

Blood Indices as Predictors of Anastomotic Leak after Colorectal Surgery – Is It Useful? A Retrospective Analysis

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ABSTRACT

Anastomotic leak (AL) remains a major complication after colorectal surgery, with significant morbidity and mortality implications. The clinical utility of routine blood indices in predicting AL remains insufficiently characterized. This study aimed to evaluate whether blood indices derived from daily postoperative blood work could serve as early predictors of AL following colorectal anastomosis. This single-center retrospective cohort study was conducted at King Abdulaziz University Hospital between 2012 and 2020. We included 441 adult patients who underwent elective or emergency colorectal surgery with a primary anastomosis involving at least one colonic or rectal segment. Patients were excluded if they had a defunctioning stoma, preoperative infection, active inflammatory bowel disease, immunosuppressive therapy, or chronic corticosteroid use. AL was defined clinically or radiologically: on CT imaging, this included anastomotic collection within 5 cm, extraluminal contrast leak, or pericolic free air; intraoperatively, it was confirmed by visible dehiscence or anastomotic discontinuity. Preoperative and daily postoperative complete blood counts (days 1–7) were collected. Indices analyzed included white blood cell (WBC) count, absolute neutrophil count, red blood cell distribution width (RDW), neutrophil-to-lymphocyte ratio (NLR), derived neutrophil-to-lymphocyte ratio (dNLR = absolute neutrophil count / [WBC – absolute neutrophil count]), lymphocyte-to-monocyte ratio (LMR), and platelet-to-lymphocyte ratio (PLR). Normality was assessed using the Shapiro–Wilk test. Independent-samples t-tests were used for normally distributed variables; non-parametric alternatives were considered where appropriate. Multiple comparisons were adjusted using the Bonferroni correction, and adjusted p-values are reported. Pearson's correlation assessed linear relationships, and receiver operating characteristic (ROC) curve analysis with area under the curve (AUC) estimation was performed to assess predictive accuracy. The mean age was 52 years; 261 (59.2%) were male and 283 (64.2%) underwent open surgery. AL was significantly associated with diabetes mellitus, high ASA class (II–III: 82.7%), and open operative approach. Preoperatively, WBC count was higher in the AL group (mean 8.66 vs $7.56 \times 10^9/L$; adjusted $p = 0.049$), as was absolute neutrophil count (6.60 vs $4.93 \times 10^9/L$; adjusted $p = 0.009$); LMR was lower in the AL group. Postoperatively, WBC and neutrophil counts were significantly elevated on POD4–POD7 in patients with AL. NLR was significantly higher on POD6 in the AL group (8.98 vs 5.82 ; adjusted $p < 0.05$); NLR at POD7 did not reach statistical significance ($p = 0.051$) and should not be regarded as a confirmed predictor. dNLR was significantly elevated from POD5 through POD7 in the AL group (mean 4.31 – 4.42 vs 2.74 – 2.83). Among all indices assessed by ROC analysis, dNLR at POD7 demonstrated the strongest overall predictive accuracy (AUC 0.727; 95% CI: 0.611–0.843; $p = 0.001$), with a cut-off of 2.8 yielding sensitivity 71.4% and specificity 60.2%. WBC count at POD7 predicted AL with an AUC of 0.689 (95% CI: 0.555–0.823; $p = 0.007$), sensitivity 76.2%, specificity 60.2% at a cut-off of $9.1 \times 10^9/L$. Absolute neutrophil count at POD7 (AUC 0.716; $p = 0.002$) outperformed WBC at the same time point, with a cut-off of $6.7 \times 10^9/L$ yielding sensitivity 76.2% and specificity 63.7%. RDW, LMR, and PLR did not differ significantly between groups. Routine blood indices, particularly dNLR — the single strongest predictor identified (AUC 0.727 at POD7) — as well as WBC count, absolute neutrophil count, and NLR, demonstrate a time-dependent association with AL after colorectal surgery, becoming most discriminatory from POD4 onward. Their moderate predictive accuracy supports their use as adjuncts within composite risk stratification models rather than as standalone diagnostic tools. Prospective validation is warranted.

Keywords: Anastomotic Leak; Blood Indices; White Blood Cell Count; Neutrophil-to-Lymphocyte Ratio; Derived NLR; Colorectal Surgery; Postoperative Complications

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