Tuboovarian Abscess Treatment Outcomes at an Academic Safety Net Hospital in Los Angeles, California

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Abstract

Purpose: To identify patient factors associated with medical management failure and hospital readmission among patients admitted with a diagnosis of tuboovarian abscess at a public hospital in Los Angeles, California.

Methods: We conducted a retrospective chart review of admissions for tuboovarian abscess from January 2014 through August 2019, describing treatment plans and their subsequent outcomes. Patient factors associated with failure of medical management, as defined by requiring image-guided drainage or surgery, and hospital readmission were identified via bivariate analyses, using Chi-square, Fisher's exact, and Wilcoxon signed-rank tests as appropriate. Factors independently linked to failure of medical management were determined via logistic regression.

Results: We treated 147 patients with tuboovarian abscess over 5 years, comprised primarily of Hispanic/Latinx (74%; n=109/147) women, median age 39 (range: 18-70) years. The median abscess size was 6.3cm (range: 4.8-8.0). Only 16% (n=23/147) who initially received parenteral antibiotic therapy failed medical management. Factors independently and positively linked to parenteral antibiotic failure included elevated white blood cell count (aOR 1.17; 95%CI 1.04-1.32) and abscess size (aOR 1.07; 95%CI 1.04-1.10). No tuboovarian abscesses under 5.5 centimeters required procedural intervention when treated with parenteral antibiotics alone. We identified rehospitalizations among 13.6% (n=20/147) of patients; no factors were significantly linked to rehospitalization.

Conclusions: Tuboovarian abscesses were successfully treated with medical management in more than 80% of cases. Early procedural intervention for tuboovarian abscesses greater than 5.5 centimeters in diameter may help to avoid short and long-term morbidities.

Introduction

Tuboovarian abscess (TOA) is a clinical and imaging-guided diagnosis of an inflammatory mass involving the fallopian tube, ovary and/or surrounding tissue in the setting of pelvic inflammatory disease [1]. Guidelines from the Centers for Disease Control and Prevention state that individuals diagnosed with TOA should be hospitalized and treated for a minimum of 24 hours [2]. Identifying and expediently managing TOAs is critical given their associated mortality rate, estimated at 3.1–7.3% [3, 4]. Additionally, TOAs are associated with irreversible and longstanding complications inclusive of infertility, ectopic pregnancy and chronic pelvic pain [5].

The standard of care for non-ruptured TOAs is medical management with parenteral antibiotic therapy [1]. However, medical management failure rates range from 18–59%, with varying definitions of medical management failure including the need for procedural intervention and the lack of clinical improvement at various time points [6, 7]. Except for TOA size, identified risk factors remain inconsistent across studies, and the available clinical guidance does not specify cases in which early procedural intervention may prevent delays in receiving effective treatment. Expert consensus currently recommends early procedural intervention for TOAs between 8 and 10 centimeters (cm) [3, 8]. However, this threshold is aimed at resolving clinical symptoms in the inpatient setting, rather than resolution of TOA or the prevention of inflammation-related morbidity.

This study aimed to characterize patients admitted with TOA and explore clinical factors related to TOA treatment outcomes, including response to medical treatment, hospital readmission, and TOA resolution. Findings from this study may be used to select patients who might benefit from early procedural intervention.

Materials And Methods

We conducted a retrospective chart review of patients admitted with a diagnosis of TOA at Los Angeles County + University of Southern California Medical Center, an academically-affiliated, tertiary care, safety net hospital in Los Angeles, California. We identified female patients above the age of 18 years with TOA from a five-year (January 2014 – August 2019) query of our department's quality improvement case lists, as well as pathology records of specimens surgically confirmed to be a TOA. As the electronic medical record captures patient encounters from all clinics and hospitals within the Los Angeles Department of Health Services system, data from subsequent hospitalization and outpatient management at other safety net sites were included.

