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Original Research Article

Investigation of neutrophil-to-lymphocyte ratio and red cell distribution width in sudden senseurineural hearing loss

Caner Sahin[1], Ceyhun Varim[2]*, Cengiz Karacaer[2]

[1]Department of Medicine, Alanya Alaattin Keykubat University, Faculty of Medicine, ENT Clinic, Antalya, Turkey
[2]Department of Internal Medicine, Sakarya University, Faculty of Medicine, Sakarya, Turkey

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***Correspondence:**
Dr. Ceyhun Varim,
E-mail: ceyhunvarim@sakarya.edu.tr

ABSTRACT

Background: Sudden hearing loss (DHL) is a sudden sensorineural hearing loss effecting et least 3 or more frequencies more than 30 Decibel. The purpose of this study was to investigate the usefulness of the neutrophil to lymphocyte ratio (NLR) and Red Cell Distribution Width (RDW) in the first diagnosis of sudden sensorineural hearing loss (SSHL).
Methods: Total 24 patients diagnosed with SSHL and 24 control patients included in the study. Serum samples were analyzed retrospectively on the initial presentation.
Results: On admission, the NLR was 2.1±1.1 The mean absolute neutrophil count was 7100±400/mm^3, and the mean complete lymphocyte count was 3400±1100/mm^3. RDW was 11.9±0.6. Eight patients had total healing, 12 patients had partial cure, and two patients had no healing in the study. Statistically significant changes in NLR determined in the measurements between SSHL and control group ($p<0.05$). Significant differences were not observed in hemoglobin and hematocrit values, lymphocyte counts, RDW measurements between SSHL and control group ($p<0.05$).
Conclusions: In lights of this information we recommend to screen NLR levels in SSHL patients. This may help us follow up patients recovery and if the patients recover from the disease higher level of NLR may create doubt for recurrence of the disease in risky patients.

Keywords: Neutrophil to lymphocyte ratio, Red cell distribution width, Sudden hearing loss

INTRODUCTION

Sudden hearing loss (DHL) is a sudden sensorineural hearing loss effecting et least 3 or more frequencies more than 30 Decibel. Hearing loss can be partial or total. The incidence of the disease is 5-20/100.000 in the literature1. Vascular causes (emboli, thrombus, vasospasm), autoimmune diseases and inflammation of the cochlea(viral) can be the etiological factors of the disease.[1]

The neutrophil to lymphocyte ratio (NLR) shows the general inflammatory condition. The presence of an elevated NLR was confirmed in follow up of inflamatuar and acute thrombotic diseases like chronic hepatitis, Acute Intracerebral Hemorrhage, and acute myocardial infarction.[2-4]

Red Cell Distribution Width (RDW) is a parameter that can be used to investigate general inflammation and peripheric microvascular thrombotic disease in the literature. Recent evidence in the literature suggests that, besides erythrocyte abnormalities, many human disorders may be frequently associated with a high degree of RDW abnormalities.[5]

RDW abnormalities is shown in cardiovascular diseases in the literature.[6,7] There are very few investigations about RDW and SSHL in the literature.

In the present study, authors aimed to evaluate the NLR and RDW differences of SSHL patients. Authors aimed to investigate the whole markers that can be examined from a simple blood test in SSHL.

METHODS

Patients admitted to the Sakarya Akyazi State Hospital between February 2013 and December 2015 with complaints about SSHL evaluated retrospectively. The study population comprised 24 patients diagnosed with SSHL.

Patients underwent general examination, with neurological and otorhinolaryngological examination. Blood biochemistry and whole blood analyses were performed. Temporal Magnetic Resonance (MR) performed on all members of the study population for the differential diagnosis of intracranial and inner ear pathologies.

The exclusion criteria comprised the presence of an acute/chronic ear infection history, history of hearing loss, chronic inflammatory immunological disorders, diabetes mellitus, hypertension, chronic renal failure, active connective tissue disorder, vasculitis, inflammatory bowel disease, and chronic liver failure. Patients using drugs such as antidiabetic drugs, steroids, immunomodulatory drugs, antihistaminic drugs, sedative drugs and analgesics were also excluded from study.

Peripheral venous sampling for whole blood analysis and blood biochemistry performed between 08:00 and 10:00. Complete blood analyses were performed using the same device (ABBOTT CELL DYN 3700). Whole blood analyses performed on admission.

