Journal of Obstetrics and Gynaecology

ISSN: 0144-3615 (Print) 1364-6893 (Online) Journal homepage: www.tandfonline.com/journals/ijog20

Serum procalcitonin levels together with clinical features and inflammatory markers in women with tubo-ovarian abscess for discriminating requirements for surgery for full recovery

Kenan Karaca, Enis Ozkaya, Meryem Kurek Eken, Ilgi Uygun, Sule Yıldırım Kopuk & Murat Alpay

To cite this article: Kenan Karaca, Enis Ozkaya, Meryem Kurek Eken, Ilgi Uygun, Sule Yıldırım Kopuk & Murat Alpay (2018) Serum procalcitonin levels together with clinical features and inflammatory markers in women with tubo-ovarian abscess for discriminating requirements for surgery for full recovery, Journal of Obstetrics and Gynaecology, 38:6, 818-821, DOI: 10.1080/01443615.2017.1405927

To link to this article: https://doi.org/10.1080/01443615.2017.1405927

Published online: 09 Mar 2018.

JOURNAL OF OBSTETRICS AND GYNAECOLOGY
2018, VOL. 38, NO. 6, 818–821
https://doi.org/10.1080/01443615.2017.1405927

Taylor & Francis
Taylor & Francis Group

ORIGINAL ARTICLE

Check for updates

Serum procalcitonin levels together with clinical features and inflammatory markers in women with tubo-ovarian abscess for discriminating requirements for surgery for full recovery

Kenan Karaca[a], Enis Ozkaya[b], Meryem Kurek Eken[c], Ilgi Uygun[a], Sule Yıldırım Kopuk[a] and Murat Alpay[a]

[a]Department of Obstetrics and Gynecology, Umraniye Training and Research Hospital, Istanbul, Turkey; [b]Department of Obstetrics and Gynecology, Zeynep Kamil Maternity and Children Training and Research Hospital, Istanbul, Turkey; [c]Department of Obstetrics and Gynecology, Adnan Menderes University Medical Faculty, Aydın, Turkey

ABSTRACT

Tubo-ovarian abscess (TOA) coexists in 15% of cases with pelvic inflammatory disease. Medical treatment is the first line of approach in women with TOA, however, 25% of cases fail to respond to antibiotics, therefore, these cases need to undergo surgical intervention. We aimed to determine factors leading to failure of medical treatment in women diagnosed with TOA. According to our results among 144 women, 27 cases required surgical intervention for full recovery. None of the demographic, sonographic or laboratory findings, including procalcitonin level, had significant predictive value for the failure of medical treatment in women with TOA.

KEYWORDS
Tubo-ovarian abscess; procalcitonin; pyosalpinx; surgery

IMPACT STATEMENT

- **What is already known on this subject?** Tubo-ovarian abscess (TOA) coexists in 15% of cases with pelvic inflammatory disease. Medical treatment is the first line approach in women with TOA, however, 25% of cases fail to respond to antibiotics, therefore, these cases need to undergo surgical intervention. Several risk factors have been evaluated in order to predict the failure of medical treatment.
- **What do the results of this study add?** None of the variables, including age, parity, mass diameter, serum CRP, procalcitonin levels and sedimentation rate had significant value for predicting TOA cases that required surgical intervention for full recovery.
- **What are the implications of these findings for clinical practice and/or further research?** In clinical practice, identification of risk factors leading to the failure of medical treatment helps clinicians to inform patients and help surgeons predict those who need surgical intervention.

Introduction

Tubo-ovarian abscess (TOA) coexists in 15% of cases with pelvic inflammatory disease (PID) (Taylor et al. 1978). TOA has been defined as an inflammatory mass consisting of a conglomeration of the adnexa and other adjacent organs secondary to genital infection (Bennett et al. 2002; Sam et al. 2002; Granberg et al. 2009). Sonography is a well-established tool to confirm TOA diagnosis in women with PID, while PID is diagnosed according to physical examination findings and laboratory tests. The sensitivity and specificity of sonography were shown to be high enough to be used as a screening tool in diagnosing TOA in cases diagnosed with PID (Taylor et al. 1978). Some sonographic classifications have been established to define the sonographic morphology of TOAs, such as a unilocular cystic structure, a complex multicystic structure with thick walls and septation (tubo-ovarian complex) or a pyosalpinx (Callen 2008). Medical treatment is the first line of approach in women with TOA, however, 25% of cases fail to respond to antibiotics, therefore, these cases need to undergo surgical intervention (Mirhashemi et al. 1999). Increased age, a high white blood cell (WBC) count and a cyst larger than 6 cm in size were shown to be factors that lead to the failure of medical treatment in cases with TOA (Dewitt et al. 2010; Greenstein et al. 2013; Akkurt et al. 2015; Kinay et al. 2016). The sonographic appearance of masses were shown to have no value in determining the cases that would require surgery for a full recovery (Kinay et al. 2016). Procalcitonin was shown to be a marker for systemic inflammation and was shown to be superior to C-Reactive Protein (CRP) for this purpose (Pan et al. 2017). A meta-analysis of the prognostic value of procalcitonin and CRP revealed that the diagnostic accuracy of the procalcitonin was superior to CRP among the patients who were hospitalised for suspected bacterial infections (Simon et al. 2004). The aim of this study was to determine factors leading to the failure of medical treatment in women with TOA.