Standard treatment guidelines for all forms of PID, including TOA, state that improvement in signs and symptoms of pelvic infection should occur in less than three days of therapy initiation [2]. At our institution, patients are not considered candidates for procedural or operative management until at least 48 hours of antibiotics have elapsed without improvement in the patient's condition, or if the patient develops acute abdominal signs or refractory sepsis. Initial therapy is based on provider experience and preference among standard parenteral regimens. Our primary outcome was failure of medical management, defined as needing image-guided drainage or surgical intervention during their admission. As primary medical management is contraindicated in cases of peritonitis and instability, we excluded these patients by excluding those who received procedural intervention within 24 hours of admission. Secondary outcomes included unplanned readmissions and resolution of the abscess following hospital discharge on outpatient imaging.

The above outcomes were reviewed in relation to patient demographics (e.g., age, race/ethnicity, marital status); medical, surgical, social, sexual and reproductive history; vital signs at time of admission as well as body mass index (BMI); and laboratory (e.g., white blood cell count, gonorrhea and chlamydia) and pathology results. If these data were not available for all patients, the number of patients for which it was available was noted. These data were abstracted by two independent, clinically trained reviewers (SGL, HN); ambiguities were resolved by arbitration and consensus with a third, clinically trained reviewer (BTN). All data were collected and stored in the University of Southern California's instance of REDCap (Research Electronic Data Capture) [10, 11]. Institutional review board approval was obtained.

Patient characteristics, treatments, and outcomes were analyzed using descriptive statistics. We determined factors associated with our outcomes using Chi-square, Fisher's exact, and Wilcoxon signed rank tests for bivariate association where appropriate, with statistical significance suggested by $p < 0.05$. Factors independently associated with failure of medical management and readmission were determined via logistic regression whereby associated factors in bivariate analysis ($p < 0.20$) were included in a model, refined via stepwise, backwards regression. Data was analyzed using STATA (StataCorp LLC, version 14.2).

Results

We identified 153 cases of TOA (Fig. 1), six of which were not candidates for primary medical management and required procedural intervention within 24 hours; these six cases were thereby excluded from our assessment. Of the 147 included cases, the majority occurred among single, Hispanic/LatinX, and obese women with a mean age of 39 years.

Less than one quarter of cases (15.6%, $n = 23/147$) failed initial medical management. The most commonly initiated parenteral antibiotic regimens included: cefoxitin with doxycycline (40.8%); cefoxitin with doxycycline and

metronidazole (15.6%); ceftriaxone with doxycycline (8.8%); and ampicillin with gentamicin and clindamycin (6.8%). Parenteral antibiotic regimens were switched in approximately one-quarter (23.8%, n = 35/147) of cases, though antibiotic regimen was not associated with medical management failure in bivariate analysis.

The median abscess size was 6.3 cm (range: 4.8-8.0) (Fig. 2). The smallest TOA requiring procedural intervention was 5.6 cm. For cases of failed medical management, the median abscess size was 9.5 cm (interquartile range: 8.8 cm-13 cm). Failed medical management was linked in bivariate analysis to obesity (BMI ≥ 30 ; $p < 0.01$), low gravidity ($p = 0.03$), reported history of TOA ($p < 0.05$), fever on admission ($p < 0.01$), increasing white blood cell count ($19.7 \pm 5.6 \times 10^3$ vs. $14.0 \pm 5.0 \times 10^3$, $p < 0.01$) and abscess size ($p < 0.01$) (Table 1, Table 2). Only WBC count (aOR 1.17; 95%CI: 1.04–1.32) and abscess size (aOR 1.07; 95%CI: 1.04–1.10) remained positively and independently linked to failed medical management, following backwards stepwise logistic regression modeling.

