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RESEARCH ARTICLE

NEUTROPHIL TO LYMPHOCYTE RATIO (NLR) AS AN INFLAMMATION MARKER IN PATIENT WITH CHRONIC TONSILLITIS

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ABSTRACT

Introduction: Neutrophil to Lymphocyte ration (NLR) is being studied extensively as a viable and inexpensive alternative to many recognized markers of inflammation (e.g. Cytokines, TNF, ASO, Prolactin etc.). Most of these studies are around GI and other condition/surgeries. This is a study which is examining the role of NLR in chronic tonsillitis cases pre & post-tonsillectomy vis-à-vis other established markers of inflammation. **Aim:** To examine the performance of NLR as reliable marker of inflammation in chronic tonsillitis subjects pre and post tonsillectomy. **Methods:** Thirty Chronic tonsillitis subject's various parameters viz, Total WBC, Hemoglobin, Hematocrit, Neutrophil, Lymphocytes, ASO, CRP, ESR & NLR was estimated and compared pre (oneday prior tonsillectomy) and post surgery (around 1 month after surgery). Data were statistically analysed for reliability of NLR as marker of inflammation. **Results:** Statistically significant reduction in TC, Neutrophil, Lymphocytes, CRP, ASO and ESR level was observed, post surgery. Significant rise in NLR value was recorded. A negative correlation was established between reduced ASO, CRP, ESR etc. with raised NLR level pre to post-surgery. **Conclusion:** NLR value can be as useful as other markers of inflammation (ASO, CRP etc) especially in monitoring surgical management of chronic tonsillitis cases or those undergoing tonsillectomy operations. However a large scale study with more subject is essential.

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INTRODUCTION

Tonsillectomy is a common surgery carried out by ENT surgeons. Frequency was more earlier in absence of properly framed scientific indication for surgery (Tonsillectomy) and lesser application of antibiotics then current usage (Alexiou *et al*., 2011). Currently tonsillectomy is indicated in children with chronic tonsillitis and as surgical management of obstructive sleep apnoea. Certain parameters of human hemograms are prone to change upon any inflammation e.g. Neutrophils and the lymphocyte count. Neutrophil counts get raised in acute inflammation but can in conditions like malnutrition, immune-disorders and chronic inflammation (Fock *et al*., 2010). Parameters like ASO, CRP and ESR usually registers a rise in acute inflammatory conditions.

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Our quest for alternative new markers to follow-up inflammatory process is a continuous process since long time and it is in this context Neutrophil to Lymphocyte ration (NLR) could be a new and inexpensive marker providing a simple method for assessment of inflammatory status. The aim of our study was to retrospectively compare NLR values with ESR, ASO and CRP values used as markers of inflammation in post tonsillectomy patients with chronic tonsillitis.

MATERIALS AND METHODS

The study was a retrospective case study and involving 30 patients between 4 and 15 years of age, who had been operated due to chronic tonsillitis. Exclusion criteria: Those diagnosed with other conditions (e.g. acute tonsillitis, malignancies, the use of drug affecting the haematologic system, chronic lung, kidney or renal diseases, malnutrition, chronic inflammatory or autoimmune diseases). Patients undergoing tonsillectomy due to chronic tonsillitis were taken in to the study. The surgery criteria were: tonsillitis attacks at least six times in the past

year, or five consecutive tonsillitis attacks at least five times in the past two years, or tonsillitis attacks at least three times in the past three years (Koshy *et al*., 2014). Tonsillitis attacks were described as fever over 38º C, hyperaemia of tonsils and exudate. Value of ASO, CRP and ESR were found out. Haemogram, ASO, CRP and ESR were collected a day before and one month after the surgery. Hemogram, TC, DLC (total WBC, platelet, neutrophil, lymphocyte, monocyte, eosinophil and basophil counts per microlitre) etc. were counted by both automated and manual method in the dept. of pathology, FAA Medical College, Barpeta. NLR was calculated by dividing absolute neutrophil count with absolute lymphocyte count (on one day before surgery and after 1 month of surgery). Collected data were analysed using standard software packages (SPSS). Mean and Standard deviation expressed the descriptive data. Differences within each group before and after the surgery were assessed with non-parametric test (Wilcoxon signed-rank test) as the distribution of both sets of data (Pre-surgery & Post Surgery) were not normal. (Checked by Shapiro-Wilk test). A statistically significant two-tailed value of p was taken to be at <0.05.

RESULTS

Thirty patients were included in the study with 17 female and 13 males, age range being 5 to 15 years (mean age, 8.1±3.2 yrs). Preoperative ASO values were 157.13±2x43.68 U, ESR values were 13.27±2x5.9 mm/h., CRP values were 8.75±2.93 mg/L and NLR was calculated as 0.92 ± 2x0.12 (Table1). Postoperative ASO values were 172.54± 2x47.0 U, ESR values were 11.81±2x4.7 mm/h., CRP values were 7.33±2.25 mg/L and NLR was calculated as 1.07± 2x 0.18 (Table1). Preoperative WBC values were 11.19±2x1.39 K/ul lymphocyte values were 5.34±2x0.84 K/ul and neutrophil values were 4.84±2x0.68 K/ul. Postoperative WBC values were 10.65 ± 2x1.12 K/ul, lymphocyte values were 4.42±2x0.51 K/ul and neutrophil values were 4.68±2x0.7 K/ul. (Table1). Statistically significant decreases were observed in WBC, Neurophils, lymphocyte, ASO, ESR, CRP, and ASO values after the surgery ($p<0.05$). (Table1). On the other hand, NLR was raised post-surgery and this raise was statistically significant in these 30 subjects ($p=0.001$).

