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ORIGINAL ARTICLE

Clinical characteristics and treatment outcomes of patients with tubo-ovarian abscess at a tertiary care hospital in Northern Taiwan

Chien-Feng Kuo [a], Shin-Yi Tsai [b,*], Te-Chu Liu [c,d,e], Cheng-Chih Lin [a], Chang-Pan Liu [a,f], Chun-Ming Lee [a,f,g,**]

[a] Division of Infectious Disease, Department of Medicine, Mackay Memorial Hospital, Taipei, Taiwan
[b] Department of Laboratory Medicine, Kaohsiung Medical University Chung-Ho Memory Hospital, Kaohsiung, Taiwan
[c] Department of Emergency Medicine, Mackay Memorial Hospital, Taipei, Taiwan
[d] Department of Nursing, Mackay Memorial Hospital, Taipei, Taiwan
[e] Graduate Institute of Nursing, Chang Gung University, Taoyuan, Taiwan
[f] Mackay Medicine, Nursing and Management College, Taipei, Taiwan
[g] Taipei Medical University, Taipei, Taiwan

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Background/Purpose: Controversy exists regarding the need for surgical intervention in patients with tubo-ovarian abscess (TOA). This study was aimed at investigating the clinical characteristics and treatment outcomes in patients with TOA at a tertiary care hospital in Taiwan.

Methods: The medical records of 83 patients who presented at the hospital with TOA between January 1, 2006, and December 31, 2007, were retrospectively reviewed. Outcomes of patients who received medical treatment alone or underwent surgical intervention were analyzed using univariate and logistic regression analyses.

Results: Among the 83 patients with TOA, 13 patients (15.7%) underwent surgical intervention, and 70 patients (84.3%) received medical treatment alone. Significant variables related to surgical treatment in the univariate analysis were length of stay (short vs. long; $t = -2.267$, $p = 0.026$), department of admission (emergency room vs. outpatient department; $\chi^2 = 7.459$, $p = 0.006$), number of live births (nulliparous vs. multiparous; $\chi^2 = 18.202$, $p = 0.001$), and C-reactive protein (CRP) level (high vs. low; $t = -2.250$, $p = 0.028$). Logistic

* Corresponding author. Department of Laboratory Medicine, Kaohsiung Medical University Chung-Ho Memory Hospital, No. 100, Tzyou First Road, Kaohsiung, Taiwan.
** Corresponding author. Division of Infectious Disease, Department of Medicine, Mackay Memorial Hospital, No. 92, Section 2, Zhongshan N. Road, Taipei, Taiwan.
E-mail addresses: tsaisy@ntu.edu.tw, kakutsi1230@yahoo.com.tw (S.-Y. Tsai), leecm4014@yahoo.com.tw (C.-M. Lee).

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regression analysis performed to determine influential factors for surgical treatment showed that the operation odds ratio of three to four live births versus no live births was 33.995 ($p = 0.043$) and that of two live births versus no live births was 13.598 ($p = 0.026$).
Conclusion: Patients with TOA who underwent surgery had a longer duration of hospitalization. Among the patients who underwent surgical intervention, those admitted to the emergency room had higher CRP levels and were more likely to be multiparous.

Introduction

Tubo-ovarian abscess (TOA) affects about 70,000 women receiving medical care in hospitals annually.[1] It usually occurs in sexually active women aged 20—40 years, and about three-fifth of these women are nulliparous. Typically, the pregnancy rate after an episode of TOA is approximately 15% or less.[1] Common microorganisms that cause TOA are *Escherichia coli* (37%), *Bacteroides fragilis* (26%), *Bacteroides* species (26%), *Peptostreptococcus* species, *Peptococcus* species and aerobic streptococci.[2]

TOA is a well-recognized sequela of pelvic inflammatory disease (PID), accounting for more than 80% of unsuccessfully managed PID cases. The options for its treatment have been widely investigated,[3,4] and the effects of antibiotic therapy and surgery in patients with TOA have been studied.[1,5–8] Patients with PID with a complication of TOA usually respond to intravenous antibiotic therapy alone, and broad-spectrum antibiotics can yield a satisfactory prognosis without the need for surgery.[8] However, surgical intervention is necessary in 25% of unruptured TOA cases,[9] so it is imperative that clinicians determine the severity of the condition to ensure treatment is started early. However, early detection by physical examination alone is difficult; furthermore, it is difficult to differentiate patients with TOA on the basis of their signs, symptoms and laboratory findings.[6,10]

Over the past few decades, research on the management of TOA has revealed several issues, and some remain controversial despite the amount of data available on this condition. Moreover, much less is known about the factors necessitating surgical treatment for patients with TOA. Therefore, in this retrospective study, we aimed to elucidate the differences between women with TOA who underwent surgery and those who did not.

