Original Article / *Özgün Araştırma*

DOI: 10.4274/haseki.25633
Med Bull Haseki 2018;56:187-91

Adnexal Torsion: Difficulty in Diagnosis and Management

Adneksiyal Torsiyon: Tanı ve Tedavide Zorluk

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Abstract

Aim: To investigate both the diagnostic value of Doppler-ultrasonography and factors influencing surgical intervention in patients with adnexal torsion (AT).

Methods: We retrospectively examined medical records of 66 women with AT in a single center between January 2007 and December 2016.

Results: Forty-three out of 66 patients (65.1%) with AT were correctly diagnosed preoperatively. On Doppler examination, reduced ovarian arterial blood velocity was observed in 39 patients (59.1%); and the sensitivity was 0.67. AT was diagnosed in 49 patients (74.2%) via laparotomy, and the number of patients who were subjected to radical treatment was higher than that of patients managed with conservative treatment (54.6% vs 45.4%). Although there was no difference in the surgical approaches (laparoscopy vs laparotomy) between the groups, age, gravidity, parity, body mass index, and ovarian cyst size were significantly lower in patients who were treated conservatively (p<0.05).

Conclusion: The diagnostic value of Doppler examination for AT is limited and the decision for surgical management should not be delayed based on Doppler results. Early age, low gravidity, parity and body mass index, and small size of ovarian cyst on ultrasonography were indication for conservative treatment, whereas black-bluish macroscopic appearance had no influence on the preference towards the selection of treatment.

Keywords: Adnexa uteri, torsion abnormality, ultrasonography, Doppler, color, disease management

Öz

Amaç: Adneksiyal torsiyonlu (AT) hastalarda Doppler ultrasonografinin tanısal değeri ve cerrahi müdahaleyi etkileyen faktörlerin araştırılmasıdır.

Yöntemler: Ocak 2007-Aralık 2016 tarihleri arasında, tek merkezde AT'si bulunan 66 kadının tıbbi kayıtları retrospektif olarak incelendi.

Bulgular: Operasyon öncesi 66 hastanın 43'ünde (%65,1) doğru tanı koyulmuştu. Doppler incelemede, 39 hastada (%59,1) overyan arterde akım kaybı olduğu izlendi; ve duyarlılık 0,6 idi. Kırk dokuz hastada (%74,2) AT tanısı laparotomi ile koyulmuştu ve radikal tedavi konservatif tedaviye göre daha fazla hastada uygulanmıştı (%54,6'ya karşı %45,4). Her ne kadar cerrahi yaklaşımlara (laparoskopiye karşı laparotomi) göre gruplar arasında fark olmasa da; yaş, gravidite, parite, vücut kütle indeksi ve over kist boyutu, konservatif tedavi uygulanan hastalarda anlamlı olarak daha düşüktü (p<0,05).

Sonuç: AT için Doppler incelemesinin tanı değeri sınırlıdır ve cerrahi tedavi kararı Doppler sonuçlarına göre geciktirilmemelidir. Erken yaş, düşük gravidite, parite ve vücut kitle indeksi, ultrasonografide küçük çaplı over kisti konservatif tedavi yönünde etkiliyken, siyah-mavimsi makroskopik görünümün tedavi seçimi üzerinde etkisinin olmadığı gösterildi.

Anahtar Sözcükler: Uterus ekleri, torsiyon anormalliği, ultrasonografi, Doppler, renkli, hastalık yönetimi

Introduction

Adnexal torsion (AT) is a gynecological emergency and occurs as a result of interruption of the blood flow due to distortion of the adnexa, ovary, and rarely the fallopian tube alone (1). In the absence of treatment, the ischemia results in necrosis of the ovary, fallopian tube, or the entire adnexal tissue. When necrosis occurs, it is followed by loss of the ovary or adnexa, and necrosis may adversely affect fertility in young patients (2,3). Rarely, AT can cause potentially fatal complications because of necrosis and release of cytokines, which can cause pelvic thrombophlebitis or indeed peritonitis (4).

