

LRINEC (Laboratory Risk Indicator for Necrotizing Fasciitis) Score as a Predictor of Necrosis and Perforation in Cases of Pediatric Appendicitis in Haji Adam Malik Hospital Medan

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Abstract: Pediatric Appendicitis Score has been used as a tool in assessing the risk of necrotizing fasciitis in cases of soft tissue infection. This study aims to determine the LRINEC (Laboratory Risk Indicator for Necrotizing Fasciitis) Score as a predictor of necrosis and perforation in cases of pediatric appendicitis in Haji Adam Malik Hospital Medan. The study was prospective with patient data collection from January 2014 to December 2014. Patient data were collected including age, LRINEC (Laboratory Risk Indicator for Necrotizing Fasciitis) Score, and postoperative histopathology. For 12 months, 30 patients with acute appendicitis who met the inclusion criteria obtained a strong correlation of Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) Score with operating findings, Pearson correlation coefficient (r) of .551 and p -value 0.002 ($0.002 < 0.05$, significance 0.05). With the LRINEC score cutoff ≥ 9 , it has a positive predictive value of 78.5% (95% CI) and a negative predictive value of 62.5% (95% CI). The sensitivity itself is 64.7% and the specificity is 76.9%. This can be utilized in the management of preoperative and postoperative appendicitis patients in children.

1 INTRODUCTION

Appendicitis is cases of pediatric surgical emergencies that are often encountered. The most common complications are necrosis and perforation which is one of the emergency abdomens that requires immediate surgery (Ballester, 2009, Victor, 2012, Maki, 2012, Adelia, 2012, Huckins, 2013).

The incidence of acute appendicitis in children in the world ranges from 1 - 8% of all pediatric patients who come to the Emergency Department (Jangra, 2013). In 2009, 60 cases of acute appendicitis were registered in the Haji Adam Malik Hospital, Medan (Ivan, 2009).

There is no good scoring system to assess the risk of necrosis and perforation in cases of pediatric appendicitis. Previous research has been conducted on the use of LRINEC (Laboratory Risk Indicator for Necrotizing Fasciitis) score as a diagnostic tool to determine the risk of necrotizing fasciitis in cases of soft tissue infection. By the same principle of pathophysiology, the author is interested in researching LRINEC (Laboratory Risk Indicator for

Necrotizing Fasciitis) score as a predictor of necrosis and perforation of appendicitis cases of children at Haji Adam Malik Hospital, Medan.

2 MATERIALS AND METHODS

This study is an analytical study with a retrospective design using a correlation test. The significant number used is $p < 0.05$. We retrospectively reviewed all pediatric patients with a diagnosis of appendicitis who underwent surgery at Haji Adam Malik Hospital, Medan from January 1, 2014, to December 31, 2014. Sampling in this study was carried out in total sampling, where 30 samples were obtained.

Statistical analyses were performed using the SPSS statistical software (version 11.0, SPSS, Chicago, IL). Sixth variables were analyzed. The first biochemical and hematologic tests were done on admission were analyzed. Variables analyzed were age, gender, total white cell count, hemoglobin,

serum sodium, glucose, creatinine (Cr), and C-reactive protein (CRP).

The LRINEC score of each patient was calculated by totaling the scores of each independent variable. The predictive accuracy of the LRINEC score was expressed as the area under the receiver operating characteristic curve. The curve represents the relationship between corresponding values of sensitivity and specificity with all possible values of probabilities as a cutoff point to predict for the presence of necrosis and perforation.

3 RESULTS

Thirty pediatric patients with appendicitis were analyzed, complicate appendicitis in 17 patients (56.67%) and simple appendicitis in 13 patients (43.44%). There were 16 males (53.3%) and 14 females (46.7%) with a mean age of 11 years.

LRINEC Score data are normally distributed. The Kolmogorov-Smirnov test normality test obtained the Asymp. Sig. (2-tailed) of 0.519 (greater than 0.05). Of the 30 samples obtained an average LRINEC score of 7.27 patients with the highest total score was 7. The standard deviation for the LRINEC Score is 3.65.

