

HAND SEWN SINGLE LAYER SEROSUBMUCOSAL INTERRUPTED VS. CONTINUOUS INTESTINAL ANASTOMOSIS

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Abstract

Objectives: To compare the effectiveness of single layer serosubmucosal (extramucosal) continuous / interrupted intestinal anastomosis.

Design: Prospective comparative study.

Setting: Department of surgery Nawabshah Medical

College Hospital Nawabshah and GMMC Hospital Sukkur.

Study Period: From January 2007 to January 2012. For period of 6 year.

Subject: Total of 174 patients undergoing construction of intestinal anastomoses.

Evaluation: For anastomotic leakage.

Results: Overall 13 (7.47%) patients developed anastomotic leakage, 3 (1.72%) patients had sub-clinical and 10 (5.74%) clinical (obviously) anastomotic leakage. 7 (8.04%) patients and 6 (6.89%) developed anastomotic leakage, in group "A" and "B" respectively.

Conclusion: Anastomotic failure is a reflection of operating skills, decision making of surgeon and post-operative care. There is no significant difference in anastomotic dehiscence between continuous and interrupted single layer serosubmucosal technique if patients selection is proper, however interrupted method is comparatively easy to construct in less accessible site.

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Introduction

The technique of joining two pieces of bowel together (anastomosis) is central to gut surgery. The anastomotic leakage and its consequences that is localized abscess, generalized peritonitis, fistulae, stricture and bleeding are life threatening.¹ Leakage being a dreadful complication and is a major cause of morbidity and mortality following gut surgery.² Since the dawn of surgery intestinal anastomosis has remained a contro-

versial topic in respect to suture material, anastomotic technique, distance between stitches and borders.³ The optimal method of anastomosis is considered one that causes accurate alignment, minimal disruption of local vascularity, incorporates minimum amount of foreign material, do not implant malignant cell at the anastomosis and do not enhance risk of metachronous cancer. Though a number of anastomotic techniques such as conventional hand sewn, stapled and unconventional like compression rings, glue and laser welding are invented but none of these is perfect, all of these compromise the healing.⁴ Halsted in 1887 pointed out that in double layered intestinal anastomosis the second layer is hazardous it predisposes to necrosis by impairing circulation at anastomotic site and submucosa is the layer of greatest resistance. He proposed the single layer anastomosis and postulated that suture should be anchored in submucosa, performed with fine sutures, should not perforate mucosa and be made in extra mucosal layer.⁵ These principles remained forgotten for decades until Gorodiche and Jourdan 1951 reviewed these principles and supported extramucosal single layer anastomosis.⁶ Subsequently several studies in the following decades by Gambiae 1956, Letwin and Willim 1967 Orr N.W.M 1969 confirmed good performance of single layer suture.⁷⁻¹⁰ Faria in 1972 proved less exudative inflammatory reaction and earlier more intense fibroblast proliferation, the advantages of extra mucosal single layer,¹¹ but such technique had not been adapted widely. Therefore we planned to design a study to observe the effectiveness of single layer serosubmucosal interrupted/ continuous intestinal anastomotic technique.

Material and Methods

A prospective & comparative study was conducted at department of surgery PUMHS Nawab Shah and GM-MC Hospital Sukkur from January 2007 – 2012. A total of 174 patients were included in this study who underwent intestinal anastomoses from Jejunum proximally to proximal 2/3 of rectum distally. Patients above fifteen years of age belonging to either sex undergoing elective or emergency surgery were included. Surgery was performed by consultant surgeon or residents having experience of at least 5 years. Patients who needed preoperative gut preparation were prepared by giving magnesium sulphate 30 mg in glass of water orally two hourly till loose motions occurred due then it was administered 8 hourly and klean enema

was given one day prior to surgery incase of elective large bowel surgery. In emergency cases of peritonitis due to small / large bowel perforation segmental resection and anastomosis was carried, only when deemed feasible by operating surgeon when pulse was of good volume, haemoglobin more than 8 gm% and peritoneal cavity was free of faeces. Those patients who did not fulfill the above criteria were submitted to enterostomy. Similar suture material i.e. 2/0 polyglyactin (vicryl) and antibiotics cefuroxime 750 mg B-D, gentamycin 80 mg 8 hourly and metronidazole 500 mg 8 hourly were administered up to 5th postoperative day.

