

Analysis of Advantages of Single Layer Vs Double Layer Anastomosis of Bowel

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I. Introduction

In the modern day surgical practice, we come across situations in abdominal surgery, where we require resection and anastomosis of bowel. In small bowel resection and anastomosis, conventionally, two layer suturing technique i.e., inner layer with absorbable suture material in continuous fashion and outer layer with non absorbable suture material in a continuous or interrupted fashion, was considered secure. Recently, it has been advocated that anastomosis of small bowel with a single layer suturing using a non absorbable monofilament suture material in a continuous fashion has the same outcome when compared to double layer suturing technique. In our study, we have compared the advantages of single layer anastomosis of small bowel, over double layer anastomosis.

II. Aims And Objectives

Our study aims to study the Complications of Single layer technique and the Double layer technique in emergency and elective surgeries. Time consumption for performing single layer anastomosis as well as double layer anastomosis. Cost effectiveness of single layer anastomosis.

III. Materials & Methods

All adult patients requiring intestinal anastomosis at Govt. Rajaji Hospital from July 2008 to June 2010 were considered eligible. Totally 60 patients were included in our study. 30 patients under went single layer anastomosis and 30 patients underwent double layer anastomosis. Patients who underwent elective or emergency surgery were included in our study. Based on a careful history and meticulous physical examination, combined with adjunctive investigations, a decision to operate urgently or electively was taken.

Baseline laboratory parameters like blood urea, blood sugar, serum creatinine, serum electrolytes, blood grouping and typing were done in all the cases, to rule out co morbid conditions collagen formation is much greater in the first 48 hrs.

Evaluation of patients with Acute abdomen

Immediately after receiving the patient, primary survey was done, which included resuscitation secondary survey included definitive management.

Definitive Management

Ultra sonogram abdomen and CT scan abdomen was not done as a routine diagnostic investigation; however few cases were subjected to the same in view of the special circumstances. A proforma of each case including the age, sex and an accurate history was compiled. Personal history of previous surgery, alcohol or drug intoxication were specifically sought for. Plain X-ray abdomen, Chest X-ray PA view and four quadrant aspiration were done in required patients. All the patients received in emergency situations were resuscitated with Ringer Lactate solution and or blood or both before surgical intervention and were mandatorily maintained on Nasogastric suction, continuous bladder drainage with the help of Foley's catheter, intravenous fluid replacement and broad spectrum antibiotics. Postoperative complications were specifically sought for and treated appropriate as and when they arose. Elective patients were investigated appropriately before surgery.

Technique of Small Bowel Anastomosis

In double layer anastomosis we performed two layer anastomosis using a 2/0 vicryl continuous suturing for inner mucosal layer and a 2/0 silk interrupted for outer seromuscular layer. The affected segment of bowel was divided between clamps and resected. The bowel ends were cleaned with a betadine swab and

approximated. All two layer anastomosis were constructed using interrupted 2/0 silk Lembert sutures for the outer layer and a running 2/0 polyglycolic acid suture for the transmural inner layer.

All single layer anastomosis were constructed using a continuous 2/0 silk double needle suture that began at the antimesenteric border. Bite was taken such that it included whole of serosa and part of mucosa so that mucosa got approximated. Each bite included 4 to 6 mm of the seromuscular wall; the larger bits were used at the mesenteric border to ensure an adequate seal. Each stitch was advanced approximately 5 mm. To avoid ischemia of the anastomosis the surgeon had to ensure that only adequate pressure was applied to the suture while following to approximate the end of the bowel and render the anastomosis air tight. Air tightness of the anastomosis was checked by dipping the anastomotic site into normal saline. If there was air leak interrupted sutures with 2/0 silk was made at the site of air leak. The time recorded for the construction of the anastomosis began with the placement of the first stitch and ended with cutting the excess material from the last stitch. Anastomotic failure was defined as a fistula documented radiographically or by the finding of a non absorbable suture material draining from the wound after oral administrations or a visible disruption of the suture line during re exploration. The complication of wound infection, anastomotic leak, fistula, intra abdominal abscess formation were also included in the analysis because they are potentially related to the anastomosis.

