DOI Number: 10.5958/2321-1024.2019.00032.1

Original Article

A Prospective Comparative Study of Intestinal Anastomosis, Single Layer Extramucosal Versus Double Layer

Sohan Pal Singh[1], Divya Prakash[2], Dheeraj Raj Baliyan[1], Virendra Kumar[3], Vishal Saxena[4], Prachi[2]

[1]Professor, [2]Resident, [3]Associate Professor, [4]Assistant Professor, Department of Surgery, LLRM Medical College Meerut

Abstract

Background: Intestinal perforation peritonitis is a common surgical emergency in the Indian subcontinent and in tropical countries. Formation of an intestinal stoma is frequently a component of surgical intervention for diseases of the small bowel. The technique for stoma reversal has remained controversial in the use of single layer or two layers of anastomosis. **Method:** 30 patients for stoma closure were taken for study. These patients divided in two groups A and B, 20 and 10 each. These patients were taken up for ileostomy closure in single layer group A n-20 & double layer group B n-10. **Results:** 30 Patients of ileostomy were studied, divided in 2 groups, both groups were found to be comparatively equal in outcome with no any significant difference in complications. **Conclusion:** Double-layer anastomosis for ileostomy closure offers no definite advantage over single layer anastomosis in terms of postoperative leak and other complications. Single layer ileostomy closure technique is safe, easy to perform and simply to taught. Considering duration of the closure procedure and cost benefits, single-layer intestinal anastomosis may prove the choice of procedure for most of the surgeons.

Key words: *Ileostomy closure, Acute abdomen, Peritonitis, Anastomosis, Stoma reversal*

Introduction

The intestinal anastomosis is a surgical procedure to restore intestinal continuity after removal of a pathological condition affecting the bowel. Intestinal anastomosis is one of the most commonly performed surgical procedures, especially in emergency setting and is also commonly performed in elective setting when the resection are carried out for benign or malignant lesions of the gastrointestinal tract.

The basic principles of intestinal suture were established more than 100 years ago by Travers, Lembert and Halsted[1], and have since undergone little modification. One aspect of intestinal suturing technique that has remained controversial is the use of either one or two layers of sutures for anastomosis.

Corresponding author :
Divya Prakash JR-III
E-mail: dr.divya_prakash@yahoo.com

Historically, two-layer anastomosis using interrupted silk sutures for an outer inverted seromuscular layer and a running absorbable suture for a transmural inner layer has been standard for most surgical situations. Some recent reports have described single-layer continuous anastomosis using monofilament sutures as requiring less time and cost than any other method, without incurring any added risk of leakage[2-5]. Many surgeons probably now use single-layer suturing due to reductions in ischemia, tissue necrosis or narrowing of the lumen compared to the two-layer method.

Leakage from an anastomosis in the gastrointestinal tract that is often associated with increased morbidity, mortality rate[6] and adversely affect length of hospital stay and cost[7]. The cause of the leakage may be multifactorial, including contribution from faulty technique, ischemia of the intestine at the suture line, excessive tension across anastomosis and mesentery, the presence of local sepsis, presence of obstruction distal to the anastomosis. Among other factors are male gender, smoking, obesity,

alcohol abuse, long duration of operation, preoperative blood transfusion and timing during duty hours[8]. The mortality rate for an anastomotic leak in the literature typically is in the 6 to 39% range and a 10- 100% rise of permanent stoma[9]. So the aim of this prospective study is to define the risk factors, comparison of single layer Vs double layer technique in patient outcome, morbidity and cost effectiveness.

Theory

It has been stated that "the key to a successful anastomosis is the accurate union of two viable bowel ends with complete avoidance of tension"[10]. Thus, the most important factors in the creation of a bowel anastomosis are[1]: meticulous technique[2]; good blood supply; and no tension[3].

