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Original Article / Çalışma - Araştırma

High sensitivity C-reactive protein levels in chronic rhinosinusitis and allergic rhinitis

Kronik rinosinüzit ve alerjik rinitte yüksek duyarlılıklı C-reaktif protein düzeyleri

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Objectives: In this study we evaluated the relationship between peripheral blood high sensitivity C-reactive protein (hs-CRP) levels with allergic rhinitis and chronic rhinosinusitis (CRS) with or without nasal polyps.

Patients and Methods: The study included 100 patients who were divided into four groups each 25 patients; as follows: allergic rhinitis (group 1), CRS with nasal polyps (group 2), CRS without nasal polyps (group 3), and controls (group 4) who were non-smokers. All patients underwent a detailed symptom enquiry, physical examination, and investigations including a complete blood count and radiograph of the paranasal sinuses. The hs-CRP was measured in all the patients by a semi quantitative assay using the latex enhanced immunonephelometric test.

Results: There was no statistically significant difference in the levels of hs-CRP between the group 1, group 2, and group 3 by the control group respectively (p=0.861, p=0.7196, and p=0.127).

Conclusion: Allergic rhinitis, CRS with nasal polyps and CRS without nasal polyp groups compared with the control group were statistically not significant differences in the hs-CRP levels with peripheral blood.

Key Words: Allergic rhinitis; chronic rhinosinusitis; high sensitivity-C-reactive protein; nasal polyp.

Amaç: Bu çalışmada alerjik rinitli, nazal polipli ve polipsiz kronik rinosinüzitli (KRS) hastaların periferik kanlarındaki yüksek duyarlılıklı C-reaktif protein (hs-CRP) düzeyleri arasındaki ilişki değerlendirildi.

Hastalar ve Yöntemler: Çalışmaya dahil edilen 100 hasta; alerjik rinitli hastalar (grup 1), nazal polipli KRS'li hastalar (grup 2), nazal polipsiz KRS'li hastalar (grup 3) ve sigara içmeyen kontroller (grup 4) olmak üzere 25'er kişilik dört gruba ayrıldı. Tüm hastalara detaylı semptom sorgulaması, fizik muayene, tam kan sayımı ve paranazal sinüs radyografileri yapıldı. Tüm hastalarda hs-CRP düzeyleri semi kantitatif olarak, lateks ile güçlendirilmiş immünonefelometrik yöntem ile ölçüldü.

Bulgular: Yüksek duyarlılıklı-CRP düzeyleri açısından grup 1, grup 2 ve grup 3 ile kontrol grubu arasında istatistiksel olarak anlamlı farklılık yoktu (sırasıyla; p=0.861, p=0.7196 ve p=0.127).

Sonuç: Alerjik rinit, nazal polipli KRS ve nazal polipsiz KRS gruplarında periferik kan hs-CRP düzeyleri kontrol grubu ile karşılaştırıldığında istatistiksel anlamlı farklılık saptanmadı.

Anahtar Sözcükler: Alerjik rinit; kronik rinosinüzit; yüksek duyarlılıklı-C-reaktif protein; nazal polip.

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C-reactive protein (CRP) is one of the most characteristic markers of the inflammatory process.[1] It was first discovered in the plasma of patients during the acute phase of pneumococcal pneumonia. C-reactive protein appears in the peripheral blood after being produced by the liver in response to inflammatory cytokines such as tumor necrosis factor alfa (TNF-α), interleukin 1 (IL-1), and in particular IL-6, within a few hours following infection, trauma, or myocardial infarction.[2-4]

High-sensitivity C-reactive protein (hs-CRP) is a sensitive marker for infection, inflammation, and tissue damage and it also helps in the host's defense against infection by activating the complement pathway.[5-7] Measurement of serum hs-CRP levels has been recommended in cases of low-grade systemic inflammation in many disorders. An increase in serum hs-CRP may be associated with airflow obstruction and airway inflammation and may serve as a marker of airway inflammation in asthma. A recent epidemiological study showed that increased levels of hs-CRP correlate significantly with respiratory symptoms.[8,9] Therefore, CRP is a very useful systemic marker in the presence of inflammation and infection. Rhinosinusitis is characterized as symptomatic inflammation of the nasal cavity and paranasal sinuses.[10] However, the relevance of high-sensitivity assays for C-reactive protein has not been fully studied in rhinosinusitis. The aim of the present study was to evaluate the relationship between peripheral blood hs-CRP levels and allergic rhinitis, and peripheral blood hs-CRP levels and chronic rhinosinusits (CRS) with or without nasal polyps (NPs).

