

The investigation of neutrophil to lymphocyte ratio and platelet to lymphocyte ratio in children with pathological cervical lymphadenopathy

Saime Güzelsoy Sağırođlu¹, Selman Sarıca¹, Nagihan Bilal¹, İsrail Orhan¹, Ayşegül Erdođan², Metin Kılıç³

¹Department of Otorhinolaryngology, Faculty of Medicine, Kabramanmaraş Sütçü İmam University, Kabramanmaraş, Turkey

²Department of Public Health, Faculty of Medicine, Kabramanmaraş Sütçü İmam University, Kabramanmaraş, Turkey

³Department of Biochemistry, Faculty of Medicine, Kabramanmaraş Sütçü İmam University, Kabramanmaraş, Turkey

Abstract

Objective: To reveal whether if neutrophil to lymphocyte ratio (NLR) and platelet to lymphocyte ratio (PLR) rates are useful or not in children followed-up due to pathological cervical lymphadenopathy (LAP) of unknown etiology who have a normal hematologic examination.

Methods: A total of 100 children admitted to the otorhinolaryngology clinic between 2014 and 2017 with the complaint of swelling in the neck without any etiology revealed on examination and established with the diagnosis of idiopathic pathological LAP were retrospectively included in the study. The control group consisted of 100 children who did not have any infectious condition and could be considered healthy in terms of examination and laboratory findings. Patients' and the control group's age, gender, clinical history, disease course and examination findings were screened from the patients' records in the clinic.

Results: Mean white blood cell and lymphocyte count parameters in the patient group were higher than the control group, and the difference was statistically significant ($p=0.008$ and $p=0.001$, respectively). In the patient group, mean NLR and PLR values were significantly lower than the control group ($p=0.009$ and $p=0.020$, respectively).

Conclusion: NLR and PLR rates may be well correlated with inflammation in children followed-up due to pathologic cervical LAP with unknown etiology.

Keywords: Neutrophil to lymphocyte ratio, platelet to lymphocyte ratio, lymphadenopathy.

Özet: Patolojik servikal lenfadenopatili çocuklarda nötrofil/lenfosit ve trombosit/lenfosit oranlarının araştırılması

Amaç: Bu çalışmada, bilinmeyen etiyojili patolojik lenfadenopati (LAP) nedeniyle takip edilen, hematolojik muayeneleri normal çocuklarda nötrofil/lenfosit (NLO) ve trombosit/lenfosit oranlarının (TLO) yararlı olup olmadığının açıklığa kavuşturulması amaçlanmıştır.

Yöntem: Muayene sırasında saptanan herhangi bir neden olmaksızın boyunda şişme şikayetiyle 2014 ile 2017 yılları arasında KBB kliniğine kabul edilen ve idiyopatik patolojik LAP tanısı konulan toplam 100 çocuk retrospektif çalışmaya dahil edildi. Kontrol grubu herhangi bir enfeksiyonu olmayan ve muayene ve laboratuvar tahlillerine göre sağlıklı olduğu düşünülen 100 çocuktan oluşmaktaydı. Hastalar ve kontrol grubu klinikteki hasta kayıtlarına bakılarak yaş, cinsiyet, klinik öykü, hastalık süreci ve muayene bulguları açısından tarandı.

Bulgular: Hasta grubunda ortalama lökosit ve lenfosit sayıları kontrol grubundan daha yüksek olup farklılık istatistiksel olarak anlamlıydı (sırasıyla $p=0.008$ ve $p=0.001$). Hasta grubunda ortalama NLO ve TLO değerleri kontrol grubuna göre anlamlı derecede daha düşüktü (sırasıyla $p=0.009$ ve $p=0.020$).

Sonuç: Bilinmeyen etiyojili patolojik servikal LAP nedeniyle takip edilen çocuklarda NLO ve TLO enflamasyonla iyi bir korelasyon gösterebilir.

Anahtar sözcükler: Nötrofil/lenfosit oranı, trombosit/lenfosit oranı, lenfadenopati.

