ORIGINAL RESEARCH

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Image-Guided Percutaneous Drainage Reduces the Need for Surgical Interventions in Patients with Tubo-Ovarian Abscess: A Cohort Study

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ABSTRACT Objective: Management of tubo-ovarian abscess (TOA) is a challenging healthcare problem especially in reproductive age women. The aim of this study is to determine the current role of image-guided primary percutaneous drainage in avoidance of surgical intervention in the management of TOA. **Material and Methods:** A total of 76 patients hospitalized in our tertiary care center with the diagnosis of TOA were retrospectively evaluated. The study population was divided into 2 groups based on the treatment modalities as antibiotic treatment (n=48) and image-guided percutaneous drainage (n=28) and evaluated in terms of clinical and laboratory characteristics and the requirement for surgical intervention. **Results:** Surgical intervention was required in 1 (3.6%) patient treated with percutaneous drainage and in 10 (20.8%) patients treated with antibiotics (p=0.036). The choice of treatment modality was independent of demographic characteristics, clinical and laboratory findings. The size of TOA in percutaneous drainage group was significantly larger compared to the antibiotic treatment group (mean 6.75±1.886 cm versus 5.92±5.88 cm, respectively, p=0.047). Rehospitalization during follow-up was higher among patients treated with antibiotics only compared to percutaneous drainage group (p=0.06). **Conclusion:** Percutaneous drainage is an acceptable treatment option including large-sized TOA and decreases the requirement of surgical intervention in selected cases.

Keywords: Abdominal abscess; diagnostic imaging; drainage; pelvic infection; gynecologic surgical treatment

Tubo-ovarian abscess (TOA) is an infection involving the fallopian tubes and ovaries, resulting in the formation of a purulent fluid collection, which may extend to nearby abdominal organs. This inflammatory process often occurs as a complication of pelvic inflammatory disease (PID). Up to one-third of cases of PID are associated with a TOA.[1] Efficient early diagnosis and appropriate management is essential for PID and TOA. The majority of TOA cases can be treated with broad-spectrum antibiotics, with approximately 70% success rate. Experts suggest that women who had failed antibiotic therapy (with worsening clinical signs or symptoms), have large size abscess (>8 cm), are hemodynamically unstable, or have signs of ruptured TOA should be treated surgically.[2,3] However, surgical interventions have certain associated complications such as infertility and collateral tissue damage.[4,5] Percutaneous drainage of abscesses in general has become a common practice.[6]

As surgical interventions have several risks, we initially prefer conservative approach in every case according to the current literature and our clinical protocol since our primary goal was to prevent surgical intervention in those cases.[4,5] The aim of this study was to evaluate the role and success rate of primary percutaneous drainage in the management of TOA and long-term follow up of those patients.

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MATERIAL AND METHODS

STUDY POPULATION

A total of 80 consecutive patients hospitalized with diagnosis of TOA at our tertiary care center between January 2013 and May 2021 were included in a retrospective observational cohort study. Four patients were excluded owing to following reasons: declination of therapy (n=2), development of septic shock and requirement of emergency surgery (n=1), and development of superimposed wound infection (n=1). The remaining 76 patients formed the study population. Patients were divided into 2 groups based on treatment modality: antibiotic treatment only (n=48) and percutaneus drainage in addition to the antibiotic treatment (n=28).

This study was conducted in accordance with the principles of the Declaration of Helsinki protocol. This study was approved by Manisa Celal Bayar University Faculty of Medicine Clinical Research Ethics Committee (date: February 15, 2021, no: 134). The general consent forms were obtained on admission for each patient however, there were no informed consent because of the retrospective nature of the study.

ACQUISITION OF DATA

Hospital records were collected based on the International Classification of Disease codes. Demographic characteristics, clinical presentation, duration of symptoms, prior medical history, laboratory findings on admission, size of TOA, type and duration of antibiotic treatment and hospitalization time were obtained in all patients. According to our hospital treatment protocol for TOA, all hospitalized patients were initiated on intravenous antibiotic treatment, and consulted to interventional radiologist for possible percutaneous drainage intervention. The choice of antibiotics was determined by infectious disease consultant.