Methods

Study design and data collection

We retrospectively reviewed the medical records of consecutive patients diagnosed with TOA at Mackey Memorial Hospital [a 2100-bed tertiary care center in Taiwan, with 72 beds in the medical and surgical intensive care units (ICUs)] from January 1, 2006, to December 31, 2007. The data included demographic characteristics, initial clinical symptoms, laboratory and bacteriologic findings, and final diagnosis. If the findings of history or physical examination were not noted in the records, they were classified as "missing data." The institutional review board approved the study and waived the need for written patient consent.

Patients needed ultrasonographic or computed tomographic examination of the pelvis in the emergency room (ER) or outpatient department (OPD), or after admission to the hospital. Ultrasonographically, TOA was defined as the presence of a complex cystic adnexal mass exceeding 4 cm in diameter without distinguishable ipsilateral ovarian tissue. On computed tomography (CT), TOA typically presented as a mass with regular or irregular and thick margins and debris similar to that seen in endometrioma or hemorrhagic cyst. An associated low-attenuation area representing an adjacent or contained fluid-filled fallopian tube was noted sometimes.

Statistical analysis

Continuous variables (e.g., age, length of stay, number of live births and abortions, and blood test parameters) were analyzed by using dependent *t* test and categorical variables (e.g., reason for admission, presence of intrauterine device (IUD), antepartum status, infertility status, marital status, and history) were evaluated using χ^2 and Fisher's exact tests. A two-sided *p* value <0.05 was considered statistically significant. Finally, significant variables (factors related to operation) in a univariate analysis were included in a logistic regression analysis to calculate the odds ratio (OR) and to interpret the impact of the independent variables on the dependent variables.

Results

Clinical characteristics

There were 102 women with TOA during the study period. However, 18 patients with a diagnosis of suspected TOA at discharge but a hospital stay of only 2 hours were excluded from analysis; another patient who discharged herself against advice was also excluded, A total of 83 women took part in the study and received antibiotics for a minimum of 48 hours.

The age of the study group ranged from 21 to 39 years (Table 1), and the mean (± SD) length of stay was 8 (±5) days. Sixty-three (75.9%) patients were admitted via the ER. Fifty-three (64.9%) were married, 24 (28.9%) single, three (3.6%) divorced, and one (1.2%) widowed. All patients

Table 1 Demographic characteristics of 83 patients with tubo-ovarian abscess

Variables	Mean ± standard deviation (range) or no. of cases (%)
Age (y)	33 ± 5 (21–39)
Length of hospital stay (d)	8 ± 5 (4–41)
Route of admission	
Emergency room	63 (75.9)
Outpatient clinic	20 (24.1)
Menstruation	
Regular	61 (73.5)
Irregular	10 (12.0)
Missing data	12 (14.5)
Sexual activity	
No	0 (0.0)
Yes	83 (100.0)
Intrauterine device status	
No	65 (78.3)
Yes	18 (21.7)
Antepartum status	
No	82 (98.8)
Yes (ectopic)	1 (1.2)
Infertility status	
No	78 (94.0)
Yes	5 (6.0)
Marital status	
Single	24 (28.9)
Married	53 (64.9)
Divorced	3 (3.6)
Widowed	1 (1.2)
Missing data	2 (2.4)
Number of live births	
0	38 (45.8)
1	21 (25.3)
2	19 (22.9)
3	4 (4.8)
4	1 (1.2)
Number of abortions	
0	59 (71.1)
1	12 (14.5)
2	6 (7.2)
3	5 (6.0)
4	1 (1.2)
Underlying disease	
Gynecological disease	47 (56.6)
Medical disease	18 (21.7)
Surgical disease	18 (21.7)
Ear, nose & throat disease	2 (2.4)
Kidney/urological disease	1 (1.2)
Psychosis	1 (1.2)
Operation	
No	70 (84.3)
Yes	13 (15.7)
Discharge status	
Provisional discharge	77 (92.8)
Against advice	6 (7.2)

were sexually active and 21.7% used an IUD. Five (6.0%) patients had a history of infertility. Only one (1.2%) patient was pregnant (ectopic), 38 (45.8%) had not experienced a live birth, 21 (25.3%) had had one live birth, and 19 (22.9%) had had two live births. Only 12 of the women (14.5%) had experienced an induced abortion once. The common underlying disorders were gynecological diseases (56.6%), followed by medical diseases (21.7%) and surgical diseases (21.7%). Of the 83 patients, 13 (15.7%) underwent surgery, and 77 (92.8%) completed a treatment course and were provisionally discharged.

