

Role of USG in Evaluation of Acute Pelvic Pain in Reproductive Age Female Patients

Dr Swati Sirohiwal¹, Dr. V. G. Goswami²

¹Resident (M.D. Radiology) , Civil Hospital and B.J. Medical College, Ahmedabad

²Associate Professor of Radiology, Civil Hospital and B.J. Medical College, Ahmedabad

Abstract: *In an emergency setting pelvic ultrasound is the tool of choice for the evaluation of the patients presenting with acute pelvic pain. It has a high sensitivity and specificity for detection of pelvic pathology, low cost, widespread availability and lack of ionizing radiation. Aim of the study was to evaluate the role of USG in diagnosing conditions presenting as acute pelvic pain in females of reproductive age group that pose a diagnosis dilemma on clinical findings. Material and methods: 12 female patients who presented with acute pelvic pain were evaluated by USG and managed accordingly. Results : USG examination was able to diagnose the cause of acute pelvic pain in 11 patients correctly. In one patient there was given possibility of rupture of ovarian cyst and it was found out to be torsion of ovary intraoperatively. This article presents a variety of case scenarios regarding the female of reproductive age presenting with acute pelvic and lower abdominal pain. By using illustrative images, the reader will be able to differentiate between the most common causes of abdominal and/or pelvic pain and identify typical B-mode and color Doppler ultrasound findings that require immediate treatment, while minimizing the performance of unnecessary additional imaging and invasive procedures.*

Keywords: USG, acute pelvic pain, reproductive females

1. Introduction

Acute pelvic and/or lower abdominal pain in women of reproductive age is an extremely common presentation to emergency departments, urgent care centers and outpatient office practices. Approximately 1.4 million gynecologic visits were made to emergency departments annually, for an average annual rate of 24.3 visits per 100 women between the ages 15 to 44 years.¹ Acute pelvic pain generally implies pain that is of less than 3 months duration in a toxic, ill appearing and unstable patient, or chronic pain that is worsening.^{2,3} When a female in the reproductive age presents with acute pelvic and/or lower abdominal pain, the first diagnoses to consider are those that are life threatening and would require urgent and/or emergent surgical intervention.⁴ Because the differential diagnosis of acute pelvic pain in the female of reproductive age includes many different organ systems (i.e. gastrointestinal, gynecological, urological, vascular, etc.) a cost-effective and efficient strategy, such as ultrasound, needs to be employed.

It is essential in the assessment of pelvic pain in women of reproductive age to initially exclude pregnancy via urine. The diagnosis of pelvic pain is a composite picture (history, physical examination and investigations). No single fact or observation elicits the diagnosis. When evaluating pelvic pain, as with any clinical presentation, it is important to ask about the onset, location, quality, severity, radiation, duration, aggravating and alleviating factors and any temporal changes of the pain overtime. In addition, one must ask about associated symptoms, such as nausea, vomiting, diarrhea, fever, flank pain, dysuria, hematuria, pyuria, frequency, urgency, vaginal bleeding and vaginal discharge. The medical history should focus on the patient's last menstrual period, age of onset of menarche, sexual history, history of sexually transmitted diseases and a complete obstetric history. The physical examination should concentrate on the vital signs, abdominal and pelvic

examinations. Unfortunately, in many instances, there is variability of the physical examination (abdominal and pelvic) between examiners. There have been some studies conducted evaluating the validity and reliability of the pelvic examination⁵ Bimanual examination appears to be of limited value due to a discrepancy in the detection of adnexal masses on physical examination between attending physicians and residents.⁶ Another study conducted in the emergency department setting showed poor interexaminer reliability.⁷

