



EFFICACY OF LEAK TEST USING NORMAL SALINE INSTILLATION IN BOWEL ANASTOMOSES

General Surgery

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ABSTRACT

AIM: To apply and see the efficacy of leak test using normal saline instillation in cases of bowel anastomoses in preventing post-operative leaks due to technical failure with the objective of documenting intraoperative leaks and repairing them till test is negative.

MATERIALS AND METHODS: This study comprised of patients between age 12 to 79 years undergoing hand sewn bowel anastomoses for bowel pathology. During surgery, leak test was performed and if leak was present, it was positive. All positive leak test were repaired intraoperatively and the test was repeated till the test was negative. Post operatively the patients were followed up for three weeks to check for anastomotic leak. The results were analysed to know technical failure and anastomotic leak following correction of intraoperative positive leak test.

RESULTS: Twelve patients out of 51 enrolled in the study developed intraoperative leaks which were repaired and test was repeated till test was negative. One patient developed leak in the post-operative period in spite of the test being negative intraoperatively.

CONCLUSION: Leak test provides a useful guide to the surgeon for demonstrating deficiencies of surgical technique in inter bowel anastomoses which can be corrected intraoperatively. It helps reduce anastomotic leaks due to failure in anastomotic technique.

KEYWORDS

anastomotic leak, drain, re exploration, sepsis.

INTRODUCTION

Bowel anastomosis is an operation that every surgeon comes across during his residency & later in practice. Many a times the precision and surgical proficiency of a surgeon is measured through how good he or she can perform this operation with least anastomotic leaks and complications.

Anastomotic leak significantly increases the morbidity and mortality of patients, as shown in the St Mary Large Bowel Cancer Project (1). This also affects the surgeon as the associated morbidity & mortality of the patient has a long lasting impact on a surgeon's mind.

This complication has been extensively studied and there is a lot of work available on testing the anastomotic integrity of colorectal anastomoses, but not much published work is there concerning inter-bowel anastomoses.

Present pilot study is an attempt to objectively test the integrity and water tightness of bowel anastomoses through a simple and easy test using normal saline. This will also help to correct the technical failure intraoperatively.

MATERIALS AND METHODS:

This was a prospective study carried out in a tertiary referral centre over a period of 2 years. All patients between the age of 13 to 79 years irrespective of sex who were undergoing bowel anastomoses were enrolled after written valid informed consent. This study was conducted after approval from Institutional Ethics Committee. All patients undergoing hand sewn bowel to bowel anastomoses were included. Their complete blood count, renal profile & albumin levels were also noted.

Patients undergoing ileorectal or colorectal anastomoses and patients undergoing anastomoses with proximal covering ileostomies were excluded. All patients undergoing bowel anastomoses were subjected to leak test

STEPS OF THE LEAK TEST

i) Bowel Clamps are applied on either ends of bowel and hand sewn

anastomosis is started

- ii) Before completing the last few stitches of inner layer, normal saline is instilled through the defect (BLUE ARROW, FIG 1)
- iii) Normal saline is instilled into the defect till the bowel between the clamps is completely filled with the saline and the saline starts to gush back out. This marks the end point of instillation (Fig 2)
- iv) The defect is then closed with final stitches.
- v) The suture line is checked for leaks by applying pressure on the either side of anastomosis, till the suture line bulges out (this is the pressure that the suture line will have to endure during normal peristalsis). No further pressure beyond this point is required. (Fig 3)
- vi) Leak, if any, is repaired
- vii) Pressure is reapplied till no leaks are seen.

All patients were followed up in the postoperative period for three weeks to check for anastomotic leaks.

