

The Diagnostic Value of the Neutrophil-Lymphocyte Ratio in Stroke Recognition

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Abstract— This study investigated the diagnostic value of the neutrophil-lymphocyte ratio (NLR) in stroke recognition. The NLR is a marker of inflammation. Since a stroke causes local inflammation, hypothetically, the NLR should be influenced. This study analyzed 3 years worth of data from the Raritan Bay Medical Center. The significance of typical risk factors was ruled out and the Receiver Operating Characteristic (ROC) for different NLR values was compared. It was determined that the NLR has diagnostic value in stroke recognition. An NLR above 4.0 decreases the likelihood of the presence of a stroke, while an NLR lower than 4.0 makes the diagnosis of a stroke probable in patients with stroke-like symptoms.

I. BACKGROUND

Strokes, the third leading cause of death in America, involve the cessation of blood flow to the brain, and ultimately result in cell death [1]. Two major factors are considered in the search for a superior diagnostic tool: duration and cost.

This study investigated the NLR. Finding this value takes less than 10 minutes in a hospital setting, compared to the hour long process of traditional scanning techniques[2]. In addition, unlike scanning methods which are \$6,000 per patient, a routine blood test is no more than \$200 [3].

The rationale for investigating the NLR is as follows: events occurring throughout the course of a stroke promote the entry of neutrophils, but not lymphocytes, to the brain. Thus, the ratio of the two should increase. However, even the neutrophilic reaction caused by a stroke is not extremely large. Therefore, an NLR value that is *far* greater than the average value implies that a stroke is not responsible for the change. In other words, increased deviation from the average NLR value decreases the likelihood of the presence of a stroke.

Finally, a bar graph showing the Precision Value and Negative Precision Value for the both stroke categories as the NLR increases was made.

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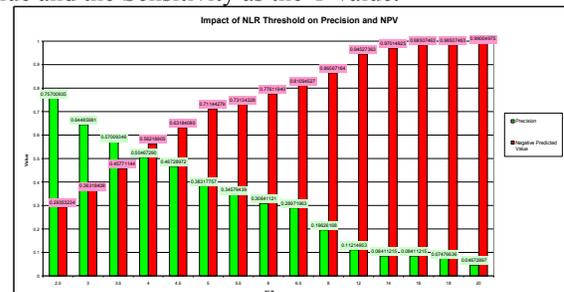
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II. EXPERIMENTAL PROCEDURE

The medical information of stroke patients from 2010 to 2013 was collected from the Raritan Bay Medical Center. The NLR of each patient was calculated. To certify that the NLR was solely responsible for the stroke outcome, the following factors were tested for significance using a t-test and chi-square analysis: age, sex, diabetes, smoking, and renal function. Once the factors proved to be insignificant, Receiver Operating Characteristic (ROC) space charts were made for NLR values ranging from 2.5 to 20.0. A ROC graph was then created using the false positive rate as the X value and the Sensitivity as the Y value.



III. RESULTS AND DISCUSSION

The bar graph, which used results from the ROC analyses, makes it evident that a threshold value exists:

Based on the results, the NLR holds diagnostic. An NLR lower than 4.0 is very likely suggesting the presence of a stroke. An NLR greater than 4.0 suggests the absence of a stroke: the value is far too great to be attributed to a stroke, and is most likely being caused by a different condition.

These results are significant to third world countries, where emergency medical centers lack imaging resources. Using the NLR is a far more feasible and cheaper alternative.

ACKNOWLEDGMENT

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