PERCUTANEOUS DRAINAGE TECHNIQUE

Transabdominal percutaneous catheter drainage was performed by an interventional radiologist with 12 years of experience. It was performed by using 18 Gauge needle under ultrasound and computed tomography (CT)-guidance (Figure 1). Ultrasonographic-guidance was preferred rather than CT-guidance because of its lower cost and easier performance. Local anesthesia induction by subcutaneous lidocaine (10 cc) was performed just before the procedure. The shortest pathway that is far from the bowel loops and vascular structures was selected for the access of the needle. Simple aspiration technique was performed for small (<4 cm) and interloop abscess. Sample from TOA was taken for bacteriologic evaluation in all cases. If the aspiration material was purulent and the size of abscess was larger than 4 cm, drainage and catheterization were performed. An 8 to 14 French locked drainage catheter was used for catheterization by using Seldinger technique.[7] Washing of the catheter with 10 mL saline was performed twice daily in order to avoid catheter obstruction. The catheter was removed by clinical recovery, disappearance of TOA by imaging or the presence of less than 10 mL/daily drainage material.

STATISTICAL ANALYSIS

Statistical analysis was performed by SPSS 24.0 (IBM Statistics, U.S.A) statistical programme. $p<0.05$ (2-sided) was considered statistically significant. Normally distributed variables were presented as mean±standard deviation and compared using student's t-test. Non-normally distributed variables were

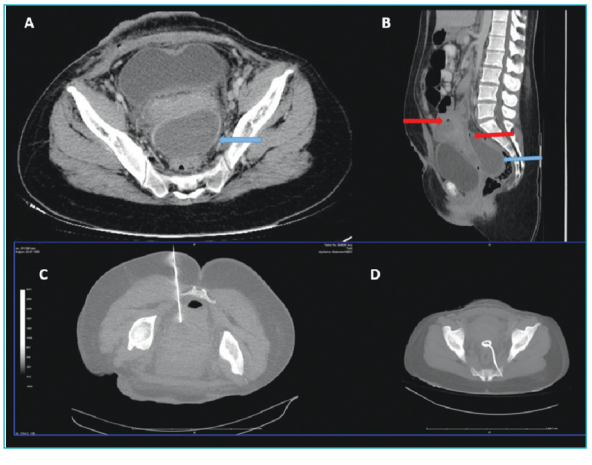

FIGURE 1: Axial and sagittal images in contrast-CT scan. The blue arrow showing the wall of TOA, the red arrow showing air focuses in endometrial cavity (a, b). MIP axial CT imaging showing the drainage by Chiba needle during (c) and after (d) the drainage procedure.
CT: Computed tomography; TOA: Tubo-ovarian abscess; MIP: Maximum intensity projection.

presented as median and compared using Mann-Whitney U test. Categorical variables were compared using Pearson's chi-squared and Fisher's exact test. Nominal distribution was analysed with Shapiro-Wilk test as the number of cases was less than 30.

RESULTS

Comparison of demographic characteristics, size of TOA, type and duration of antibiotic treatment and hospitalization, and laboratory findings were presented in Table 1.

Presenting symptoms were pelvic/abdominal pain and malodorous servico-vaginal discharge (89.1%), thrilling and fever (10.9%), pain during sexual intercourse (10.9%), nausea and abnormal vaginal bleeding (6.5%). Comparison of the demographic, clinical and laboratory findings of the groups was presented in Table 2.

TABLE 1: Clinical and demographic characteristics of the study population.

Characteristic	mean±SD (range)
Age (year)	39.19±9.71 (18-67)
Gravida	2.62±1.52 (0-6)
Parity	1.96±1.20 (0-5)
Size of TOA (cm)	6.23±4.81 (1.5-43)
CRP (mg/L)	160.1±92.09 (14.5-453)
WBC (10^3/μL)	14.47±6.58 (6-40.3)
Antibiotherapy	
• Beta-lactam+tetracycline	59 (81.9%)
• Clindamycin+ceftriaxone	13 (18.1%)
Duration of hospitalization (day)	14.47±5.76 (5-37)

Values are presented as mean±standard deviation (minimum-maximum) and percentage (%); TOA: Tubo-ovarian abscess; CRP: C-reactive protein; WBC: White blood cell count.

