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Is there any relationship between complicated appendicitis and leucocyte counts?

Komplike apandisitler ile lökosit sayısı arasında herhangi bir ilişki var mı?

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Abstract

Aim: We aim to show the increasing in leucocyte count according to severity of inflammation in complicated appendicitis.

Materials and Methods: 174 patients who had appendectomy were included in this prospective study. Patient consents were taken. Types of appendicitis were categorized as negative appendicitis, non-complicated appendicitis, and complicated appendicitis. Groups were formed according to leucocyte count as 6000/uL and below (L_1), 6001-12000/ uL (L_2), 12001-16000 /uL (L_3), and 16001/ uL and higher (L_4). Types of appendicitis were compared with leucocyte counts. P <0,05 value was considered positive.

Results: All 174 patients were evaluated prospectively. Number of negative appendicitis was 15 (8,62%), non-complicated appendicitis was 135 (77,58%), and complicated appendicitis was 24 (13,79%). There were 4 patients (2,29%) in L_1 group, 78 patients (44,82%) in L_2, 43 patients (24,71%) in L_3, and 49 patients (28,16%) in L_4. The sensitivity and specificity of leucocyte counts were 69,7% and 80% in diagnosis of acute appendicitis. Complicated appendicitis cases were compared with leucocyte groups. Complicated appendicitis count was 0 (0%) in L_1 group, 6 (7,69%) in L_2, 8 (18,60%) in L_3, and 10 (20,40%) in L_4. There was a positive relationship between complicated appendicitis and increasing in leucocyte count (P<0,03).

Conclusion: We have concluded that leucocyte count can be helpful in detecting severity of appendix inflammation in adults.

Keywords: Acute Appendicitis; Complicated Appendicitis; Leucocyte Count.

Öz

Amaç: Komplike apandisitlerde lökosit sayısının inflamasyonun şiddetine göre arttığını göstermeyi amaçladık.

Gereç ve Yöntem: Prospektif çalışmaya apandektomi yapılan 174 hasta dahil edildi. Hasta onamları alındı. Apandisit tipleri; apandisit olmayan, non-komplike apandisit ve komplike apandisit şeklinde guruplandırıldı. Lökosit sayısı ise; 6000/uL ve altında olan (L_1), 6001-12000/uL (L_2), 12001-16000/uL (L_3) ve 16001/uL'den büyük (L_4) şeklinde gruplandırıldı. Apandisit tipleri lökosit sayılarıyla karşılaştırıldı. P<0,05 değeri anlamlı kabul edildi.

Bulgular: Toplam 174 hasta prospektif olarak değerlendirildi. Hasta sayıları sırasıyla Apandisit olmayan 15 (%8,62), non-komplike apandisit olan 135 (%77,58) ve komplike apandisit olan 24'tü (%13,79). L_1'de 4 (%2,29), L_2'de 78 (%44,82), L_3'de 43 (%24,71) ve L_4 grubunda 49 (%28,16) hasta bulunuyordu. Akut apandisit tanısında lökosit sayısı duyarlılığı %69,7 ve özgüllüğü %80 idi. Komplike apandisitler ile lökosit grupları karşılaştırıldı. L_1 grubunda komplike apandisit sayısı 0 (%0) iken, L_2'de 6 (%7,69), L_3'te 8 (%18,60), L_4'te 10 (%20,40) bulundu. Komplike apandisitlerle lökosit sayısı artışı arasında anlamlı bir ilişki vardı (P<0,03).

Sonuç: Erişkin hastalardaki apandiks inflamasyon şiddetinin belirlenmesinde, lökosit sayısının da değerli olduğu kanısına vardık.

Anahtar Kelimeler: Akut Apandisit; Komplike Apandisit; Lökosit Sayısı.

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INTRODUCTION

Acute appendicitis is the most frequent one among the acute abdomen reasons. Its prevalence throughout the human life is 7% and the perforation rate is 17-20%. Mortality risk is lower than 1% (1). Its prevalence in white people between the ages of 15 and 30 is higher. As the age advances, its prevalence decreases. It is 3 times more frequently seen in men than in women. While the prevalence of appendicitis throughout the life in men is 9%, the same value for women is 6%. Misdiagnosis is more frequent among females (24-42%) than males (12-23%) (2). Besides good anamnesis, physical examination, laboratory examinations, and imaging methods, and laparoscopy can be utilized. In diagnosis, the scoring systems (Alvarado score), ultrasonography, magnetic resonance, and scintigraphy are used. Despite all these diagnostic methods, the rate of accurate diagnosis is only 85% (3). In appendicitis, the values such as leucocyte count, C-reactive protein (CRP), sedimentation speed, neutrophil/lymphocyte ratio, bilirubin level, and IL-6 are the indicators of diagnosis and the severity of inflammation. In our study, we investigated if there is a relation between the leucocyte count and the complication. We determined that there is a significant relationship between the level of leucocyte count and complicated appendicitis (gangrenous, perforated).