Table 1

Sociodemographic, biometric, and health-related characteristics of patients diagnosed with tuboovarian abscess and their association with medical management failure and readmission

TOA case characteristics	Total (n = 147) ^a	Medical management failure (n = 23)	Medical management successful (n = 124)	p ^b	Readmission (n = 20)	No readmission (n = 127)	p ^b
Age (years)	39.1 ± 10.1	40.2 ± 9.4	38.8 ± 10.2	.72	38.4 ± 8.6	39.2 ± 10.3	.75
Ethnicity							
Hispanic/Latinx	109 (74.1)	17 (73.9)	92 (74.2)	.58	14 (70)	95 (74.8)	.78
Non Hispanic/Latinx	38 (25.9)	6 (26.1)	32 (25.8)		6 (30)	32 (25.2)	
Marital status							
Single	84 (57.1)	10 (43.5)	74 (59.7)	.40	10 (50)	74 (58.3)	.74
Married	44 (29.9)	9 (39.1)	35 (28.2)		7 (35)	37 (29.1)	
Divorced/Widowed	19 (12.9)	4 (17.4)	15 (12.1)		3 (15)	16 (12.6)	
BMI (kg/m ²)							
< 30	85 (57.8)	6 (26.1)	79 (63.7)	< .01	10 (50)	75 (59.1)	.47
> 30	62 (42.2)	17 (73.9)	45 (36.3)		10 (50)	52 (40.9)	
Gravidity	3 (1–4)	2 (0-2.5)	3 (1–4)	0.03	3 (0.75–3.25)	3 (1–4)	.90
Parity	2 (0-2.5)	1 (0-2.5)	2 (1–3)	0.36	1 (0-2.25)	2 (1–3)	.15
Uterine instrumentation (6 weeks prior)	13 (8.8)	3 (13)	10 (8.1)	.43	0	13 (10.2)	.22
History of STI	21 (14.3)	4 (17.4)	17 (13.7)	.75	2 (10)	19 (15)	.74
<i>TOA</i> tuboovarian abscess, <i>BMI</i> body mass index, <i>STI</i> sexually transmitted infection, <i>IUD</i> intrauterine device							
Data are n (%), mean ± SD, or median (quartile 1 - quartile 3) unless otherwise specified							
^a Six patients with image-guided drainage or surgery on hospital day #1 excluded							
^b Bivariate analyses conducted with significance at the p < 0.05 level							
^c Total is less than total number of patients given GCCT results only available for 152 cases							

TOA case characteristics	Total (n = 147) ^a	Medical management failure (n = 23)	Medical management successful (n = 124)	p ^b	Readmission (n = 20)	No readmission (n = 127)	p ^b
History of pelvic inflammatory disease	17 (11.6)	3 (13)	14 (11.3)	.73	3 (15)	14 (11)	.71
History of TOA	9 (6.1)	4 (17.4)	5 (4)	.03	1 (5)	8 (6.3)	1.0
Active smoker	18 (12.2)	1 (4.4)	17 (13.7)	.30	3 (15)	15 (11.8)	.71
Menopausal status (n = 152) ^c							
Premenopausal	124 (84.9)	21 (91.3)	103 (83.7)	.89	18 (90)	106 (84.1)	.53
Perimenopausal	12 (8.2)	1 (4.35)	11 (9)		2 (10)	10 (7.9)	
Postmenopausal	10 (6.9)	1 (4.35)	9 (7.3)		0	10 (7.9)	
Endometriosis	6 (4)	0	6 (4.8)	.60	1 (5)	5 (3.9)	.59
IUD	11 (7.5)	3 (13)	8 (6.5)	.38	2 (10)	9 (7.1)	.65
Diabetes	17 (11.6)	4 (17.4)	13 (10.5)	.31	3 (15)	14 (11)	.71
Immunocompromised	4 (2.7)	0	4 (3.2)	1.0	0	4 (3.2)	1.0
TOA tuboovarian abscess, BMI/body mass index, STI/sexually transmitted infection, IUD intrauterine device							
Data are n (%), mean ± SD, or median (quartile 1 - quartile 3) unless otherwise specified							
^a Six patients with image-guided drainage or surgery on hospital day #1 excluded							
^b Bivariate analyses conducted with significance at the p < 0.05 level							
^c Total is less than total number of patients given GCCT results only available for 152 cases							

