DOI: 10.14260/jemds/2015/1243

ORIGINAL ARTICLE

OVARIAN AND ADNEXAL TORSION: SPECTRUM OF IMAGING FINDINGS WITH INTRA-OPERATIVE AND PATHOLOGIC CORRELATION

Archana Agarwal[1], Gaurav Sharma[2], Anoop[3], Meera[4], B. B. Thukral[5]

HOW TO CITE THIS ARTICLE:
Archana Agarwal, Gaurav Sharma, Anoop, Meera, B. B. Thukral. "Ovarian and Adnexal Torsion: Spectrum of Imaging Findings with Intra-Operative and Pathologic Correlation". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 49, June 18; Page: 8595-8604, DOI: 10.14260/jemds/2015/1243

ABSTRACT: OBJECTIVE: The purpose of this study was to review the role of ultrasound in prompt pre-operative diagnosis of adnexal torsion so that no time is wasted before surgery and salvage of ovarian tissue be achieved. **METHODS:** Twenty patients presenting with lower abdominal/pelvic pain referred for ultrasound with provisional diagnosis of ovarian torsion or appendicitis, were evaluated with gray scale and colour doppler sonography (Both transabdominal & transvaginal). Patients with USG diagnosis of ovarian torsion underwent surgery within twenty four hours and the specimen sent for histopathological analysis. **RESULTS:** The twenty patients were in the age group of 18- 40 years, none were post menopausal. Common symptoms/signs were lower abdominal or pelvic pain (100%), nausea/vomiting (60%), and a palpable mass (40%). Leukocytosis was present in 60% patients. Common imaging findings were an enlarged hypoechoic ovary (90%), peripherally arranged follicles with/without associated mass, decreased or absent flow on colour doppler and free fluid (90%). Common surgical findings were enlarged, congested and hemorrhagic ovary consistent with ovarian torsion, often associated with torsion of ipsilateral fallopian tube. There was a slight right-sided predominance 14(70%) and in one case isolated fallopian tube was involved. A correct pre-operative diagnosis of torsion was made in all the cases except in one. At pathologic examination, underlying adnexal masses were found in 16/20 cases (80%); they were benign in all (100%) of 20 cases. **CONCLUSION:** Ultrasound with doppler provides accurate preoperative imaging diagnosis & saves crucial time so as to achieve maximum salvage of ovarian tissue.

KEYWORDS: Lower abdominal/pelvic pain, Ultrasound, Ovarian torsion, Intraoperative findings, Pathologic correlation.

INTRODUCTION: Adnexal torsion is an uncommon gynecologic emergency that is caused by the twisting of the ovary, fallopian tube, or both along the vascular pedicle. Adnexal torsion is reported to be the fifth most common gynecologic emergency condition encountered, with a prevalence of 2.7%.[1-4] If torsion is not relieved, persistent vascular occlusion results in infarction of the adnexal structures. Prompt diagnosis of adnexal torsion and surgical restoration of the blood supply are essential for salvage of the tube or ovary and more rarely, potentially fatal thrombophlebitis or peritonitis.[5] However, the clinical signs and symptoms are often undistinguishable from those of other abdominal or pelvic conditions, and the imaging features associated with adnexal torsion are sometimes nonspecific. The purpose of our study was to review the role of ultrasound and doppler in diagnosing torsion in emergency setup so that early salvage operation can be done and to observe the correlation between the clinical features, imaging features, and pathologic aspects of this condition.

MATERIALS AND METHODS: We prospectively reviewed clinical, laboratory, USG, surgical and pathological data of twenty patients from April to Dec 2012, who presented with acute lower

DOI: 10.14260/jemds/2015/1243

abdominal/ pelvic pain, in whom a sonographic diagnosis of ovarian torsion was made. Gray scale and Colour Doppler sonography (trans-abdominal and trans-vaginal) was performed and a diagnosis of adnexal torsion (predominantly ovarian) was made. In none of the patients CT or MRI was done due to time constraints. All the patients underwent surgery within the first twenty four hours. Specimen were then sent for histopathological analysis. Operative and histological findings were correlated with pre-operative USG diagnosis in all the patients.