Lymphadenopathies constitute most of the neck masses of the children. Lymph nodes are arranged along the lymphatic canal. They are rich in lymphocytes and antigen-

presenting cells and surrounded by a fibrous capsule. Lymph node enlargement in local and systemic infectious cases is seen as lymphadenomegaly or lymphadenopathy

Correspondence: Saime Güzelsoy Sağırođlu, MD. Department of Otorhinolaryngology, Faculty of Medicine, Kahramanmaraş Sütçü İmam University, Kahramanmaraş, Turkey.
e-mail: guzelsoys@yahoo.com

Received: July 1, 2017; Accepted: July 26, 2017

Online available at:
www.entupdates.org
doi:10.2399/jmu.2017002004
QR code:



(LAP). Due to the antigenic state caused by any infection or other reasons, lymphocytes and macrophages migrate to lymph nodules and cause to grow.^[1,2] In childhood period, the most common causes leading to LAP are viral and bacterial followed by autoimmune diseases and malignancies.^[1-3]

White blood cell, lymphocyte and neutrophil counts that could routinely be performed in every clinic and used in hemogram data are laboratory tests showing the existence of infection and they do not have high financial load. Parameters such as procalcitonin, pro-adrenomedullin, serum amyloid A, fibrinogen and CD-14 binding protein, which are used following some infections, are extremely expensive tests.^[4,5] Recently, neutrophil to lymphocyte ratio (NLR) and platelet to lymphocyte ratio (PLR) rates calculated according to hemogram data in patients with a white blood cell count within the normal range can be used to evaluate systemic inflammation.^[6,7]

In this study, we aimed to reveal whether if NLR and PLR rates are useful or not in children followed-up due to pathological cervical LAP of unknown etiology who have a normal hematologic examination.

Materials and Methods

Study design

A total of 100 children admitted to the otorhinolaryngology clinic between 2014 and 2017 with the complaint of swelling in the neck without any etiology revealed on examination and established with the diagnosis of idiopathic pathological LAP were retrospectively included in the study.

One hundred subjects were included as the control group. The control group consisted of children who did not have any infectious condition and could be considered healthy in terms of examination and laboratory findings. The patients' and the control group's age, gender, clinical history, disease course and examination findings were screened from the patients' records in the clinic.

The patients who have hypertension, diabetes mellitus, metabolic diseases, coronary artery disease, thyroid dysfunction, kidney and liver disease, epilepsy, malignancy and anemia, those operated within the last 3 months, and the patients having systemic infections, chronic inflammation and other chronic diseases were excluded from the study.

Patients had multiple LAPs about 1 to 3 cm in size detected with ultrasonography who were followed-up for

about 6 months. Most of the patients were followed by the pediatric hematology clinic. Most of these patients which revealed reactive LAP were made incisional biopsy according to the proposal of hematology department.

Patient files and data on white blood cell (WBC) count, erythrocyte count (RBC), platelet count (PC), mean platelet volume (MPV), neutrophil count, lymphocyte count were obtained from the archives of the hospital computer automation program for analysis. NLR value was calculated by dividing neutrophil count to lymphocyte count. PLR value was obtained by dividing platelet count to lymphocyte count. The age, gender, WBC, RBC, PC, MPV, PLR and NLR values were recorded, and the data were statistically analyzed.

Statistics analysis

All statistical analyses were done with using SPSS software. Normal distribution suitability of groups were tested Kolmogorov-Smirnov. The difference meaningful between groups were tested with chi-square, Student's t-test, and for comparison of non-uniform distribution, groups were tested with Mann-Whitney U test. Less than $p < 0.05$ values were considered statistically significant.

Results

The patient group included 71 (52.6%) boys and 29 (44.6%) girls whose median age was 8 (range: 2 to 15) years. Also, the control group had 64 boys (47.4%) and 36 (55.4%) girls whose median age was 9 (range: 2 to 15) years. There was no difference between the two groups in terms of the age. Comparison of gender and age between patient and control groups is shown in Table 1.

Comparison of hemogram parameters between patient and control groups is shown in Table 2. Mean WBC and lymphocyte count parameters in the patient group were higher than the control group, and the difference was statistically significant ($p = 0.008$ and $p = 0.001$, respectively).

Table 1. Comparison of gender and age between patient and control groups.

