Original Article

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The Role of Clinical and Inflammatory Parameters to Predict the Success of Medical Treatment in Patients with Tubo-ovarian Abscess

Tubo-ovaryan Apseli Hastalarda Medikal Tedavinin Başarısını Öngörmede Klinik ve Enflamatuvar Parametrelerin Rolü

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ABSTRACT

Objective: To examine the role of hematological inflammation markers and clinical findings on the day of hospitalization in predicting medical treatment failure in patients with tubo-ovarian abscess (TOA).

Methods: A total of 49 patients with TOA who were hospitalized in our hospital were included in this study. The patients whose clinical findings, biochemical inflammation-related markers or radiological findings that did not improve despite the medical treatment and surgery or minimally-invasive drainage performed were enrolled into the medical treatment failure group (n=12). Demographic data (age, weight, gravidity, parity, abortion, presence of abdominal guarding, rebound, vaginal discharge, cervical motion tenderness, fever, length of stay), laboratory results [C-reactive protein (CRP), procalcitonin, white blood cell count, neutrophil count, lymphocyte count, neutrophil-to-lymphocyte ratio] and radiological reports (abscess size) of the patients on the day of hospitalization were obtained from hospital records.

Results: Cervical motion tenderness, CRP levels and the length of stay of the medical failure group were higher than successful medical treatment group on the day of hospitalization ($p<0.05$ for all). CRP level had diagnostic adequacy in predicting the success of medical treatment of TOA (AUC =0.71, p=0.03). At the time of admission, CRP level <144 mg/L had 88.2% positive predictive value (PPV).

ÖZ

Amaç: Tubo-ovaryan apseli (TOA) hastalarda medikal tedavi başarısızlığını öngörmede hastaneye yatış günündeki hematolojik enflamasyon belirteçleri ve klinik bulguların rolünü incelemektir.

Yöntemler: Bu çalışmaya hastanemizde yatan toplam 49 TOA'lı hasta dahil edildi. Medikal tedavi ve cerrahi veya minimal invaziv drenaj uygulanmasına rağmen klinik bulgusu, biyokimyasal enflamasyon belirteçleri veya radyolojik bulguları düzelmeyen hastalar "başarısız medikal tedavi" grubuna alındı (n=12). Demografik veriler (yaş, kilo, gravida, parite, kürtaj, defans/rebound varlığı, vajinal akıntı, servikal hareket hassasiyeti, ateş, hastanede kalış süresi), laboratuvar sonuçları [C-reaktif protein (CRP), prokalsitonin, beyaz küre sayısı, nötrofil sayısı, lenfosit sayısı, nötrofil-lenfosit oranı] ve hastaların hastaneye yatış günündeki radyolojik raporları (apse boyutu) hastane kayıtlarından alındı.

Bulgular: Medikal tedavinin başarısız olduğu grubun hastaneye yatış gününde servikal hareket hassasiyeti, CRP düzeyleri ve hastanede kalış süresi başarılı medikal tedavi grubundan daha yüksekti (tümü için $p<0,05$). CRP düzeyi, TOA'da medikal tedavi başarısını öngörmede tanısal yeterliliğe sahipti (AUC =0,71, p=0,03). Başvuru sırasında CRP seviyesi <144 mg/L olması %88,2 pozitif prediktif değere (PPV) sahiptir. Servikal hareket hassasiyetinin olmaması ile beraber CRP seviyesi <144 mg/L olması,

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ABSTRACT

The absence of cervical motion tenderness with CRP <144 mg/L had 100% PPV in prediction of the success of the medical treatment of TOA (AUC =0.77, p=0.006).

Conclusion: The absence of cervical motion tenderness and the CRP level on the day of hospitalization may predict the success of medical treatment in TOA.

Keywords: Cervical motion tenderness, CRP, tubo-ovarian abscess

ÖZ

TOA'da medikal tedavi başarısını tahmin etmek için %100 PPV'ye sahipti (AUC =0,77, p=0,006).

Sonuç: Hastaneye yatış gününde servikal hareket hassasiyeti olmaması ve CRP düzeyi TOA'da medikal tedavi başarısını öngörebilir.