OBSERVATION AND RESULTS: Twenty patients with USG diagnosis of adnexal torsion underwent surgery and pathological analysis. Patient's age ranged from 18 to 40years. None were post-menopausal. Four patients were pregnant: Two in the first trimester (14wks) & two in third trimester (30wks). The most common clinical presentation was abdominal/pelvic pain, which was noted in all patients (20/20), of whom (18/20) had acute onset in the past 24 hours and two patients had intermittent pain. Other common clinical features were leukocytosis (12/20), nausea/vomiting (12/20), a palpable abdominal/pelvic mass (8/20), and a fever higher than 38°C (6/20).

No.	Age	Clinical data	USG & Doppler findings	Intra-operative findings	Histo-pathological diagnosis
Case 1	40	Pain lower abdomen & vomiting	Enlarged, edematous right Ovary with peripherally arranged follicles, no colour flow and free fluid in Pouch of douglas(POD)	Enlarged right ovary with one and half turn torsion of right tube. Free fluid	Large right ovary, dark tan in colour, hemorrhagic, congested with twisted fallopian tube.
Case 2	20	Left pelvic pain, nausea/vomiting	Left ovary enlarged(20ml) peripherally placed follicles,edematous, free fluid present, Right ovary(5ml), echogenic fluid present, no color flow seen in left ovary	Ruptured corpus luteum, ovarian torsion having two and half turns at infundibulopelvic ligament. Uterus and left ovary congested and enlarged. 50 ml hemorrhagic fluid in POD	Hemorrhagic and necrotic left ovary with ruptured corpus luteum cyst
Case 3	26	30 wks- Third trimester pregnancy with left lower abdominal pain	Well encapsulated left ovarian cyst with fatty component in wall and intracystic hair like echoes. Ovarian tissue seen at one corner which was swollen. No colour flow on doppler. USG	Left ovarian dermoid cyst (7x6x5 cm) with torsion, which was enucleated and removed. Edematous left ovary, Right ovary and uterus normal	Mature cystic teratoma

DOI: 10.14260/jemds/2015/1243

			diagnosis- Dermoid with torsion of right ovary		
Case 4	25	14wks -1st trimester pregnancy with intermittent lower abdominal pain, now persisting for 3 days	Right Ovary enlarged (8x10) cm, cortex thick, 1-2 peripherally placed follicles seen, no color flow. Free fluid present and Right ovary normal	Enlarged right ovary with 1-1/2 turn involvement of right tube. Free fluid and early intrauterine pregnancy	Left Tubo-ovarian mass seen
Case 5	28	Pelvic pain, vomiting, fever & leukocytosis	Left ovary enlarged, 10x5 cm, with multiple cysts and thick septae, with edematous cortex, peripherally placed follicles & no color flow. Right ovary shows multiple cysts typical of polycystic ovarian syndrome(Image not taken) Normal flow in Right ovary, uterus normal	Left tubo-ovarian mass (10x5 cm) formed by 3 cystic structures with torsion at Left tubal ligation site. Right tubal stricture at ligation site. Right ovary shows Polycystic ovarian syndrome (PCOS), few cysts were punctured and clear fluid oozed out	Left ovary suggestive of Polycystic ovarian syndrome (PCOS). Left tube is congested
Case 6	18	Pain right lower abdomen, nausea/vomiting	Enlarged right ovary,peripherally arranged follicles. 8 x10 cm size necrotic cyst seen in right ovary. Pelvic fluid present. No intra ovarian colour flow s/o right ovarian torsion	Right ovarian cyst (10x6 cm) and torsion (2 and half turn at pedicle). Peritoneal fluid	Hemorrhagic and necrotic right ovary with hemorrhagic cyst
Case 7	35	Right pelvic pain, nausea vomiting	Retort shaped right adnexal tubular structure with one end at right cornu of uterus & other near right ovary. Right ovary-Normal. USG diagnosis- Hydrosalpinx	Twisted isolated right Hematosalpinx	Hemorrhagic and necrotic fallopian tube with normal ovary