PATIENTS AND METHODS

One hundred subjects were enrolled into the study. The study was conducted with the approval of the ethics committee of the İzzet Baysal Medical Faculty at the University of Abant İzzet Baysal, Bolu, Turkey. Patients with acute upper or lower respiratory tract infection and respiratory symptoms (throughout the two months prior to the current presentation), ischemic heart disease, diabetes mellitus, hypertension, trauma, systemic inflammatory disorders (such as collagen vascular diseases) and malignancy were excluded from the study. The participants were divided into four groups of 25 patients each. Group 1 had patients with allergic rhinosinusitis (15 males, 10 females; mean ages 36.7 years; range 23 to 44 years), group 2 patients had CRS with NPs (13 males, 12 females; mean ages 35.4 years; range 21 to 44 years), group 3 patients had CRS without NPs (14 males 11 females; mean ages 35.5 years; range 19 to 43 years), and group 4 was the healthy (control) group (13 males, 12 females; mean ages 36.0 years; range 26 to 45 years) of non-smokers. All patients underwent a detailed symptom investigation, physical examination, and investigations including a complete blood count, IgE, prick test and radiograph of the paranasal sinuses (computed tomography). Samples of peripheral venous blood were collected and sent to the laboratory of clinical biochemistry.

Measurement of serum high-sensitivity C-reactive protein levels

All laboratory measurements were carried out in the Department of Clinical Biochemistry, Abant İzzet Baysal University Hospital, Bolu, Turkey. Samples of peripheral venous blood were collected and stored at –80 ºC and the sera were centrifuged for 10 min at 4000 rpm at 4 ºC. The hs-CRP was measured in all the patients by a semi-quantitative assay using the latex enhanced immunonephelometric test. The hs-CRP levels in the serum samples were analyzed in duplicate using the commercial kit CardioPhaseTR HsCRP (Siemens Healthcare Diagnostics inc. Newark, DE, 19714 USA). The sensitivity of the assay ranged from 0-3.41 mg/l.

Statistical analysis

The data was evaluated using MedCalc statistical software v11.4.4 (MedCalc Software, Mariakerke, Belgium). The Wilcoxon signed-rank test was used to compare repeated measures variables and the Mann-Whitney U-test and Independent samples t-test were used to test between-group differences. Data was expressed as mean ± standard deviation. $P<0.05$ was considered statistically significant.

RESULTS

The groups were similar in terms of age and sex. Mean, variance, standard deviation, relative standard deviation, standard error of mean, median, minimum, maximum, and 10-90 percentiles are shown in table 1. There was no statistically significant difference between the CRS with NPs group and the control group in the levels of hs-CRP ($p=0.7196$). There was no statistically significant difference between the CRS with NPs group and the control group in the levels of hs-CRP ($p=0.1277$). There was no statistically significant

Table 1. Mean, variance, standard deviation, relative standard deviation, standard error of mean, median, minimum, maximum, and 10-90 percentiles

	Mean	Variance	SD	RSD	SEM	Median	Min.-Max.	10-90 P
C-reactive protein with NPs	4.77	69.17	8.31	1.74	1.66	1.34	0.17-35.10	0.29-9.38
C-reactive protein without NPs	3.39	10.81	3.28	0.97	0.65	1.95	0.24-13.70	0.64-7.50
Allergic rhinitis	3.64	30.12	5.48	1.50	1.09	1.12	0.17-20.10	0.25-9.84
Control	2.13	5.84	2.41	1.13	0.48	1.46	0.17-12.30	0.23-3.89

SD: Standard deviation; RSD: Relative standard deviation; SEM: Standard error of mean; Min.: Minimum; Max.: Maximum; NPs: Nasal polyps.

difference between the allergic rhinitis group and the control group in the levels of hs-CRP (p=0.8614). A comparative view of the hs-CRP levels in all groups is shown in figure 1.