A total of 28 (36.8%) were found suitable for percutaneus drainage following evaluation by interventional radiologist during the first 48 hours of hospitalization. A total of 11 (14.5%) patients needed surgical intervention because of clinical and laboratory [increase in C-reactive protein (CRP) value] unresponsiveness to antibiotic treatment and unsuitability for percutaneous drainage because of multiseptation, multiloculation and/or unsuitable location of TOA. Among the surgical intervention group, 10 of those patients were on antibiotic treatment group and one patient was in percutaneous drainage group (20.8% versus 3.6%, p=0.047), respectively.

The overall mean size of TOA was 6.23±4.81 cm (range 1.5-43). The size of TOA was larger than 6.23 cm in 30 (39.5%) patients. Percutaneous drainage was performed in 17 of those patients. The size of TOA was smaller than 6.23 cm in 46 (60.5%) patients and percutaneous drainage was performed in 11 of those patients. The choice of percutaneous drainage was more common in patients with larger size TOA (56.2% versus 23.9%, p=0.036), respectively. The need for surgical intervention did not show any statistical significance among patients divided based on the size of TOA (20.0% versus 10.9%, p=0.218), respectively (Table 3).

Percutaneous drainage was performed under CT guidence in addition to ultrasonography in the majority of the cases (n=58, 76.3%). CT was used for guidance in cases with deeply localized abscess, in obese cases or insufficiently imaged abscess by ultrasound. Magnetic resonance imaging was per-

TABLE 2: Comparison of patient characteristics among treatment modality groups.

Variable	Percutaneous drainage	Antibiotic treatment	p value	Surgery (+)	Surgery (-)	p value
Age	38.75±9.83	39.19±9.71	0.851	38.36±9.96	39.14±9.72	0.762
Gravida	2.48±1.37	2.58±2.48	0.890	1.50±1.29	2.62±1.52	0.158
Parity	2.00±1.12	1.96±1.27	0.720	1.50±1.29	2.00±1.20	0.465
Size of TOA	6.75±1.88	5.92±5.88	0.376	8.95±11.48	5.77±2.23	0.540
CRP	167.50±81.04	155.85±98.68	0.613	133.17±92.44	163.17±92.30	0.368
WBC	15.33±6.96	13.94±6.36	0.390	14.34±7.21	14.48±6.57	0.817
Antibiotic therapy (days)	22.25±5.05	21.02±6.15	0.373	21.00±7.24	21.55±5.54	0.717
Duration of hospitalization	15.25±5.05	14.02±6.15	0.373	14.00±7.24	14.55±5.54	0.717

Statistical data is given as mean±standard deviation; TOA: Tubo-ovarian abscess; CRP: C-reactive protein; WBC: White blood cell count.

TABLE 3: The relationship between the size of the abscess and percutaneous drainage.

	<6.23 n (%)	≥6.23 n (%)	p value*
Percutaneous drainage (n=28)	11 (23.9%)	17 (56.2%)	0.047*
Surgery (n=11)	5 (10.9%)	6 (20.0%)	0.218

*Fisher's exact test (p<0.05 is accepted as statistically significant).

formed in 12 (15.7%) patients for differantial diagnosis and evaluation of the response to the therapy. There were no complications related to percutaneous drainage in our study population.

During long-term follow-up of the study population, a total of 7 (9.2%) patients were rehospitalized with the diagnosis of TOA: 5 patients belonging to antibiotic treatment group and 2 patients belonging to percutaneous drainage group (p=0.06).

DISCUSSION

We found several important aspects of the demographic characteristics, clinical presentation and potential role of percutaneus drainage to reduce the need for surgical intervention in our study.

PID and TOA are the most common gynecologic disorder necessitating hospitalization in reproductive-aged females. Cases with PID and TOA were reported to be usually sexually active, between the ages of 15 and 40 years, have multiple sexual partners, and often have a prior history of PID.[3] In our study population, the average age was 39.19±9.71 (range 18-67) years and consisted of sexually active women. Interestingly, 14 (18.42%) of our patients were in post-menopausal age which is often considered an exclusion criteria for the diagnosis of TOA.