A total number of 174 patients were allocated to two groups “A” and “B” each comprising of 87 patients. In group “A” single layer continuous, and in group “B” patient’s single layer interrupted serosubmucosal anastomosis was constructed by applying the stitches about 5 mm apart incorporating about 6-5 mm of the gut in its long axis avoiding mucosa only. Post-operatively patients were observed for anastomotic failure that is leakage. Clinically patients were diagnosed as anastomotic failure by evident faecal discharge or nonabsorbable material from wound after oral administration or as radiographic demonstration of fistula or visible disruption of suture line during re exploration.

Results

Out of 174 patients 103 (59.2%) were males and 71 (43.67%) females out of these 98 (56.32%) were operated in emergency and 76 (43.67%) were operated on elective list. In 48 (55.17%) patients belonging to group “A” continuous serosubmucosal anastomoses were constructed in emergency and in 39 (48.82%) patients on elective list. Overall 7 (8.4%) patients developed anastomotic leak. In group “B” interrupted serosubmucosal anastomoses were constructed in 50 (57.47%) and in 37 (42.52%) in emergency and on elective list respectively. Overall 6 (6.89%) patients developed anastomotic leak in this group. Overall in this study anastomotic failure was observed in 13 cases i.e. 7.4%. In group “A” it was 8.4% and in group “B” that was 6.89%.

3. Patients developed sub-clinical leak were diagnosed by contrast enema and treated conservatively. 10 patients developed obvious leak, 02 confirmed on re-exploration and 08 patients were diagnosed by faecal discharge from wound. 04 (4.59%) patients belonging to group “A” & 03 (3.4%) patients of group “B”

SERO SUBMUCOSAL SUTURE

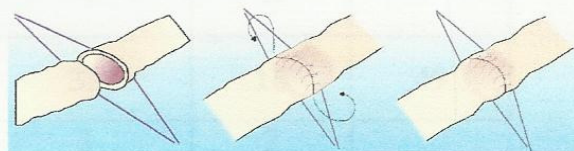
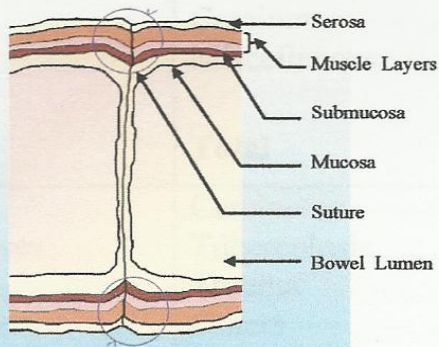


FIG – I: Single layer Serosubmucosal (Extramucosal) technique

FIG – II: Interrupted Serosubmucosal anastomoses in accessible sites.