	Patient (n=100)	Control (n=100)	p-value
Age	8 (min=2, max=15)	9 (min=2, max=15)	0.272*
Gender	Male	71 (52.6%)	0.291†
	Female	29 (44.6%)	

*Mann-Whitney U test, †Chi-square test.

Table 2. Comparison of hemogram parameter values between patient and control groups.

	Patient (n=100)	Control (n=100)	p-value
WBC	7.91±1.79	7.28±1.48	0.008*
RBC	4.86±0.32	4.85±0.39	0.813*
Platelet	327±75.18	313±67.91	0.169*
MPV	8.68±1.57	8.60±1.35	0.690*
Neutrophil	3.66±1.49	3.69±1.19	0.873*
Lymphocyte	3.22±0.96	2.77±0.79	0.001*
NLR	1.22±0.59	1.55±1.08	0.009*
PLR	107.0 (min=53.2, max=344.9)	118.7 (min=46.3, max=265.9)	0.020†

*Student's t-test, †Mann-Whitney U test. NLR: neutrophil to lymphocyte ratio, PLR: platelet to lymphocyte ratio, SD: Standard deviation.

In the patient group, mean NLR and PLR values were significantly lower than the control group (p=0.009 and p=0.020, respectively) (Figs. 1 and 2).

Discussion

Neck masses are most commonly seen in pediatric age group and require a careful differential diagnosis because of the variability of etiology. Although children's neck masses are easier to diagnose with physical examination and radiological imaging than adults, perfect medical history should be taken.^[8,9] Children usually applied to the outpatient clinic due to malignancy when the size of the neck reaches pathological size. So, in most cases surgical excision is required for definitive diagnosis. Some of the patients cannot be diagnosed despite follow-up and examination.

The size of lymph nodes that are undistinguished in newborn period varies by age, localization of the node and immunological status of individuals. Lymph nodes reach to the maximum size around the age of 8 to 12 and lymph node atrophy begins after adolescence. Lymph nodes of 1 cm in the cervical region in childhood period are usually not considered pathologic.^[1,2] Therefore, the patients who had cervical LAP in pathological sizes between 1 and 3 cm participated in this study.

Etiological factors in neck masses differ by countries. While inflammatory lesions are the most common cause of neck masses in developing countries, congenital and neoplastic masses are more prominent in developed coun-

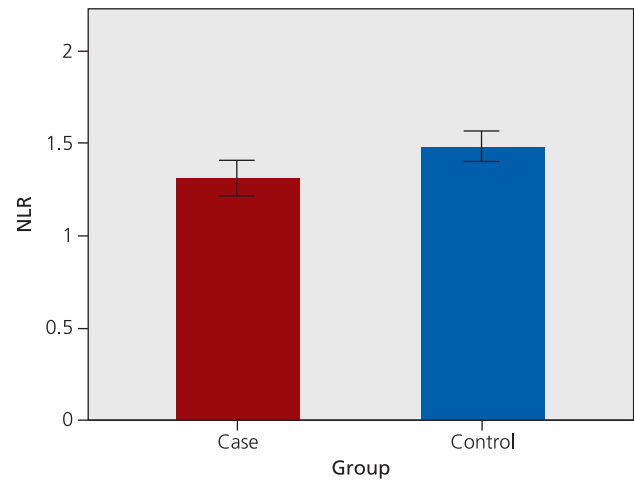


Fig. 1. Neutrophil to lymphocyte ratio values in the patient and the control groups.

tries.^[9,10] In our patient group in which we ruled out neoplastic and congenital masses, lymphocyte count was increased as viral infections increase (p=0.001). Thus, we think that an inflammation without a certain cause may exist with the increase in lymphocyte count in children with cervical LAP.

