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Original Article

Sonographic and histologic outcomes of adnexal torsion

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A B S T R A C T

Objective: This study aimed to investigate the success of ultrasound in the diagnosis of adnexal torsion before surgery and to define its histological diagnosis and results in different age periods.

Material and Methods: This study was carried out with a retrospective examination of 130 patients clinically suspected as adnexal torsion between January 2008 and May 2012. Diagnostic tests investigated the success of sonography in the diagnosis of adnexal torsion. Seventy cases confirmed by surgery were divided into three groups. Children and adolescents under 18 years of age were classified as Group 1, reproductive women Group 2, and postmenopausal women Group 3. In these three groups, mass size, type, histological diagnosis, and outcome of adnexal torsion were defined.

Results: The sensitivity, specificity, and accuracy of ultrasound were 84.3%, 78.3%, and 81.5%, respectively. There were significant differences in the presence of ultrasonic hallmarks among the true positive, false positive, and false negative cases of adnexal torsion. Adnexal torsion was identified in 70 cases. The majority of cases were found to occur in the reproductive period (47 of 70). Teratoma was the most common histological diagnosis in children and adolescents, while normal ovary was in the reproductive period. In the postmenopausal period, the most common histological diagnosis was cystadenoma, but the malignant ovarian tumor was observed in 2 of 10 cases.

Conclusion: We conclude that ultrasonography performed by a specialized obstetrics and gynecology ultrasound unit plays an essential role in the preoperative diagnosis of adnexal torsion. Most adnexal torsions occurred in women of reproductive age, and the right side was dominant. The spectrum of histological diagnosis varied at different ages.

Keywords: Torsion Abnormality, Adnexal Diseases, Adolescent, Ultrasonography, Teratoma

Introduction

Adnexal torsion is the total or partial twisting of part or all of the adnexa on its mesentery, resulting in tissue ischemia and infarction [1]. It is a gynecological emergency that can be seen in any age group [2]. Although the frequency of adnexal torsion is not fully known, it has been reported to be between 2.7 and 3% among gynecological emergency applications [3]. Torsion is the fifth most common cause of the surgical emergency, after ectopic pregnancy, corpus luteum rupture, pelvic inflammatory disease, and appendicitis. In a 10-year series, 15% of cases operated due to adnexal mass was reported to be torsion [4].

Early diagnosis is essential to maintain fertility and prevent other morbidities. However, it is difficult to make a definitive diagnosis since the symptoms are non-specific. The classic presentation of torsion is acute to moderate to severe pain, often accompanying nausea and vomiting in a woman with an adnexal mass [5]. However, the presentation may vary, and clinical symptoms may be signs of other conditions. Sometimes even torsion can occur without adnexal mass. The definitive diagnosis of torsion is direct visualization of rotated adnexa with surgical exploration.

The first assessment before surgery is pelvic ultrasonography, but the findings are not characteristic. For the diagnosis of adnexal torsion, the sensitivity of ultrasonography has been reported to be between 46 and 75% [3,6]. The diagnosis of adnexal torsion is still tricky before surgery.

Adnexal torsion can occur at any age, but it is most common in the reproductive age [7,8]. Clinical presentation is almost the same in adolescent, reproductive, and postmenopausal periods [9]. However, the condition causing torsion may differ between periods. Therefore, knowing the histological diagnosis of ovarian torsion at different ages may be helpful in preoperative diagnosis.

This study aimed to investigate the success of ultrasound in the diagnosis of adnexal torsion before surgery and to define its histological diagnosis and results in different age periods.

Material and Methods

This study was carried out with a retrospective examination of 130 patients clinically suspected as adnexal torsion between January 2008 and May 2012 at Tepecik Research and Education Hospital.

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All patients were evaluated by experienced sonographers with pelvic ultrasound and the definitive diagnosis was made by surgery.

Approval was obtained from the Research Ethics Committee of Tepecik Research and Education Hospital for the study.

Diagnostic tests investigated the success of sonography in the diagnosis of adnexal torsion. Seventy cases confirmed by surgery were divided into three groups. Children and adolescents under 18 years of age were classified as Group 1, reproductive women Group 2, and postmenopausal women Group 3. In these three groups, mass size, type, histological diagnosis, and outcome of adnexal torsion were defined.

