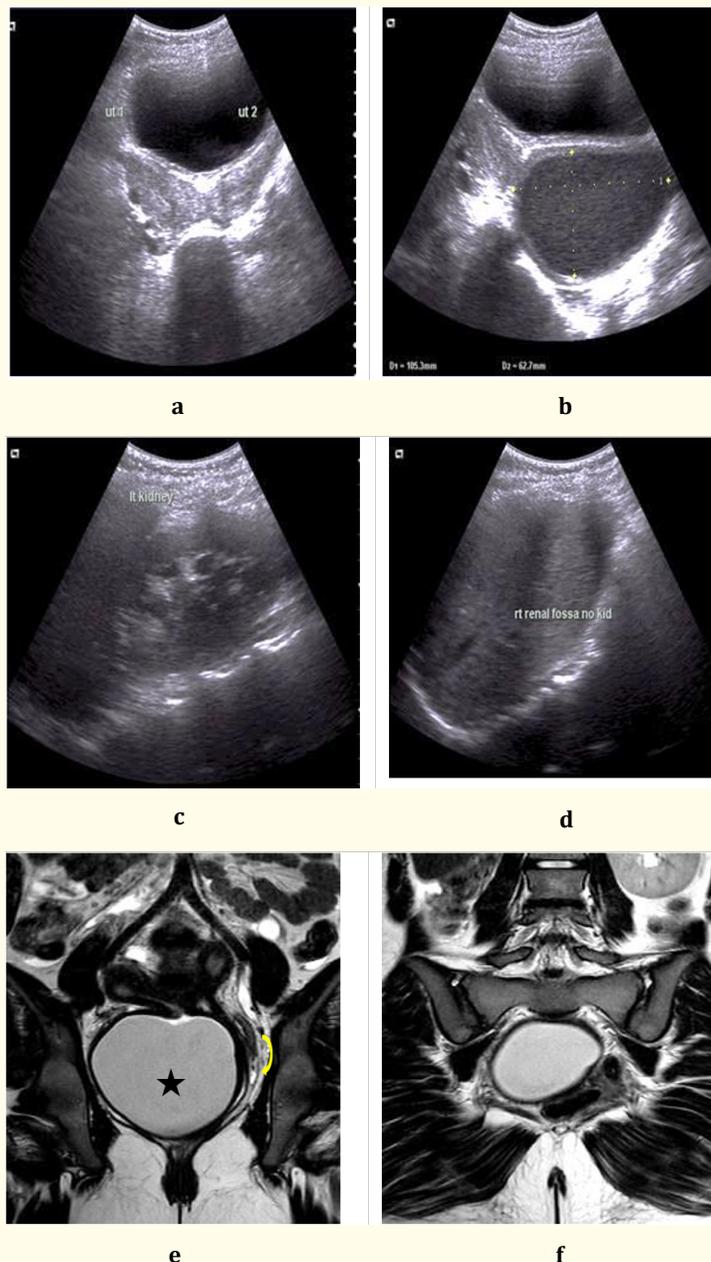


Figure 2

ney was found in the right renal fossa (figure d). We suggested Mullerian duct anomaly with uterine didelphys and obstructed hemivagina associated with right renal agenesis. The study was followed by MRI confirming the diagnosis as follows: Figure e T2 shows one of the uterine horns (the right one) opening into the ballooned va-

gina, it shows the vagina of the normal uterine horn stretched and displaced to the left side (curved arrow). It also shows shading sign of the fluid in the ballooned vagina denoting blood component. Figure f. shows empty right renal fossa (right renal agenesis)....Mullerian duct anomaly class III.

Case 3

A 35 year old married female with history of recently applied IUD (about 15 days prior to the date of the study), presenting with acute pelvic pain.