MATERIALS and METHODS

In our prospective and clinical study, a total of 174 patients, who applied to General Surgery Clinic of Malatya State Hospital between January 2013 and May 2014 and undergone the operation with the diagnosis of appendicitis, were involved. The consents of patients were obtained. Appendicitis diagnosis was made via the history of patient, physical examination, laboratory tests, and imaging methods. The leucocyte counts were determined via Sysmex XP 300 blood count device in our hospital. Normal leucocyte count values of the device were between 4 and 11,5x10^3/uL.

Appendicitis types were grouped as negative appendicitis (NA), non-complicated appendicitis (NCA) and complicated appendicitis (CA) such as gangrene-perforated appendicitis. In terms of the leucocyte number, the results were grouped as 6000 /uL and lower (L_1), between 6001 and 12000 /uL (L_2), between 12001 and 16000 /uL (L_3), and higher than 16001 /uL (L_4). The groups of the leucocyte count were determined in accordance with our clinical observations. Appendicitis types and complicated appendicitis were compared via leucocyte counts. The statistical analyses were executed via SPPS-18 software. The results were evaluated by using Pearson Chi-Square test; $p<0.05$ was considered to be significant.

RESULTS

In our study, a total of 174 patients were examined prospectively. 80 (46%) of the patients were females while 94 (54%) patients were males. The ages of the patients ranged between 10 and 80. The mean age was 27.48. The number of NA was 15 (8.62%), NCA 135 (77.58%) and CA 24 (13.79%) (Table-1). Leucocyte count values ranged between 3700 and 25800 /uL. In NA group, 2 patients had meckel diverticulitis, 1 patient had perforated meckel diverticulitis, 3 patients had Pelvic Inflamatuar Disssease, and 2 patients had serose peritonitis. There were 4 patients in L_1 (2.29), 78 in L_2 (44.82%), 43 in L_3 (24.71%) and 49 in L_4 (28.16%) (Table-2). In acute appendicitis diagnosis, the sensitivity to leucocyte count was found to be 69.7% and specificity was found to be 80%. Appendicitis types were compared to leucocyte groups. The numbers of NA patients were 0 in L_1, 12 in L_2, 0 in L_3 and 3 in L_4 (a total of 15 patients). The numbers of NCA patients were 4 in L_1, 60 in L_2, 35 in L_3 and 36 in L_4 (a total of 135 patients). The number of CA patients were 0 in L_1, 6 in L_2, 8 in L_3 and 10 in L_4 (a total of 24 patients) (Table-3). The complicated appendicitis cases were compared to leucocyte groups. While the number of patients with complicated appendicitis in L_1 group was 0 (0%), there were 6 patients in L_2 (7.69%), 8 patients in L_3 (18.60%), and 10 patients in L_4 (20.40%). It was determined that there is a significant relationship between complicated appendicitis cases and leucocyte count increase ($P<0.03$) (Table-4).

Table 1. Distribution of the patients according to the Appendicitis Types

Appendicitis Types	n	%
NA	15	8,62
NCA	135	77,58
CA	24	13,79
Total	**174**	**100**

n: Number of patients, NA: None Apandicitis, NCA: Non-complicated apandicitis, CA:Complicated apandicitis

Table 2. Distribution of the patients according to the Leucocytes groups

Leucocytes groups	n	%
L_1	4	2,29
L_2	78	44,82
L_3	43	24,71
L_4	49	28,16
Total	**174**	**100**

n: Number of patients
L_1 : Leucocyte count < 6000/uL
L_2 : Leucocyte count 6001-12000/uL
L_3 : Leucocyte count 12001-16000 /uL
L_4 : Leucocyte count > 16001/uL

Table 3. Distribution of the appendicitis types according to the Leucocytes groups

Appendicitis Types	L_1 (n)	L_2 (n)	L_3 (n)	L_4 (n)	
NA	0	12	0	3	15
NCA	4	60	35	36	135
CA	0	6	8	10	24
TOPLAM	**4**	**78**	**43**	**49**	**174**

n: Number of patients, NA: None Apandicitis, NCA: Non-complicated apandicitis, CA:Complicated apandicitis
L_1 : Leucocyte count < 6000/uL
L_2 : Leucocyte count 6001-12000/uL
L_3 : Leucocyte count 12001-16000 /uL
L_4 : Leucocyte count > 16001/uL

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Table 4. The comprasion between complicated appendicitis and leucocyte groups (p<0.03)

