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CASE REPORT

# When is CT with rectal contrast indicated in patients suspected with anastomotic leak?

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## Summary points

- There are no set criteria for the use of luminal contrast during CT scans in suspected colonic anastomotic leaks.
- Luminal contrasts increase the sensitivity, specificity and positive predictive values of CT scans in detecting anastomotic leaks.
- In persistent post-operative ileus, with persistent high inflammatory markers, there should be a low threshold of using luminal contrast with CT scans.

*Abstract*

There is no clear guidance about the use of intraluminal rectal contrast combined with computerised tomography (CT) scan when assessing for anastomotic leak (AL) following colorectal resections. ALs most commonly manifest after post-operative day 5, presenting with fevers, abdominal pain, tachycardia and rising inflammatory markers. However, some patients with AL also present with subtle symptoms and failure to progress. CT with or without luminal contrast is the most commonly used investigation for diagnosis; however, there is no consensus on the best protocol. This case report highlights a need for having criteria, which include intra- and post-operative pointers when having a luminal contrast may aid diagnosis, in difficult cases. Studies show that routine contrast enema is not recommended, and furthermore, no gold standard investigation is available. This case report explores the need for a low threshold to use rectal contrast in CT in cases of prolonged ileus.

Keywords: *reversal of Hartmann's procedure*; *anastomotic leak*; *computerised tomography (CT)*; *rectal contrast*; *luminal contrast*

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Anastomotic leak (AL) is a significant cause of morbidity and mortality following colorectal surgery. The incidence rate is approximately 9.8% of cases [1]. Rates of AL vary widely and are dependent on many pre- and intra-operative factors, including age, nutrition, emergency or elective surgeries and level of anastomosis [2]. Classification of AL varies, but a very useful one describes types A, B and C leaks. Grade A leaks are managed conservatively, whilst grade B leaks require minimally invasive therapeutic intervention (endoscopic endosponge), and grade C leaks are classified as patients requiring operative management (laparoscopy or laparotomy) [3].

AL can present with varying symptoms, and a computed tomography (CT) scan is usually the investigation of choice. Findings on CT that suggest the presence of AL include extraluminal air or fluid and extravasation of contrast [1]. Early identification of AL improves the likelihood of a good outcome – thus highlighting the importance of accurate radiology.

Using rectal contrast at the time of CT to identify AL is debated [2], and there is no gold standard investigation. We present a case of a patient who had an AL following a reversal of Hartmann's procedure, which failed to be identified on two separate CT scans.

## Case history

A 68-year-old female had reversal of Hartman's procedure. Her co-morbidities were type 2 diabetes mellitus, hypertension, hypothyroidism and obesity with a

Body Mass Index (BMI) of 30.8. She had a Hartmann's procedure 6 months before for perforated diverticulitis with associated colo-vesical fistula.

At operation, she had a stapled anastomosis, but the doughnut was incomplete. The air leak test was positive, and the defect was identified in the anterior anastomosis. The defect was closed with interrupted vicryl sutures and covered with an omental patch. Repeat air leak test was negative, but a diversion loop ileostomy was formed to protect the anastomosis.

On post-operative day (POD) 4, she spiked a temperature of 38.2°C, but this was isolated, and the only spike of six readings that day. However, she had a CT scan with intravenous contrast the next day. It was reported showing post-surgical changes, with no drainable collection and mild-to-moderate small bowel distension, likely ileus. It added stranding and haziness in the mesentery and omental fat. From the first POD, her vital signs were remarkably stable (Fig. 1) with a spike of temperature on POD 4, and single low-grade temperatures each on PODs 9 and 10 at 37.5 and 37.4°C, respectively.

The daily median readings of vital signs are shown in Fig. 1. There were three to six full vital signs taken per day, with a median of six. At no point in the first 14 PODs, the overall Early Warning Score (EWS) generate escalation of treatment.