Ultrasound was firstly done were the contraceptive device wasn't found within the intrauterine cavity. Figure a, b and c show the uterus with no detectable contraceptive device within its cavity along with interconnecting multilocular right adnexal cystic le-

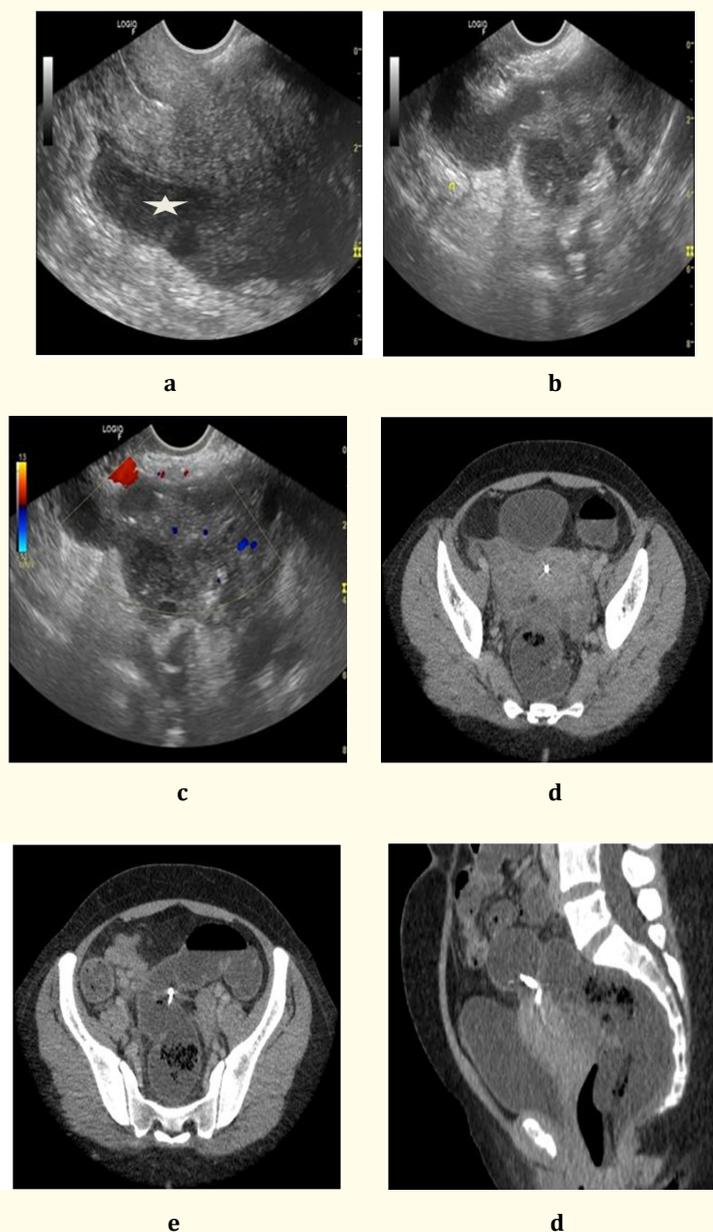


Figure 3

sion showing heavily turbid fluid content (star) with no detectable vascularity on color Doppler examination. CT was followed were Figure d. shows part of the contraceptive device within the myometrium, it also shows the multilocular interconnecting mural enhancing right adnexal cystic lesion (arrow head). Figure e and f show the

contraceptive device piercing the uterine fundus and reaching the sigmoid colon lumen (transfixing it)...Features of migrated contraceptive device into the sigmoid colon with subsequent right sided tubo-ovarian inflammatory process (tubo-ovarian abscess).

Case 4

A 23 year old unmarried (virgin) female giving history of regular menses, the LMP was 9 days from the date of examination, presented with acute pelvic pain and tenderness.

Ultrasound was primarily done showing a huge heterogeneous pelvi-abdominal mass lesion measuring about 20 x 10 cm showing cystic changes (figure a). Compressed endometrium is seen in (figure b) raising the suspicion of uterine origin of the mass lesion.