Post Operative care

Like all patients undergoing abdominal surgery early post operative mobilisations was encouraged to reduce the potential risk for development of deep vein thrombosis and pulmonary embolism. In those who underwent elective surgery identification of high risk patients, particularly those with cardiac and respiratory disease and those undergoing an extensive procedure was done. On the first post operative day, serum proteins were measured and fresh frozen plasma and Injection Human Albumin were transfused in patients with hypoproteinaemia. Their Hemoglobin status was checked and compatible blood transferred accordingly. All the patients who underwent ileal resection and end to end anastomosis and Truncal Vagotomy with Posterior Gastrojejunostomy whether it is single layer or double layer were started sips of oral fluids on the 4th or 5th post operative day once the patients passed flatus and bowel sounds were heard. Till then they were maintained Nil per mouth, continuous nasogastric suction and intravenous fluids. We observed earlier return of bowel sounds in patients who underwent single layer anastomosis.

On the 5th or 6th post operative day, after tolerating oral fluids we started soft diet. Bowel surgery involving anastomosis particularly in the emergency setting, has the potential for development of complications. Good surgical technique and appropriate decision making at the time of intervention reduces the potential for postoperative problems. The ideal anastomosis is one, which does not leak, does not obstruct, and facilitates restoration of normal bowel function within a few days of reconstruction. The greatest morbidity and mortality is not with the development of postoperative bowel complications but with delays in recognising problems and instituting management. Apart from ileus, the postoperative intestinal problems that one may encounter include mechanical obstruction, anastomotic dehiscence, intra abdominal abscess formation and fistula formation. Intolerance to oral intake, development of peritonitis, pain, or systemic evidence of sepsis, should raise the possibility of suture dehiscence. This usually occurs in the first few postoperative days and may give rise to a controlled fistula or peritoneal soiling. This contamination may be localized (intra abdominal abscess) or generalized resulting in septicaemia and multiorgan failure. With the advancement of radiological techniques the vast majority of localized intraabdominal abscesses can be successfully drained using percutaneous techniques. Failure to improve despite percutaneous drainage is an indication for an open procedure. Gastrograffin dye is useful in identifying anastomotic leakages and obstructions. If there were a high index of suspicion for suture dehiscence, such as diffuse peritonitis or systemic deterioration, re-exploration of the abdomen becomes essential. In our study one patient in each group developed intra abdominal abscess. As they did not respond to conservative line of management we performed exploratory laparotomy.

Inter-loop abscesses were drained and anastomotic breakdowns were defunctioned by fashioning an appropriate stoma. Re-suturing leaking bowel in the presence of peritoneal contamination exposes the patient to an unacceptable mortality rate. Enterocutaneous fistulae were best managed conservatively in the initial period. A stoma bag was placed over the cutaneous opening and gastrograffin studies were instigated to identify the origin of the fistulous tract. We inserted a central line, commenced TPN, and allowed only clear fluids. We waited for spontaneous closure of fistula. Immediate re-exploration of a fistula is a recipe for disaster, which may only result in the subsequent development of further fistulae. In one of our cases a defunctioning stoma was performed for a high-output fistula that did not respond to conservative line of management. After the initial inflammatory process got settled, the patients' nutritional status optimized and after appropriate radiological investigations performed, re-exploration done and fistula dealt with electively. In patients with

Duodenal Ulcer with Gastric Outlet Obstruction, Truncal Vagotomy with Posterior Gastrojejunostomy done in single layer or double layer.

