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The Diagnostic Value of Neutrophil Lymphocyte Ratio in Acute Appendicitis

Akut Apandisitte Nötrofil Lenfosit Oranının Tanısal Değeri

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Amaç: Çalışmamızın amacı akut apandisitte nötrofil lenfosit oranının (NLR) tanısal dağerini değerlendirmektir.
Gereç ve Yöntemler: Apendektomi uygulanan 310 hasta çalışmamıza dahil edildi.Hastaların yaşları, cinsiyetleri, preoperatif beyaz küre, nötrofil yüzdesi, lenfosit yüzdesi ve NLR'leri, çekilmiş olan ultrasonografi (USG) ve patoloji sonuçları retrospektif olarak elde edildi. İstatistik analizde student t test, ki-kare testi ve olasılık oranları kullanıldı.
Bulgular: Çalışmamıza appendektomi ameliyatı yapılan 310 hasta dahil edildi. Çalışmaya dahil olan hastaların 176'sı (%56,8) erkek idi ve erkek kadın oranı 1,3: 1 olarak tespit edildi. Hastaların ortalama yaşı 24,5±12,2 yıl olarak bulundu. Patoloji sonuçları incelendiğinde 54 hastanın inflamasyon bulgusu olmayan appendiks vermiformis, 14 hastanın (%5,5) perfore, 5 hastanın(%2,0) gangranöz akut appendisit, 1'er hastanın karsinoid ve müsinöz kistadenom olarak rapor edildiğini görüldü. Akut appendisit çıkan hastalarda NLR ortalama değeri 7,0±5,6 idi. NLR'nin yüksek olması patolojik olarak akut appendisit arasında istatistiksel anlamlı ilişki olduğu görüldü (p
Sonuç: Akut appendisit tanısında iltihabi belirteç olan NLR kullanılabilir bir parametredir. Akut appendisit tanısında beyaz küreden daha yüksek oranlarda yüksek tespit edilse de çok merkezli geniş çalışmalarla NLR'nin tanı koyma gücü değerlendirilmelidir.
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Anahtar Kelimeler: Akut apandisit, Nötrofil Lenfosit Oranı

Abstract ***Aplication:*** *10.06.2013* ***Accepted:*** *07.07.2013*

Objective: *The aim of our study is to evaluate, and discuss the diagnostic value of neutrophil lymphocyte ratio (NLR) in acute appendicitis.*
Materials and Methods: *Three hundred and ten patients underwent appendectomy included in our study. Patients ages, genders, preoperative white blood cell (WBC), neutrophil and lymphocyte percentages, and NLR, applied ultrasonography (US) findings, and pathological reports were retrieved retrospectively. Student t test, chi-square test, and odds ratios were used in statistical analysis.*
Results: *Our study included appendectomy applied 310 patients, 176 patients (56,8%) were male, and male-female ratio of patients was determined as 1,3: 1. The mean age of patients was 24,5 ± 12,2 years. Pathological reports showed that 54 patients reported as appendix vermiformis with no sign of inflammation, and also 14 patients (5,5%) reported as perforated, 5 patients (2,0%) as acute gangrenous appendicitis, 1 patient as musinous cystadenoma, and 1 patie.nt as carsinoid tumor. Average value of NLR was 7,0±5,6 in patients with acute appendicitis. Elevated NLR values were found statistically associated with acute appendisitis diagnosed pathologically (p*
Conclusion: *NLR is an inflammatory marker of acute appendicitis, and diagnostic strenght of NLR in the diagnosis of acute appendicitis must be evaluated by large, multi-centered studies.*

Keywords: *Acute appendicitis, Neutrophil Lymphocyte Ratio*

Introduction:

Acute appendicitis is defined as an inflammation of the inner lining of the appendix vermiformis that spreads to its other parts. This condition is a common, and urgent surgical disease with variable clinical manifestations, generous overlap with other clinical syndromes, and significant morbidity, which increases with diagnostic delay.

The classic history of anorexia and periumbilical pain followed by nausea, right lower quadrant (RLQ) pain, and vomiting occurs in only 50% of acute appendicitis cases. Although surgeons use clinical scoring systems such as Alvarado, and imaging procedures such as ultrasonography (US), and computed tomography (CT) at the present time, the diagnosis is not always easy[1].