In recent years, among the novel markers used in the measurement of inflammatory status, NLR is used for the evaluation of systemic inflammatory response against several diseases including cardiovascular diseases, diabetes melli-

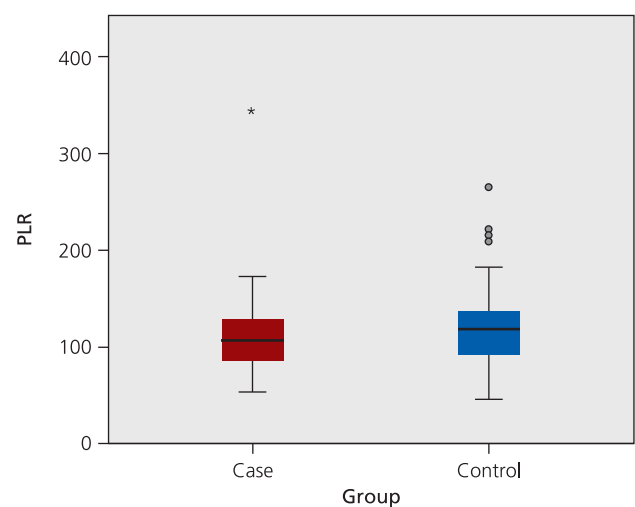


Fig. 2. Platelet to lymphocyte ratio values in the patient and the control groups.

tus, metabolic syndrome, local and systemic infections and cancer (lung, ovarian and colorectal).^[6-11] Wolfswinkel et al.^[12] argued that evaluation of NLR together with lymphocytopenia is more effective than studying CRP and total leukocyte count. Again, numerous studies suggested that NLR is an important criterion in making diagnostic and prognostic decisions in psoriasis, infective endocarditis, pneumonia, bacteremia and acute appendicitis.^[13-17] In our study, we found that lymphocyte was higher in the patient group than the control group, and as a result, NLR was significant. This result supports the cause of chronic inflammation which plays an etiologic role in children with LAP.

PLR as another novel marker is a poor prognosis in some cancers and cardiovascular diseases reported.^[18] Another study by Sula et al. reported that PLR and PDW values were higher in patients with leishmaniasis compared to the control subjects.^[19] In our study, we found that lymphocyte was higher and PLR values were significantly lower in the patient group. This finding suggests that PLR value can be used as a criterion indicating subclinical inflammation in children with pathological cervical LAP.

There are many studies in the literature demonstrating that mean platelet volume (MPV), which is one of the parameters used in the evaluation of platelet size, is used for the evaluation of both systemic inflammatory activity and response to treatment.^[19-22] In a study, platelet count was measured at high levels and MPV at low levels in the active period of inflammation and infection, and they were suggested as reliable markers.^[22] However, Sula et al.^[19] found no significant difference in MPV level in patients with leishmaniasis. Similarly, we could not obtain any significant results at the levels of MPV in our patient group. In our study, we found that the platelet counts did not change much.

Conclusion

In the present study, we attempted to demonstrate inflammation using NLR and PLR rates in children with LAP. As a result, we think that these descriptive parameters may be well correlated with inflammation in children followed-up due to pathologic cervical LAP with unknown etiology.

Conflict of Interest: No conflicts declared.