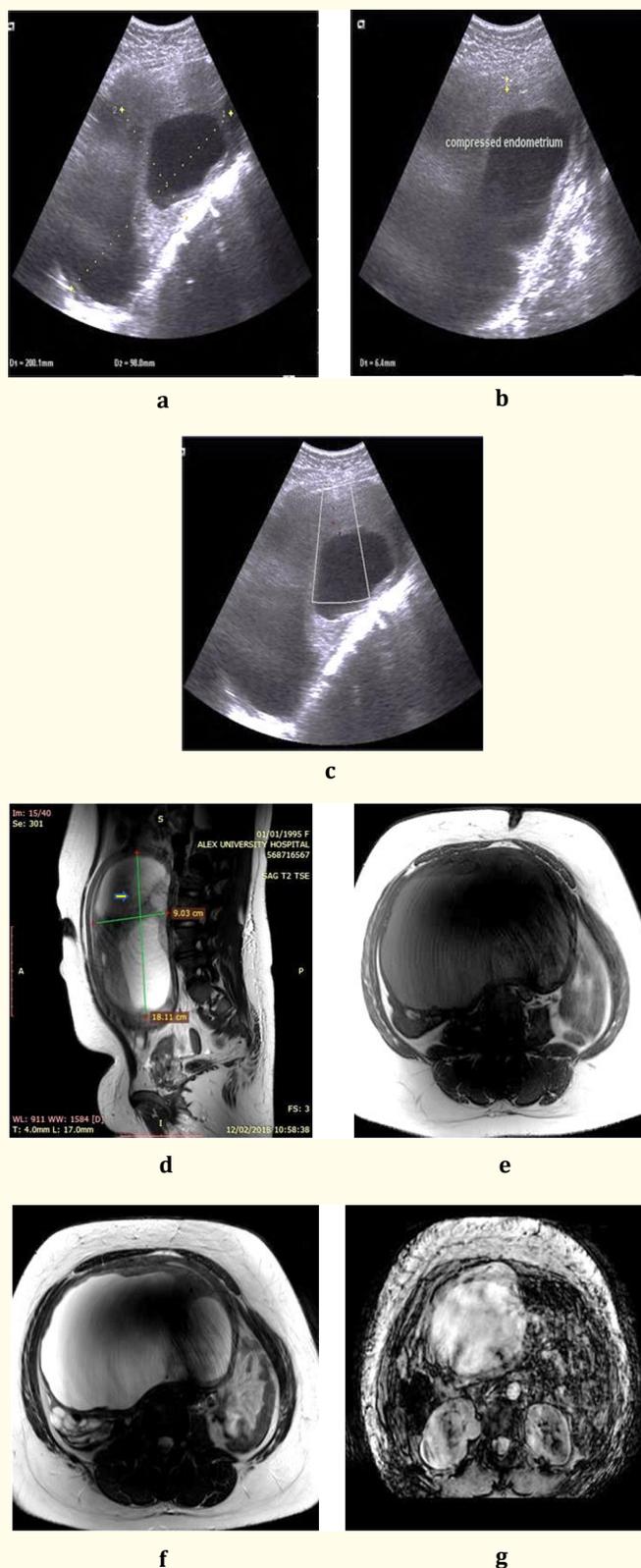


Figure 4

Figure c shows no detectable vascularity on Doppler examination. MRI was complementary done to delineate the site of origin showing Figure d. Sagittal T2WI shows that the mass lesion is of uterine origin as it appears as a posterior wall myometrial lesion with cystic degeneration compressing and displacing the endometrium anteriorly (arrow head), the cystic changes appear of intermediate signal in T1WI (figure e) and hyperintense with shading in axial T2WI

(figure f). We added SWI sequence which shows blooming denoting blood component (figure g)...Features of posterior wall fibroid with red degeneration.

Case 5

A 27 year old married female giving history of recent agonizing pelvic right iliac fossa pain which was relieved by the time of the study.