When one considers the organs located in the pelvis and the abdominal cavity whose pain may be referred to the pelvis (i.e. the gall bladder, the appendix, cecum, ascending colon, transverse colon, descending colon, sigmoid, rectum, kidneys, ureter, bladder, uterus, ovaries and fallopian tubes), one has to consider that the diseases most likely originate from these organs. Given such a vast differential diagnosis, the key investigative tool for acute lower abdominal and pelvic pain is the ultrasound.⁸⁻¹⁵ In the emergency department setting ultrasound is the best initial imaging modality for evaluation of pelvic pathology due to its low cost, easy accessibility, widespread availability and lack of ionizing radiation.¹⁶

Ultrasound can be used to evaluate the following differential diagnosis:

- 1) Gastrointestinal sources of both right and left lower quadrant and pelvic pain:
 - Appendicitis
 - Inflammatory bowel disease
 - Inguinal hernia (incarceration and strangulation)
 - Diverticulitis
 - Irritable bowel syndrome
 - Biliary colic
 - Cholecystitis

- 2) Gynecological sources of both right and left lower quadrant and pelvic pain:
- Ectopic pregnancy
 - Ruptured ovarian cyst
 - Adnexal torsion
 - Hemorrhagic cyst
 - Pelvic inflammatory disease
 - Tuboovarian abscess
 - Dysmenorrhea
 - Endometriosis
- 3) Urological sources of both right and left lower quadrant and pelvic pain:
- Pyelonephritis
 - Cystitis
 - Urinary retention
 - Nephrolithiasis/ureteral stone
 - Ureteral obstruction

- Hydronephrosis

2. Results and Discussion

In this study we encountered following cases

Diagnosis	Number of cases
Appendicitis	4
Hemorrhagic ovarian cyst	3
Ruptured ovarian cyst	1
Ovarian torsion	1
Ureterolithiasis	2
Ectopic pregnancy	1

Case Discussion

Appendicitis

UPT was negative in all patients.

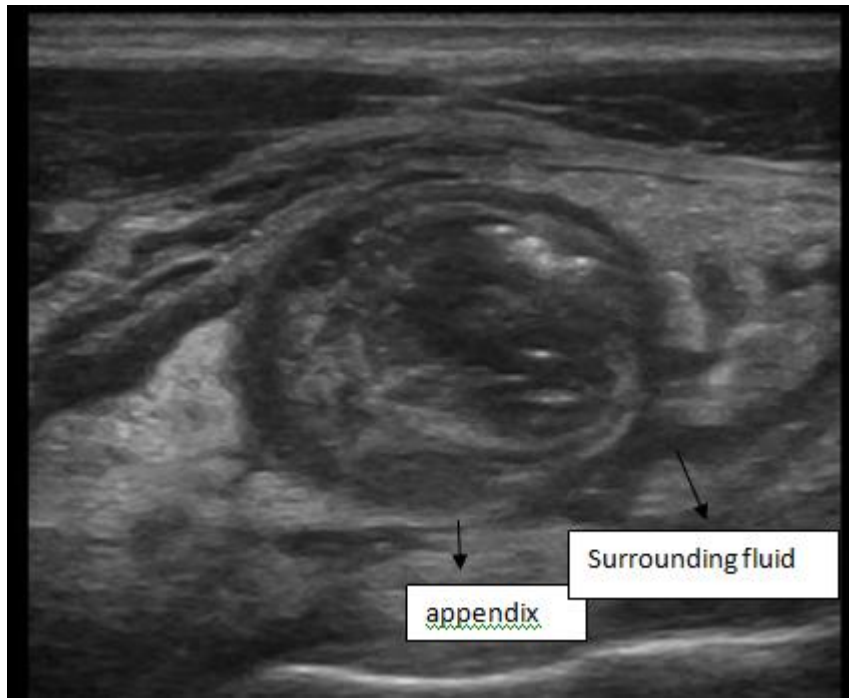
age	complaints	Menstrual history	Blood investigation	Examination	Other
26	Pain on right side of pelvis and lower abdomen	Mid cycle	Raised counts	Tenderness present	
30	Pelvic pain on right side	Menstruating	Normal counts	Tenderness absent	
21	Pain on right side of pelvis and lower abdomen	Mid cycle	Raised counts	Tenderness present	
32	Pelvic pain	Pre menstrual	Raised counts	Tenderness present	

USG was done which showed inflamed appendix in all 4. Hence the diagnosis was made.