In contrast to the stable vital signs, acute phase proteins, albumin and C-reactive protein (CRP; normal > 5 mg/L) and leucocytes failed to normalise in the first 13 PODs (Fig. 2). The expected post-operative rise in CRP peaked on the second POD at 253 mg/L and began to fall, but this fall stopped on the sixth POD. The CRP level briefly rose to a second peak on the tenth POD, before falling (Fig. 2). Albumin (normal 34–50 g/L) is a negative acute phase protein as expected after a major operation fell and reached its lowest at 24 g/L on POD 3. However, the rise towards normality was brief, and it became static. Leucocyte count (normal 4–11 × $10^9$/L) was similar, remaining persistently elevated, and from POD 6 onwards, it was above 12 × $10^9$/L (Fig. 2), thus fulfilling one of the four clinical criteria for Systemic Inflammatory Response Syndrome (SIRS).

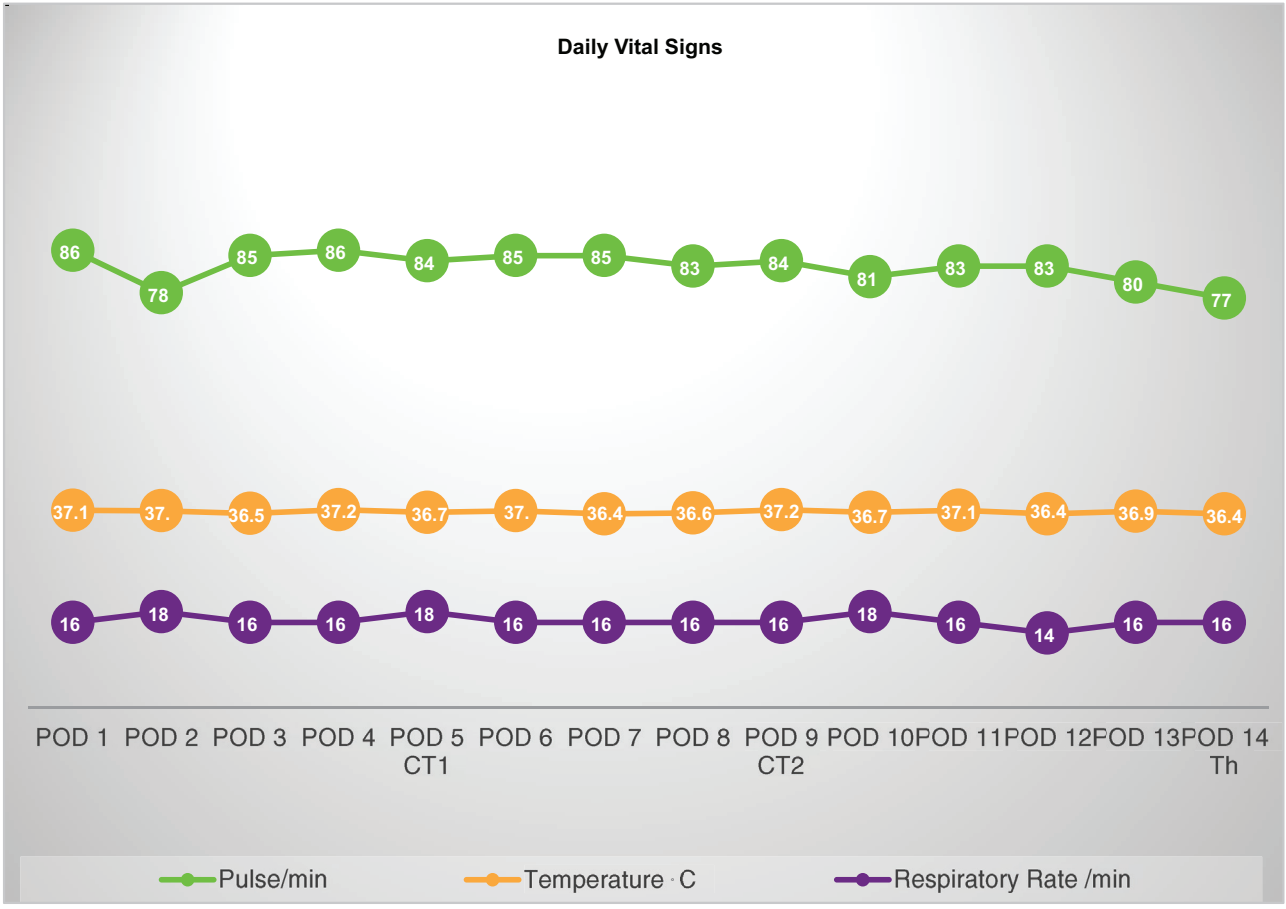


*Fig. 1.* Median daily vital signs criteria for Systemic Inflammatory Response Syndrome (SIRS). POD – post-operative day, CT1 – the first CT scan performed on the fifth POD, CT2 – the second CT scan on the ninth post-operative day, TH – return to theatre on POD 14 and Min – minutes.



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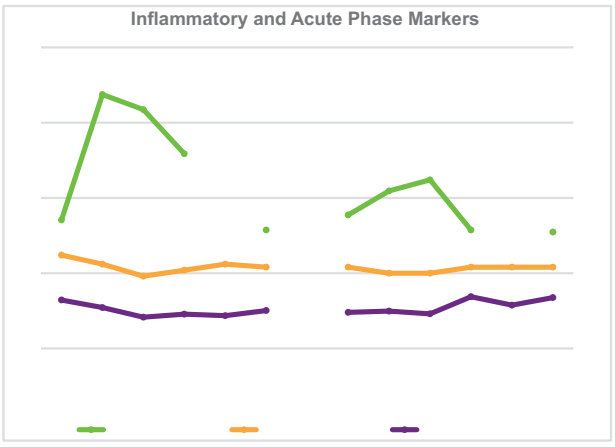


*Fig. 2.* Daily inflammatory markers and acute phase proteins. Y-axis on the left for CRP, and Y-axis to the right for leucocyte and albumin. CRP – C-reactive protein, mg – milligram, g – gram, L – litre, POD – post-operative day, CT1 – the first CT scan performed on the fifth POD and CT2 – the second CT scan on the ninth post-operative day.

On POD 7, in view of worsening bilious vomiting, a nasogastric (NG) tube was inserted, and with a continued heavy NG tube aspirate, a second CT scan, with intravenous contrast, was performed on POD 9 (Fig. 3). This was reported to show more pronounced distension of small bowel, tapering in the pelvis due to either ileus or early mechanical obstruction. There was a resolving pre-sacral haematoma, but no evidence of a leak.