The moderate risk group (LRINEC score 6-7) found 5 samples (63.5%) with complicated appendicitis and 3 samples with simple appendicitis. Whereas in the high-risk group (LRINEC score > 7) there were 11 samples (73.3%) with complicated appendicitis and 4 samples with simple appendicitis. The higher value of the LRINEC score, the more proportion of surgical findings is complicated. From the chi-square statistical analysis of the LRINEC risk group with the findings of the Asymp. Sig. for 0.031 (0.031 < 0.05). It was concluded that there was a significant relationship between LRINEC score and operating findings.

Correlation of Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) Score with operating findings

Using Pearson correlation, Pearson correlation coefficient (r) was equal to .551 or strong, with p-value 0.002 (0.002 < 0.05, significance 0.05). So that the higher the Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) Score, the more operational findings lead to complications.

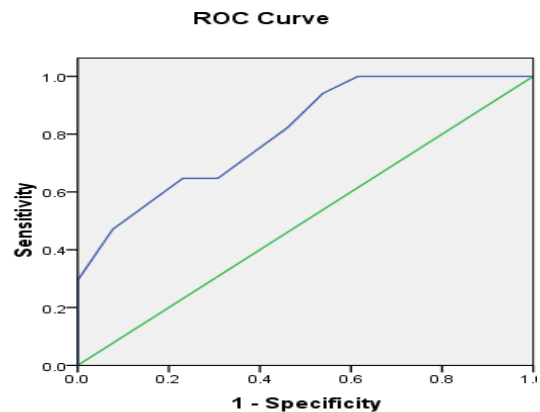


Figure 1: Receiver operating characteristic curve

The area under the curve for LRINEC score as a predictor of cases of pediatric appendicitis in this study was 0.805 (95% Confidence interval, 0.651-0.960). The perfect predictor has an Az value of 1. A score of ≥ 9 is the cut off point in this study.

Table 1: Sensitivity and specificity of LRINEC

Positive if Greater Than or Equal To ^a	Sensitivity	1 - Specificity	Sensitivity + Specificity
.00	1.000	1.000	1.000
1.50	1.000	.692	1.308
2.50	1.000	.615	1.385
4.50	.941	.538	1.403
6.50	.824	.462	1.362
7.50	.647	.308	1.339
8.50	.647	.231	1.416
9.50	.471	.077	1.394
10.50	.294	.000	1.294
11.50	.176	.000	1.176
12.50	.118	.000	1.118
14.00	.000	.000	1.000

Table 2: Prediction value of LRINEC score

		Histopathology		Total
		Simple	Complicate	
LRINEC	Score < 9	10	6	16
	Score \geq 9	3	11	14
Total		13	17	30

With LRINEC cutoff score of ≥ 9 has a positive predictive value of 78.5% (CI 95%) and negative predictive value 62.5% (CI95%). The sensitivity is 64.7% and the specificity is 76.9%.

4 DISCUSSION

From the results of this study, the majority of the samples were male as many as 16 patients (53.3%) and the remaining women were 14 patients (46.7%). From epidemiological data, there were no differences in the incidence of appendicitis between men and women in children (Schwartz, 2009).

Most cases in this study were complicated appendicitis, 17 patients (56.67%). Patients with simple appendicitis were 13 patients (43.33%). This is supported by previous research conducted in the Netherlands (Rotterdam Hospital) by V.C Cappendijk et al. Of the 129 acute appendicitis samples in children found 71% with perforated appendicitis.

Necrotizing Fasciitis is associated with severe sepsis. SIRS and sepsis cause changes in biochemical and hematological variables. LRINEC score is very important in measuring this change and predicts the probability of necrotizing fasciitis based on the severity of sepsis.

Research by Maurer et al. (2014) showed that hyponatremia, fever, and tachycardia had moderate to high specifications for colonic perforation. LRINEC score can be used for early detection of cases of necrotizing fasciitis in patients with severe soft tissue infections. LRINEC score of more than 5 has a positive predictive value of 92.0% (95% CI), while a score of more than 7 has a positive predictive value of 93.4%.