Table 2 clearly shows that medians of pre-operative and post-operative values Total WBC, Neutrophil, Lymphocytes, ASO, CRP and ESR from the same subject populations (30 subjects) are different (wilcoxin signed rank test) with significant p-values. Also median NLR values of both data sets (Pre & post-opeartive) are significantly different. If NLR values were compared with the ASO, CRP and ESR values, which were used as inflammation markers., a negative correlation was found between a decrease in ASO, CRP and ESR values and an increase in NLR values.

DISCUSSION

Due to frequent use of potent antibiotics, frequency of tonsillectomy operations, once a common operation, have reduced considerably (Koshy *et al*., 2014). It is more indicated now for obstructive sleep apnoea in the paediatric population. The criteria for the operation are specified clearly in the literature. Usually markers such as ASO, CRP and ESR examined before surgery to support the (Geiayler *et al*., 2014). The role of NLR as a marker of infection/inflammation is a commonly studied topic in the literature (Kemal *et al*., 2014; Demir *et al*., 2014; Chen *et al*., 2014; Okyay *et al*., 2013).

Many studies of NLR in chronic kidney disease, chronic liver disease, chronic heart disease and chronic obstructive pulmonary disease are already available in literature. But studies on the role of NLR in patients with chronic tonsillitis (Yenigun, 2015) are rare. In this study, NLR values were retrospectively compared with ESR, ASO and CRP values used as markers of inflammation in patients who had undergone surgeries due to chronic tonsillitis. Changes are observed one month after the surgery. NLR is increasingly being recognized as a marker of infection /inflammation. It can be used in the diagnosis, treatment and follow-up in cancer patients (Jiang *et al*., 2014; Grenader *et al*., 2015). NLR, as a systemic inflammation marker, is useful (Yamagishi *et al*., 2015). Valuable information can be derived just from peripheral blood counts without resorting to otherwise expensive alternative like cytokines, interleukin or tumour necrosis factor etc. Neutrophil count shows the status of inflammation in the body; lymphocyte count shows overall stress and status of nutrition (Chung *et al*., 2015).

Table 1. Preoperative and postoperative values of the patient

Parameters	Pre-operative value N=30 (Mean ±2xSD)	Post-operative (one month of surgery) N=30 (Mean ±2xSD)	p-value
Age (yrs)	8.1±3.2		
Hemoglobin (gm/dl)	12.2± 2x0.6	12.4±2x0.5	0.4
Hematocrit (%)	37.81±2x2.223.9	38.22±2x2	0.11
WBC (Thousand/ml)	11.19±2x1.39	10.65 ± 2x1.12	0.018
Neutrophil (Thousand/ml)	4.84±2x0.68	4.68±2x0.7	0.031
Lymphocyte (Thousand/ml)	5.34±2x0.84	4.42±2x0.51	0.0001
NLR	0.92 ± 2x0.12	1.07± 2x 0.18	0.001
ASO (IU/ml)	172.54± 2x47.0	157.13±2x43.68	0.0021
CRP (mg/100ml)	8.75±2.93	7.33±2.25	0.0012
ESR (mm/H)	13.27±2x5.9	11.81±2x4.7	0.011

Table 2. Data analysis before and after surgery (Wilcoxin signed rank test)

	hb2–hb1	hct2-hct1	WBC2-WBC1	neu2 - neu 1	Lym2-Lym1	NLR2-NLR1	ASO2-ASO1	CRP2-CRP1	ESR2-ESR1
Z	-2.856[b]	-2.683[b]	-2.367[a]	-2.161[a]	-3.691[a]	-3.445[b]	-4.145[a]	-3.517[a]	-2.529[a]
Asymp. Sig (2-tailed)	0.4	0.11	0.018	0.031	0.0001	0.001	0.0021	0.0012	0.011

a= based on positive ranks; b=based on negative ranks

In the current study, NLR values were compared retrospectively with ESR, ASO and CRP values before and one month after the surgery in patients post tonsillectomy due to chronic tonsillitis. The study was a retrospective study, a prospective controlled studies would provide more objective information on the subject. It was felt that with information on the nutritional status of study subjects, analysis would have been more robust. Also the differences in the numbers of tonsillitis attacks experienced by the patients may affect the neutrophil and lymphocyte counts. Hence a bigger prospective study with large sample size will give a better picture.

Conclusion

This study indicates that NLR values increases significantly after the operation and this increase is negatively correlated with ASO, CRP and ESR. On the other hand, there was a significant decrease in Neutrophil, lymphocyte and Total WBC counts. The decrease in the number of lymphocytes may be due to the fact that our study group was composed of pediatric patients; There were corresponding reduction in values of CRP, ASO and ESR – all statistically significant. Based on these data, we can conclude that NLR can be used as a new and inexpensive marker of inflammation in chronic tonsillitis. ASO, CRP and ESR values can also be used in assessment of chronic tonsillitis.

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