DISCUSSION

C-reactive protein, one of the markers of the inflammatory process, can be easily measured and this procedure is commonly performed in clinical practice. Importantly, measurements of serum hs-CRP levels have suggested the involvement of low-grade systemic inflammation in several disorders.[1-4,6]

A study by Sahoo et al.[6] suggested that in non-atopic asthmatics, hs-CRP levels may be used as a systemic biomarker for lung inflammation, and Allam et al.[7] suggested that hs-CRP can indirectly reflect the degree of severity of airway inflammation in bronchial asthma. Moreover, Olafsdottir et al.[8] concluded that increased levels of hs-CRP are associated with respiratory symptoms and non-allergic asthma but not with allergic asthma. A study by Takemura et al.[9] examined the serum hs-CRP levels in steroid-naive and steroid-inhaling adult non-smoker patients with asthma and healthy controls. They compared the controls' serum hs-CRP levels and found that they were significantly increased in steroid-naive patients, but not in patients on inhaled corticosteroids.

Several other diseases such as diabetes mellitus and cardiovascular disorders could affect the serum levels of hs-CRP. The presence of cardiovascular disease, diabetes mellitus or obesity is associated with increased serum hs-CRP levels, which may be due to adipocyte-derived IL-6.[11,12]

A study by Tracy[13] concluded that the serum hs-CRP levels suggested the presence of low-grade systemic inflammation in cardiovascular disorders, as a marker of low-level inflammation, thus indicating an increased risk of myocardial infarction and stroke in otherwise healthy individuals. On the other hand, serum CRP is elevated in many malignancies and it may be a prognostic indicator

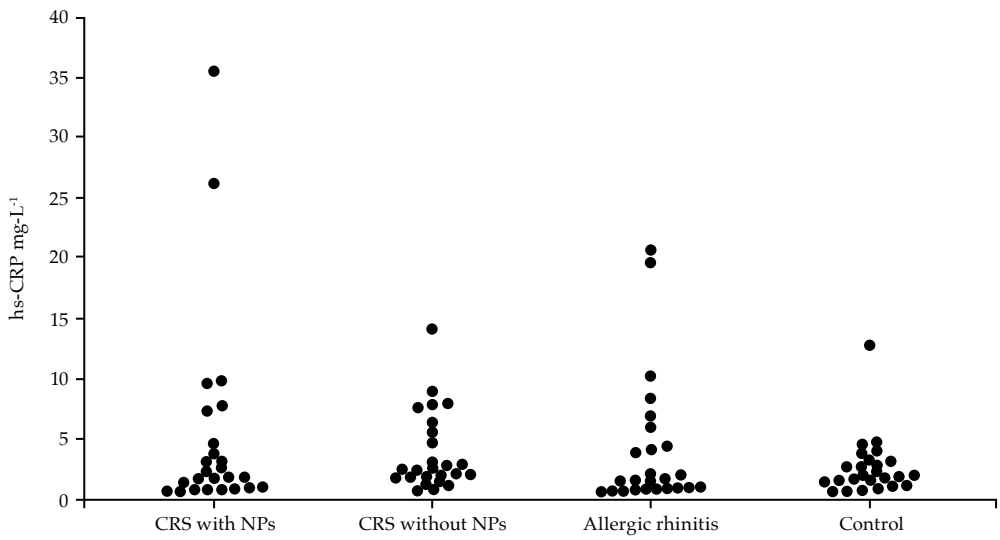

Figure 1. *Comparative view of the hs-C-reactive protein levels of all groups.* *CRS: chronic rhinosinusitis; NPs: Nasal polyps.*

of the potential of the malignancy. Furthermore, a study on gastric cancer patients demonstrated that the preoperative serum hs-CRP level was elevated in 38.2% of the patients and the authors deduced that it might be a potential prognostic biomarker. They also suggested that CRP level might be a promising therapeutic target for gastric cancer patients, although it is not a specific biomarker for this type of cancer.[3,14]

A study by Panaszek et al.[15] indicated that the serum concentration of hs-CRP is not associated with asthmatic inflammation expressed by bronchial hyperresponsiveness, and it cannot be considered as a marker of the local inflammatory process in either atopic or non-atopic asthma.

Chronic rhinosinusitis is a common chronic disease, affecting a large part of the population. The relevance of high sensitivity assays for hs-CRP, which is known to be a sensitive marker of low-grade systemic inflammation, has not been fully studied in rhinosinusitis. The present study demonstrated that hs-CRP peripheral blood levels are not associated with allergic rhinitis or rhinosinusitis with or without polyps. However, one limitation of this study is that the studied population was small.

In conclusion, the levels of hs-CRP in patients with CRS and allergic rhinitis were similar to those of the control group. Moreover, the effect of inflammation on the peripheral blood level of hs-CRP levels and allergic rhinitis, and CRS with or without polyps is not statistically significant.

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