In addition various patient and technical factors can influence anastomotic healing are-

Patient factors affecting anastomotic healing

Positive factors: Good nutritional status[11] - low pre-operative albumen and recent weight loss of over 5 kg are independent risk factors for anastomotic leakage[12] Haemodynamic stability[14] Healthy bowel ends and microvasculature[14]

Negative factors : High-dose steroids[11] Old age[11] Anaemia - haemoglobin < 11g/dL is an independent risk factor for anastomotic leakage[11] Uraemia[11] Diabetes mellitus[11] Smoking[12] Alcohol abuse[12] High risk site of anastomosis e.g., low colorectal anastomoses[12] Male sex in colorectal anastomoses - presumably as the narrow pelvis results in poor visualisation and a more challenging operation[12]

Technical factors affecting anastomotic healing

Positive factors : Accurate seromuscular apposition[3], No distal obstruction[14], Closure of the mesenteric window[3]

Negative factors : Faecal contamination[12], Haematoma formation[12]

Method

Patients and Method

The study was approved by the Ethics Committee of the CCS University Meerut. All patients who were admitted for closure of ileostomy to the SVBP Hospital Meerut from Sept 2017 to August 2018 were included in the study. The following information was extracted from the patient admitted at hospital: patient demographics, indication for ileostomy, comorbidity status, length of hospital stay, duration of stoma, time taken to achieve bowel movement after closure, time taken or passage of flatus and feces, time taken for orally allowed performance status of the patient, experience level of surgeon performing the operation junior resident or consultants, duration of the surgery, duration of hospital say and morbidity, and whether the patient required re-operation or not.

The complications observed were divided into 3 main groups, major, minor and medical complications. The major complications included reoperation and anastomotic leaks, the occurrence of wound site dehiscence, fever >3 days, chest infection. Minor complications included surgical site infection, bleeding per rectum and occurrence of a stitch granuloma. Medical complications included pneumonia, UTI, line sepsis, cardiac complications, renal failure, anemia, DVT and allergic reaction to medication. The frequency of these complications was then recorded for each patient.

Surgical Technique

All patients had a radiological contrast study loopogram done prior to closure to rule out any distal bowel obstruction and leaks. All patients receive bowel preparation prior to closure. At the operation all patients received a single dose of prophylactic antibiotics Ceftriaxone 1g IV about 30 minutes prior to the skin incision. A peristomal skin incision was used and none of the patients needed a laparotomy for the closure. Standard loop ileostomy closure was performed using either a single layer hand sewn end to end anastomosis or double layer in form of continuous simple or interrupted simple or connell or alternate simple and connell. All operations were performed by a senior resident under the supervision of a senior consultant

Data Analysis

Data was analyzed after taking mean of various outcomes.

Inclusion Criteria

1. All patients undergoing stomach closure

coming to SVBP Hospital between a period of Sept 2017 to August 2018.

2. Age between 6 years and 65 years.

Exclusion Criteria

1. Esophageal, Duodenal, Jejunal, Anastomosis
2. Age <6 years and >65 years

Technique

Technique: the bowel loop of stoma was mobilized from surrounding skin, minor adhesions were separated using blunt dissection. The bowel ends were cleaned and freshened using 15 no. blade for fresh bleeding points and approximated. **Double layer anastomosis**: The inner layer was constructed in a continuous manner using silk 3-0 suture, or full thickness interrupted simple suture with silk 3-0. The outer seromuscular sutures were taken in an interrupted manner, inverting the inner layer using 3–0 silk suture. **Single layer anastomosis**: All the single layered intestinal anastomoses were performed using an interrupted 4–0 silk that began at the mesenteric border, incorporating outer seromuscular layer. Each bite included 4–6 mm of the wall from the edge and about 5 mm from each other. The larger bites were used at the mesenteric border to ensure an adequate seal. Only enough pressure was applied to the suture to avoid ischemia of the anastomosis. The edges of the mesentery were closed to prevent any internal herniation. The patency of the anastomosed segment was confirmed by gently palpating the anastomosis between the thumb and the index finger.

Each case was analyzed with respect to duration required to perform intestinal anastomosis & post-operative complications like anastomotic leak. The duration of anastomosis begins with patient being taken on operation table and ended when the last stitch was cut. All single layer anastomoses were done with silk 3-0 pack which had a suture material of 60 cm length. For double layer, 3-0 silk was used taking through all layers and seromuscular layer with 3-0 Silk pack which had suture material measuring 60 cm.