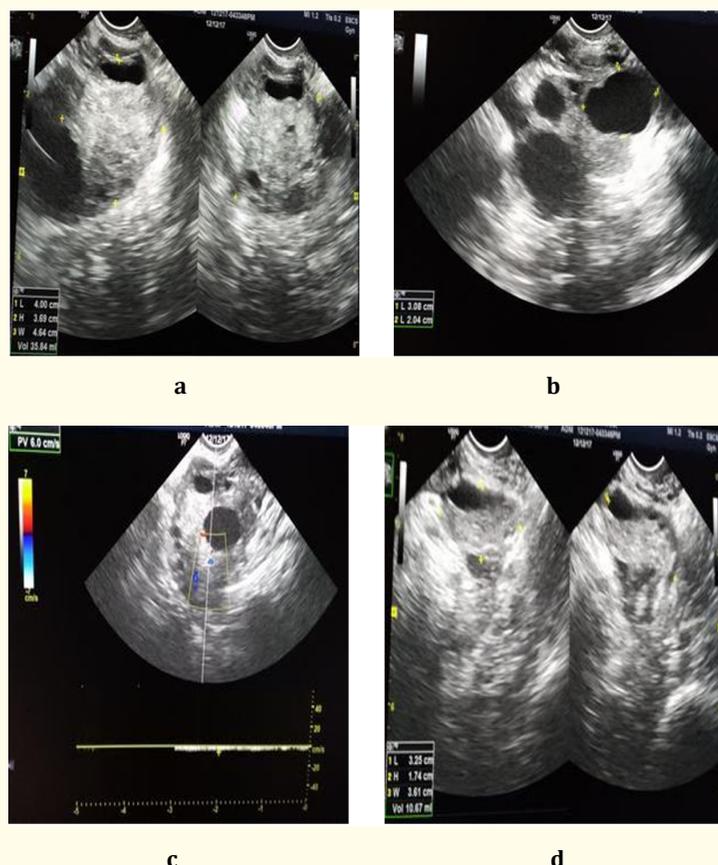


Figure 5

Ultrasound revealed: Figure a shows bulky right ovary with increased volume, showing few simple cysts (figure b) yet with preserved venous flow as shown in figure c. Figure d. shows normal left ovary....Suggesting the provisional diagnosis of right ovarian torsion detorsion considering the severe agonizing pain which was relieved, and our diagnosis was confirmed intraoperative were the gynecologist had done right oophoropexy.

Discussion

Acute pelvic pain is considered as pain in the lower abdomen or pelvis lasting less than three months [9]. One of the challenges facing clinicians is the wide range of differential diagnoses that must be considered when assessing pelvic pain. Often it can be difficult to distinguish gynaecological from gastrointestinal emergencies [10]. The present work discusses the current status of imaging

modalities used for the evaluation of female patients having acute pelvic pain. The study included 30 patients with acute pelvic pain. Their ages ranged between 12 and 46 years old. All our (30) studied cases had pelvic ultrasonography as an initial imaging modality and this agrees with Dupuis CS, Kim YH and Andreotti RF, et al. [11,12], Who reported that the role of ultrasonography as one of the main tools in the radiologists' arsenal for evaluation of pelvic pain is well established. According to the American College of Radiology appropriateness criteria, in whom a gynaecologic etiology for pelvic pain is suspected, ultrasonography is the recommended primary imaging modality. And agreeing with Kaproth-Joslin K., et al. [3], Who mentioned that it allows a detailed evaluation of the pelvic anatomy. In addition, it decreases or eliminates the need for imaging studies that involve radiation exposure.

Ultrasound was followed by computed tomography (CT) in [13] of our cases. A non-contrast scan was taken and sometimes it was followed by intravenous contrast administration in cases where ultrasound was insufficient either due to uncooperative patient, gaseous distension or machine resolution and this was in accordance with many papers such as Roche O., et al. [10]. Who reported that CT is seldom used as an initial diagnostic tool in suspected gynaecological emergencies due to the risks associated with irradiating the pelvis. However, it may be difficult to localise the site of origin of the symptoms to the gynaecological tract due to the significant overlap in symptoms and signs with gastrointestinal pathologies. Cano Alonso R., et al. and Bennett GL., et al. [6,14], agreed where they reported that the role of computed tomography (CT) in the evaluation of acute female pelvic disease is of great value especially in those cases in which gynaecologic exploration is undone since it is not the initial suspicion, US findings are equivocal or if the abnormality remains characterized in an incomplete way and further characterization is required.

Some of our cases (7 in number) went for MRI when we thought of better soft tissue resolution which agreed with many papers such as Cox M., et al. and Ratner ES., et al. [8,15], who mentioned that MR is particularly useful for problem-solving after suboptimal sonographic evaluation of the pelvic organs caused by a poor acoustic window. Furthermore, MR has been shown to reduce the need for diagnostic laparoscopy as well as the need for follow-up imaging by providing definitive characterization of lesions because of its better soft tissue assessment.

Conclusion

Upon analysing the collected clinical, laboratory, imaging and the follow up data, we found that in the studied 30 cases, ultrasonography reached a final diagnosis without further evaluation via an additional CT or MRI in 11 cases, in 15 cases further investigation via CT was performed and in only 1 case additional information lead to a final diagnosis. where in the rest of the 14 cases it was only confirmatory to the data interpreted from the ultrasonographic study. 7 cases underwent complimentary MRI assessment where in only 2 cases additional information was interpreted from the study that helped establish a final diagnosis and the other 5 cases the study only confirmed the provisional diagnosis of the ultrasonography.

Concluding that ultrasonography diagnosed with accuracy 27 out of the 30 cases that we included in our study, and further imaging studies helped reach the diagnosis in the remaining 3 cases.

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