Leukocyte count (WBC) is used in the diagnosis of acute appendicitis, but also C-reactive protein (CRP), interleukin 6 (IL-6), interleukin-10 (IL-10) can be used such as inflammatory markers[2]. Perforation and negative laparatomy rate decreases with accurate, and rapid diagnosis. Goodman et al asserts neutrophil-lypmphocyte ratio (NLR) as a diagnostic tool, and that is sense to the diagnosis of acute appendicitis when greater than 3,5[3]. After that, a few studies have investigated the use of NLR in the diagnosis of acute appendicitis[4,5,6]. The aim of our study is to evaluate, and discuss the diagnostic value of NLR in acute appendicitis.

Materials and Methods

Three hundred and ten patients underwent appendectomy between January 2012 and December 2012 were included in our study, and the datas retrieved retrospectively. Patients ages, genders, preoperative WBC, neutrophil and lymphocyte percentages, and NLR, applied US findings, and pathological reports were noted. Fifty four patients with negative appendectomy evaluated as in control group. The sensitivity, spesivity, and positive predictive value of NLR were identified for the diagnosis of acute appendicitis.

Statistical analysis was performed using SPSS 16.0. The datas were spesified as mean value ± standart deviation. Student t test, chi-square test, and odds ratios were used in statistical analysis. p<0,05 was considered statistically significant.

Results

Our study included appendectomy applied 310 patients, 176 patients (56,8%) were male, and male-female ratio of patients was determined as 1,3:1. The mean age of patients was 24,5 ± 12,2 (5-86) years (table 1). We determined 228 patients applied US (73,6%) preoperatively. US findings were reported as compatible with acute appendicitis to 120 patients, not compatible for acute appendicitis to 93 patients, and suspicious to 15 patients (table 2). Pathological reports showed that 54 patients reported as appendix vermiformis with no sign of inflammation. And also 14 patients (5,5%) reported as perforated, 5 patients (2,0%) as acute gangrenous appendicitis, 1 patient as musinous cystadenoma, and 1 patient as carsinoid tumor.

Table 1 Sociodemographic features of patients	
Age	24,5±12,2 years
Gender	176 (56,8%) Male
	134 (43,2%) Female

Table 2. Distribution of preoperatively applied ultrasonographic findings

US	Acute appendicitis (+)	Suspicious	Acute appendicitis (-)
Number of patients (percentages)	120 (%52,63)	15 (%6,58)	93 (%40,79)

US: Ultrasonography

Average value of NLR was 7,0±5,6 (1,0-38,3) in patients with acute appendicitis, and 5,2±5,2 (0,4-24,5) in patients with no acute appendicitis. Elevated NLR values in acute appendicities were statistically significant (p<0,001). The cut-off value of NLR was calculated as 3,5 statistically. High values of NLR were found statistically associated with acute appendisitis diagnosed pathologically (p<0,001). There was no statistically significant difference between NLR, and the gender (p>0,05). WBC cut-off value was taken as 12,000. High values of WBC was found associated with acute appendicitis (p<0,05).

Acute appendicitis was found to be 69,0%, when NLR is smaller than 3,5, and WBC is greater than 12,000. And also acute appendicitis was found to be 82,4%, when NLR is greater

than 3,5, and WBC is smaller than 12,000. But there were no significant difference between them (p>0,05).

The sensitivity and specificity of WBC, and NLR were calculated in our study for the diagnosis of acute appendicitis, showed in table 3.

Table 3. The sensitivity and specificity of WBC, and NLR for the diagnosis of acute appendicitis

	Sensitivity (%)	Specificity (%)
WBC	69,5%	57,4%
NLR	76,6%	59,3%

WBC: white blood cell, NLR: neutrophil lymphocyte ratio

Discussion

Acute appendicitis is an infectious and inflammatory disease of appendix vermiformis. The etiology is not known accurately, but pathophysiology is thought initiated by obstruction of appendiceal lumen.

There is no insidence study for appendicitis in Turkey. Appendicitis occurs in 7% of the United States population, with an incidence of 1,1 cases per 1000 people per year[7,8]. There is a slight male predominance of 3:2 in young adults, and teenagers. In adults, the incidence of appendicitis is approximately 1,4 times greater in men than in women. Median age in appendectomy is 21 years[8]. Acute appendicitis is seen more frequently in the 2nd decade of life[8]. Appendectomy carries a complication rate of 4-15%, and overall mortality rate of 0,2-0,8% is attributable to complications of the disease rather than to surgical intervention[8].