Materials and methods

Medical records of 144 women with TOA who were treated in the Obstetrics and Gynecology department of Umraniye

CONTACT Meryem Kurek Eken meryemkurek@yahoo.com Adnan Menderes University, Obstetrics and Gynecology Department, Aytepe Mevkii, Aydın, Turkey

Training and Research Hospital between January 2014 and December 2016 were reviewed from the hospital database. Women with inflammatory pelvic mass determined according to history, ultrasonography, laboratory findings and physical examination were included in the study. Sonographic findings, and demographic and clinical parameters were compared between women who did not respond to medical treatment and women with full recovery with antibiotic administration. Pelvic inflammatory mass was determined according to the suggestions of the US Centers for Disease Control and Prevention criteria (Centers for Disease Control and Prevention 2014). Patients were only excluded if the patient records included incomplete data. Written informed consent for future data use was obtained from all participants at the time of treatment. In addition to demographic data, laboratory and pelvic ultrasonography findings, treatment modality and duration of hospitalisation were all evaluated for each case. All patients underwent an ultrasonography examination using a 6- to 10-MHz transvaginal probe (LOGIQ P5; GE Healthcare Inc., Milwaukee, WI). At sonographic examination, maximum diameter and the characteristics of the mass were recorded. A routine bimanual examination was performed for each woman. Venous blood samples were obtained on admission to analyse serum WBC counts, erythrocyte sedimentation rate (ESR), CRP and procalcitonin level. All cases were scheduled for broad-spectrum antibiotic regimen as the first step of treatment. Response to this first step treatment was followed for 10 days based on the recommendations (Sweet 2011). During follow up, surgical intervention was indicated for cases that did not have any clinical improvement by the third day of treatment, had acute abdomen or had rupture of TOA. Surgical treatment included uni-/bi-lateral salpingectomy/salpingo-oophorectomy or total abdominal hysterectomy combined with uni-/bi-lateral salpingectomy/salpingo-oophorectomy determined according to the findings of surgical exploration. Complete blood count was assessed with an automated cell counter (Abbott, Cell Dyn 3700, Abbott Diagnostics, 2010). Serum CRP concentrations were evaluated with standard methodology (Abbott, Acrhitecti1000sr, Abbott Diagnostics, 2012). Serum procalcitonin levels were analysed for the cases (Wondfo, Finecare Multi-channel, China, 2012). Sonographic findings, and demographic and clinical parameters were compared between women who responded and those who did not respond to medical treatment.

Statistical analyses

All analyses were performed with the SPSS 15.0 programme package (SPSS Inc, Chicago, IL). The Mann–Whitney *U*-test or independent samples *t*-test were used to compare continuous variables and the Chi-square test was used to compare categorical variables.

Results

Among 144 women, 27 cases required surgical intervention for full recovery. The mean age of the study population was 36.3 years (21–65), gravidity 2.3 (0–8), parity 1.8 (0–5) and number of living children 1.8 (0–5). Comparison of groups in terms of demographic and clinical parameters showed no significant differences ($p > .05$, Table 1). There were 43 (29.8%) cases with pyosalpinx detected by sonography at the initial evaluation and among all these cases, five (11.6%) participants required surgical intervention for full recovery. Analysis of these cases revealed significant differences between groups of women with and without pyosalpinx in terms of age, gravidity, parity and number of living children ($p < .05$, Table 2). There were no significant differences between the groups of women with and without pyosalpinx including mass diameter, procalcitonin, sedimentation, CRP, duration of hospital stay, white blood cell, neutrophils and lymphocytes ($p > .05$, Table 2).