Audiological examinations performed on the first, third, seventh, and thirtieth day of admission. Audiological examinations were performed) by the same audiologist (AC 40; Interacoustics, Denmark. The hearing thresholds of the patients recorded at 250, 500, 1000, 2000, 4000, and 8000 Hz. Patients received prednisolone treatment at a beginning dose of 1 mg/kg IV, which was tapered off in 15 days. Patients received 12 g/day piracetam.

Patients with a recent history of viral infection received antiviral treatment (acyclovir 1000 mg/day).

Patients divided into three groups according to the response to treatment.

Total healing

Pure-tone average (dB) within 10 dB of initial hearing level or 10 dB of the hearing level of the unaffected ear

Partial healing

Pure-tone average (dB) within 50% of initial hearing level or greater than 10 dB improvement of the hearing level

No cure

Less than 10 dB improvement in hearing level relative to the initial hearing level.[8]

Systemic otorhinolaryngological examinations performed. Whole blood analysis results evaluated retrospectively. The NLR calculated by dividing the neutrophil count by the lymphocyte count per microlitre (NLR = neutrophils (×103 per μl) ÷ lymphocytes (×103 per μl)).

Statistical analysis

Statistical analysis was performed using SPSS, version 19.0 for Windows (IBM, Armonk, NY). Descriptive data expressed as means and standard deviation. The Kolmogorov-Smirnov test used for a normality test. Mann Whitney-U tests were used to evaluate differences between the groups. The Wilcoxon test was used to assess differences between whole blood count parameters on admission. For each test, a P value of 0.05 or less treated as statistically significant.

RESULTS

Total 24 patients were included in the study (10 males (41%), 14 females (59%). The mean age was 32.5±10.2 (18–59).

Socio-demographic data and the entire blood results of the SSHL population demonstrated in Table 1. On admission, the NLR was 2.1±1.1 (Figure 1 and 2). The mean absolute neutrophil count was 7100±400/mm^3, and the mean complete lymphocyte count was 3400±1100/mm^3. RDW was 11.9±0.6 (Table 1). Mean Hemoglobin (g/dl) is 13.4±0.9. Mean Haematocrit (%) is 39.8±3.9. Mean neutrophil (K/ul) is 7.1±0.4. Mean lymphocyte (K/ul) is 3.4±1.1.

On admission, NLR was 1.4±0.9, The mean absolute neutrophil count was 5100±400/mm^3, and the mean complete lymphocyte count was 3600±1100/mm^3. RDW was 11.2±0.4 on the control group. Mean Hemoglobin (g/dl) is 12.8±0.8. Mean Haematocrit (%) is 38.7±3.4. Mean neutrophil (K/ul) is 5.1±0.4. Mean lymphocyte (K/ul) is 3.6±1.1

Statistically significant changes in the neutrophil count and NLR determined in the measurements between SSHL and control group (p=0.04, p=0.0012 respectively) (Table 1).

Significant changes were not observed in haemoglobin and haematocrit values, lymphocyte counts, RDW measurements between SSHL and control group (p=0.41, p=0.56, p=0.521, 0.7 respectively).

Table 1: Haemogram parameters of patients with sudden hearing loss.

Parameters	SSHL (Mean± Std Dev)	Control group	p
Hemoglobin (g/dl)	13.4±0.9	12.8±0.8	0.41
Haematocrit (%)	39.8±3.9	38.7±3.4	0.56
Neutrophil (K/ul)	7.1±0.4	5.1±0.4	0.04
Lymphocyte (K/ul)	3.4±1.1	3.6±1.1	0.521
NLR	2.1±1.1	1.4±0.9	0.0012
RDW(%)	11.9±0.6	11.2±0.4	0.7

Mean±Std. Dev: Mean±Standard Deviation, WBC: White Blood Cell, NLR: Neutrophil to Lymphocyte Ratio, RDW; Red Cell Distribution.

Table 2: Haemogram parameters of patients with sudden hearing loss.

Parameters	Total healing	Partial healing	No healing	p
Hemoglobin (g/dl)	12.9±0.9	13±0.8	12.5±0.8	0.45
Haematocrit (%)	38.8±3.9	39.2±3.4	37.2±3.4	0.67
Neutrophil (K/ul)	5.9±0.5	6.1±0.4	7±0.4	0.03
Lymphocyte (K/ul)	3.5±1.1	3±1.4	3.2±1.1	0.621
NLR	1.7±1.1	1.9±0.9	2.2±0.5	0.002
RDW(%)	12.2±0.6	11.2±0.7	11.9±0.4	0.7

Mean±Std. Dev: Mean±Standard Deviation, WBC: White Blood Cell, NLR: Neutrophil to Lymphocyte Ratio, RDW; Red Cell Distribution.