AT is a diagnostic challenge for both patients and clinicians. In many patients, except for a mild leukocytosis, laboratory findings are usually normal (5). Ultrasonography (USG) imaging findings (i.e. unilateral ovarian enlargement,

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Received/Geliş Tarihi: 08 October 2017 **Accepted/Kabul Tarihi:** 29 December 2017

ovarian mass, uniform peripheral cystic structures and free pelvic fluid in the cul-de-sac) and Doppler studies (absence of ovarian venous and arterial vasculature) might be helpful; however, none of them are specific for the diagnosis of AT (1,5-7). Currently, the only definitive method of diagnosis is surgery, either laparoscopy or laparotomy.

Patients with AT can be treated either conservatively (untwisting) or via a radical (excision of the twisted adnexa with/without hysterectomy) approach. While radical treatment was common in the past, with the latest reports demonstrating recovery of the ovarian function following conservative treatment, many authors have recommended untwisting for AT (1,5,8-10). However, this recommendation is not universally practiced, yet (11,12).

In this study, we evaluated the demographic, clinical, and surgical characteristics of patients who were hospitalized for suspected AT or were diagnosed with AT during surgery, in the last 10 years. We investigated both, the diagnostic value of Doppler USG and factors influencing surgical intervention.

Methods

This retrospective study, was approved by the Ethical Review Board (approval no: 26379996/82) of Ankara Yıldırım Beyazıt University Faculty of Medicine (Ankara, Turkey), the medical records of women who were hospitalized for suspected AT and/or those in whom AT was detected intraoperatively at Ankara Yıldırım Beyazıt University Ankara Atatürk Training and Research Hospital from January 2007 to December 2016 were reviewed. All participants provided oral informed consent. Research was conducted in accordance with the 1964 Declaration of Helsinki and its later amendments.

A total of 76 women were detected to have AT during the study period; however only 66 women, whose diagnosis was confirmed by surgery, were enrolled in this study. Data of patients' demographics [age, gravidity, parity, body mass index (BMI, kg/m²)], clinical characteristics [preoperative serum hemoglobin (Hb, g/dL) level, USG findings (if present, both the maximum ovarian cyst size and free pelvic fluid diameter (cm), velocity of ovarian arterial blood flow measured by Doppler USG) and period of time from the emergency room to surgery] and morphological characteristics [macroscopic appearance of the adnexa during surgery (black-bluish vs normal)] and type of surgical intervention [laparoscopy vs. laparotomy, conservative (untwisting ± cystectomy) vs radical (adnexectomy ± hysterectomy)], were retrieved from the hospital records. Once all patients' demographic, clinic, and surgical characteristics were summarized, both, the diagnostic value of Doppler USG and the related factors that influenced the surgical interventions were evaluated.

Statistical Analysis

All statistical analyses were conducted using the Statistical Package for the Social Sciences for Windows software version 21.0 (IBM Corp., Armonk, NY, USA). The Kolmogorov-Smirnov test was used to assess the data normality. Independent samples t-test and Mann-Whitney U tests were used to compare the groups for the distribution of parametric and non-parametric variables. Categorical variables were compared using the chi-squared test. A value of less than 0.05 was considered statistically significant and odds ratios and 95% confidence intervals (95% CI) were determined.

Results

The study design is represented in a flow chart (Figure). The preliminary diagnosis of AT was confirmed in 43 out of 53 patients (81.1%) during surgery; while only 43 out of 66 patients (65.1%) with AT were correctly diagnosed, preoperatively. In contrast, ovarian cyst rupture (OCR) was the most frequent misdiagnosis in patients with AT (31%).