Anahtar Sözcükler: Servikal hareket hassasiyeti, CRP, tubo-over apse

Introduction

Tubo-ovarian abscess (TOA) is an inflammatory disease involving the fallopian tubes, ovaries, and in some patients, other adjacent pelvic organs (1). TOA is most often caused by the ascending progression of upper genital tract infections to the adnexa in sexually active women. TOA is one of the important causes of morbidity and mortality in gynecology. Sepsis and death secondary to TOA occurred in almost one out of every two patients during periods when antibiotherapy and interventional approaches could not be applied effectively (2). Today, TOA is a disease that can be treated only with antibiotic therapy in most patients. However, it causes a major cost due to long hospital stays. In addition, the prolongation of the hospitalization period undermines the patients' belief in treatment and reveals the possibility of refusal of the treatment by the patient. Surgical treatment of TOA provides the definitive solution in medical treatment-resistant patients. However, surgery in TOA is a challenging intervention due to the presence of adhesions in pelvis, risks of injuries to adjacent organs such as bowel and bladder, and possibility of salpingectomy, oophorectomy and even hysterectomy. It is necessary to avoid approaches that may impair the function of the genital system, especially in patients in the reproductive period.

Various hematological markers are used in the diagnosis and management of many diseases associated with inflammation and infection. Among them, white blood cell count (WBC) and C-reactive protein (CRP) are the most commonly used biomarkers. It has been found that procalcitonin (PCT) is also a useful marker for systemic inflammation and is superior to CRP for this purpose (3). A meta-analysis evaluating the prognostic functions of PCT and CRP reveals that the diagnostic accuracy of PCT is superior to CRP in patients hospitalized for suspected bacterial infection (4). In addition, it has been shown in recent years that neutrophil-to-lymphocyte ratio (NLR) can be used in the management of some inflammation-related diseases such as gastritis (5), appendicitis (6) and surgical site infection (7,8). There are studies in the literature, examining the relationship between NLR and TOA. In a study performed in terms of prediction of TOA diagnosis, preoperative NLR was found to be a highly successful marker in the performance analysis (9). In another study, the role of NLR was found useful in predicting medical treatment failure in TOA (10). There are only these two studies in the literature examining the relationship between NLR and TOA. Although NLR has been speculated as a marker with a high potential in both studies, the predictive value of NLR is still controversial.

In this study, we aimed to examine the role of hematological inflammation markers and clinical findings on the day of hospitalization in predicting medical treatment failure in patients with TOA.

Methods

This retrospective cohort study was conducted with patients admitted to our hospital and hospitalized with the diagnosis of TOA between August 1, 2020 and July 1, 2021. Ethics committee approval was obtained for our study (approval number: 2021-08-170).

The diagnosis of TOA was made by the presence of a tubo-ovarian mass on ultrasound in patients with suspected pelvic inflammatory disease (PID). The diagnosis of PID was made clinically in sexually-active patients with pelvic or abdominal pain in the presence of cervical, uterine or adnexal tenderness. Additional signs and symptoms of PID werevaginal purulent discharge, high fever (>38.3 °C) and abnormal biochemical tests such as elevated CRP, PCT and/or WBC.

In our clinic, all patients diagnosed as having TOA are hospitalized and followed-up. All patients are treated with intravenous gentamicin and clindamycin in accordance with TOA management in the Centers for Disease Control and Prevention guideline (11). After the treatment is initiated, complete blood count, CRP and PCT examinations are performed every other day, and the size of the mass is followed daily by ultrasound.

The diagnostic criteria for the group considered as medical treatment failure were clinical findings, biochemical inflammation-related markers or radiological findings that did not improve despite treatment. Surgery or minimally-invasive drainage was performed in medical treatment failure group after at least 48 hours of antibiotic treatment. After intervention, antibiotherapy was continued in all patients until discharge. In this study, patients who did not receive an appropriate antibiotic therapy regimen, who left the hospital without completing their treatment, or whose diagnosis of TOA could not be confirmed during surgery were not included in the study.

Demographic data (age, weight, gravidity, parity, abortion, presence of abdominal guarding, rebound, vaginal discharge, cervical motion tenderness or fever, length of stay), laboratory results [CRP, PCT, WBC, neutrophil count (NEU), lymphocyte count, NLR] and radiological reports (abscess size) of the patients on the day of hospitalization were obtained from hospital records.

Finally, a total of 49 patients who met these inclusion and exclusion criteria and from whom all necessary information for the study could be obtained from the hospital records were enrolled into the study.