Common clinical symptoms at initial presentation (Table 2) included abdominal pain (90.4%), especially lower abdominal pain (90.7%), fever (59.0%), chills and rigor (25.3%), increased vaginal discharge (18.1%), and nausea and vomiting (15.7%). Leukocytosis and lymphopenia were noted in 72 (86.7%) and 70 (84.3%) patients, and 61 (89.7%) had elevated serum C-reactive protein (CRP) levels at admission (Table 3). Furthermore, 28 (38.4%) women had a urinary tract infection at admission, but only two (22.2%) still had a urinary tract infection while in hospital.

Laboratory characteristics

Leukocytosis and lymphopenia were noted in 86.7% (72/83) and 84.3% (70/83) of the patients, respectively (Table 3). Sixty-one (89.7%, 61/68) patients had elevated serum C-reactive protein (CRP) levels at admission. Leukocytosis

Table 2 Initial clinical symptoms of 83 patients with tubo-ovarian abscess

Symptoms	No. of patients (%)
Pain	75 (90.4)
Lower abdomen	68
Whole abdomen	6
Upper abdomen	1
Fever	49 (59.0)
Chills or rigor	21 (25.3)
Increased vaginal discharge	15 (18.1)
Nausea or vomiting	13 (15.7)
Diarrhea	7 (8.4)
Anorexia	4 (4.8)
Dysmenorrhea	4 (4.8)
Frequent urination	4 (4.8)
Headache	3 (3.6)
Asthenia universalis	3 (3.6)
Constipation	3 (3.6)
Vaginal spotting	2 (2.4)

Table 3 Laboratory characteristics in 83 patients with tubo-ovarian abscess at admission and during hospitalization

Variables	No. of patients/no. of patients for whom data were available (%)	
	At admission[a]	During hospitalization[b]
Hematological examinations		
Leukopenia (<4000/mm^3)	1/83 (1.2)	3/73 (4.1)
Leukocytosis (>10,000/mm^3)	72/83 (86.7)	11/73 (15.1)
Segment percentage >75%	65/83 (78.3)	17/73 (23.3)
Lymphopenia (<20%)	70/83 (84.3)	33/73 (45.2)
Erythrocyte sedimentation rate >12 mm/h	4/4 (100.0)	—
Biochemical examinations		
C-reactive protein level >0.8 mg/dL	61/68 (89.7)	43/56 (76.8)
Glutamic oxaloacetic transaminase (GOT) level >40 U/L	6/58 (10.3)	—
Glutamic pyruvic transaminase (GPT) level >40 U/L	3/21 (14.3)	—
Urinalysis		
Hematuria (erythrocytes > 10/high power field)	32/73 (43.8)	1/9 (11.1)
Pyuria (leukocytes > 10/high power field)	28/73 (38.4)	2/9 (22.2)

[a] "At admission" indicates abnormal data at the first visit to the emergency room or outpatient clinic.
[b] "During hospitalization" indicates the last abnormal data before discharge.

and lymphopenia were found in 11 (15.1%, 11/73) and 33 (45.2%, 33/73) patients, and elevated serum CRP levels were noted in 43 (76.8%, 43/56) patients at the last data collection before provisional discharge.

Bacteriologic characteristics

Microbiological results of women with TOA at provisional discharge are shown in Table 4. Of the 23 patients whose blood culture was taken, two (8.7%) had bacteremia. Of 26 cervical specimens for culture, two grew *Neisseria gonorrhoeae,* two *Staphylococcus* species and two *Candida albicans*. Of the 13 women who underwent surgery, seven had pus collected during the operation for culture: *Escherichia coli* was found in five women, and *Streptococcus* species in one other patient.