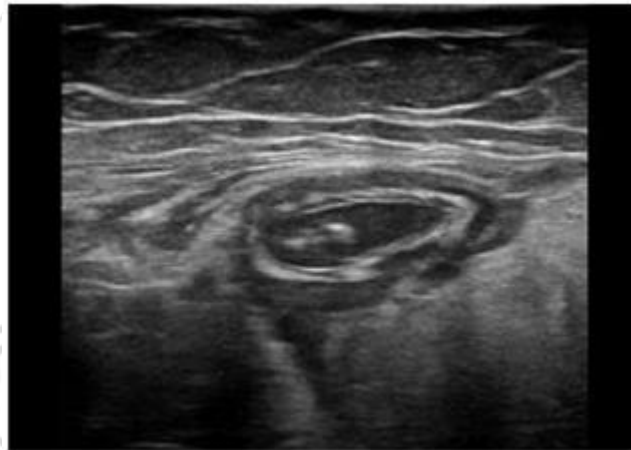
Appendicitis occurs when there is a progressive increase in intraluminal pressure that occurs when the appendix is blocked (i.e. fecalith), which leads to a compromise in venous outflow, ischemic injury, stasis of luminal contents which progresses to inflammation, infection, necrosis and finally perforation. Classically, appendicitis begins with nonspecific periumbilical pain which over the course of the next 24 hours localizes to the right lower quadrant. In addition, the pain may radiate to the right flank and right pelvic area. The patient may also present with nausea, vomiting, fever and a decreased appetite. The symptoms are very similar to the cases described above and listed in the differential diagnosis. Ultrasound offers widespread availability, low cost and absence of ionizing radiation.²⁷ In addition, it is the initial imaging modality for almost all pelvic pathologies. One can order a CT scan of the abdomen and pelvis and not be faulted, but would be exposing a patient to radiation. An alternative is to order an ultrasound, view the appendix and look for other causes of pelvic pain.



