

A Prospective Observational Study on the Role of Serum C Reactive Protein in the Early Detection of Leaks in Colorectal Anastomosis**Dhanunjaya Rao Gottapu¹, Manmadha Rao Vayalapalli², Vamsee Priya Yelisetti³, Janardhana Rao Konkana⁴**¹Post Graduate, Department of General Surgery, Andhra Medical College, Visakhapatnam²Professor and HOD, Department of General Surgery, Andhra Medical College, Visakhapatnam³Assistant Professor, Department of General Surgery, Andhra Medical College, Visakhapatnam⁴Associate Professor, Department of General Surgery Andhra Medical College, Visakhapatnam

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Abstract:**Introduction:** Advancements in surgery have led to a point where the modern surgeon no longer looks upon a colorectal malignancy as an unconquerable obstacle. Unfortunately, despite rapid advances in surgery and neo-adjuvant chemoradiation, the spectre of anastomotic leaks continues to cast a dark veil even in the best equipped facilities. Several studies have shown the role of Serum C-Reactive protein as a useful marker of anastomotic healing with consistently high negative predictive values, as early as post-operative day 4 onwards.**Methods:** This study is conducted in prospective observational pattern for a period of 18 months from March 2022 to September 2023 in a tertiary care hospital. The study population included 60 participants who were planned for colorectal surgeries. 57 participants were eligible for analysis after considering inclusion and exclusion criteria and their preoperative and postoperative 4th day C - reactive protein values were identified and they were followed for a period of 15 days for anastomotic leak.**Results:** The cut-off values of the 4th day CRP with highest area under the ROC is calculated and found to be 166 mg/L. Elevated CRP on the 4th day above 166mg/L is a sensitive and specific marker for the early detection of leaks in colorectal anastomosis.**Conclusion:** The subjects who underwent colorectal anastomosis can be safely discharged on 4th post-operative day if the C Reactive Protein values are below the cutoff value of 166mg/L without any significant risk of anastomotic leaks.**Keywords:** Colorectal Cancer, Anastomosis, Leaks, CRP, Bowel Anastomosis.

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Introduction

More favorable outcomes can be achieved following a leak, if post-operative anastomotic leak is identified early. With constant negative predictive values starting on postoperative day 4 and beyond, C- reactive protein is now being explored as a helpful predictor of anastomotic healing.

However, the variability in accepted cut-off values, the inadequate representation of laparoscopic procedures, and the scarcity of prospective data now restrict its usage.

CRP as an ideal marker of inflammation

Its production is not affected by nutritional or health status; hepatic failure is the only condition that lowers production.

There isn't any diurnal variation in synthesis, and the production is unaffected by diet, age, sex, race, or gender. Within five hours of an inciting stimu-

lus, blood levels of CRP rise rapidly under the regulation of IL- 6 transcription and translation. It continues to be an incredibly stable blood analyte that is well-suited for precise and reliable evaluation using immunoassay techniques.

Aim and Objectives

- The purpose of this study is to evaluate CRP's role in early diagnosis of colorectal anastomotic leak.
- Determining clinically appropriate post-operative CRP cut off levels to enable safe and prompt discharge following elective colorectal surgery.
- To evaluate how the laparoscopic procedure affected the post-operative CRP readings.

Materials and Methods:

- The present study was conducted in the Department of General Surgery at King George Hospital, Visakhapatnam.
- In order to recruit patients serially from a prospective surgical theatre posting list, we decided to use a prospective observational study design.
- The institutional review board and the ethical committee both reviewed and approved the study design.

Inclusion criteria

- Patients >18 years.
- All patients who gave consent.
- Patients undergoing a large intestinal anastomosis.

Exclusion criteria

- Emergency surgery.
- Active infection prior to surgery.
- Re-exploration/ leak detected before 4th post-operative day.
- Acute or chronic liver failure.
- SLE, dermatomyositis, scleroderma.
- Inflammatory bowel disease.
- Leukaemia.

Statistics/Operative Details**Source of Data:**

Patients who are operated in King George Hospital, Visakhapatnam for large intestinal anastomosis in between February 2022 and May 2023.

Method of Collection of Data:

- A total of 57 individuals who were having elective abdominal surgery with a primary anastomosis had their serum CRP levels checked before and after surgery.
- For 15 days, every patient was monitored every day for the emergence of an anastomotic leak.
- Receiver operator curve analysis was used to analyze the CRP data in order to evaluate the diagnostic precision of using a day 4 CRP val-

ue as a forerunner of an anastomotic leak detector.

Results

- A total of 60 patients were enlisted over the span of 18 months; they were willing patients who matched the requirements.
- As previously noted, 3 patients were removed from consideration once exclusion standards were used. After this, a total of 57 patients were eligible for analysis. A total of 12 leaks were observed.
- 57 patients had a colonic, rectal, and anal anastomosis. A day 4 CRP value wasn't available for 3 patients. Due to the fact that the samples were handled independently or because they weren't collected on day 4 or there could have been a laboratory error.
- The cut-off values of the 4th day CRP with highest area under the ROC is calculated and found to be 166 mg/L.
- This 166 mg/L cutoff was associated with a sensitivity and specificity of 81.81% and 82.42%, respectively.
- The range between 150 mg/l (0.82%, 81%) and 169 mg/l (0.77%, 82%), was the optimal cutoff value.
- A CRP cutoff value which is too high, such as >200 mg/L, would only detect patients with leak and have a high specificity while having a higher rate of false negatives.
- The sensitivity values between 104 and 165 mg/L in our data, however, remained at 82%.
- Beyond this, at 86%, a cut off value of 102mg/L resulted with 86% sensitivity but only 56% specificity.
- As a result, it was determined that the 166 mg/L value was a suitable threshold for determining continued admission.
- The negative predictive value was 93.8% at this level.
- A negative predictive value of 94.4 was obtained with a cut off of 102 mg/l, although at the expense of a lower specificity. This value was not noticeably higher than that of 166 mg/l.