Discussion

In the present study, analysis of the data revealed that none of the variables, including age, parity, mass diameter, serum CRP, procalcitonin levels and sedimentation rate had significant value for predicting TOA cases that required surgical intervention for full recovery. Presence of pyosalpinx at sonographic evaluation resulted in a favourable outcome. Analysis of these groups showed younger women more frequently

Table 1. Comparison of some demographic and clinical characteristics between cases who responded and failed to response to medical treatment.

	Full recovery with medical treatment ($n = 117$)	Cases that required surgery for full recovery ($n = 27$)	p value
Age (years)	35.7 ± 8.4	37.8 ± 7.1	NS
Gravidity	2.4 ± 1.5	1.9 ± 0.8	NS
Parity	1.8 ± 1.2	1.5 ± 0.8	NS
#of living children	1.8 ± 1.2	1.5 ± 0.9	NS
Mass diameter (mm)	62.7 ± 25.7	59.8 ± 22.9	NS
Sedimentation (mm/h)	64.5 ± 37.2	64 ± 82.1	NS
CRP (mg/dl)	29.3 ± 41.3	24.2 ± 24.5	NS
Procalcitonin level (ng/ml)	0.73 ± 1	0.6 ± 0.6	NS
Duration of hospital stay (days)	7.01 ± 4.5	6.5 ± 3.2	NS
WBC $\times 10^3/\mu L$	13.8 ± 2.1	12.9 ± 1.9	NS
Neutrophils $\times 10^3/\mu L$	8.7 ± 1.1	8.4 ± 0.9	NS
Lymphocytes $\times 10^3/\mu L$	5.1 ± 2.1	4.5 ± 1.9	NS

NS: non-significant; CRP: C-Reactive Protein; WBC: white blood cell.

Table 2. Comparison of some demographic and clinical characteristics between cases with and without sonographically detected pyosalpinx.

	TOA without pyosalpinx ($n = 101$)	TOA with pyosalpinx ($n = 43$)	p value*
Age (years)	39.9 ± 6.2	27.9 ± 2.8	$<.001$
Gravidity	2.6 ± 1.4	1.5 ± 1.1	.001
Parity	2.1 ± 1.2	1.1 ± 1.1	.001
# of living children	2.1 ± 1.2	1.1 ± 0.9	.001
Mass diameter (mm)	64.7 ± 27.7	58.8 ± 16.9	NS
Sedimentation (mm/h)	86.1 ± 30.1	46.5 ± 44.5	NS
CRP (mg/dl)	28.8 ± 42.2	26.9 ± 27.5	NS
Procalcitonin level (ng/ml)	0.72 ± 1	0.67 ± 0.68	NS
Duration of hospital stay (days)	7.1 ± 4.3	6.6 ± 4.4	NS
WBC $\times 10^3/\mu L$	13.6 ± 1.9	13.7 ± 2.4	NS
Neutrophils $\times 10^3/\mu L$	8.7 ± 1.1	8.6 ± 0.9	NS
Lymphocytes $\times 10^3/\mu L$	4.9 ± 1.8	5.1 ± 2.6	NS

*$p < .05$; NS: non-significant; CRP: C-Reactive Protein; WBC: white blood cell.

had pyosalpinx. Sonography is the most commonly used imaging modality to diagnose TOA cases. A recent study utilised sonographic features of adnexal mass to predict failure of medical treatment. In this study, no association was shown between TOA morphology and failure of medical treatment (Greenstein et al. 2013; Kinay et al. 2016). Additionally, the authors found lower ESR and smaller mass in cases with pyosalpinx. Consistent with this finding, a previous study showed that the cases with pyosalpinx had a less severe form of PID. Furthermore, they also reported a lower rate of surgery requirement in cases with pyosalpinx (Kim et al. 2015). In our study, we also compared the rate of pyosalpinx in sonographic evaluation between the two groups. Consistent with the previous reports, we did not find significantly lower rates of surgical intervention in cases with pyosalpinx on admission. Our data also showed this group to be significantly younger than cases without pyosalpinx, which explains why the presence of pyosalpinx was reported to have a favourable outcome in previous studies. In the literature, clinical and laboratory characteristics and ultrasonography findings have been introduced as significant predictors of failure to respond to medical treatment (Halperin et al. 2003; Kuo et al. 2012; Mizushima et al. 2013; Topçu et al. 2015). Age, parity and a maximal white blood cell count were some of the factors shown to be significant predictors of surgery requirement (Greenstein et al. 2013). It is obvious that due to fertility issues, age and parity were shown to be common confounders for surgery indication in the majority of the studies. Other studies showed variable results for the laboratory markers; for example, CRP and ESR were the most significant predictors in one study (Güngördük et al. 2014). A cut-off value of 8.0 mg/L was proposed for CRP as an important indicator for surgical treatment (Kuo et al. 2012). In addition to these markers, body temperature at admission was also assessed in some studies and shown to have some value for the cases who underwent surgical intervention (Kuo et al. 2012; Güngördük et al. 2014). The size of the mass was also reported as a predictor in some studies and a cut-off value of 8 cm was introduced by Dewitt et al. (2010). A higher mean mass diameter was reported by Greenstein et al. (2013), compared to the cases who recovered with medical treatment (4.4 versus 7.3). An ultrasound-guided TOA aspiration was proposed to be a first-line procedure for the treatment of TOA in a stable patient without peritonitis (Perez-Medina et al. 1996; Gjelland et al. 2005; Soakar et al. 2008).