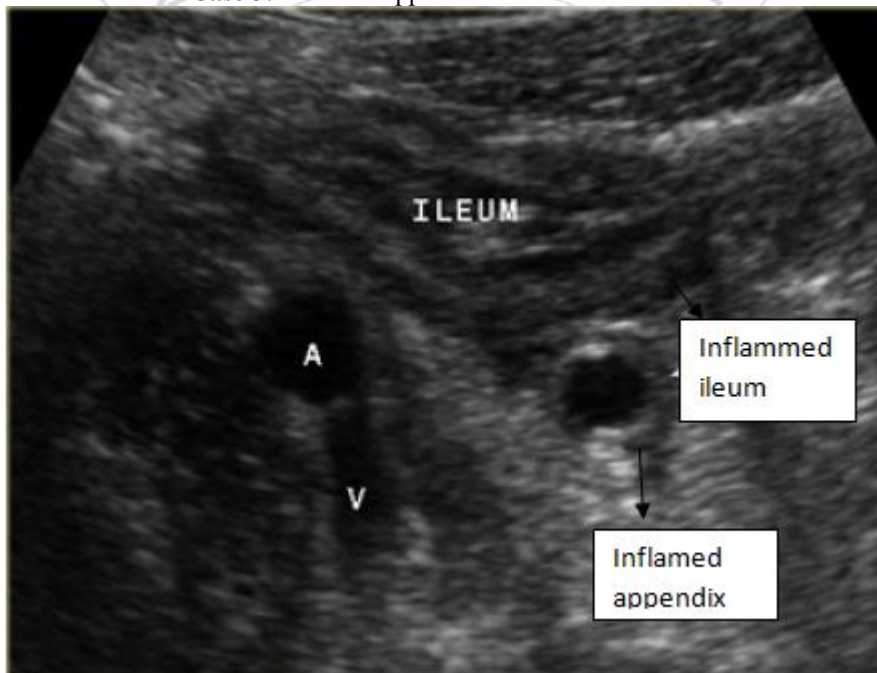
Case 1



Case 2



Case 3: Inflamed appendix with fecolith within



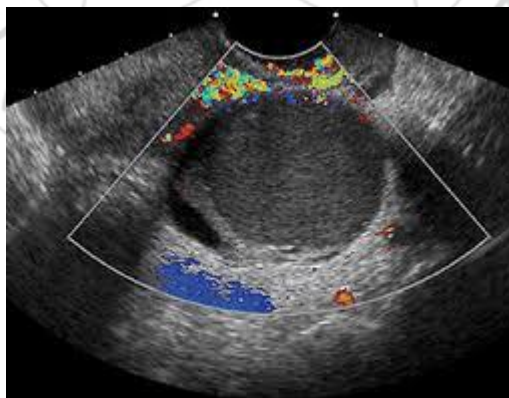
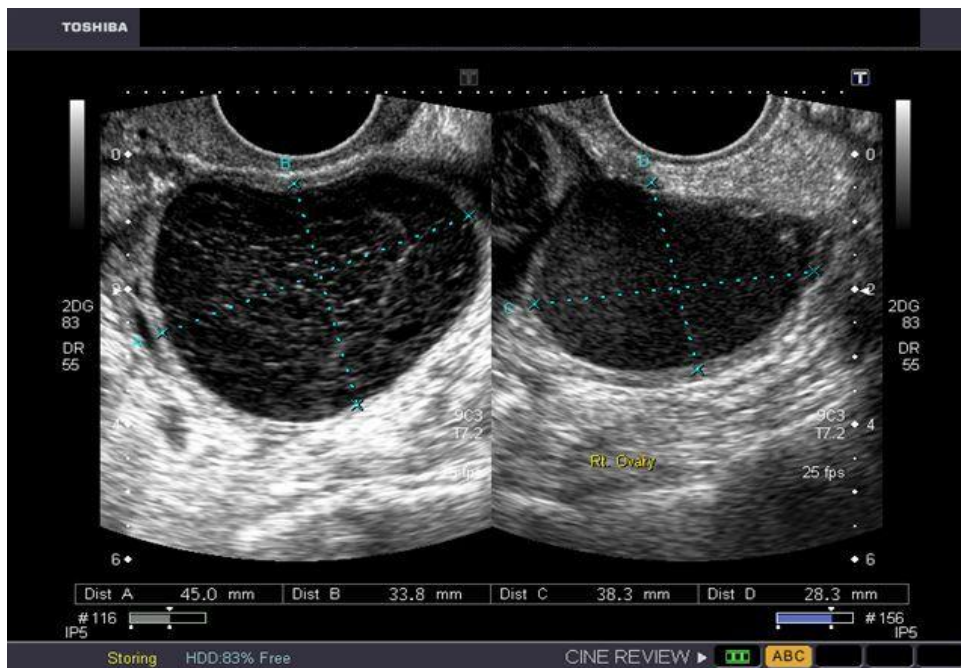
Case 4

Hemorrhagic Ovarian Cyst-3 Cases

Age	Complaints	Examination
32	Dull left sided lower abdominal pain	No significant findings
30	Suprapubic pain	Right adnexal tenderness on p/v
28	Tenderness in supra pubic area	No significant findings