Anastomotic leak was defined as fecal discharge in the drain or from the wound. On discharge, the patients were followed up at 1st week thereafter. The patients were evaluated for gastrointestinal complaints and other complaints, if any.

Table 1: Showing site of anastomosis

Disease Group	No. of Cases	n%
FUC of ileostomy	28	93.3%
FUC of Colostomy	2	6.6%

Table 2: Comparison between site of anastomosis

Site of anastomosis	This Study		Previous study Burch et al study[9]	
	Group A	Group B	Group A	Group B
Ileo ileal	18	9	37%	28%
Ileo colic	2	1	29%	40%

Table 3: Comparison between single Vs double layer anastomosis

Groups	This Study		Previous study Burch et al study[9]	
	Silk	Vicryl	Silk	Prolene
Single layer Group A	14	6		1
Double layer Group B	6	4	3	0

Table 4: Comparison between duration of anastomosis

Groups	Mean duration of Anastomosis		
	My Study	Burch et al9	Khan et al12
Single layer Group A	46.0 min	20.8	20
Double layer Group B	86.5 min	30.7	35

Table 5: Comparison between hospital stay

Groups	Hospital stay		
	My Study	Burch et al 9	Garude et al 10
Single layer Group A	8.45 days	7.9	12
Double layer Group B	8.2 days	9.9	12

Table 6 : Postop characteristics of patients

Groups	ICU		
	ICU Stay	**Oral sips allowed**	**Flatus Passed**
Single layer Group A	3.8	3.7	2.05
Double layer Group B	4.8	3.2	2.4

Results

Twenty patients were selected in single layer group, and 10 patients in double layer group. in single layer 66.6 % of the patients were male while in double layer 80% were male. The mean age for single layer was 27.2 years and in double layer was 31.9 year. all of procedures were performed in elective settings with proper bowel wash. In maximum cases 18 in single layer and 9 in double layer end to end type of anastomosis was done (Table 2). Single pack of suture material silk used in single layer and two pack of silk used in double layer anastomosis(Table 3). Mean duration required for single layer anastomosis was 46.0 minutes and for double layer anastomosis was 86.5 minutes (Table 4). The mean duration of hospital stay in single layer was 8.45 days and in double layer 8.2 days (Table 5). None of the patients in either group developed anastomotic leak. So when the data was compared, hospital stay and the number of patients developing complication anastomotic leak rate in the single-layered group was not found to be significant, whereas the mean time required for construction of anastomosis and no. of sutures used was found to be highly significant when compared with the double-layered group.

Discussion

This study assessed the efficacy and safety of single layer anastomosis in comparison with double layer anastomosis in stoma closure. The study included two groups: Group A-Single layer and Group B-Double layer, with a total of 30 cases. technique of single Vs double layer was surgeons choice depending on comfort zone. Anastomosis was done at stoma site between bowel loops and delivered into peritoneal cavity. The efficacy of both groups was compared in terms of duration required to perform intestinal anastomosis, cost effectiveness and post-operative complications like anastomotic leak. In our study majority of procedures involved were of ileo-ileal type of anastomosis Single layer-90 % and Double layer-90%. In our study the mean duration required to construct a single layer anastomosis was 46.0 minutes and 86.5 minutes for double layered anastomosis. Therefore there is significant difference in time taken between both groups Single layered found to economical compare to double anastomosis as the total number of suture silk packs required in double-layered anastomosis was 2, whereas in single-layer anastomosis only one pack of silk was used. In our study we used silk as suture material because it is cheap and easily available. In our comparative study the mean duration of hospital stay in single layer was 8.45 days and in double layer it is 8.2 days which almost equal to mean duration of stay in Niyaz Ahmed study 7.32 and 7.92 where as in Garude et al. study duration of stay is equal in each group 12 and 12 and in Burch et al study 7.9 and 9.9, 2 days more in double layer was noted. But in our study, no significant change noted on duration of hospital stay (Table 5). The number of anastomotic leak in our study was nil in both groups. Whereas in Khan et al. study 1 6% leak in single layer and 2 12% in double layer while in Niyaz Ahmed study 1 4% leak was present in single layer and 2 8% in double layer. However in our study, anastomotic leak rate is nil as all the patients were electively chosen for stoma closure, with negligible comorbidities and proper bowel preparation