The patient continued to have high output from her NG tube, and on POD 14, she was taken back to theatre for a likely small bowel obstruction secondary to adhesions. At laparotomy, there was dense, immature adhesions, and despite multiple distended small bowels, no obvious mechanical obstruction was found. There was collapsed small bowel on top of the omental patch and was explored, and it revealed a contained leak limited by the omental patch. The anastomosis was taken down, and an end colostomy was formed. Multiple enterotomies were closed. She needed a third laparotomy to close an enterotomy that leaked, and she developed a pulmonary embolus. She made a slow progress, and she was discharged 9 weeks and 2 days after admission.

## Discussion

AL can present with a variety of symptoms: most frequently, fever, tachycardia and abdominal pain [4]. Less common symptoms include those of ileus and failure to progress post-operatively, as demonstrated in the case discussed. Blood results such as CRP and white cell count are also important markers – one study reporting a CRP > 132 on POD 5 was a statistically significant factor in risk of a leak [5].


*Fig. 3.* Sagittal plane and axial planes of CT scan of abdomen and pelvis on POD 9. A – distended small bowel, B – resolving pre-sacral haematoma, C – collapsed small bowel on top of omental patch (E) and D – anastomosis with no evidence of free gas or peri-anastomotic collection to suggest a leak.

Various risk factors can also increase the likelihood of disruption of the anastomosis. Pre-operatively, increasing patient age, male gender, poor nutrition and immunosuppression increase the rates of AL [4]. This case is an example of a contained AL. The difference between contained and free ALs is said to be defined by the absence or presence of widespread peritonitis and localised findings on contrast studies. Free leaks usually present earlier than contained leaks [6]; however, there is no evidence suggesting a difference in outcomes.