DOI: 10.14260/jemds/2015/1243

Case 8	32	Recurrent right sided pelvic pain. Appendicular, ovarian fullness in right fornix.	Right ovary is enlarged and edematous. A hemorrhagic cyst with thin fine septae, no central color flow seen. Left ovary and uterus normal	Right Tubo-ovarian torsion and hemorrhagic cyst	Hemorrhagic cyst, necrotic ovary
Case 9	29	Acute pelvic pain, vomiting, no free fluid	Large ovary in midline location with central necrotic component with thick capsule seen posterior to uterus. Uterus seen being dragged to right side along twisted ovary and uterus appears deformed. POD collection seen. Diagnosis of Right ovarian torsion with necrotic cyst was made.	Large fibroid with cystic degeneration arising from posterior wall of uterus. Bilateral ovaries normal	Large intramural fibroid
Case 10	36	Chronic dull dragging sensation in right iliac fossa. PV examinations s/o mass in pelvis	Right ovary shows a mass measuring 5x7 cm on Right side. Multiple thin septae, no solid component. No color flow. Left ovary and uterus normal, Mild free fluid seen	Hemorrhagic cyst in right ovary, free fluid present, Right ovary congested, Torsion seen at pedicle	Serous cystadenoma with torsion

Table 1: Summary of clinical, radiological, operative & histopathological data in 10 out of 20 patients of adnexal torsion

Fig. 1a: Enlarged, edematous Right Ovary with peripherally arranged follicles and free fluid in POD.

Fig. 1a

DOI: 10.14260/jemds/2015/1243

Fig. 1b: No colour flow on power doppler evaluation.

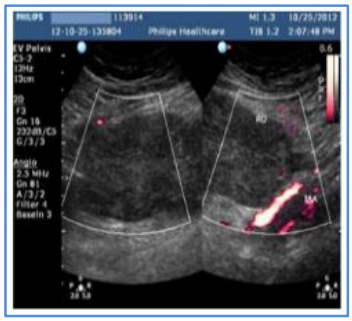

Fig. 1b

Fig. 2a: Left ovary enlarged (20ml), edematous and shows peripherally placed follicles, free fluid present.

Fig. 2b: No colour flow within left ovary on doppler evaluation.

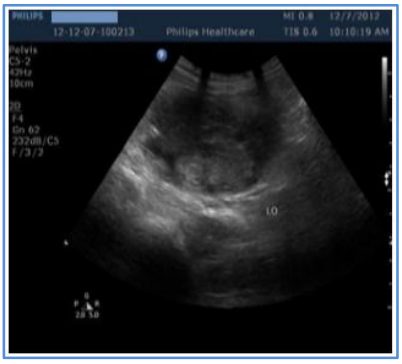

Fig. 2a

Fig. 2b

Fig. 3a: Well encapsulated left ovarian cyst with fatty component in wall and intracystic hair like echoes. Dermoid with right ovarian torsion.

Fig. 3b: No colour flow on doppler. USG diagnosis.

Fig. 3a

Fig. 3b

DOI: 10.14260/jemds/2015/1243

Fig. 4a: Right ovary (8x10) cm, cortex thick, 1-2 peripherally placed follicles seen, few septations noted.

Fig. 4b: No color flow present on doppler evaluation. Early intrauterine pregnancy noted, free fluid present.

Fig. 4a

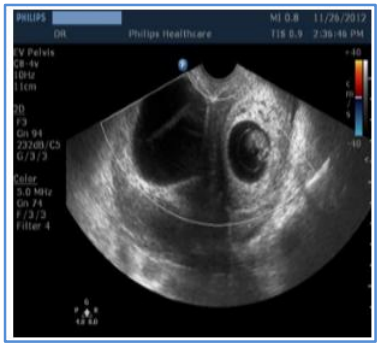

Fig. 4b

Fig. 5a: Left Ovary enlarged, 10x5 cm, with multiple peripherally placed follicles with edematous cortex.

Fig. 5b: Cystic component of left ovary with thick septae, no color flow on doppler examination.