Acute appendicitis is one of the most seen cause of surgical emergencies, and the most common disease requiring abdominal surgery[7,9].

Acute appendicitis is diagnosed clinically. The patient's history, and the physical examination in diagnosis have an important role. In spite of development of therapeutic modalities, scoring systems such as Alvarado, and imaging procedures, the diagnose of 30-40% patients is suspicious[1,10]. The Alvarado scoring system is based on the following 8 variables; migrating of pain to RQL, anorexia, nausea/vomiting, tenderness in RQL, rebound pain, elevated temperature (>37,7°C), leukocytosis (>10,000/ µL), and left shift[1]. The most common using inflammatory marker is WBC, on the other hand CRP, IL-6, and IL-10 may also be used[2].

Many studies have been performed in order to diagnose acute appendicitis accurately, and rapidly. Goodman et al asserts NLR as a diagnostic tool, and that is sense to the diagnosis of acute appendicitis when greater than 3,5 [3]. They examined 402 patients operated for acute appendicitis, retrospectively. Appendix vermiformis with no inflammation has been reported in pathological examination for 22 patients (5,5%). They identified high WBC in 298 patients (79%) with acute appendicitis, and also NLR value 3,5 or greater than 3,5 was seen in 324 patients (88%) with acute appendicitis, and the difference was found statistically significant (3). We determined NLR cut off value as 3,5, and identified NLR value greater than 3,5 in 216 patients (%69,7). High values of NLR were found statistically associated with acute appendisitis diagnosed pathologically (p<0,001), but there was no significant difference between NLR and WBC (p>0,05).

Bialas et al examined 469 patients operated for acute appendicitis retrospectively in their study published in 2006. They defined NLR cutt off value as 3,5 smilar to our study. In this study, NLR≥3,5 occurred to have much higher sensitivity (77.5% vs. 55%) but lower speci□city (73.3%vs. 81.6%) than leukocytosis[4]. In our study, we detected NLR (NLR≥3,5) both sensitive (76,6% vs 69,5%), and spesific (59,3% vs 57,4%) than leukocytosis for acute appendicitis. But the difference was not statistically significant (p>0,05).

Infection markers such as WBC, neutrophil, CRP have limited worth for early diagnosis of non nosocomial bacteriemia. Cornelis et al showed availability of lymphocytopenia as infectious urgent diagnose in their study, and concluded that NLR was able to predict bacteriemia with more high rate[11].

Karman et al examined 100 patient with acute appendicitis. Sensitivity and specificity of WBC as calculated in this study was 76,5% and 73,7% respectively. They defined WBC by itself was not completely preventive against negative appendectomy[12]. In our study, we calculated sensitivity and specifi-

city of WBC 69,5%, and 57,4% respectively, and smillarly we identified WBC by itself was not preventive against negative appendectomy.

Narci et al evaluated 130 patients operated for acute appendicitis retrospectively. In this study, elevated NLR was found in 109 patients, and this was statistically significant[13]. Smilarly, we identified NLR (NLR >3,5) and pathologically diagnosed inflammatory acute appendicitis as statistically significant.

Terradas et al examined 2311 patients by eosinophil, and NLR as prognostic factor for bacteriemia in a retrospective cohort study. They determined low eosinophil count, and high values of NLR (NLR>7) as independent risk factors for mortality[14].

There are many studies investigating relationship between NLR and prognosis, and chemotherapy activities in colorectal and breast cancers. Cook et al evaluated 100 patients, and they showed statistically significant releationship between NLR (NLR≥ 9,3 postoperative 1st day), and complication rate (odds ratio2,12; 95% confidence interval 1,366-3,253)[15]. Chua et al evaluated a total of 349 patients of two centers, as a result they found significant relationship between combination of chemotherapy agents with NLR≤5 and clinical success in a multivariate comparative study[16]. Azab et al investigated relationship between early, and long term mortality, and NLR in breast cancers. They identified that high levels of NLR and lymphopenia as independent risk factor in breast cancer for prognosis[17].

NLR is an inflammatory marker of acute appendicitis, and diagnostic strenght of NLR in the diagnosis of acute appendicitis must be evaluated by large, multi-centered studies.

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