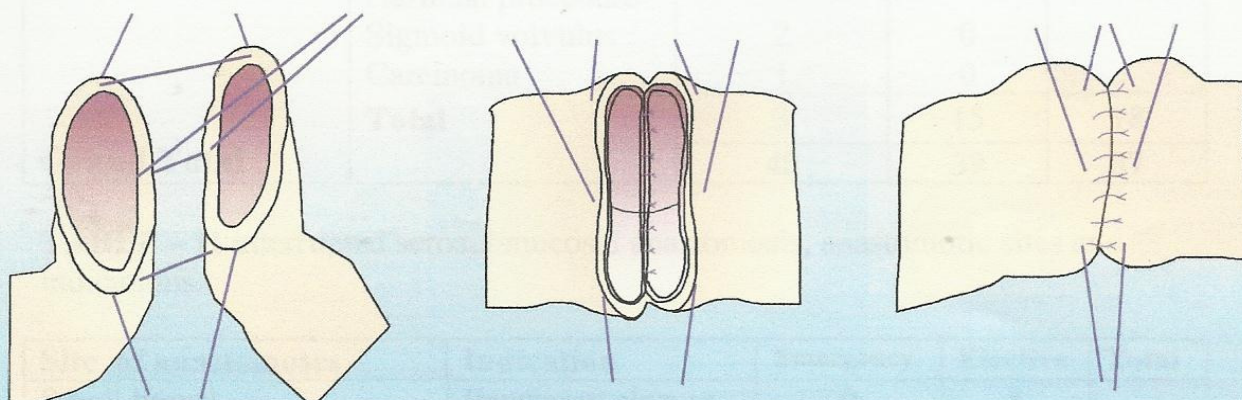


FIG – III: End to end Serosubmucosal anastomosis in sites with limited access.

Figures with Curtsey Surgery International.

Table 1: Continuous Single Layer Serosubmucosal Anastomotic Site indication.

Site of Anastomoses	Indication	Emergency	Elective	Total
Small bowel Enteroenteric anastomoses	Ileostomy closure	0	10	
	Perforation	11	0	
	Tuberculosis	3	3	
	Strangulation gut	2	3	
	Trauma	11	0	
	Carcinoma	2	1	
	Miscellaneous	2	2	
	Total	33	16	49
Ileocolic anastomoses	Carcinoma	3	2	
	Tuberculosis	2	3	

Site of Anastomoses	Indication	Emergency	Elective	Total
	Trauma	7	0	
	Others	0	3	
	Total	12	8	20
Colocolic Anastomoses	Colostomy closure	0	9	
	Restoration of Hartman procedure	0	6	
	Sigmoid volvulus	2	0	
	Carcinoma	1	0	
	Total	3	15	18
Grand Total		48	39	87

Table 2: Interrupted serosubmucosal anastomosis, anastomotic sites and indications.

Site of Anastomoses	Indication	Emergency	Elective	Total
Small bowel Enteroenteric anastomoses	Ileostomy closure	0	8	
	Typhoid enteric perforation	16	0	
	Tuberculosis	0	2	
	Bands and adhesions	2	3	
	Strangulation	4	0	
	Miscellaneous	9	0	
	Traumatic	1	2	
	Other	0	5	
Enteroentericanastomosis	Total	32	20	52
Ileocolic anastomoses	Ileocecal mass	3	7	
	Perforation	11	0	
	(traumatic)	2	0	
	Caecal volvulus Intussusception	2	0	
	Total	18	7	25
Colocolic Anastomosis	Clostomy closure	0	10	10
	Total	50	37	87
Grand Total				

expired.

Overall mortality rate in this study is 4.02%.

Discussion

Anastomotic leak is a terrible complication of gastrointestinal anastomosis that affects the surgical outcome adversely. Abnormal vital signs are extremely common after bowel resection with anastomosis.² Though anastomotic technique is the most important determinant of outcome, but its process of healing is influenced by a number of factors, such as profuse blood supply, proper apposition, appropriate alignment & lack of tension have favourable impact whereas distal obstruction, perianastomotic sepsis, haematoma, hypotension, hypoxia, malnutrition, jaundice, uraemia and corticosteroids have adverse effect on healing.⁴ Melish 1966, Jansen 1981, Ravitch 1987 showed that method of border coaptation influences the process of epithelial repair.¹²⁻¹⁴ Enoch 2005 suggested that accurate apposition is ideal for primary healing in epithelial wounds and same applies to intestinal anastomosis.¹⁵ The strength of intestinal anastomosis is relatively low in the first days after operation probably as a result of localized degradation of supporting matrix by enzymes from matrix metalloproteinic family,¹⁶ therefore Intestinal anastomosis has little intrinsic resistance to distension and longitudinal distraction is weak so until collagen deposition is established extrinsic support is required during lag phase to maintain tissue continuity.¹⁷ The safety of single layer gut anastomosis is well proven by many investigators Carty, Khonery, Matheson, Iwrwin in their studies.^{2,18-20} Staefano is of opinion that single layer anastomosis results in more complete vascularization of ends, minor ischemic changes, more resistance to distension and minor re-absorption of collagens.²¹ Jibron proved by utilizing radioactive microspheres that better vascularization of anastomosis is maintained after continuous technique²² and Houdart observed in rats that there is no histological and microangiographic difference between continuous and interrupted single layer anastomosis.^{3,24} Demartine-S observed in his study that leakage in single layer interrupted stitches is more than continuous one.²⁵ Overall in the present study anastomotic failure was 7.4%. In group "A" continuous serosubmucosal anastomosis leakage was 8.4% where as in group "B" interrupted serosubmucosal anastomosis it was 6.9%. It is obvious that anastomotic failure in group "A" is more than group "B" but it is not much significant. Failure rate in inter-