A hemorrhagic ovarian cyst is a cyst that is filled with blood, which usually occurs when a blood vessel breaks into the cyst. Pain from a hemorrhagic cyst is probably due to stretching of the ovarian capsule, as opposed to pain from ovarian cyst rupture which is due to peritoneal irritation.²⁵ Similar to ovarian torsion and ruptured ovarian cysts, patients with a hemorrhagic cyst also present with unilateral lower abdominal and/or pelvic pain associated with nausea,

vomiting and/or vaginal bleeding. Again, the differential diagnosis is varied. As with both adnexal torsion and ruptured ovarian cyst, ultrasound is the initial imaging investigation of choice: Low cost, easy availability and no radiation exposure²⁵. Because hemorrhagic cysts evolve in different stages, fresh blood on the ultrasound initially appears anechoic, later transforming to a blood clot (echogenic content with thin septations) and finally resolving.^{25,26} The typical appearance on ultrasound is that of an enlarged ovary containing multiple echogenic areas (representing blood clots) in a reticular pattern due to clot (representing fibrin strands, not tissue septations) retraction.



USG image showing well defined cystic structure with echoes and septa within in left adnexa and without internal vascularity.

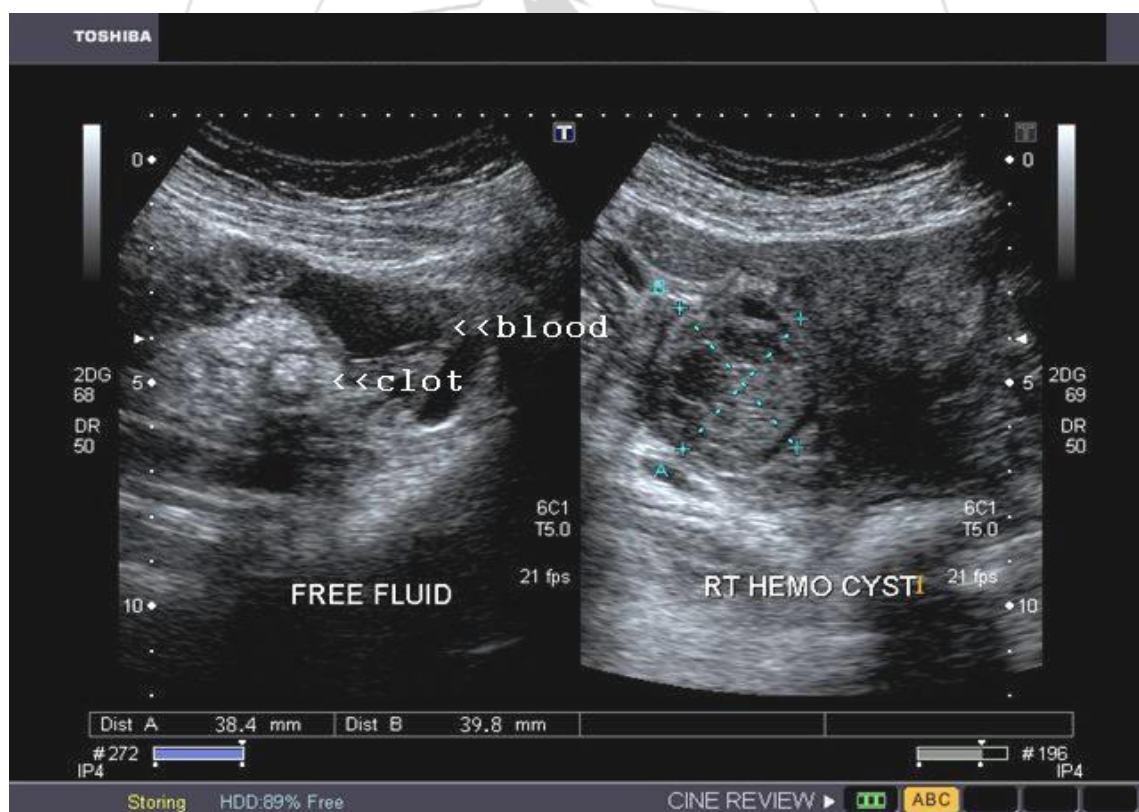


Cystic lesion with internal septae and echoes, giving a typical fish net appearance noted in right ovary- diagnosis of hemorrhagic cyst was made. The lesion did not show internal vascularity.