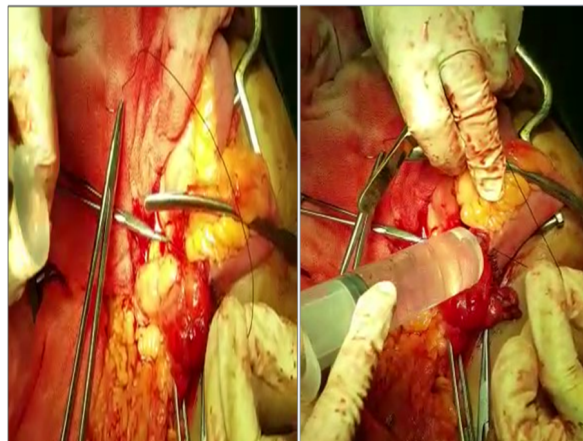


Fig 1: Anastomotic Defect Seen Before The Last Few Stitches Are Taken **Fig 2: Normal Saline Instilled Through The Defect.**



Fig 3- Suture Line Being Checked For Leaks After Compressing Bowel Lumen From Both Sides.

RESULTS

A total of 51 patients were enrolled in the study who satisfied the inclusion criteria. Median age for patients who underwent leak testing for bowel anastomoses was 39 years. Most of the patients were in their fourth decade. In the present study group, male to female ratio was 1.7, suggesting a higher incidence of bowel anastomosis in men.

In the present study, bowel anastomoses, irrespective of emergency or elective surgery was considered and it was observed that most of the patients belonged to the fourth decade. The most common indication of the anastomosis were done due to bowel obstruction. Second most common cause was ileostomy closure. (Table-1). The most common etiology for bowel obstruction was stricture, seen mostly in the ileocecal region. Most patients (7 out of 11), gave a positive current or past history of abdominal Koch's.

Of the 51 patients, 28 cases were done in emergency and 23 were done in an elective setting. In the present study, intraoperative leaks were demonstrated in 12 out of 51 patients (23.5%). These were sutured till anastomotic integrity was achieved and there were no further leaks. In the post-operative period of observation, there was one incidence of leak, which was detected clinically (Table-2). Hence incidence of technical failure in hand sewn anastomoses was 23.52% whereas incidence of leak after correction of positive leak test was 1.96%.

A total of 11 patients showed leukocytosis on admission. Rest 40 patients had normal counts at the time of admission. Most of the patients with leukocytosis showed a consistent decrease in counts except for the patients with leak.

Patient with post operative leak showed a consistent increase in counts, hence increasing leukocytosis and sepsis prove to be an independent risk factor for predicting leak. Average albumin level was 3.59 g/dl, with lowest albumin level of being 2.1 g/dl which was seen in the patient that presented with leak.

Table-1: Table Showing Various Conditions Requiring Bowel Anastomoses

Etiology for bowel anastomoses	Number of cases(%)
ileostomy closure	17(33%)
colostomy closure	2(3.9%)
intestinal obstruction	24(47%)
sma thrombus	3(5.8%)
enterocutaneous fistula	1(1.9%)
chronic pancreatitis	1(1.9%)
perforation	3(5.8%)

Table-2: Table Comparing Total Number In Intra-Op Vs Post-op Leak

total number of cases	51
number of intraoperative leak	12
number of post operative leak	1

DISCUSSION

Anastomotic leak is one of the dreaded complication of intestinal anastomosis. It significantly increases the mortality and morbidity of the patient undergoing the procedure. Various studies have analysed and reported various preoperative, para and post-operative factors affecting the leak.

Fielding et al. (1) reviewed 1466 patients where an enteric anastomosis was performed and for 28 consultant surgeons, the leak rate varied

from 0.5% to over 30% and they attributed this variability to surgical technique. Present study was undertaken to rule out this bias of technical failure by doing intraoperative leak test

There are few studies that have actually tried to test the technique of anastomosis. Gilbert JM et al (2), devised a similar method using normal saline to test the integrity of anastomosis with bowel to rectum and so did Wheeler JMD et al (3). Beard et al filled the pelvis with normal saline and insufflated the sigmoid colon with air to identify the leaks and then sutured it. In all of these studies, the authors felt that intraoperative leak testing did in fact played a significant role in preventing clinical leaks in a majority of patients.