Table 1 summarizes the demographic and clinical characteristics of patients with AT. Sixty of 66 patients (91%) were in the reproductive age group and the rest were post-menopausal. Thirty-one (47%) of 66 patients were nulliparous. All the 66 patients, who were diagnosed with AT, were examined with Doppler USG, and reduced ovarian arterial blood velocity was observed in only 39 patients (59.1%). The calculated sensitivity and positive

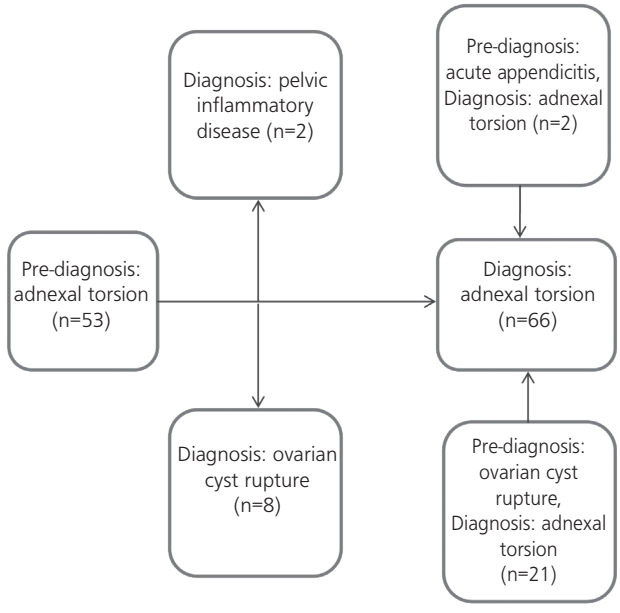

Figure. The flow-diagram of all patients (n=76) who had hospitalized with the preliminary diagnosis of adnexal torsion or had diagnosed

predictive value of Doppler examination in predicting AT were 0.67 and 0.81, respectively.

Table 2 summarizes the surgical details of patients with AT. AT was diagnosed in 49 patients during laparotomy and radical treatment was more often considered than conservative treatment (54.6% vs 45.4%). In the "radical treatment group," except for one postmenopausal patient who refused hysterectomy, hysterectomy with salpingo-oophorectomy was performed for postmenopausal patients (n=5). When the patients were grouped according to surgical approaches (laparoscopy vs laparotomy), and compared in terms of demographic and clinical characteristics; the differences were not significant (p>0.05) (Table 3). On the other hand, when the patients were grouped according to surgical interventions (conservative vs radical) and compared in terms of same parameters; age, gravidity, parity, BMI, and ovarian cyst size were significantly lower in patients who were treated with conservative treatments (p=0.005, 0.01, 0.01 and 0.04, respectively) (Table 3). However, the black-bluish macroscopic appearance of twisted adnexa had no correlation with the choice of surgical intervention (conservative vs radical treatment) (p=0.12) (Table 3).

Table 1. The demographic and clinic characteristics of patients with adnexal torsion (n=66)

Characteristic	Patients
Age (years), mean ± SD (range)	30.6±10.6 (15-62)
Gravidity, median (IQR) (range)	1 (3) (0-6)
Parity, median (IQR) (range)	1 (2) (0-6)
BMI (kg/m²), mean ± SD (range)	24.6±4.6 (17-42)
Presence of ovarian cyst at USG, n (%)	
Yes No	49 (74.2) 17 (25.8)
Ovarian cyst size at USG (cm)*, mean ± SD (range)	7.4±3.1 (4-15)
Presence of pelvic fluid at USG, n (%)	
Yes No	39 (59.1) 27 (40.9)
Pelvic fluid diameter at USG (cm)ˣ, mean ± SD (range)	2.05±0.96 (0.5-4.5)
Preoperative Hb (g/dL) level, mean ± SD (range)	12.1±1.6 (8-15.3)
Time period (from emergency room to the surgery) (hours), mean ± SD (range)	13.5±15.2 (1-48)
Loss of velocity at Doppler, n (%)	
Yes No	39 (59.1) 27 (40.9)
Black-bluish macroscopic appearance of adnexa during surgery, n (%)	
Yes No	54 (81.8) 12 (18.2)