The sonographic evaluation was performed using a GE LOGIQ™5 PRO with a 5- to 9-MHz transvaginal probe or an abdominal 4- to 8- MHz probe (GE Medical Systems; Milwaukee, Wisconsin 53201, USA). A transabdominal/transrectal approach was performed in virgin patients with consent by the individual or her guardian, and a transvaginal approach was performed in sexually active patients. Possible findings of adnexal torsion were obtained from ultrasonography records. These are; (1) ovarian edema, commonly indicating as heterogeneous central stroma with several small peripheric follicles; (2) ovarian enlargement compared with the unaffected ovary; (3) an ovarian cyst or mass; (4) an abnormal location of the ovary; (5) abnormal ovarian blood flow, described as the absence of venous and arterial flow or detection of only arterial flow on Doppler evaluation; (6) the being of free fluid in the Douglas pouch. For the pre-diagnosis of adnexal torsion, the presence of at least two of these ultrasound findings was considered a criterion.

Statistical analyses were performed using SPSS version 22 (IBM, New York, NY, USA). The sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of the ultrasound were evaluated to determine its ability to diagnose adnexal torsion. The descriptive parameters are expressed as a mean ± standard deviation or as a number (%). The chi-square test, Fisher's exact test, t-test, and ANOVA were used for statistical comparisons as appropriate. A p-value of <0.05 was considered statistically significant.
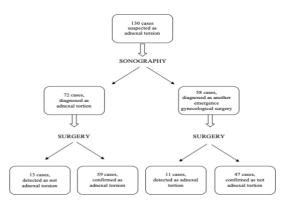
Results

One hundred thirty cases who were asked for gynecology consultation from the emergency department due to suspicion of adnexal torsion, the preoperative sonographic evaluation was performed, and who were taken to diagnostic surgery due to adnexal torsion or other gynecological emergencies were included in the study. As a result of the sonographic evaluation, 72 cases were diagnosed with adnexal torsion. Although intraoperative torsion was confirmed in 59 of 72 cases, no torsion was detected in 13 of them. In 58 cases that were not diagnosed with torsion by sonographic evaluation, 11 of them were detected to have intraoperative torsion, while 47 of them were confirmed no torsion. The data flow chart is shown in Figure 1.

Totally 70 of 130 cases were confirmed as adnexal torsion. The other conditions observed by surgery as number and percentage were listed in Table 1.

Sensitivity, specificity, positive predictive value, negative predictive values, and accuracy of sonographic findings are listed in Table 2.

Figure 1: The data flow chart of suspicious adnexal torsion cases

The sensitivity of the sonography was 84.3%, the specificity was 78.3%, the positive predictive value was 81.9%, the negative predictive value was 81.0%, and the overall accuracy was 81.5%. In the sonographic findings, abnormal ovarian blood flow and free fluid in the Douglas pouch were significant statistically (p<0.05). (Table 2)

Table 1: Surgical findings of cases

Surgical findings	N (%)
Total cases	130 (100%)
Adnexal torsion	70 (53.8%)
Right	41 (31.5%)
Left	29 (22.3%)
Ectopic pregnancy	27 (20.8%)
Ovarian cyst rupture	13 (10.0%)
Non-torsed ovarian tumor	12 (9.2%)
Pelvic inflammatory disease	3 (2.3%)
Corpus luteum hemorrhage	3 (2.3%)
Tubal mesosalpinx cyst	1 (0.8%)
Appendicitis	1 (0.8%)

The 70 true cases of adnexal torsion were divided into three groups. There were 13 (18.6%) cases in Group 1 (female children and adolescents); 47 (67.1%) cases in Group 2 (fertile women); and 10 (14.3%) cases in Group 3 (postmenopausal women). The mean patient age, mean mass size, and torsion side of each group are listed in Table 4. The mean age of all patients was 33,6 ± 14.9 years old. There was no significant difference in the mean mass size statistically between the three groups (p=0.173). There were 29 (41.4%) cases that twisted on the left, whereas 41 (58.6%) cases twisted on the right. In total cases, the torsion side was statistically significant (p=0.043). Whereas, there was no statistically significant difference between the three groups (p=0.961). (Table 3)