There was a delay in treating an unrecognised AL in this patient because of two false negative CT scans. Despite the negative CT, in the presence of prolonged ileus, there were intra-operative reasons to have suggested a more thorough look for an AL. The doughnut was incomplete, but rather than the anastomosis being reconstituted, the defect was closed and the omental patch was used to reinforce it. In a study by Ricciardi et al., out of 998 left-sided anastomosis with 4.8% clinical leak, clinical leaks were noted in 7.7% of anastomosis with positive air leak test compared with 3.8 with negative air leak test. In anastomosis yielding positive air leak test, those repaired with suture alone were associated with 12.2% leak compared to 0% for re-anastomosis [7].

Marres et al. [8] reviewed 1,183 records of patients who underwent colorectal surgery with primary anastomosis. Clinical and radiological outcomes of patients with and without rectal contrast were compared in 225 patients who had CT scan in suspected AL. Anastomotic leakage was found in a total of 57 patients, 4.3% of all patients and 24.8% of patients who had CT scans. The overall sensitivity and specificity in all patients to detect AL was 68 and 93%, respectively. The positive predictive value (PPV) was 0.75 and negative predictive value (NPV) 0.90. Of the 175 of 225 (77.8%) patients who received rectal contrast, the sensitivity and specificity were 78 and 94%, respectively, with a PPV of 0.78 and a NPV of 0.94. If contrast reached the anastomosis (81.7% of cases), then the sensitivity increased to 93%. In the group without rectal contrast ($n$ = 50), the sensitivity was 47% and specificity was 88% with a PPV of 0.66 and NPV of 0.76.

Kaur et al. [1] reviewed 170 patients who underwent left-sided colonic resections. Twenty-eight of them had CT scan to assess for possible AL, with either an unenhanced or enhanced (arterial phase) CT examination with the addition of intravenous contrast medium. The use of rectal contrast medium was at the discretion of the radiologist performing the examination. Rectal contrast medium was used to help determine whether an AL was present in 80% of the CT examinations that showed an AL. They concluded that extravasation of rectal contrast medium is the most reliable marker of an AL, thus should be administered in all cases, but their study lacked adequate numbers.

Caution and care need to be taken whilst administering rectal contrast and should be administered by a member of the surgical team or an experienced radiologist in the case of a fresh anastomosis. It is best to use a soft pliable catheter rather than a semi-rigid enema tip and exercising caution whilst inflating the balloon and instilling contrast to avoid occluding the anatomy and masking a leak or disrupting the anastomosis [9]. Interpretation of CT scan with rectal contrast could be challenging in patients with side-to-side, side-to-end and end-to-side anastomosis. It is known that water soluble contrast aids in better interpretation than barium contrast and also avoids the risks of barium peritonitis.

A total of 153 CTs performed for AL were reviewed by two radiologists in Kauv et al.: 58 with a contrast enema and 95 without. They found that contrast enema significantly increased the PPV of the CT, in one case from 40 to 100%. They concluded that contrast extravasation is the most reliable sign for AL, and rectal contrast should be performed during CT for suspected AL [10].

Huiberts et al. published a review of 108 patients who underwent CT post-operatively. They identified that contrast leakage was the only independent predictor for AL in multivariable analysis. They concluded that contrast administration near the anastomosis is crucial to improve the accuracy of CT imaging [11].

## Conclusion

ALs remain serious complications post-colorectal surgery. The literature does not present a clear consensus on the superiority of either CT scanning alone or in combination with rectal contrast. It does, however, highlight the importance of early detection and management. Further studies evaluating the use of rectal contrast CT are required to determine if it has a role in routine investigations for possible ALs. Rectal contrast enema with a CT scan in suspected individuals may have increased sensitivity to diagnose AL, thereby aiding early intervention if required, and reducing morbidity and mortality. Where rectal contrast is not used routinely, there should be low threshold for its usage in persistent ileus with persistent raised inflammatory markers, and especially when there have been intra-operative adverse events. In this case, the use of rectal contrast with a CT scan could have potentially identified a leak and would have returned to theatre earlier, thereby reducing the hospital stay and morbidity.

## Conflict of interest and funding

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