Statistical Analysis

In descriptive statistics, categorical variables of gravidity, parity, abortion, presence of abdominal guarding, rebound, vaginal discharge, cervical motion tenderness and fever were presented as frequency and percentage. Chi-square test was used for comparison of the categorical variables. Mann-Whitney U test was used to compare the continuous parameters among the successful medical treatment and medical treatment failure groups and the results were given as median (25-75th percentile). Correlations between parameters were tested with Spearman's test and the correlation coefficient (r) of 0.10-0.39 was interpreted as weak correlation and of 0.40-0.69 was interpreted as moderate correlation (12). Receiver operating characteristic analysis was performed for CRP level to predictt the success of medical treatment of TOA. The optimal cut-off values were selected using Youden's (13) index. Sensitivity, positive predictive value (PPV), specificity and negative predictive value (NPV) of the cervical motion tenderness and optimal cut-off value of CRP were calculated and reported. All statistical analyses were performed using SPSS 17 (SPSS Inc., Chicago, Illinois, USA) and p-value <0.05 was considered statistically significant.

Results

Comparatively results of demographic, clinical and biochemical of the patients with TOA who had successful medical treatment (n=37) and those who had medical treatment failure (n=12) were given in Table 1. TOA groups were homogeneous for age, weight, gravidity, parity and abortion (p>0.05 for all). At the time of admission, cervical motion tenderness was present in 62.2% of the successful medical treatment TOA group while it was present in 100% of the medical treatment failure TOA group (p=0.01). CRP levels in the medical failure group at admission were higher than successful medical treatment group (158 vs 97 mg/dL; p<0.001). The length of stay of the medical failure group was longer than successful medical treatment group (12 vs 7 days; p=0.003).

The correlations between the parameters among patients with TOA are given in Table 2. Weak positive correlations were found between abscess size, CRP level and length of stay while there was moderate positive correlation between CRP level and length of stay (r=0.31, p=0.04; r=0.34, p=0.03; r=0.40, p=0.004, respectively).

It was determined that CRP level had diagnostic adequacy for prediction of the success of the medical treatment of TOA (AUC =0.71, p=0.03). At the time of admission, CRP level <144 mg/L had 88.2% PPV. The absence of cervical motion tenderness with CRP <144 mg/L had 100% PPV for prediction of the success of the medical treatment of TOA (AUC =0.77, p=0.006) (Table 3).

Discussion

Our study revealed that the absence of cervical motion tenderness and CRP levels below 144 mg/L at the time of admission might predict the success of the medical treatment in TOA.

Treatment modalities in TOA are broad-spectrum antibiotic therapy, invasive intervention such as drainage or surgery, or a combination of both. Broad-spectrum antibiotics are sufficient in approximately three-quarters of patients (14). Even if a surgical intervention is performed, it is often preferred to use antibiotics before and after the procedure since antibiotic therapy is an important part of the treatment. Predicting medical treatment failure in patients with TOA can shorten the treatment period, reduce the cost of hospitalization and possible complications with an early intervention. There are studies conducted in this purpose in the literature. In previous studies, the relationship between age, presence of intrauterine device, abscess size, WBC and CRP levels and medical treatment failure in TOA were examined (10,15-17). In the study of Farid et al. (15), it was stated that high WBC count in large abscesses could predict the medical treatment failure. In a study, Greenstein et al. (17) determined that in addition to these two predictors, age and parity were also associated with the medical treatment failure in TOA. In another study, the size of the tubo-ovarian mass was investigated as a predictor and the mean abscess diameter was found larger in patients with TOA who underwent surgery (18). However there were different cut-off values for abscess size reported in literature (19-21). Therefore, there was no consensus in this regard. Güngördük et al. (16), stated that CRP was significantly higher in the group with TOA that did not respond to the medical treatment. Erenel et al. (18) found that the initial serum PCT levels in patients with TOA were significantly higher compared to patients with PID without TOA. In this study, it was argued that PCT provided a better differentiation than CRP between PID patients with and without TOA. In another study aiming to predict the progression to surgical treatment in patients with TOA, no significant difference was found in terms of PCT levels between successful medicaltre treatment and medical treatment failure groups (22). Finally, in a recent study by Alay et al. (10), age, WBC, NEU, and NLR were found to be independent risk factors for the medical treatment failure in TOA. In this study, it was speculated that especially NLR might be a promising biomarker in predicting the medical response in TOA. In this study, CRP levels were found higher in the medical treatment failure group.