Present study used instillation of normal saline before final stitches of anastomoses. Once anastomosis is complete, the two bowel loops are compressed so that the suture line bulges & water leak can be seen if the anastomosis is not watertight. Water leak from anastomotic suture line is a positive leak test & shows technical failure. This was then repaired intraoperatively. Leak test was performed again till it was negative.

Postoperatively, studies have used contrast enema to identify post operative leaks on day seven (4). However postoperative tests do not give an opportunity of correction as intraoperative leak test.

The age range of present study was comparable to other studies (Table-3). However, other studies mainly implied their leak tests in colorectal anastomoses. Their cases consisted mainly of oncological etiologies and the median age is higher in other studies as compared to present study.

Table-3. Age Range And Median Age

	agerange(yrs)	medianage(yrs)
Gilbert JM et al	57-87	74
Wheeler JMD et al	16-89	65.7
Beard et al	35-92	69
Present study	17-63	39

Out of 51 patients, 28 cases were done in emergency and 23 were done in an elective setting. The intraoperative leaks were demonstrated in the anastomoses done mostly in the emergency settings. Senior consultants may not be present in emergency timings & majority of the times Junior consultants & senior residents are the operating surgeons. Hence this test is of special importance for residents and junior consultants who are still learning and refining their skills, as this test serves as a guide to show the deficiencies in the surgical technique, at a time when it can be corrected.

In the present study, Leak test was positive in 12 anastomoses out of 51 cases constituting 23.5% of total cases. This was comparable with other series as shown in Table 4. All these 12 patients underwent corrective sutures and test was repeated till it was negative. These patients were observed in the post-operative period to look for clinical evidence of leak. One patient showed clinical signs of leak in the post-operative period in spite of a negative intra-operative leak test.

Table-4 Comparison Of Intra-op And Post-op Leaks With Other studies

	Number of Patients	Intra operative leak	Post operative leak
Gilbert/JMetal	21	5 (23.8%)	1
Wheeler/JMDetal	102	21(20.5%)	2
Beardetal	74	18(24.3%)	4
Presentstudy	51	12(23.5%)	1

Further analysis of the patient data was done to look for other independent factors that could have aided in anastomotic leak. On comparing the total leucocyte count of the patient was in excess of 16000/dl. Even the preoperative albumin level was also low (2.1 g/dl). There are various studies that also have concluded hypoalbuminemia and sepsis as independent factors causing anastomotic leak (5,6). Hence these factors may be contributory in this case.

SUMMARY

Anastomotic leak has a multifactorial aetiology. Leak test done intraoperatively demonstrates technical failure. It gives an opportunity to correct this technical failure, thereby preventing postoperative

complication. This is a useful test in fit and optimised patients undergoing bowel anastomosis.

“Negative leak test doesn't mean no risk of leak”. In the only case in which there was a leak, our intra op testing indicated that the anastomosis was intact. This means that other independent factors, (albumin levels, sepsis, intraperitoneal soiling, etc) need to be considered to maintain a high degree of suspicion to detect anastomotic leak in the post-operative observation.

This test lessens the risk of probable anastomotic failures due to technical reasons, because if the intra operative leak positive anastomoses had been left unrepaired, there was a high probability that they would have showed clinical signs of leak in the post-operative period.

Most of these anastomoses were done by senior residents or junior consultants in emergency settings, hence this test provides a means to identify and correct the faulty technique intraoperatively.

CONCLUSION

The method described provides a useful guide to the surgeon for demonstrating deficiencies of surgical technique. Technical failure in anastomoses are demonstrated at a time when they can be corrected. 'A STITCH IN TIME SAVES NINE'. Present study shows that leak test may be useful for young surgeons and in emergency settings. However, multicentric studies will be required to demonstrate its significance.

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