Ruptured Ovarian Cyst

A 30-year-old female (G1 P1001) presented with a sudden onset of right lower quadrant pain. There is no vaginal bleeding or discharge. Her last menstrual period was 3 weeks ago and was normal. Her urine pregnancy test is negative. Her physical examination is significant for right lower quadrant tenderness, guarding and rebound. Her pelvic examination is significant for right adnexal tenderness, and no masses appreciated.

Any collection of fluid surrounded by a thin wall within the ovary exceeding 2.5 to 3 cm in mean diameter is termed an ovarian cyst. Ovarian cysts are extremely prevalent.²⁵ The majority of ovarian cysts are benign.²⁵ Rupture of an ovarian cyst commonly presents as sudden onset of lower abdominal and/or pelvic pain. This presentation may be similar to appendicitis, an ovarian torsion and/or a hemorrhagic cyst. In addition, due to peritoneal irritation, patients may present with nausea and/or vomiting.



Ovarian Torsion

Torsion refers to torsion of the ovaries, the fallopian tubes or both.²⁰ Clinically, the patient presents with sudden onset of unilateral abdominal and/or pelvic pain. Other non-specific symptoms include nausea, vomiting and, in some patients, fever.²¹ The primary pathology invariably involves an enlarged ovary. This enlarged ovary alters the position of the

fallopian tube setting up the scenario for torsion. Torsions lead to strangulation compromising blood flow, initially venous, then arterial blood flow, ultimately leading to ischemia and necrosis.²⁰ With early diagnosis, the prognosis is excellent. Delay in diagnosis may affect fertility in certain populations.

A 38-year-old female (G0P0) presented with a 1-day history of sharp right lower quadrant pain. The pain started this morning and has progressively worsened. She also complains of being nauseated and has vomited twice. She is currently sexually active and is undergoing preparation for *in vitro* fertilization. Her urine pregnancy test is negative.

Ureterolithiasis

Nephrolithiasis refers to stones in the kidneys. Ureteral calculi or ureterolithiasis refers to stones in the ureters. Almost all ureteral calculi originate in the kidneys. The classic presentation is flank pain, hematuria, nausea and vomiting. In addition, the pain may radiate to the lower quadrant and pelvic area. This is a common clinical presentation to emergency departments.²⁸ There have been studies to show the efficacy of ultrasound for detection of calculi and secondary signs of hydronephrosis.²⁸ In addition, as mentioned earlier, ultrasound has the advantage of detecting other pelvic pathologies.

Both of the cases presented with right back, right lower quadrant and right pelvic pain. An ultrasound was ordered in both cases. In one case a right lower ureteric stone was seen with mild hydronephrosis in right kidney. In the other case right VUJ calculus was seen with normal kidney.

Ectopic Pregnancy

A 24 year old female presented with lower abdominal and pelvic pain, clinical examination revealed tenderness in right iliac fossa. There was h/o bleeding P/V 2 days back. UPT was done, it was faintly positive. USG of the patient was done, which revealed ectopic pregnancy in right adnexa. Fetal cardiac activity was present, along with free fluid in pelvis

3. Conclusion

Acute pelvic pain may be the manifestation of various gynecologic and non-gynecologic disorders from less alarming rupture of the follicular cyst to life threatening conditions such as rupture of ectopic pregnancy or perforation of inflamed appendix. In order to construct an algorithm for differential diagnosis we divide acute pelvic pain into gynecologic and non-gynecologic etiology, which is then subdivided into gastrointestinal and urinary causes. Appendicitis is the most common surgical emergency and should always be considered in differential diagnosis if

appendix has not been removed. Apart of clinical examination and laboratory tests, an ultrasound examination is sensitive and specific to diagnose the condition and helpful in further management.

Ovarian torsion



Large cystic structure with internal echoes and debris, which on color Doppler did not show vascularity within, right ovary was not seen separately from the lesion.

Intraoperatively torsion of ovary was found.



Ectopic Pregnancy



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