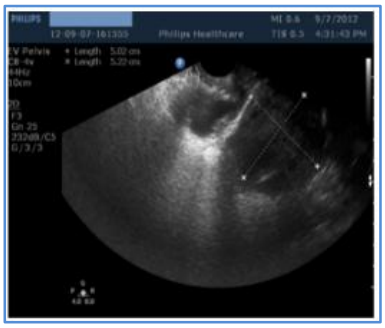

Fig. 5a

Fig. 5b

Fig. 6a: Enlarged right ovary, peripherally arranged follicles.

Fig. 6b Necrotic cyst seen in Right ovary. Pelvic fluid present.

Fig. 6a

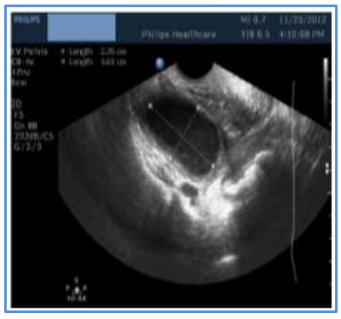

Fig. 6b

DOI: 10.14260/jemds/2015/1243

Fig. 7a: Retort shaped right adnexal tubular structure with one end at right cornu of uterus and other near right ovary.

Fig. 7b: No colour flow in right ovary on doppler evaluation. USG diagnosis- Hydrosalpinx.

Fig. 7a

Fig. 7b

Fig. 8: Right ovary is enlarged and edematous. A hemorrhagic cyst with thin fine septae. No central color flow seen. (Not shown in the image).

Fig. 8

Fig. 9a: Large ovary in midline location with central necrotic component with thick capsule seen posterior to uterus.

Fig. 9b: Uterus appears deformed and is seen being dragged to right side along twisted ovary. POD collection seen. USG diagnosis- Right ovarian torsion with necrotic cyst.

Fig. 9a

Fig. 9b

DOI: 10.14260/jemds/2015/1243

DISCUSSION: Adnexal torsion is caused by twisting of the vascular pedicle of the adnexa, which results in vascular impairment. Unrelieved torsion is likely to be followed by hemorrhagic infarction and necrosis of the adnexal structures, which may lead to complications such as peritonitis and infertility. Prompt diagnosis and surgical restoration of blood flow may avoid irreversible adnexal damage and may preserve ovarian function. However, because of nonspecific clinical and laboratory findings, surgery is frequently delayed. [6-7] The clinical presentation of adnexal torsion sometimes mimics that of other abdominal/pelvic conditions, such as tubo-ovarian abscesses, endometriosis, appendicitis, and ruptured ovarian cysts.[6-7]

Adnexal torsion is reported to be the fifth most common gynecologic emergency, with a prevalence of 2.7%.[8] It occurs predominantly in women of reproductive age and occasionally occurs in prepubescent girls.[9] The right ovary has been reported to be more frequently affected by torsion than the left[8,10] which is sometimes thought to be due to the colon occupying the left side of the pelvic cavity. Our study also showed a slight right-sided predominance, which was found in 6 out of 10 patients. Torsion of the adnexal structure may involve the fallopian tube (found in 20 % patients in our study).

Preexisting adnexal pathologic conditions, either neoplasms or cysts, are common in adnexal torsion and have been found in 50% to 81% of patients in previous reports.[8,10,11] Of the various ovarian neoplasms, benign cystic teratoma has been considered the most common cause, with rates ranging from 3.5% to 16.1% in the literature.[8,12] In our study, 12 patients had an underlying adnexal pathologic condition, which included 2 cases of mature cystic teratoma and 2 cases of serous cystadenoma. Adnexal torsion can also occur in the absence of an underlying condition. This is more common in children and younger women, in whom the adnexa are especially mobile, which allows torsion at the mesosalpinx.[13-15] In our study 2 patients did not have any associated adnexal conditions, whereas 4 had a benign hemorrhagic cyst, 2 PCOS and two had ruptured corpus luteum cyst. It has been proposed that malignant lesions are unlikely to be associated with adnexal torsion because they are more likely to cause inflammation and fibrosis, which leads to adhesive disease and stabilization of surrounding structures. [16] None of the patients in our study had malignant etiology.