Intestinal anastomosis has been intensely studied and many comparisons between alternative techniques and suture materials have been made. Double-layered intestinal anastomosis was first performed by Travers and Lembert[6] in the early 19th century. Since then double layer technique was used widely over the years. The single-layered interrupted anastomosis was first described by Hautefeuille[8] in 1976. Outcome of any intestinal anastomosis depends upon its ability to heal without leakage. Healing process in gastrointestinal tract proceeds through same stages as wound healing elsewhere in body. Several factors like blood supply is less compromise, less damage to submucosal venous plexus, excessive inversion of tissue or very less narrowing, may responsible for good outcome in single layer anastomosis. In our institute like government hospitals where large number of emergency procedures perform and most of patients are poor with economic problems, single layer anastomosis method is beneficial as it reduces operative time, time of anesthesia and less suture material required so economical and equally safe.

Permission from ethical committee -taken

Source of Funding - Self

Conflict Interest - None

References

1. Brooks DC, Zinner MJ. Surgery of the Small and Large Bowel. In: Zinner MJ, editor. Maingot's Abdominal operations. 10. Vol. 2. Stamford: Appleton & Lange; 1997. pp. 1309–1310.
2. Thomson WHF, Robinson MHE. One-layer continuously sutured colonic anastomosis. Br J Surg. 1993;80:1450–1451.
3. AhChong AK, Chiu KM, Law IC, Chu MK, Yip AW. Single-layer continuous anastomosis in gastrointestinal surgery: a prospective audit. Aust NZ J Surg. 1996; 66:34–36.
4. Brodsky JT, Dadian N. Single-layer continuous suture for gastrojejunostomy. Am Surg. 1997;63:395–398.
5. Law WL, Bailey HR, Max E, Butts DR, Smith KW, Thompson DA, Skakun GB, Graves E. Single-layer continuous colon and rectal anastomosis using monofilament absorbable suture Maxon: study of 500 cases. Dis Colon Rectum. 1999;42:736–740. doi:10.1007/BF02236928
6. Bruce J, Krukowski ZH, Al-Khairy G et al 2001. Systematic review of the definition and measurement of anastomotic leak after gastrointestinal surgery. Br J Surg. 889: 1157- 68.
7. Sultan R, Chawla T and Zaidi M 2014. Factors affecting anastomotic leak after colorectal anastomosis in patients without protective stoma in tertiary care hospital.J Pak Med Assoc. 642:166-70.
8. Gorissen KJ, Benning D, Berghmans T et al 2012. Risk of anastomotic leakage with nonsteroidal anti-inflammatory drugs in colorectal surgery. Br J Surg. 995:721-7.
9. Brisinda G, Vanella S, Cadeddu F et al 2009. End-to-end versus end-to-side stapled anastomoses after anterior resection for rectal cancer. J Surg Oncol. 991:75-9.
10. Kirk RM, Winslet M. Essential General Surgical Operations. Edinburgh: Churchill Livingstone; 2001.
11. Paterson-Brown S, Beck DE, Whitlow CB. A Companion to Specialist Surgical Practice: Core Topics in General and Emergency Surgery. 4th ed.Philadelphia: Elsevier Saunders; 2009. pp. 167–192.
12. Taflampas P, Christodoulakis M, Tsiftsis DD. Anastomotic leakage after low anterior resection for rectal cancer: facts, obscurity, and fiction. Surg Today. 2009;39:183–188.
13. Saha AK, Tapping CR, Foley GT, Baker RP, Sagar PM, Burke DA, Sue-Ling HM, Finan PJ. Morbidity and mortality after closure of loop ileostomy. Colorectal Dis. 2009;11:866–871.
14. Scott-Conner CEH. Chassin's Operative Strategy in General Surgery. Heidelberg: Springer; 2002.