In cases of Ileal Perforation where the patients required resection, unhealthy bowel was resected and end to end anastomosis was performed. For calculations of the outcome variables of leak, wound infection, fistula formation and time for construction of the anastomosis used the number of anastomosis in each group for the denominator. Calculations of the cost of materials were based on the actual hospital costs for the suture material used by the surgeons. For two layer anastomosis one pack of 2/0 vicryl and one pack of 2/0 silk were utilized. For single layer anastomosis, one pack of 2/0 silk was utilized. All procedures were performed by our unit Chief and Asst. Professors. All the procedures were approved by the Ethical Committee formed by The Dean, Government Rajaji Hospital, Madurai.

Statistical Tools used in our study

The information collected regarding all the selected cases were recorded in a Master Chart. Data analysis was done with the help of computer using **Epidemiological Information Package (EPI 2008)**. Using this software range, frequencies, percentages, means, standard deviations, chi square and 'p' values were calculated. Kruskal Wallis chi-square test was used to test the significance of difference between quantitative variables. A 'p' value less than 0.05 is taken to denote significant relationship.

IV. Results

We conducted the study in 30 patients with single layer anastomosis and 30 patients with double layer anastomosis from July 2008 to June 2010 at Government Rajaji Hospital, Madurai. The age distribution of the patients is shown in the Table.

Age in Years	Single Layer		Double Layer	
	Nos	Percentage	Nos	Percentage
upto 30	7	23.3	3	10
31 - 40	8	26.7	8	26.7
41 - 50	9	30	9	30
51 - 60	3	10	8	26.7
Above 60	3	10	2	6.6
Total	30	100	30	100
Range	22 -88 years		28 - 72 years	
Mean	41.7 years		45.7 years	
SD	13.9 Years		11.4 years	
P	0.1272 Not significant			

Sex distribution

Sex	Single Layer		Double Layer	
	Nos	Percentage	Nos	Percentage
Male	23	76.70	18	60.00
Female	7	23.30	12	40.00
Total	30	100.00	30	100.00
P	0.267 Not significant			

Anastomotic Leak

Anastomotic Leak	Single Layer		Double Layer	
	Nos	Percentage	Nos	Percentage
Yes	1	3.30	1	3.30
No	29	96.70	29	96.70
Total	30	100.00	30	100.00
P	0.7542 Not significant			

Anastomotic Leak in Emergency cases

Anastomotic Leak	Single Layer		Double Layer	
	Nos	Percentage	Nos	Percentage
Yes	1	5.00	1	5.00
No	19	95.00	19	95.00
Total	20	100.00	20	100.00
P	0.7564 Not significant			

Wound Infection

Wound Infection	Single Layer		Double Layer	
	Nos	Percentage	Nos	Percentage
Yes	2	6.70	3	10.00
No	28	93.30	27	90.00
Total	30	100.00	30	100.00
P	0.5 Not significant			

Wound Infection in Emergency cases

Wound Infection	Single Layer		Double Layer	
	Nos	Percentage	Nos	Percentage
Yes	2	10.00	3	15.00
No	18	90.00	17	85.00
Total	20	100.00	20	100.00
P	0.5 Not significant			

Fistulae formation

Fistulae	Single Layer		Double Layer	
	Nos	Percentage	Nos	Percentage
Yes	0	0.00	0	0.00
No	30	93.30	30	96.70
Total	30	93.30	30	96.70
P	0.6944 Not significant			

Fistulae formation in Emergency cases

Fistulae	Single Layer		Double Layer	
	Nos	Percentage	Nos	Percentage
Yes	2	10.00	2	10.00
No	18	90.00	18	90.00
Total	20	100.00	20	100.00
P'	0.6975 Not significant			

Intra abdominal abscess formation

Abscess	Single Layer		Double Layer	
	No.	Percentage	No.	Percentage
Yes	1	3.30	1	3.30
No	29	96.70	29	96.70
P	0.7542 Not significant			

Intra abdominal abscess formation in Emergency cases

Abscess	Single Layer		Double Layer	
	No.	Percentage	No.	Percentage
Yes	1	5.00	1	5.00
No	19	95.00	19	95.00
Total	20	100.00	20	100.00
P	0.7542 Not significant			