In our study, it was determined that the absence of cervical motion tenderness (sensitivity 37.8%, PPV 100%, specificity 100% and NPV 34.3%) and lower CRP levels (for cut-off value of 144 mg/L, sensitivity 81.1%, PPV 88.2%, specificity 66.7%,

Table 1. Demographic, clinical and biochemical results of the patients with TOA

	Successful medical treatment group (n=37)	Medical treatment failure group (n=12)	p value
Age (years)	38 (35-43)	42 (32-47)	0.37
Weight (kg)	65 (61-75)	70 (65-84)	0.24
Gravidity (n)	3 (2-4)	2 (2-4)	0.71
Parity (n)	0 (0-2)	1 (0-1)	0.85
Abortion (n)	2 (1-3)	2 (1-3)	0.86
Presence of guarding (n, %)	12 (32.4%)	7 (58.3%)	0.17
Presence of rebound (n, %)	9 (24.3%)	2 (16.7%)	0.71
Presence of vaginal discharge (n, %)	6 (16.2%)	4 (33.3%)	0.23
Presence of cervical motion tenderness (n, %)	23 (62.2%)	12 (100%)	**0.01**
Presence of fever (n, %)	2 (5.4%)	3 (25.0%)	0.09
Abscess size (cm)	5.2 (4.0-7.0)	6.3 (5.1-7.9)	0.25
Length of stay (days)	7 (4-8)	12 (10-16)	**<0.001**
CRP (mg/L)	97 (46-142)	158 (90-219)	**0.03**
PCT (ng/mL)	0.12 (0.04-0.66)	0.31 (0.08-0.75)	0.23
WBC (10^9/L)	12.6 (9.2-17.5)	13.4 (12.1-18.7)	0.24
NEU (10^9/L)	9.7 (6.7-14.4)	9.9 (9.0-15.1)	0.52
LYM (10^9/L)	1.6 (1.4-2.2)	2.1 (1.2-2.7)	0.29
NLR	6.0 (4.6-8.2)	4.5 (3.7-9.4)	0.55

CRP: C-reactive protein, PCT: Procalcitonin, WBC: White blood cell, NEU: Neutrophil, LYM: Lymphocyte, NLR: Neutrophil lymphocyte ratio

Table 2. Correlations (r) between parameters among patients with TOA

	Age	Abscess size	Length of stay	CRP	PCT	WBC	NEU	LYM	NLR
Age	1	-0.04	0.30*	-0.02	0.17	-0.02	-0.01	-0.15	0.06
Abscess size		1	0.31*	0.34*	0.07	-0.01	0.01	-0.04	0.04
Length of stay			1	0.40**	0.21	0.13	0.11	-0.12	0.17
CRP				1	0.52**	0.41**	0.42**	-0.20	0.51**
PCT					1	0.21	0.26	-0.40**	0.56**
WBC						1	0.97**	0.29*	046**
NEU							1	0.13	0.62**
LYM								1	-0.63**
NLR									1

*p<0.05, **p<0.01
CRP: C-reactive protein, PCT: Procalcitonin, WBC: White blood cell, NEU: Neutrophil, LYM: Lymphocyte, NLR: Neutrophil lymphocyte ratio

Table 3. Diagnostic performances of cervical motion tenderness and CRP level in prediction of the success of medical treatment of TOA

	Cut-off	Sensitivity	PPV	Specificity	NPV
Absence of cervical motion tenderness	-	37.8%	100%	100%	34.3%
CRP (mg/L)	<144	81.1%	88.2%	66.7%	53.3%
Absence of cervical motion tenderness with CRP <144 mg/L	-	32.4%	100%	100%	32.4%

PPV: Positive predictive value, NPV: Negative predictive value

and NPV 53.3%) might have a role in predicting the medical treatment success in TOA. We could not find any significant differences in WBC, NEU, NLR or PCT among the groups.

Study Limitations

There are some strengths and limitations of our study. To our knowledge, this is the second study in the literature to investigate the role of NLR in predicting the success of medical treatment in TOA. Unlike previous studies, it has been shown that the absence of cervical motion tenderness may be associated with response to treatment. However, cervical motion tenderness is a subjective finding. Therefore, this is one of the limitations of our study. Also, the small sample size reduces the generalizability of the results.

Conclusion

The absence of cervical motion tenderness and CRP level on the day of hospitalization may predict the success of medical treatment in TOA. Further studies are needed to clarify the results obtained in order to predict the treatment response in TOA.

Ethics

Ethics Committee Approval: Ethics committee approval was obtained for our study (approval number: 2021-08-170).

Informed Consent: Retrospective study.

Peer-review: Externally peer reviewed.

Authorship Contributions

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

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