SD: Standard deviation, IQR: Interquartile range, BMI: Body mass index, USG: Ultrasonography, Hb: Hemoglobin, *The mean diameter of ovarian cyst (cm) in 49 patients, ˣThe mean diameter of free pelvic fluid (mm) in 39 patients

Table 2. The surgical characteristics of patients with adnexal torsion (n=66)

	Laparoscopy (n=17, 25.8%)	Laparotomy (n=49, 74.2%)	Total (n=66, 100%)
Conservative (n, %)	10 (15.1)	20 (30.3)	30 (45.4)
Radical (n, %)	7 (10.6)	29 (44)	36 (54.6)

Conservative treatment options include untwisting (± cystectomy) of adnexa, whereas radical treatment options include adnexectomy (± hysterectomy)

Discussion

AT can occur in women of any age, although it generally occurs during the early reproductive years. In a report from Korea, the incidence of AT among women of all ages was 5.9 per 100.000 women, and the average age of occurrence of AT was 33.79 years (13). Benign ovarian cysts, which are more common in reproductive years, were an attempted explanation of this condition (1). In previous reports, ovarian cysts were detected in more than 90% of patients who presented with AT, and the average size of the cysts on USG varied between 6 and 8 cm (11-15). In our case series, both the mean age of patients (30.6 years) and cyst size (7.4 cm) were consistent with previous reports; however, the percentage of detected ovarian cysts (74.2%) was slightly lower than others.

A prompt diagnosis and surgical intervention is necessary to preserve both, adnexal structure and function in patients with AT. However, the proportion of cases correctly diagnosed before surgery varied between 22% and 66% (1,12). To improve diagnostic accuracy, Doppler USG examination has been recommended; however, the diagnostic value of preoperative Doppler examination is still debatable (11,15-18). In our case series, 65.1% of patients with AT were correctly diagnosed preoperatively, whereas the sensitivity of Doppler USG examination in diagnosis was 59.1%. As a result, we agree with other authors that the diagnostic value of Doppler USG in the diagnosis of AT is limited when AT is suspected and surgical treatment should be preferred in emergency.

Although early diagnosis and surgical salvage attempts are recommended for AT, the time from emergency room to surgery is delayed by more than 12 hours in many patients. In a previous report by Sahlu et al. (12), the mean time interval from initial evaluation to surgery was reported to be 53.8 hours (range: 4 to 168 hours). The mean time interval was 13.8 hours (range: 1 to 48 hour) in our case series and two out of three patients were treated within 12 hours. On the other hand, all patients, whose time interval was over 12 hours, were hospitalized

Table 3. The characteristics of patients according to surgical characteristics (laparotomy vs laparoscopy; and conservative vs radical treatments)