Table 2: Accuracy of sonographic findings

Sonographic findings	The measure of Accuracy, %					
	Sensitivity	Specificity	PPV	NPV	Accuracy	*P*
Ovarian edema	84.3	21.7	55.7	54.2	55.4	>0.05
Relative enlargement of ipsilateral ovary	82.9	26.7	56.9	57.1	56.9	>0.05
Abnormal ovarian blood flow	82.9	35.0	59.8	63.6	60.8	**<0.05**
Free fluid in Douglas pouch	68.6	73.3	75.0	66.7	70.8	**<0.05**
Ovarian mass	38.6	73.3	62.8	50.6	54.6	>0.05
Abnormal ovarian location	35.7	78.3	65.8	51.1	55.4	>0.05
Overall sonography	*84.3*	*78.3*	*81.9*	*81.0*	*81.5*	**<0.05**

PPV, positive predictive value; NPV, negative predictive value

The patients were subjected to laparotomy or laparoscopy: Of the 38 cases treated via adnexectomy, which removed the affected ovary and fallopian tube, all of the cases were performed by laparotomy; of the 20 cases treated via adnexa detorsion and cystectomy, 11 cases were performed by laparotomy, and 9 cases were performed by laparoscopy; moreover, 12 cases were treated by total abdominal hysterectomy and bilateral salpingooferectomy due to suspicious of malignancy or other accompanying gynecological pathologies. The salvage rate of the ovary was 28.6% (20 of 70).

Table 3: Patient mean ages and mass size and torsion side at different ages

		Group 1 (n=13)	Group 2 (n=47)	Group 3 (n=10)	Total (n=70)	*P value*
Patient Age (years), mean±SD		14.2 ± 4.2	34.3 ± 8.8	55.6 ± 8.4	33,6 ± 14.9	0.173
Mass Size (mm), mean±SD		66.2 ± 33.0	83.3 ± 34.0	91.7 ± 37.3	81.3 ± 35.3	0.961ᵃ
Torsion Side	Left, n (%)	5 (38.4%)	20 (42.6%)	4 (40.0%)	29 (41.4%)	**0.043ᵇ**
	Right, n (%)	8 (61.6%)	27 (57,4%)	6 (60.0%)	41 (58.6%)	

a between three groups; b in total cases

None of the patients experienced other postoperative complications. The surgical procedures, according to the age group, are listed in Table 4.

Table 4: Treatment of adnexal torsion at different ages

Operation (N=70)		Group 1 (N=13)	Group 2 (N=47)	Group 3 (N=10)
Laparotomy (61)	*Salpingooferectomy (38)*	2	32	4
	Adnexa detorsion and tumorectomy (11)	5	6	0
	Hysterectomy and salpingooferectomy (12)	0	6	6
Laparoscopy (9)	*Adnexa detorsion and tumorectomy (9)*	6	3	0

The histological diagnoses were as follows in descending order: normal ovary (21 of 70), cystadenoma (16 of 70), ovarian cyst (15 of 70), teratoma (14 of 70), sex cord-stromal tumour (12 of 70), and cystadenocarcinoma (2 of 70). The most common histological diagnoses of Groups 1, 2, and 3 were teratoma, normal ovary, and mucinous cystadenoma, respectively. The histological diagnoses, according to age groups, are summarized in Table 5.

Table 5: Histologic diagnosis at different ages

Histologic Diagnosis (N=70)		Group 1 (N=13)	Group 2 (N=47)	Group 3 (N=10)
Ovary (21)	*Necrosis (21)*	0	20	1
Ovarian cyst (15)	*Simple cyst (9)*	3	6	0
	Hematoma (4)	0	4	0
	Endometrioma (2)	0	2	0
Teratoma (14)	*Mature cystic teratoma (14)*	7	7	0
Cystadenoma (16)	*Serous cystadenoma (10)*	3	5	2
	Mucinous cystadenoma (6)	0	3	3
Sex cord stromal tumor (2)	*Fibroma (2)*	0	0	2
Malignant tumor (2)	*Serous cystadenocarcinoma (2)*	0	0	2