One of these studies assessed 302 TOA cases and a total of 449 aspirations were performed. Following needle aspiration, among all participants, 20 cases needed surgical intervention and comparison of groups with and without surgery revealed no difference between groups with regard to age, parity, menopausal status, mean diameter of TOA, mean aspirate volume and bilaterality ($p > .05$). In their study, the majority of cases underwent surgery due to the remaining pain symptoms following aspiration of the abscess (Gjelland et al. 2005).

These data showed that even in cases treated with abscess aspiration as the first line treatment, surgical intervention could be required regardless of age, parity, menopausal status, mean diameter of TOA, mean aspirate volume or bilaterality. The conclusion drawn from the results of needle aspiration and the results of our data lead us to conclude that the main reason for the failure of medical treatment may not be the failed antibiotic dissemination into the abscess, presumed to be affected by diameter or structural characteristics of the mass. As our data showed, none of the inflammatory markers, including procalcitonin, nor mass diameter nor age significantly discriminated cases with failure of medical treatment. Pain threshold, anatomic localisation of mass, pelvic adhesions and neuronal involvement may play a role in cases requiring surgical intervention.

The main strength of our study was the utilisation of procalcitonin to determine the severity of the inflammatory process, since recently published data pointed both to elevated CRP and procalcitonin levels in the absence of bacterial infection, and indicated that procalcitonin offered an advantage over CRP in the diagnosis of bacteraemia (Ivaska et al. 2016). Although a recent study revealed a cut-off level of 0.330 ng/ml for procalcitonin with 62% sensitivity and 75% specificity in predicting TOA among cases with PID (Erenel et al. 2017), our data showed no significant difference with regard to procalcitonin levels between the groups who responded or failed to respond to conservative treatment.

In conclusion, none of the demographic, sonographic or laboratory findings, including procalcitonin, were found to have predictive value for the failure of medical treatment in women with TOA.

Acknowledgements

We thank www.englishedited.com who reviewed the language of the manuscript.

Disclosure statement

The authors report no conflict of interest. The authors are responsible for the content and writing of this paper. The authors have received no funding for the article.

References

Akkurt MÖ, Yalcin SE, Akkurt İ, Tatar B, Yavuz A, Yalçın Y, et al. 2015. The evaluation of risk factors for failed response to conservative treatment in tubo-ovarian abscesses. Journal of the Turkish German Gynecological Association 16:226–230.

Bennett GL, Slywotzky CM, Giovanniello G. 2002. Gynecologic causes of acute pelvic pain: spectrum of CT findings. Radiographics: a Review Publication of the Radiological Society of North America, Inc 22:785–801.

Callen PW. 2008. Ultrasonography in obstetrics and gynecology. 5th ed. Philadelphia: Saunders.

Centers for Disease Control and Prevention. 2014. Pelvic Inflammatory Disease (PID) Statistics; [cited 2015 Jan 5]. Available from: http://www.cdc.gov/std/pid/stats.htm

Dewitt J, Reining A, Allsworth JE, Peipert JF. 2010. Tuboovarian abscesses: is size associated with duration of hospitalization & complications? Obstetrics and Gynecology International 2010:847041.

Erenel H, Yilmaz N, Oncul M, Acikgoz AS, Karatas S, Ayhan I, et al. 2017. Usefulness of serum procalcitonin levels in predicting tubo-ovarian abscess in patients with acute pelvic inflammatory disease. Gynecologic and Obstetric Investigation 82:262–266.

Gjelland K, Ekerhovd E, Granberg S. 2005. Transvaginal ultrasound-guided aspiration for treatment of tubo-ovarian abscess: a study of 302 case. Am J Obstet Gynecol 193:1323–1330.