Table 4 Microbiological results of 83 patients with tubo-ovarian abscess

Pathogens	No. of cases/total cases (%)
Blood cultures	23/83 (27.7)
Bacteremia	2/23 (8.7)
Non-glucose-fermenting	1
Gram-negative bacilli	
Salmonella	1
Cervical cultures	26/83 (31.3)
Bacterial growth	6/26 (23.1)
Staphylococcus species	2
Neisseria gonorrhoeae	2
Candida albicans	2
Escherichia coli	1
Streptococcus agalactiae	1
Yeast	1
Pus obtained during surgery	7/83 (8.4)
Bacterial growth	6/7 (85.7)
Escherichia coli	5
Streptococcus species	1

Differences between women with and without surgery

Significant variables related to surgery in the univariate analysis were the length of stay ($p = 0.026$), route of admission ($p = 0.006$), number of live births ($p = 0.001$), and serum CRP level ($p = 0.028$) (Table 5). When these variables were included in the logistic regression analysis to determine the influential factors for surgical treatment, the operation OR of three to four live births was 34.0 times that of no live birth ($p = 0.043$), and the operation OR of two live births was 13.6 times that of no live birth ($p = 0.026$) (Table 6).

Discussion

TOA, found most commonly in women aged 20—40 years,[11] is characterized by a pelvic walled-off inflammatory mass.[12] In our study, the age of the participants ranged from 21 to 39 years. Patients with TOA may present with different symptoms. In a previous study, the most common symptoms and signs were found to be lower abdominal or pelvic pain (98%), fever and chills (50%), vaginal discharge (28%), nausea (26%) and abnormal vaginal bleeding (21%).[2] Similarly, in our study, abdominal pain (90.4%) was the most common symptom, followed by fever (59%), chills (25.3%), increased vaginal discharge (18.1%), and nausea and vomiting (15.7%).

TOA is usually associated with polymicrobial infections with a mixture of aerobes and anerobes. *N. gonorrhoeae*, although rarely isolated from abscesses, is thought to be a significant causative agent. A study has demonstrated that *N. gonorrhoeae* is more easily recovered from the endocervix than from the abscess.[2] Similar to the findings in

Table 5 Univariate analysis of 83 patients with tubo-ovarian abscess receiving surgical or medical therapy

Variables	No. (%) of patients		χ^2/t test	*p* values
	Medical therapy (n = 70)	Surgery (n = 13)		
Age (y)	32.3 ± 5.0	34.9 ± 4.1	−1.776	0.079[b]
Length of hospital stay (d)	7.4 ± 4.9	10.9 ± 5.5	−2.267	0.026[b,*]
Route of admission				
Emergency room	57 (81.4)	6 (46.2)	7.459	0.006[a,*]
Outpatient clinic	13 (18.6)	7 (53.8)		
Intrauterine device status	14 (20.0)	4 (30.8)		0.465[c]
Infertility status	5 (7.1)	0 (0.0)		1.000[c]
Marital status				
Single	22 (32.4)	2 (15.4)	2.229	0.526[a]
Married	43 (63.2)	10 (76.9)		
Divorced	2 (2.9)	1 (7.7)		
Widowed	1 (1.5)	0 (0.0)		
Number of live births				
0	36 (51.4)	2 (15.4)	18.202	0.001[a*]
1	19 (27.1)	2 (15.4)		
2	13 (18.6)	6 (46.2)		
3	1 (1.4)	3 (23.1)		
4	1 (1.4)	0 (0.0)		
Number of abortions				
0	49 (70.0)	10 (76.9)	6.880	0.142[a]
1	11 (15.7)	1 (7.7)		
2	5 (7.1)	1 (7.7)		
3	5 (7.1)	0 (0.0)		
4	0 (0.0)	1 (7.7)		
Underlying disease				
Medical disease	17 (24.3)	1 (7.7)		0.280[c]
Sedical diseaseicel or medical therapy.	13 (18.6)	5 (38.5)		0.110[a]
Surgical disease				
Gynecological disease	40 (57.1)	7 (53.8)	0.049	0.826[a]
Laboratory surveys (first data obtained in the first week of admission)				
Leukocytes (per mm^3)	15,904.3 ± 6553.6	15,323.1 ± 5312.7	0.301	0.764[b]
Segment percentage	80.9 ± 8.6	81.8 ± 6.5	−0.328	0.744[b]
Lymphocyte percentage	11.7 ± 7.0	12.4 ± 5.0	−0.347	0.729[b]
C-reactive protein level (mg/dL)	10.4 ± 9.1	18.9 ± 12.4	−2.250	0.028[b*]
Glutamic oxaloacetic transaminase level (U/L)	32.2 ± 54.1	25.0 ± 21.3	0.433	0.667[b]
Glutamic pyruvic transaminase level (U/L)	26.8 ± 23.7	24.4 ± 17.3	0.255	0.801[b]
Urine erythrocyte count	17.0 ± 27.3	17.8 ± 30.0	−0.091	0.928[b]
Urine leukocyte count	24.2 ± 28.3	14.3 ± 19.3	1.149	0.254[b]