The higher the value of the LRINEC score, the more the proportion of surgical findings is obtained. In the moderate risk group (LRINEC Score 6-7), there were 5 patients (62.5%) of surgical complications of appendicitis. Whereas in the high-risk group (LRINEC Score 8-13) there were 11 patients (73.3%) with complicated appendicitis.

Previous research by Wong (2004) in the case of LRINEC score necrotizing fasciitis was able to classify patients into 3 risk categories low (LRINEC score <6) with a risk of soft tissue necrosis <50%, moderate (LRINEC score 6-7) with the risk of necrosis soft tissue 50-75%, and high (LRINEC score > 7) with the risk of soft tissue necrosis > 75%.

From the results of Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) correlation statistical analysis with the findings of operations, the Pearson correlation coefficient (r) is equal to .551 or strong. Based on existing criteria, the relationship between the Laboratory Risk Indicator variables for Necrotizing Fasciitis (LRINEC) scores with surgical findings is significant because of the significance is 0.02. (the significance is < 0.05). The

area under the curve for LRINEC score as a predictor of cases of pediatric appendicitis in this study was 0.805 (95% Confident interval, 0.651-0.960). The cut-off LRINEC score 9 has a positive predictive value of 78.5% (95% CI) and a negative predictive value of 62.5% (CI95%). The sensitivity is 64.7% and the specificity is 76.9%.

Based on research by Chin-Ho Wong and Kok-Chai Tan in 2014 at Changi General Hospital Singapore, LRINEC score of more than 5 had a positive predictive value of 92.0% (95% CI), while a score of more than 7 had a positive predictive value of 93.4 %.

Liao et al from Tzu Chi University in 2012 validated LRINEC scores in cases of necrotizing fasciitis at Tzu Chi General Hospital, Chiayi Taiwan. From a sample of 3155 patients, it was concluded that a score of > 5 LRINEC scores had a sensitivity of 59.2% and a specificity of 83.3%, a positive predictive ratio of 37.9% and a negative predictive ratio of 92.5%.

The study by Kaser et al. (2013) concluded that temperature, heart rate, serum sodium levels, CRP and leukocytes correlated significantly with perforated colonic diverticulitis and perforated appendicitis. Where there was an increase in temperature ($P = 0.029$, $OR = 1.508$), heart rate, decreased serum sodium level ($P = 0.047$, $OR = 0.912$), increase in CRP ($P < 0.001$, $OR = 1,006$).

Mosele et al (2010) retrospectively assessed laboratory results in 46 patients with colonic ischemia proven by biopsy. Higher leukocyte means scores ($P < 0.0001$), creatinine ($P = 0.003$), urea ($P = 0.008$), and lactate dehydrogenase (LDH $P < 0.0001$) between groups with colon ischemia compared to the control group.

Montoro et al (2011) prospectively studied 364 patients with definite and probable colonic ischemia. Leukocytes > $15 \times 10^9 / l$, hemoglobin < $12g / dL$, and albumin < $2.8g / l$ were more frequent in patients with severe ischemic colon.

Anon et al (2006) assessed 85 patients retrospectively and found that patients with severe colonic ischemia had a frequency of anemia (Hgb < $12g / dL$, 37.5% vs 10.1%; $P = 0.012$) and hyponatremia (serum sodium < $136mEq / L$, 46.6% vs. 14.9%; $P = 0.012$) which is high.

Research by Cevikel (2004) concluded that there was a correlation between CRP levels and bacterial translocation in obstruction cases. Where an increase in CRP is parallel with an increase in the number of colonies forming units (CFU) from lymph node mesenteric (MLN) and liver cultures ($P < 0.001$)

5 CONCLUSION

LRINEC (Laboratory Risk Indicator for Necrotizing Fasciitis) score can be applied as a predictor of necrosis and perforation in cases of pediatric appendicitis in H. Adam Malik General Hospital Medan with a cutoff of 9.

LRINEC Score can be included in the clinical pathway in the policy of preoperative management of appendix cases in children both BPJS programs and other insurance programs and as a standard of service in RSUP. H. Adam Malik Medan.

For further research on antibiotic variables that have been given as well as secondary infections that can be included as one of the variables in assessing LRINEC score as predictors of cases of appendicitis.

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