Discussion

Adnexal torsion is the total or partial twisting of part or all of the adnexa on its mesentery, resulting in tissue ischemia and infarction [1]. The clinical presentation can imitate other conditions; therefore, the differential diagnosis of adnexal torsion include a non-torsed pelvic cyst or tumor, pelvic inflammatory disease, ectopic pregnancy, corpus luteum hemorrhage, ovarian cyst rupture, appendicitis, diverticulitis, and urolithiasis [10]. A preoperative diagnosis

is crucial because the complications of a delayed diagnosis may cause the loss of the adnexa or ovary, fatal thrombophlebitis, or peritonitis [11,12]. Early and definite ultrasonic diagnosis of adnexal torsion comprises the basis of treatment. However, the coherence between ultrasound and surgical diagnoses of adnexal torsion differs widely and is predominantly affected by the ultrasound specialist [3,13,14]. In our study, we determined the sonographic findings and their success. This finding supported that ultrasound examination plays an essential role in the preoperative diagnosis of adnexal torsion. In this study, it is shown that uniquely, in the presence of adnexal mass, accompanying free fluid in Douglas pouch and abnormal ovarian blood flow, the ultrasonography helps to diagnose early. We attained a high rate of agreement between ultrasound examination and surgery for the diagnosis of adnexal torsion as a result of the use of a specialized gynecology ultrasound unit and a combination of sonographic signs to indicate adnexal torsion.

Adnexal torsion may occur at all ages. It has been mostly reported in women of reproductive age;15% of cases occur during childhood, and 15% of cases occur during or after menopause [8,15]. Our study endorsed these findings that torsion occurred mainly in women of reproductive age (67.1%), with 18.6% of cases in children and adolescents and 14.3% of cases in postmenopausal women. The mean size of the torsion mass in the postmenopausal women was increased compared with the other groups. Our data also confirmed that the right side was dominant in cases of adnexal torsion, likely because the right utero-ovarian ligament is physiologically longer than the left ligament or because of the presence of the sigmoid on the left, which reduces the space needed for torsion to occur [16,17].

The most common histological diagnosis has varied among studies and includes teratoma, cystadenoma, and ovarian cyst [18,19]. In our study, the most common diagnosis was normal ovary, which supports the idea that ovarian torsion is not only associated with pathological changes but may also occur in the normal ovary [9]. The histological diagnosis varied among the age groups. In children and adolescents, the most common diagnosis was teratoma. This result is in parallel to previous studies that reported benign cystic teratomas and hemorrhagic or follicular cysts as common causes of torsion [20]. Teratoma, followed by a normal ovary, was the most common diagnosis in reproductive ages. In postmenopausal cases, mucinous cystadenoma was the most common histological type. All of the sex cord-stromal tumors (SSCT) (2 of 70 cases) were fibroma. These two cases were diagnosed in postmenopausal age. Fibromas are the most common of the benign SCSTs and account for 4 percent of all ovarian neoplasms. They are benign behavioral tumors and mostly occurred in postmenopausal age [21]. About 30% of ovarian masses found in postmenopausal women are malignant, and the risk of malignancy increases with age. For these reasons, the possibility of a malignant adnexal mass is higher than the possibility of torsion [22].

Two patients in our study exhibited cystadenocarcinoma torsion at a postmenopausal age. In the postmenopausal group, 2 of 10 cases (20%) were confirmed as a malignant ovarian tumor. Yousefi et al. found the rate of malignant neoplasm as 20% in postmenopausal torsion cases, similar to our results [23].

An adnexectomy was suggested when the adnexa appeared necrotic or did not appear viable after detorsion the ischemic adnexa [16]. Recently, conservative surgery has been advocated, which typically involves detorsion of the twisted ischemic adnexa and ovarian tumorectomy to protect ovarian function [17,24]. In our study, 20 patients were subjected to conservative surgery. Total abdominal hysterectomy and bilateral salpingooferectomy were performed in 6 reproductive women and six postmenopausal women due to suspicious of malignancy or other accompanying gynecological pathologies, and the remaining 38 patients lost adnexa. The results of our surgical treatment are similar to Feng et al. [14].

The limitations of our study include its retrospective nature and the exclusion of patients not undergoing surgery, which may result in the exclusion of patients with adnexal torsion.

In conclusion, we emphasize that ultrasonography performed by a specialized obstetrics and gynaecology ultrasound unit plays an essential role in the preoperative diagnosis of adnexal torsion. Most adnexal torsions occurred in women of reproductive age, and the right side was dominant. The spectrum of histological diagnosis varied at different ages.

Declaration of interest statement

The authors report no conflict of interest.

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