Table 2

Exam, laboratory, and imaging characteristics of patients diagnosed with tuboovarian abscess and their association with medical management failure and readmission

Characteristic	Total (n = 147) ^a	Medical Management Failure (n = 23)	Medical Management Successful (n = 124)	p ^b	Readmission (n = 20)	No Readmission (n = 127)	p ^b
Fever on admission	53 (36.1)	15 (65.2)	38 (30.7)	< .01	7 (35)	46 (36.2)	1.0
Peritonitis	5 (3.4)	2 (8.7)	3 (2.4)	.17	2 (10)	3 (2.4)	.14
WBC count (x10 ³)	14.9 ± 5.5	19.7 ± 5.6	14.0 ± 5.0	< .01	15.4 ± 5.0	14.8 ± 5.8	.65
Neisseria gonorrhea or Chlamydia trachomatis (n = 135) ^c	17 (12.6)	0	17 (14.8)	.08	0	17 (14.5)	.13
Abscess laterality (n = 152) ^d							
Right	51 (34.7)	8 (34.8)	43 (34.7)	.77	6 (30)	45 (35.4)	.38
Left	59 (40.1)	8 (34.8)	51 (41.1)		11 (55)	48 (37.8)	
Bilateral	37 (25.2)	7 (30.4)	30 (24.2)		3 (15)	34 (26.8)	
Abscess size (centimeters)	6.3 (4.8-8.0)	9.5 (8.8-13.0)	5.9 (4.7-7.1)	< .01	6.3 (5-8.2)	6.3 (4.8-8)	.95
<i>WBC</i> white blood cell							
Data are n (%), mean ± SD, or median (quartile 1 - quartile 3) unless otherwise specified							
^a Six patients with image-guided drainage or surgery on hospital day #1 excluded							
^b Bivariate analyses conducted with significance at the p < 0.05 level							
^c Total is less than total number of patients given GCCT results only available for 140 cases							
^d Total is less than total number of patients given abscess laterality only available for 152 cases							

Readmission to the Los Angeles Department of Health Services hospital system was documented in 13.6% (n = 20/147) of cases. The median time to hospital readmission was 36 days (range: 4-1288 days), with median duration of follow-up from hospital admission until last clinical contact being 90 days (range: 1-1354 days). Characteristics of TOA cases that resulted in readmission did not differ significantly from those that did not (Table 1, Table 2), even when considering their receipt of image-guided drainage or surgical management. Nearly

half of patients with recorded hospital readmission had more than one readmission for management of TOA (9/20 cases).

With respect to imaging-confirmed resolution of the TOA, 44.9% (n = 66/147) of cases had follow-up imaging recorded, 42.4% (n = 28/66) of which showed resolution. The median time to initial outpatient imaging was 67 days (range: 10–396 days). The median time to resolution was 98 days (range: 38–866 days). The majority of TOAs resolved without needing procedural interventions, with only 21.4% (n = 6/28) of resolved cases having received any procedural intervention.

Discussion

Several retrospective cohort studies of TOA management report medical management failure rates, ranging from 18–59% [6, 7]. We report a comparatively low failure rate of 15.6%, which may reflect our institution's longstanding experience in managing this condition. Alternatively, some studies define primary parenteral antibiotic failure as the need to switch antibiotic regimens during the patient's admission. Including these cases, our failure rate would have risen to approximately one-fourth of cases. Further, we noted that in ten cases, TOAs were evaluated for image-guided drainage but did not receive drainage due to the location of the TOA, where drainage could not be performed safely. These cases thus received prolonged antibiotic therapy, which ultimately led to symptomatic improvement, but required a prolonged hospital stay. Had these TOAs been successfully drained, our success rate with primary medical management would have been lower.