[a] χ^2 test.
[b] *t* test of independent samples.
[c] Fisher's exact test.
The data represent the number of patients (%) or the mean ± SD.
*$p < 0.05$.

our study, in the above-mentioned study, *N. gonorrhoeae* was isolated from two endocervix culture specimens, but not found in abscess culture. *E. coli*, *Prevotella*, *Bacteroides* and *Peptostreptococcus* spp. are the most common pathogens.[9] In this study, *E. coli* (83.3%) was the most commonly isolated microbe from pus cultures; however, anerobes were not recovered.

The majority of patients with TOA respond well to broad-spectrum antibiotic therapy; however, surgical intervention is necessary in about one-quarter of cases.[11] In this study, a smaller proportion (15.7%) of the patients required further surgery. This study showed several characteristics among patients who underwent operation, including: (1) longer duration of hospitalization; (2) approximately 50% were

Table 6 Logistic regression analysis data of live birth numbers and surgery for tubo-ovarian abscess

No. of live births	No. of cases	Cases with operation	Operation ratio (%)	Odds ratio	95% confidence interval	*p*
P0	38	2	5.3	Reference	—	0.054
P1	21	2	9.5	2.000	0.12—33.96	0.632
P2	19	6	31.6	13.598	1.36—135.88	0.026
P3 and P4	5	3	60.0	33.995	1.12—1030.19	0.043

transferred from the ER, compared with about 80% of those who did not receive surgery; (3) higher CRP levels were noted; and (4) the majority (70%) of them were multiparous; in contrast, 80% of those who did not receive surgical intervention were nulliparous.

A previous study reported that prolonged duration of hospitalization was required in patients with TOA who underwent drainage or surgery.[12] The study indicated that every 1-cm increase in abscess size was associated with an increase in hospitalization of 0.4 days ($p = 0.001$), and abscesses greater than 8 cm were associated with an increased need for surgery ($p < 0.01$).[12] Therefore, the study concluded that larger TOAs were associated with an increased duration of hospitalization and more complications, including an increased need for drainage or surgery. Conversely, Chan et al reported that patients with TOAs may improve with intravenous antibiotic treatment and that conservative medical therapy plays an important role in the management of TOA.[8]

The lower rates of surgical intervention among patients with TOA, particularly those with subclinical disease, who were transferred from the ER, were also in line with the previous findings.[13—17] We speculated that the patients with TOA who were admitted from the ER had greater opportunities for undergoing imaging at an earlier stage; therefore, they were easily and accurately diagnosed with TOA immediately. This finding had two clinical implications for the treatment of TOA. First, appropriate management by clinicians in the early stages is beneficial for patients with TOA. Secondly, recognition of the imaging findings might improve the diagnosis of TOA and enable a good prognosis.

In this study, a higher CRP level was identified as an important indicator for surgery. This finding is in accordance with the results of Lareau et al[15] despite the fact that their study indicated other factors, such as elevated erythrocyte sedimentation rate, fever, and inflammatory mass, on pelvic sonography. Although some researchers have suggested white blood cell (WBC) count as indexes to evaluate TOA,[8,18] the lymphocyte and WBC counts in our study were not significantly elevated, which was partially consistent with Landers and Sweet's findings that 35% of the patients with TOA in their study were afebrile and 23% had a normal WBC count.[2]

Finally, we found that multiparous patients (P2, P3 or above) tended to be candidates for surgery. There have been few attempts to establish a direct relationship between the number of live births and the number of multiparous patients with TOA necessitating surgical treatment. A possible explanation for this finding is that multiparous women may be recommended for surgical therapy if medical therapy does not work because they already have children. On the other hand, most nulliparous women would be recommended for medical therapy only in order to preserve the organ function for pregnancy and delivery.

Our study had certain limitations. First, because the population included similar individuals enrolled from the local regions in northern Taiwan, the results may not apply to patients from other regions. Secondly, the sample size and duration of data collection may not be sufficient to include all relevant information.

In conclusion, the results showed that patients with TOA who underwent surgery required longer durations of hospitalization. Clinical and laboratory characteristics associated with patients undergoing surgical intervention included a higher proportion admitted from the ER, higher CRP levels, and more likelihood of being multiparous.

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