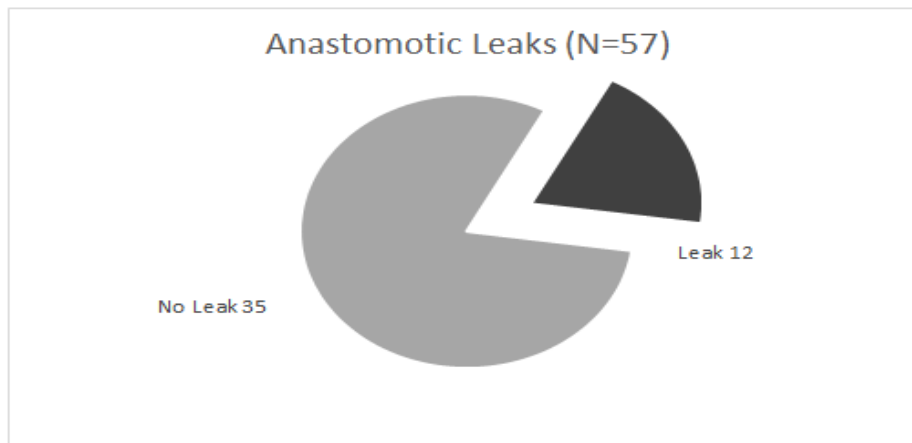


Figure 1: Pie diagram showing ratio of anastomotic leaks among the total study population

Therefore, we believe that the main purpose of CRP measurement is to identify leaks as early as possible so that appropriate actions can be put in place to assure better results.

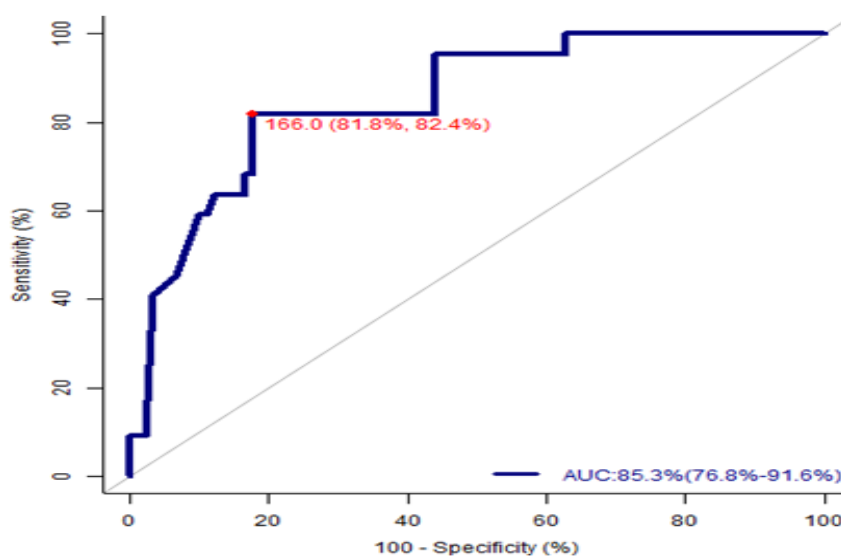


Figure 2: ROC Curve of CRP values on POD 4 of the study population

Discussion

The primary advantage of CRP is that it enables the treating clinician to diagnose anastomotic leakage quicker than what is currently possible with accessible techniques.

Earlier identification would lead to

- Earlier cross-sectional imaging.
- Earlier initiation of antibiotics.
- Quicker determination of the need for surgery.
- Overall better results from preventing overt sepsis.

A post-operative day 4 CRP value offers 3 other advantages:

1. Leak probability measured objectively, impartially, and independently
2. Increases the 'CRP first' approach's positive predictive value for cross-sectional imaging

3. As a negative predictive value index aiding in safe discharge.

One may utilize a day 4 CRP level to either:

A clinically suspected anastomotic event must be confirmed to be present.

OR

Assist in making decisions when there are ambiguous clinical indications that do not call for discharge.

Conclusion

- Our primary objectives were to determine the most appropriate cutoff ratio for predicting safe discharge.
- We advise all patients who undergo elective colorectal surgery to have a day 4 CRP done.
- The ability of CRP to identify anastomotic leaks early and enable timely management is

key to its use in colorectal surgery. The morbidity and mortality due to delayed identifying would be decreased as a result.

- For both laparoscopic and open operations, we advise that otherwise healthy patients with a day 4 CRP value less than 166mg/L can be safely discharged.
- If a different cut off is necessary in this subset for laparoscopic procedures, more information must be gathered to demonstrate this decisively.
- An anastomotic leak should be the first place to seek for sepsis-related causes on day 4, but the doctor should also think about using a CT scan for imaging.

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