Abscess size is consistently identified as a factor associated with medical management failure. However, thresholds for this association differ across studies, ranging from TOA size of 4.5 to 8 cm [12, 13]. In our study population, medical management failure was independently associated with the abscess size, with the smallest TOA failing medical management measuring 5.6 cm. Image-guided drainage of TOAs is more effective and associated with fewer complications as compared to operative management of complicated TOAs [13]. If performed for TOAs greater than 5.5 cm in diameter, early drainage could avert primary medical management failure and decrease the length of hospital stays. In our sample, we noted that drainage was not significantly associated with a higher likelihood of resolution of the TOA during follow-up imaging. However, the null finding may have been related to poor follow-up rates whereby those with successful imaging-guided drainage may have been less likely to follow-up. Recommendations for drainage may be strengthened in cases of leukocytosis as our logistic regression modeling noted the independent association of increasing white blood cell count with failure of primary medical management. This finding is supported by three previous studies noting a similar association, citing a threshold of $15 \times 10^3/\mu\text{L}$ across all studies [12, 15–17].

Given the need for long-term follow-up and maintenance of records within a single medical system, few studies report on hospital readmission rates for TOA. We noted a readmission rate of 13.6% in our population, which is similar to previous retrospective cohort studies with varying aims and duration of follow-up, reporting rates of 10–24% [18–19]. However, the true readmission rate is unknown given the possibility of readmission to hospitals outside of the electronic medical record of public hospitals in Los Angeles County in emergent settings, as well as out-of-network care in cases where individuals graduate from public insurance. Of note, nearly half of patients with a recorded readmission required multiple admissions for TOA management, suggesting that early procedural intervention may be warranted especially upon hospital readmission.

Nearly three-quarters of TOAs (72%) that were followed in the outpatient setting persisted on initial follow-up imaging. Currently, there are no guidelines on how to evaluate TOAs following initial hospitalization, likely arising from differing timeframes for follow-up amongst existing data, as well as a lack of standard definition of TOA resolution. For example, reported TOA resolution rates in retrospective cohort studies range from 20% at up to two years defined by symptoms or imaging findings [19], to 85% at two weeks defined by improvement in symptoms and exam findings [20]. Beyond ensuring clinical improvement, standardization of follow up should be considered to avoid long term complications of persistent abscess including readmission.

One of the strengths of our study is the fairly large number of TOAs reported and a unique population consisting of mainly reproductive age, Latinx females, largely with public insurance. Our study is limited by its retrospective nature and dependence on non-standardized TOA documentation, limiting our ability to draw conclusions on the full range of factors that might contribute to the failure of medical management. Further, as patients may receive follow-up care from hospitals outside the Los Angeles Department of Health Services system, our estimate of readmission may be an underestimate, especially considering our post-hospitalization attrition rate of 31%. We additionally note that the generalizability may be limited to other groups of population, however, they may still be useful to support practice changes such as the early incorporation of imaging-guided drainage.

Conclusions

Tuboovarian abscess size is a consistently reported factor linked to the failure of medical management via antibiotics alone. Our data, consistent with previous retrospective analyses, suggest that infectious complications may be averted with early procedural intervention for TOAs smaller than previously accepted thresholds.

Declarations

Author Contributions

SGL: study conception and design, data collection, manuscript writing and editing. HV: data collection, manuscript writing and editing. IS: manuscript writing and editing. BTN: study conception and design, data collection and analysis, manuscript writing and editing.

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Conflict of Interest

Financial Interests: The authors declare they have no financial interests to disclose.

Non-financial Interests: Author Dr. Brian T. Nguyen is on the medical advisory board of Aqua Therapeutics and Myovant Sciences; this work is unrelated to the research being submitted currently.

Ethics Approval

This retrospective cohort study was conducted in accordance with the principles of the Declaration of Helsinki and its later amendments. This study has been approved by the University of Southern California Institutional Review Board (HS-19-00437).

Not applicable

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Figures

Figure 1

Outcomes of tuboovarian abscesses at an academically-affiliated, tertiary care, safety net hospital in Los Angeles, California. *TOA* tuboovarian abscess, *HD* hospital day

Figure 2

Distribution of TOA size by medical management outcome (n=147)