References

- Perkins SL, Segal GH, Kjeldsberg CR. Work-up of lymphadenopathy in children. *Semin Diagn Pathol* 1995;12:284-7.
- Twist CJ, Link MP. Assessment of lymphadenopathy in children. *Pediatr Clin North Am* 2002;49:1009-25.
- Locke R, MacGregor F, Kubba H. The validation of an algorithm for the management of paediatric cervical lymphadenopathy. *Int J Pediatr Otorhinolaryngol* 2016;81:5-9.
- de Jager CP, van Wijk PT, Mathoera RB, de Jongh-Leuvenink J, van der Poll T, Wever PC. Lymphocytopenia and neutrophil-lymphocyte count ratio predict bacteremia better than conventional infection markers in an emergency care unit. *Crit Care* 2010;14:R192-5.
- Zahorec R. Ratio of neutrophil to lymphocyte counts – rapid and simple parameter of systemic inflammation and stress in critically ill. *Bratisl Lek Listy* 2001;102:5-14.
- Balta S, Demirkol S, Unlu M, Arslan Z, Celik T. Neutrophil to lymphocyte ratio may be predict of mortality in all conditions. *Br J Cancer* 2013;109:3125-6.
- Balta S, Ozturk C, Kurtoglu E. The neutrophil-lymphocyte ratio is not enough to describe inflammatory condition. *Eur Arch Otorhinolaryngol* 2014;271:1839-40.
- Demir D, Akçam MT, Karakoç Ö, Öngörü Ö, Yetişer S. Baş boyun kitlelerinde ince iğne aspirasyon biopsisinin tanısal değeri. *KBB-Forum* 2006;5:5-11.
- Yalçın Ş. Boyun kitleleri. In: Kulak burun boğaz hastalıkları ve baş boyun cerrahisi. Çelik O, editor. 1. baskı. İstanbul: Turgut Yayıncılık; 2002. p. 860-89.
- McGuirt WF. Differential diagnosis of neck masses. In: Cummings CW, Frederickson JM, Harker LA, Krause CJ, Richardson JM, Harker LA, Krause CJ, Richardson MA, Schuller DE, editors. *Otolaryngology – head and neck surgery*. 3rd ed. St Louis, MI: Mosby Year Book; 1998. p. 1686-99.
- Kilincalp S, Coban S, Akinci H, et al. Neutrophil/lymphocyte ratio, platelet/lymphocyte ratio, and mean platelet volume as potential biomarkers for early detection and monitoring of colorectal adenocarcinoma. *Eur J Cancer Prev* 2015;24:328-33.
- Van Wolfswinkel ME, Vliegthart-Jongbloed K, de Mendonça Melo M, et al. Predictive value of lymphocytopenia and the neutrophil-lymphocyte count ratio for severe imported malaria. *Malar J* 2013;12:1-8.
- Sen BB, Rifaioglu EN, Ekiz O, Inan MU, Sen T, Sen N. Neutrophil to lymphocyte ratio as a measure of systemic inflammation in psoriasis. *Cutan Ocul Toxicol* 2014;33:223-7.
- Turak O, Özcan F, İşleyen A, et al. Usefulness of neutrophil-to-lymphocyte ratio to predict in-hospital outcomes in infective endocarditis. *Can J Cardiol* 2013;29:1672-8.
- de Jager CP, Wever PC, Gemen EF, et al. The neutrophil-lymphocyte count ratio in patients with community-acquired pneumonia. *PLoS One* 2012;7:e46561.
- Terradas R, Grau S, Blanch J, et al. Eosinophil count and neutrophil-lymphocyte count ratio as prognostic markers in patients with bacteremia: a retrospective cohort study. *PLoS One* 2012;7:e42860.
- Markar SR, Karthikesalingam A, Falzon A, Kan Y. The diagnostic value of neutrophil: lymphocyte ratio in adults with suspected acute appendicitis. *Acta Chir Belg* 2010;110:543-7.
- Boyraz İ, Koç B, Boyacı A, Tutoğlu A, Sarman H, Ozkan H. Ratio of neutrophil/lymphocyte and platelet/lymphocyte in patient with ankylosing spondylitis that are treating with anti-TNF. *Int J Clin Exp Med* 2014;7:2912-5.

19. Sula B, Tekin R. Use of hematological parameters in evaluation of treatment efficacy in cutaneous leishmaniasis. *Journal of Microbiology and Infectious Diseases* 2015;5:167–72.
20. Azab B, Shah N, Akerman M, McGinn JT. Value of platelet/lymphocyte ratio as a predictor of all-cause mortality after non-ST-elevation myocardial infarction. *J Thromb Thrombolysis* 2012;34: 326–34.
21. Akarsu S, Kurt ANÇ, Kurt A, Varol İ, Şen Y. Thrombocyte volume parameters in different disease groups. [Article in Turkish] *Türk Pediatri Arşivi* 2006;41:208–13.
22. Zareifar S, Farahmand Far MR, Golfeshan F, Cohan N. Changes in platelet count and mean platelet volume during infectious and inflammatory disease and their correlation with ESR and CRP. *J Clin Lab Anal* 2014;28:245–8.

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported (CC BY-NC-ND3.0) Licence (<http://creativecommons.org/licenses/by-nc-nd/3.0/>) which permits unrestricted noncommercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Please cite this article as: Güzelsoy Sağiroğlu S, Sarica S, Bilal N, Orhan İ, Erdoğan A, Kılıç M. The investigation of neutrophil to lymphocyte ratio and platelet to lymphocyte ratio in children with pathological cervical lymphadenopathy. *ENT Updates* 2017;7(2):99–103.