Other predisposing factors for adnexal torsion include pregnancy and ovulation induction.[17] Pregnant women have a greater risk of torsion of adnexal masses than nonpregnant women. It has been reported that 12 -18 % of ovarian torsion occurs during pregnancy.[18] Among our 20 cases, there were only 4 patients who had adnexal torsion during pregnancy out of which two had no cause.
Sonography has an important role in the evaluation of gynecologic emergencies. In most cases, a cystic, complex, or solid pelvic mass is seen,[19,20] commonly associated with pelvic fluid. More specific findings include an enlarged ovary with multiple peripherally located follicles,[14] a twisted vascular pedicle,[21] and the recently reported sonographic whirlpool sign.[22] In our study 20 patients who had preoperative sonography, most had enlarged ovary with peripherally arranged follicles. Adnexal masses were found in 12 of 20 cases. These were most often cystic or complex in nature. Ovarian enlargement without a mass was found in 4 patients and one of them was pre-pubescent. The diagnostic value of Doppler evaluation has been reported in some series.[17,19,23] The conclusion of these studies is that normal Doppler findings cannot exclude adnexal torsion. This could be due to partial or intermittent torsion or a dual ovarian arterial blood supply. In our study, arterial and venous flow was considered abnormal in 18 out of the 20 patients who had Doppler assessment along with gray scale sonography. Our observations suggest that when performing sonography in patients with pelvic pain, it is important to include a Doppler evaluation to assess for torsion. This

improves the likelihood of an accurate diagnosis of adnexal torsion, also in patients not showing any central flow it's difficult to revive the ovary peroperatively. In our series all patients not showing color flow had to undergo oophrectomy. However, it must again be emphasized that normal Doppler findings cannot exclude the diagnosis.

According to the above observations, initial sonography resulted in a correct preoperative diagnosis of adnexal torsion in most of the patients, which increased further when Doppler imaging was used. Doppler findings were most helpful when abnormal, whereas normal Doppler findings did not always rule out torsion. We suggest that a combined sonographic and Doppler assessment be the first-line imaging study whenever possible. Sonography, especially transvaginally, can be useful to confirm that the abnormality is adnexal and that the involved adnexa is tender and to further characterize the nature of any adnexal mass.

CONCLUSION: Adnexal torsion usually presents with acute abdominal/pelvic pain, nausea, vomiting, and leukocytosis and can involve both the ovary and the fallopian tube in patients of reproductive age. In our prospective study we found that initial sonography with Doppler imaging was accurate in achieving the correct preoperative imaging diagnosis and in saving crucial time so as to achieve maximum salvage of ovarian tissue. The findings of enlarged, edematous ovaries with edematous cortex, peripheral placed follicles and no color flow on Doppler interrogation and free fluid in Pouch of douglas were consistent findings. Also, the absence of much talked about whirlpool sign doesn't rule out presence of ovarian torsion.

REFERENCES:

1. Bayer AI, Wiskind AK. Adnexal torsion: can the adnexa be saved? Am J Obstet Gynecol 1994; 171: 1506–1511.
2. Taskin O, Birincioglu M, Aydin A, et al. The effects of twisted ischaemic adnexa managed by detorsion on ovarian viability and histology: an ischaemia-reperfusion rodent model. Hum Reprod 1998; 13: 2823–2827.
3. Hibbard LT. Adnexal torsion. Am J Obstet Gynecol 1985; 152: 456–461.
4. Burnett LS. Gynecologic causes of the acute abdomen. Surg Clin North Am 1988; 68: 385–398.
5. Nichols DH, Julian PT. Torsion of the adnexa. Clin Obstet Gynecol 1985; 28: 375–380.
6. Moore L, Wilson SR. Ultrasonography in obstetric and gynecologic emergencies [review]. Radiol Clin North Am 1994; 32: 1005–1022.
7. Bider D, Mashiach S, Dulitzky M, Kokia E, Lipitz S, Ben-Rafael Z. Clinical, surgical and pathologic findings of adnexal torsion in pregnant and nonpregnant women. Surg Gynecol Obstet 1991; 173: 363–366.
8. Hibbard LT. Adnexal torsion. Am J Obstet Gynecol 1985; 152: 456–461.
9. Breech LL, Hillard PJ. Adnexal torsion in pediatric and adolescent girls. Curr Opin Obstet Gynecol 2005; 17: 483–489.
10. Warner MA, Fleischer AC, Edell SL, et al. Uterine adnexal torsion: sonographic findings. Radiology 1985; 154: 773–775.
11. Nichols DH, Julian PJ. Torsion of the adnexa. Clin Obstet Gynecol 1985; 28: 375–380.
12. Comerci JT Jr, Licciardi F, Bergh PA, Gregori C, Breen JL. Mature cystic teratoma: a clinocopathologic evaluation of 517 cases and review of the literature. Obstet Gynecol 1994; 84: 22–28.