Characteristic	Laparotomy (n=49, 74.2%)	Laparoscopy (n=17, 25.8%)	p	Conservative treatments (n=30, 45.4%)	Radical treatments (n=36, 54.6%)	p
Age (years), mean ± SD (range)	31.8±11.2 (16-62)	27±7.7 (15-44)	0.1	26.7±8 (15-45)	33.8±11.5 (16-62)	0.005
Gravidity, median (IQR) (range)	1 (3) (0-6)	0 (2.5) (0-4)	0.16	0 (2) (0-6)	2 (3) (0-6)	0.01
Parity, median (IQR) (range)	1 (2) (0-6)	0 (2) (0-4)	0.4	0 (1) (0-4)	2 (3) (0-6)	0.01
BMI (kg/m^2), mean ± SD (range)	25.1±4.6 (19-42)	23.1±4.1 (17-34)	0.13	23.1±3.2 (17-29)	25.8±5.2 (19-42)	0.01
Ovarian cyst on USG, n (%)						
Yes	33 (50)	16 (24.2)	0.05	23 (34.8)	26 (39.4)	0.78
No	16 (24.2)	1 (1.6)		7 (10.6)	10 (15.2)	
Diameter of ovarian cyst on USG (cm), mean ± SD (range)	7.9±3.1 (4-14)	6.3±2.8 (4-15)	0.08	6.4±2.1 (4-11)	8.2±3.6 (4-15)	0.04
Presence of pelvic fluid on USG, n (%)						
Yes	27 (40.9)	12 (18.2)	0.39	14 (21.2)	25 (37.9)	0.08
No	22 (33.3)	5 (7.5)		16 (24.2)	11 (16.7)	
Diameter of pelvic fluid on USG (mm), mean ± SD (range)	20.8±10.2 (5-45)	19.5±8.6 (10-40)	0.7	18.2±9.9 (5-45)	21.7±9.8 (5-40)	0.28
Preoperative Hb (g/dL) values, mean ± SD (range)	12.2±1.6 (8-15.3)	11.9±1.7 (8.6-14.7)	0.63	12.5±1.7 (9.6-14.7)	11.8±1.9 (8-15.3)	0.12
Time period (from emergency room to the surgery) (hours), mean ± SD (range)	12.9±15.6 (1-48)	15.5±14.5 (1-48)	0.55	10.1±10.6 (1-48)	16.4±17.8 (1-48)	0.09
Loss of velocity on Doppler, n (%)						
Yes	29 (43.9)	10 (15.1)	0.75	26 (39.4)	13 (19.7)	0.05
No	18 (27.4)	9 (13.6)		10 (15.1)	17 (25.8)	

SD: Standard deviation, IQR: Interquartile range, BMI: Body mass index, USG: Ultrasonography, Hb: Hemoglobin
Conservative treatment options include untwisting (± cystectomy) of adnexa, whereas radical treatment options include adnexectomy (± hysterectomy)

with the preliminary diagnosis of OCR. Thus, incorrect preliminary diagnosis was seen as the most prognostic factor in delaying treatment.

Laparoscopy is a well-defined surgical approach and widely used by surgeons to salvage the ovarian tissue. In a report by Cohen et al. (19), the authors compared surgical approaches (laparoscopy vs laparotomy) in patients with AT and no significant difference was found between the groups in terms of ovarian function and macroscopic appearance of the ovaries during secondary surgery. However, laparotomy was more commonly used than laparoscopy (74.2% vs 25.8%) in our patients. However, the decision was not correlated with patients' characteristics (Table 3). We think that some limitations and uncertainties, such as access to laparoscopy only during working hours, incorrect preliminary diagnosis or lack of technical skills, influenced the surgeons' preference for laparotomy over laparoscopy.

In the management of AT, conservative treatments including untwisting with/without cystectomy are the most recommended treatment options. However, radical treatment is still practiced, with the rates varying from 7% to 100% (1,11,12,14,15,19). This approach stems from the concern that a severely ischemic ovary can become non-viable or might not have a viable-looking appearance after untwisting (1,12,15). In our series, radical treatment was performed in 54.6% of patients. Early age, low gravidity, parity and BMI, small size of ovarian cyst on USG were favored for conservative treatment (p=<0.05), whereas black-bluish macroscopic appearance had no influence on treatment preference (p>0.05). This condition might be due to the fact that surgeons are concerned about the risk of thromboembolism and a possibility of missing a malignancy (20,21).

Conclusion

AT is a surgical emergency and neither the patient's clinical findings nor laboratory and imaging studies, including Doppler USG examination, can provide an accurate diagnosis. In the case of AT, the diagnosis has to be confirmed immediately by surgery, preferably via laparoscopy. However, since data about the chances in recovery of ovarian tissue after untwisting is encouraging, radical treatment should be avoided if possible, especially in women of reproductive age group.

Acknowledgements: We wish to thank Editage (www.editage.com) for English language editing.

Authorship Contributions

Surgical and Medical Practices: E.E.T., A.F.Y. Concept: E.E.T., A.F.Y. Design: E.E.T. Data Collection or Processing: E.E.T. Analysis or Interpretation: E.E.T., A.F.Y. Literature Search: E.E.T., A.F.Y. Writing: E.E.T.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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