Pelvic/abdominal pain was reported to be the most common symptom with a rate of 98% associated with thrilling and fever in 50%, vaginal discharge and nausea in 26%, and abnormal vajinal bleeding in 26% in patients with TOA.[8] The most common presenting symptoms of our patients were malodorous vaginal discharge and abdominal pain (89.1%) compatible with the literature while a minority of the patients had fever, chills, and pain during sexual intercourse or abnormal vaginal bleeding in contrast to the classical knowledge.

Medical treatment had been suggested as the primary treatment option in patients with TOA and surgery was recommended to be performed for ruptured abscesses and in patients refractory to medical treatment.[9] Previous literature reported that, the need for surgical intervention was high when percutaneous drainage was not used as a treatment option and decreased when the drainage used as an alternative in patients refractory to antibiotic treatment.[3,10] In a retrospective analysis (n=112), 85.3% of patients received antibiotics only, while 14.7% patients received antibiotics with interventional radiologic drainage or surgical drainage as initial treatment. In their study population, 20.7% failed antibiotic treatment and required interventional radiologic or surgical drainage. Older than 40 years old, larger than 7 cm TOA size, and the presence of fever were found to be predictors of failure in antibiotic treatment and primary drainage was recommended at presentation. However, performing primary drainage was found to add 2 more days of hospitalization compared to patients successfully managed conservatively.[11] In our study, the need for surgical intervention was 20.8% in our patients treated with antibiotics and 3.6% in patients treated with additional percutaneous drainage (p=0.047).

Dewitt J et al. retrospectively evaluated 135 TOA patients and reported that 31% required management with drainage and/or surgery. The average abscess size for those treated successfully with conservative management was 6.3 cm versus those requiring drainage and/or surgery (7.7 cm, p=0.02) in accordance with our data.[2]

Higher success rate of early surgery compared to medical treatment has been previously reported.[12] Surgery for TOA can be technically difficult because of difficulty in handling fragile and necrotic tissue resulting in tissues collapsing and bleeding. In addition, the associated peritoneal oedema, making visualisation of important structures such as ureters very challenging. Bowels are commonly found to be adherent to structures in the pelvis in patients with TOA and increases the risk of visceral injury.[4,5] All these technical difficulties make primary drainage as an important alternative to surgical intervention including laparoscopy.[13,14] Surgical intervention have also the

risks of infertility and early menopause.[4] Because the main population consisted of reproductive age patients, fertility preservation should always be considered. Thus, drainage of the abscess with guidance of imaging is a good treatment option by helping the recovery with minimal interventional risks. Recently TOA, especially of gynecologic origin, was reported to be managed successfully with image-guided drainage.[6,14,15]

Patients treated medically only have been reported to have tendency to hospital readmissions.[16] In our study group, the recurrence rate was 9.2% and medically treated group tend to have higher recurrence rate, although it was not statistically significant, compared to percutaneus drainage group. It might be related with the limited number of our cases.

LIMITATIONS

Number of patients was limited in terms of hospital readmissions. The average duration of hospitalization was similar among groups and longer than the reported in the literature.[3] The long hospitalization period in our population could be expained by the low cost of hospitalization in our country and waiting for complete recovery (no clinical symptom and normal range CRP value) for the decision of discharge from the hospital.

CONCLUSION

Percutaneous drainage of TOA is a safe and effective treatment option in large size (>6.23 cm) TOA and is a saving procedure from surgical intervention in both short and long terms.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Pınar Solmaz Hasdemir, Duygu Uçar;* ***Design:*** *Pınar Solmaz Hasdemir, Duygu Uçar;* ***Control/Supervision:*** *Gökhan Pekindil;* ***Data Collection and/or Processing:*** *Fatih Düzgün, Duygu Uçar;* ***Analysis and/or Interpretation:*** *Beyhan Cengiz Özyurt;* ***Literature Review:*** *Pınar Solmaz Hasdemir;* ***Writing the Article:*** *Pınar Solmaz Hasdemir;* ***Critical Review:*** *Fatih Düzgün;* ***References and Fundings:*** *Pınar Solmaz Hasdemir, Duygu Uçar;* ***Materials:*** *Pınar Solmaz Hasdemir, Fatih Dğzgğn, Duygu Uçar.*

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