Granberg S, Gjelland K, Ekerhovd E. 2009. The management of pelvic abscess. Best Practice and Research: Clinical Obstetrics and Gynaecology 23:667–678.

Greenstein Y, Shah AJ, Vragovic O, Cabral H, Soto-Wright V, Borgatta L, et al. 2013. Tuboovarian abscess. Factors associated with operative intervention after failed antibiotic therapy. The Journal of Reproductive Medicine 58:101–106.

Güngördük K, Guzel E, Asicioğlu O, Yıldırım G, Ataser G, Ark C, et al. 2014. Experience of tubo-ovarian abscess in western Turkey. International Journal of Gynaecology and Obstetrics: The Official Organ of the International Federation of Gynaecology and Obstetrics 124:45–50.

Halperin R, Levinson O, Yaron M, Bukovsky I, Schneider D. 2003. Tubo-ovarian abscess in older women: is the woman's age a risk factor for failed response to conservative treatment? Gynecologic and Obstetric Investigation 55:211–215.

Ivaska L, Elenius V, Mononen I, Ruuskanen O, Peltola V. 2016. Discrepancies between plasma procalcitonin and C-reactive protein levels arecommon in acute illness. Acta Paediatrica 105:508–513.

Kim HY, Yang JI, Moon C. 2015. Comparison of severe pelvic inflammatory disease, pyosalpinx and tubo-ovarian abscess. The Journal of Obstetrics and Gynaecology Research 41:742–746.

Kinay T, Unlubilgin E, Cirik DA, Kayikcioglu F, Akgul MA, Dolen I. 2016. The value of ultrasonographic tubo-ovarian abscess morphology in predicting whether patients will require surgical treatment. International Journal of Gynaecology and Obstetrics: The Official Organ of the International Federation of Gynaecology and Obstetrics 135:77–81.

Kuo CF, Tsai SY, Liu TC, Lin CC, Liu CP, Lee CM. 2012. Clinical characteristics and treatment outcomes of patientswithtubo-ovarian abscess at a tertiary care hospital in Northern Taiwan. Journal of Microbiology, Immunology and Infection 45:58–64.

Mirhashemi R, Schoell WM, Estape R, Angioli R, Averette HE. 1999. Trends in the management of pelvic abscesses. Journal of the American College of Surgeons 188:567–572.

Mizushima T, Yoshida H, Ohi Y, Ishikawa M, Hirahara F. 2013. Evaluating the risk factors for developing resistance to parenteral therapy for tubo-ovarian abscess: a case-control study. The Journal of Obstetrics and Gynaecology Research 39:1019–1023.

Pan YP, Fang YP, Xu YH, Wang ZX, Shen JL. 2017. The diagnostic value of procalcitonin versus other biomarkers in prediction of bloodstream infection. Clinical Laboratory 63:277–285.

Perez-Medina T, Huertas MA, Bajo JM. 1996. Early ultrasound-guided transvaginal drainage of tubo-ovarian abscesses: a randomized study. Ultrasound in Obstetrics and Gynecology: The Official Journal of the International Society of Ultrasound in Obstetrics and Gynecology 7:435–438.

Sam JW, Jacobs JE, Birnbaum BA. 2002. Spectrum of CT findings in acute pyogenic pelvic inflammatory disease. Radiographics: a Review Publication of the Radiological Society of North America, Inc 22:1327–1334.

Simon L, Gauvin F, Amre DK, Saint-Louis P, Lacroix J. 2004. Serum procalcitonin and C-reactive protein levels as markers of bacterial infection: a systematic review and meta-analysis. Clinical Infectious Diseases: An Official Publication of the Infectious Diseases Society of America 39:206–217.

Soakar A, Arellano RS, Gervais DA, Mueller PR, Hahn PF, Lee SI. 2008. Transvaginal drainage of pelvic fluid collections: results, expectations, and experience. American Journal of Roentgenology 191:1352–1358.

Sweet RL. 2011. Treatment of acute pelvic inflammatory disease. Infectious Diseases in Obstetrics and Gynecology 2011:561909.

Taylor KJ, Wasson JF, De Graaff C, Rosenfield AT, Andriole VT. 1978. Accuracy of grey-scale ultrasound diagnosis of abdominal and pelvic abscesses in 220 patients. Lancet 1:83–84.

Topçu HO, Kokanalı K, Güzel AI, Tokmak A, Erkılınç S, Ümit C, et al. 2015. Risk factors for adverse clinical outcomes in patients with tubo-ovarian abscess. Journal of Obstetrics and Gynaecology: The Journal of the Institute of Obstetrics and Gynaecology 35:699–702.