The number of patients in the leucocye groups		CA (n)	CA (%)
L_1	n = 4	0	0
L_2	n = 78	6	7,69
L_3	n = 43	8	18,60
L_4	n = 49	10	20,40

n: Number of patient
CA:Complicated apandicitis
L_1 : Leucocyte count < 6000/uL
L_2 : Leucocyte count 6001-12000/uL
L_3 : Leucocyte count 12001-16000 /uL
L_4 : Leucocyte count > 16001/uL

DISCUSSION

Generally characterized with stomachache and leukocytosis, the diagnosis of acute appendicitis requires high level of diligence. In Alvarado score used in acute appendicitis diagnosis, the scores are defined to be localized sensitivity in bottom-right, leukocytosis, left-direction of inappatency, and direct and rebound sensitivity (4). Detailed anamneses of our patients, whom we diagnosed with the preliminary diagnosis of acute appendicitis, were taken, and they were operated after physical examination, and laboratory and imaging methods. Negative appendectomy was detected in 15 (8.62%) of our patients, while the number of complicated appendicitis (gangrenous, perforated) was 24 (13.79%). Nowadays, the portion of negative appendectomy is still 15% and the rate of perforation is approximately 35% (5). Negative appendectomy or skipping the diagnosis may result in significant results for patient and surgeon. Especially when the diagnosis is skipped, perforation or infection localized in abdomen may occur and spread. In acute appendicitis, the inflammation indicators such as leucocyte count, CRP, sedimentation speed, neutrophil level and IL-6 generally increase. In our study, we only used the leucocyte values of patients. In acute appendicitis diagnosis, we determined the leucocyte count sensitivity to be 69.4% and specificity to be 80%. While Thompson MM et al. (6) have determined the leucocyte count sensitivity to be 92% and specificity to be 100% in acute appendicitis, the same parameters were found to be 83% and 62.1% in another study (7). Of 174 patients that we operated on, the leucocyte count was found to be higher than 12000 /uL in 92 patients. Mohammed AA et al. (8) have found the leucocyte count to be higher than 11,000/microL in 109 out of 135 pediatric patients, who have undergone operation due to appendicitis. In another publication, the leucocyte count threshold value was reported to be 12,500 leucocytes/dl in acute appendicitis (9).

There are many studies on the inflammation indicators used in diagnosis of acute appendicitis. Paajanen H. et al. (10) have reported that the leucocyte count is more useful than CRP in all age groups except for infants in non-complicated appendicitis. It has also been reported that increased leucocyte count and increased CRP values are more significant together in diagnosis of acute appendicitis (5). In some of the publications, it has been argued that neutrophil/lymphocyte ratio is solely more useful for the diagnosis phase of appendicitis than leucocyte count and CRP (11, 12, 13). Parallel to the severity of the clinic of appendicitis, leucocyte count, CRP level, neutrophil/lymphocyte ratio, and IL-6 level increase. In complicated appendicitis cases, the level of inflammation indicators further increases. While Mentula P. et al. (14) have reported that increased CRP value was more useful in complicated appendicitis cases, Kalliakmanis V. et al. (15) have emphasized that increased polymorph leucocyte count is more significant in indicating the severity of inflammation. Sack U. et al. (16) have reported that the leucocyte count, CRP, and IL-6 increase in line with the severity of inflammation, and that IL-6 and CRP level supported the diagnosis of advanced appendicitis cases in children, but the leucocyte count was not significant.

In our study, we tried to reveal the relationship between the leucocyte count and inflammation severity by using only the leucocyte count values of appendicitis patients. The percentage of complicated appendicitis in L_1 group has been found to be 0%, 7.69% in L_2, 18.60% in L_3, and 20.40% in L_4. It has been determined that there was a significant relationship between complicated appendicitis cases and leukocytosis (p<0.03). Guraya SY et al. (17) have found the leucocyte count in perforated appendicitis cases to be 17.9+/-2.1x10(9)/L. Goulart RN et al. (18) have determined perforated appendicitis in 57% of patients having leucocyte count higher than 20,000/mm^3. When perforation develops in appendicitis, alongside the leucocyte count and CRP values, the sedimentation speed was reported to increase in 60% of patients (19). Bialas M et al. (20) have reported that the neutrophil/lymphocyte ratio is more sensitive than leukocytosis in phlegmonous and gangrenous appendicitis cases. In another study, significant association with gangrenous appendicitis was reported in cases having neutrophil/lymphocyte value higher than 8 (21). Moreover, it was reported that bilirubin value increases in perforated appendicitis cases but the level of CRP is more important (22).

RESULT

In acute appendicitis, the leucocyte count, CRP level, neutrophil/lymphocyte ratio and IL-6 level increase. As well as in complicated appendicitis cases, the levels of these parameters increase as the severity of inflammation increases. In our study, we determined a significant relationship between complicated appendicitis and increase in leucocyte count. We concluded that the leucocyte count is more useful in determining the severity of appendix inflammation in adult patients.

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