DOI: 10.14260/jemds/2015/1243

13. Schultz LR, Newton WA, Clatworthy HW. Torsion of previously normal tube and ovary in children. N Engl J Med 1963; 268: 343–346.
14. Graif M, Itzchak Y. Sonographic evaluation of ovarian torsion in childhood and adolescence. AJR Am J Roentgenol 1988; 150: 647–649.
15. Kim YH, Cho KS, Ha HK, et al. CT features of torsion of benign cystic teratoma of the ovary. J Comput Assist Tomogr 1999; 23: 923–928.
16. Kokoska ER, Keller MS, Weber TR. Acute ovarian torsion in children. Am J Surg 2000; 180: 462-465.
17. Rosado WM Jr, Trambert MA, Gosnik BB, Pretorius DH. Adnexal torsion: diagnosis by using Doppler sonography. AJR Am J Roentgenol 1992; 159: 1251–1253.
18. Desai SK, Allahbadia GN, Dalal AK. Ovarian torsion: diagnosis by color Doppler ultrasonography. Obstet Gynecol 1994; 84: 699–701.
19. Mashiach S, Bider D, Moran O, Goldenberg M, Ben-Rafael Z. Adnexal torsion of hyperstimulated ovaries in pregnancies after gonadotropin therapy. Fertil Steril 1990; 53: 76–80.
20. Albayram F, Hamper UM. Ovarian and adnexal torsion: spectrum of sonographic findings with pathologic correlation. J Ultrasound Med 2001; 20: 1083–1089.
21. Stark JE, Siegel MJ. Ovarian torsion in prepubertal and pubertal girls: sonographic findings. AJR Am J Roentgenol 1994; 163: 1479–1482.
22. Lee EJ, Kwon HC, Joo HJ, Suh JH, Fleischer AC. Diagnosis of ovarian torsion with color Doppler sonography: depiction of twisted vascular pedicle. J Ultrasound Med 1998; 17: 83–89.
23. Vijayaraghavan SB. Sonographic whirlpool sign in ovarian torsion. J Ultrasound Med 2004; 23: 1643–1649.

AUTHORS:

1. Archana Agarwal
2. Gaurav Sharma
3. Anoop
4. Meera
5. B. B. Thukral

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Radiodiagnosis, Vardhman Medical College & Safdarjung Hospital, New Delhi.
2. Senior Resident, Department of Radiodiagnosis, Vardhman Medical College & Safdarjung Hospital, New Delhi.
3. Senior Resident, Department of Radiodiagnosis, Vardhman Medical College & Safdarjung Hospital, New Delhi.
4. Post Graduate Resident, Department of Obstetrics & Gynaecology, Vardhman Medical College & Safdarjung Hospital, New Delhi.
5. Professor & HOD, Department of Radiodiagnosis, Vardhman Medical College & Safdarjung Hospital, New Delhi.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Gaurav Sharma,
202/18, Orchid Petal,
Sohna Road, Sector 49,
Gurgaon-18, Haryana.
E-mail: dr.gaurav.rad@gmail.com

FINANCIAL OR OTHER COMPETING INTERESTS: None

Date of Submission: 18/05/2015.
Date of Peer Review: 19/05/2015.
Date of Acceptance: 11/06/2015.
Date of Publishing: 18/06/2015.