Published in final edited form as:

J Eur Acad Dermatol Venereol. 2017 November ; 31(11): e491–e492. doi:10.1111/jdv.14334.

Neutrophil to Lymphocyte Ratio Decreases After Treatment of Psoriasis with Therapeutic Antibodies

L. Zhang¹, C. Wiles², L.R. Martinez², and G. Han¹

¹Department of Dermatology, Icahn School of Medicine at Mount Sinai, New York, NY

²Department of Biomedical Sciences, New York Institute of Technology College of Medicine, Old Westbury, NY

Keywords

antibodies; neutrophil to lymphocyte ratio; psoriasis; psoriasis area severity index

Although neutrophils are a histologic hallmark of psoriasis, it is unclear whether neutrophils are simply effector cells or drive pathogenesis. A recent psoriasis study with murine models evaluated various chemokines, lipids, and cytokines proposing that neutrophils are key players in positive feedback loops perpetuating the disease.¹ Additionally, when neutrophils are depleted in pustular psoriasis, the disease drastically improves.² There is mounting evidence supporting the use of neutrophil to lymphocyte ratio (NLR) as a marker of inflammation in active psoriasis. While absolute neutrophil counts (ANC) varies significantly amongst individuals, NLR may serve as an individually-normalized measure of relative neutrophil counts in psoriasis patients, and has been shown to be elevated in psoriasis patients with severe disease.^{3–5}

To better understand the relationship between psoriasis area severity index (PASI) and NLR, we evaluated how the NLR changed as psoriasis is effectively treated and PASI declines. We conducted a retrospective chart review of plaque psoriasis patients from the Mount Sinai (MS) Medical Center, New York, NY who had completed unblinded clinical trials with therapeutic antibodies, brodalumab and ustekinumab. The improvement threshold was a PASI decrease over 50% at week 12, which is a clinically significant endpoint to stratify treatment response and meaningful change in quality of life⁶. No patients treated with placebo had a PASI decrease over 50%. The experimental groups consisted of 18 patients on brodalumab and 12 patients on ustekinumab who responded to treatment, as well as 7 placebo patients. A total of 5 treatment non-responders (patients on brodalumab or ustekinumab who did not achieve PASI50) were also included in further analysis. The absolute neutrophil count and the absolute lymphocyte value from each patient's laboratory blood test (units x 10³/μL) and PASI scores at week 0 and 12 were documented. The NLR

Corresponding Author: Lisa Zhang, Department of Dermatology at Mount Sinai, 1425 Madison Avenue, Box 1047, New York, NY 10029, Phone: 630-408-3975, Fax: 646-537-8959, Lisa.Zhang@mountsinai.org.

Disclosure Statement: None of the authors have any conflicts of interest to disclose.

IRB Approval: This study was approved by the Icahn School of Medicine at Mount Sinai institutional review board (HS#: 15-01051).

was calculated by dividing the absolute neutrophil count by the absolute lymphocyte count. The reviewers who recorded the PASI were blinded. Statistical analyses were performed using GraphPad Prism 6.0. To compare the NLR for each group at weeks 0 and 12, multiple unpaired *t*-tests were used and statistical significance ($P<0.05$) was determined using the Holm-Sidak method. A Pearson correlation was also calculated for initial PASI score and the NLR.

Our findings showed that after 12 weeks there was no significant change in the NLR of placebo patients whereas a significant reduction was observed in NLR of antibody-treated patients ($P<0.05$) (Fig. 1). Contrary to an earlier study by Kim *et al.* 2015, we did not find a correlation between the baseline PASI and NLR, which confirms previous results by Ataseven *et al.* 2014, since our calculated Pearson correlation was 0.013 ($P=0.938$).^{4,5}

As treatment with therapeutic antibodies may modulate neutrophil function and may directly affect NLR, we also examined the difference in NLR between treatment responders and non-responders. We found that treatment responders had a significant reduction in NLR ($P=0.005$) whereas treatment non-responders did not ($P=0.092$) (Fig. 2).

Our results suggest that as psoriasis patients respond to treatment with therapeutic antibodies, their NLR decreases concurrently with decrease in PASI. Only patients who improved on treatment had a decreased NLR, suggesting a key role for neutrophils in the pathogenesis of psoriasis. This critically shows that decrease in NLR is reflective of underlying disease activity and not simply a treatment effect. Thus, NLR may serve as a corollary blood value in psoriasis patients for response to treatment, which can be easily calculated from a routine blood test.

Future investigation of mechanisms underlying this change in systemic NLR may be helpful to understand the pathophysiology of psoriasis, with the potential to develop novel diagnostic and therapeutic options.

Acknowledgments

Statement of Funding: L.R.M. was supported by the National Institute of General Medical Sciences of the US NIH under award number R15GM117501.

References

1. Sumida H, Yanagida K, Kita Y, et al. Interplay between CXCR2 and BLT1 Facilitates Neutrophil Infiltration and Resultant Keratinocyte Activation in a Murine Model of Imiquimod-Induced Psoriasis. *J Immunol.* 2014; 192(9):4361–9. [PubMed: 24663678]
2. Ikeda S, Takahashi H, Suga Y, et al. Therapeutic Depletion of Myeloid Lineage Leukocytes in Patients with Generalized Pustular Psoriasis Indicates a Major Role for Neutrophils in the Immunopathogenesis of Psoriasis. *J Am Acad Dermatol.* 2013; 68(4):609–17. [PubMed: 23332516]
3. Yamanaka K, Umezawa Y, Yamagiwa A, et al. Biologic Therapy Improves Psoriasis by Decreasing the Activity of Monocytes and Neutrophils. *J Dermatol.* 2014; 41(8):679–85. [PubMed: 25099154]
4. Kim DS, Shin D, Lee MS, et al. Assessments of Neutrophil to Lymphocyte Ratio and Platelet to Lymphocyte Ratio in Korean Patients with Psoriasis Vulgaris and Psoriatic Arthritis. *J Dermatol.* 2015; 43(3):305–10. [PubMed: 26381893]
5. Ataseven A, Bilgin AU, Kurtipek GS, et al. The Importance of Neutrophil Lymphocyte Ratio in Patients with Psoriasis. *Mater Sociomed.* 2014; 26(4):231–3. [PubMed: 25395882]

6. Carlin CS, Feldman SR, Kreuger JG, Menter A, Kreuger GG. A 50% reduction in the Psoriasis Area and Severity Index (PASI 50) is a clinically significant endpoint in the assessment of psoriasis. *J Am Acad Dermatol*. 2004; 50(6):859–66. [PubMed: 15153885]

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Figure 1.

Neutrophil to lymphocyte ratio (NLR) measured in psoriasis patients 12 weeks after placebo or antibody treatment. Bars denote the average for each experimental condition, and error bars indicate standard deviations. *P* value significance (*, $P < 0.05$) was calculated by multiple unpaired *t*-tests and adjusted by use of the Holm-Sidak method.

Figure 2.

Neutrophil to lymphocyte ratio (NLR) comparing responders versus non-responders after 12 weeks of antibody treatment in psoriasis patients. Bars denote the average for each experimental condition, and error bars indicate standard deviations. Responders show a significant decrease in NLR ($p=0.005$), and non-responders do not show any significant change in NLR ($p=0.092$). P value significance (*, $P < 0.05$) was calculated by multiple unpaired t -tests and adjusted by use of the Holm-Sidak method.