Time Taken for the construction of the Anastomosis

Layer	Time(in minutes)		
	Range	Mean	S.D.
Single	14 – 24	18.30	5.00
Double	24 – 42	33.20	2.80
P	0.0001 Significant		

Time Taken for the construction of the Anastomosis in Emergency cases

Layer	Time (in minutes)		
	Range	Mean	S.D.
Single	14 – 24	18.70	4.70
Double	24 – 42	33.80	3.40
P	0.0001 Significant		

Outcome

Outcome	Single Layer		Double Layer	
	Nos	Percentage	Nos	Percentage
Recovered	29	96.70	29	96.70
Death	1	3.30	1	3.30
P	0.7542 Not significant			

V. Discussion

Our study assessed the efficacy and safety of single and double layer anastomosis after intestinal resection, in emergency and elective situations. Generally, conventional two layered technique is being practised. But this causes excessive mucosal inversion, causing narrowing of lumen and may lead to ischaemia of anastomotic site. To overcome this problem little mucosal and complete serosal continuous suturing technique was tried. It has the advantage of good opposition of serosal surfaces, no luminal narrowing and less damage to submucosal vascular plexus. In our study, anastomotic leakage in single layer group was 3.3% which is consistent with the other studies which showed leakage in the range of 1.3 to 7.7%. In emergency situations the anastomotic leak rate in single layer group is 5% The double layer group shows anastomotic leakage around 3.3% again which is consistent with the other studies. In emergency situations the anastomotic leak rate in double layer group 5%. One intra abdominal abscess occurred (3.3%) in each group. In emergency situations the rate of intra abdominal abscess formation is 5% in each group.

Two patients in each group developed enterocutaneous fistulae.

Wound infection occurred in two patients in single layer group (6.7%) and three patients in double layer group (10%). In emergency situations wound infection rate in single layer group is 10% and that of double layer group is 15%. One patient in each group died because of associated co-morbidity such as diabetes mellitus, ischaemic heart disease and delay in presentation. A mean of 18.3 minutes was required to construct a single layer anastomosis and a mean of 33.2 minutes was required to construct a double layer anastomosis. In emergency situations a mean of 18.7 minutes was required to construct a single layer anastomosis and mean of 33.8 minutes was required to construct a double layer anastomosis. The cost of one 2/0 silk pack is around Rs. 100 and the cost of one 2/0 vicryl pack is around Rs. 360. For the construction of single layer anastomosis the cost of the material required is around Rs. 100 and that of double layer anastomosis is around Rs. 460.

The following table indicates the various conditions in which patients underwent bowel anastomosis. (Single layer / Double layer)

Sl. No	Diagnosis	Single Layer		Double Layer	
		Nos	Percentage	Nos	Percentage
1	Blunt Injury Abdomen	7	23.30	5	16.70
2	Carcinoma head of pancreas	1	3.30	0	0.00
3	Ileal perforation	14	46.70	12	40.00
4	Left Femoral Hernia	1	3.30	0	0.00
5	Obstructed incisional hernia	0	0.00	3	10.00
6	Obstructed Left inguinal hernia	0	0.00	2	6.70
7	Obstructed Right inguinal hernia	1	3.30	3	10.00
8	Obstructed Umbilical hernia	0	0.00	2	6.70
9	TB Ileal stricture	6	20.00	3	10.00
	Total	30	100.00	30	100.00

VI. Conclusion

Among the two methods of small intestinal bowel anastomosis which we have studied, our observations are ; There is no much difference in the development of the complication in both the methods. However the development of complications in emergency situation is more marked in both the methods. The time required to construct a single layer anastomosis is lesser than that of the double layer anastomosis. Narrowing of the lumen of the bowel is lesser in single layer anastomosis when compared to double layer anastomosis. Bowel movements recovered early in single layer anastomosis when compared to double layer

anastomosis. Finally, construction of single layer anastomosis of small bowel is cost effective when compared to that of double layer anastomosis

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