Patients classed as 3 groups in terms of healing.

Total healing

Pure-tone average (dB) within 10 dB of initial hearing level or 10 dB of the hearing level of the unaffected ear.

Partial healing

Pure-tone average (dB) within 50% of initial hearing level or greater than 10 dB improvement of the hearing level.

No cure

Less than 10 dB improvement in hearing level relative to the initial hearing level Eight patients had total healing, 12 patients had partial cure, and two patients had no healing in the study. Entire blood results of the SSHL population according to healing demonstrated in Table 2. NLR was 1.7±1.1, The mean absolute neutrophil count was 5900±500/mm^3, and the mean complete lymphocyte count was 3500±1100/mm^3. RDW was 12.2±0.6 on the total healing group (Table 2).

NLR was 1.9±0.9, The mean absolute neutrophil count was 6100±400/mm3, and the mean absolute lymphocyte count was 3000±1400/mm3. RDW was 11.2±0.7 on the partial healing group.

NLR was 2.2±0.5, The mean absolute neutrophil count was 7000±400/mm^3, and the mean total lymphocyte count was 3200±1100/mm^3. RDW was 11.9±0.4 on no healing group.

Statistically significant changes in the neutrophil count and NLR determined in the measurements between response to healing groups (p=0.03, p=0.002 respectively). Significant differences were not observed in haemoglobin and haematocrit values, lymphocyte counts, RDW measurements between response to healing groups (p=0.45, p=0.67, p=0.621, 0.7 respectively).

DISCUSSION

The most important outcome of the present study was that the NLR count was significantly higher in patients with SSHL than in the control group. The second most important result of this study was the demonstration of a statistically not significant changes in RDW measurements. The third significant result of the research is there are statistically significant changes in the neutrophil count, and NLR determined in the frequencies between response to healing groups. Therefore, the NLR value may be a factor for screening prognosis of the disease.

Complete blood analysis may show the general condition of the patient. Higher neutrophil counts may be associated with inflammatory conditions.[8] The NLR is an inflammatory marker that has been studied in recent years for many diseases. The presence of an elevated NLR in SSHL demonstrated via the literature search.

In a study made by 40 patients of SSHL, it is demonstrated that NLR measurements are higher in SSHL.

NLR levels do not differ as the hearing loss is worser.[9] Seo YJ et al, revealed that NLR levels are higher even the disease heals and show recurrence.[10] Seo YJ et al, revealed that NLR is higher in SSHL patients and level of NLR is higher if the hearing loss is worser.[11,12]

In present study NLR count was significantly higher in patients with SSHL than in control Group and is there are statistically significant changes in the neutrophil count and NLR determined in the measurements between response to healing groups.

RDW is an indicator indicating height and heterogeneity of the erythrocyte volume.[6] This parameter can increase in anemias, myelodysplastic syndromes and cause microvascular thrombotic diseases.[7] It is demonstrated that RDW can be a marker for acute hypoxemia without anaemia.[13]

Acute hypoxia may lead to a sudden increase in erythropoietin levels. This may cause an increase in RDW without increasing mean cell volume.[14] Increase in RDW posted in heart attack, pulmonary embolism, acute cerebrovascular disease, and ischemic diseases.[15-17] Chronic inflammation may lead to differentiation of RDW.[18,19]

Authors investigated the relation between Bell's palsy and NLR in otolaryngology area before.[20] here are many investigations searching relation of inflammation and NLR both in otolaryngology region20. This research is about another illness about NLR for us. High levels of RDW correlates with acute and chronic atherosclerosis.[7] There is no actual study of RDW and SSHLin the literature.

In present research RDW was no statistically significantly higher in Bells Palsy. In the present study, the NLR was significantly higher in patients with SSHL than in those with a control group. RDW levels were in reasonable limits. In lights of this information authors recommend to screen NLR levels in SSHL patients. This may help us follow up patients recovery and if the patients recover from the disease higher level of NLR may create doubt for recurrence of the disease in risky patients.

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