rupted anastomoses in this study is higher than the studies conducted in literature but is not very much remarkable. Steinke W, is of the opinion that single layer extramucous running suture anastomosis fulfills the criteria of an "IDEAL" anastomosis and can be performed in almost all intestinal localizations,²⁶ F Ashkanai considers interrupted single layer anastomosis as "Gold Standard" whereas continuous serosubmucosal method is equally effective when access is good. While Slicker JC and others advocate single layer continuous technique using inverting sutures preferable.^{27,28}

Conclusion

From this study it is obvious that:

- There is no remarkable difference in anastomotic dehiscence between continuous and interrupted single layer Serosubmucosal technique, if patient's selection is appropriate.
- Single layer continuous anastomosis is difficult to construct in less accessible sites than interrupted. Anastomotic failure is considered a reflection of operation skills, decision making of surgeon and postoperative care that can potentially be reduced by proper training. Surgeon must do his audit honestly and thereafter take steps to correct these. We recommended single layer Serosubmucosal anastomoses, continuous anastomosis in accessible sites and interrupted for sites with limited access during training period.

References

1. Lecture, G. Anastomosis back ground. Higher surgical teaching, The Royal college of Surgeon Surgical knowledge skill December 10th, 2004.
2. Erb L, Hyman NH, Osler T. Abnormal vital signs are common after bowel resection and do not predict and do not predict anastomotic leak. *J Am coll surg.* 2014 Jun; 218 (6): 1195-9.
3. Nascimento LR, Souza VCT, Simoes MJ, Ramos ECF, Bazzano FCO, Novo NF, Gomes PO. End on extramucosal single layer suture with Double Anchoring in the submucosa on Rabbits. *Acta cerurgica Brasileria.* Vol. 14, 2 Sao Paulo April 1999. Pub Med.
4. F. Ashkanai, Z.H Krukowski, *Intestinal anastomosis Surgery International*, 2002, Vol.: 57: 104-107.
5. Halsted WS, Circular suture of the intestine; an experimental study *AmJ Med Sce.* 1887; 94: 436-61.
6. Gorodiche J, Jourdan P anastomosis Digestive en, un plan de suture, *Sem Hosp. Paris* 1951; 27: 3740-7.

7. Gambee. LP. Ten year experience with a single layer anastomosis in colon Surgery. *AMJ Surg.* 1956; 92: 222-7.
8. Heifetz CJ, Technique of single layer end to end intestinal anastomosis by triangulation. *Surg Clin North Am.* 1966; 46: 223-8.
9. Let win, William HTG. Healing of intestinal anastomosis. *Can J Surg.* 1967; 10: 109-16.
10. Orr NWM. A single layer intestinal anastomosis. *Br-J Surg.* 1969; 56: 771-4.
11. Faria PAJ Sutura, Gastrointestinal em Plano Unico extra mucosa em 2 planos Umtotal eum seromuscular invaginante: estudo experimental no cao [Discertacao] Sao Paulo; Eacola Plaulista de Medicina; 1972.
12. Melish P, inverting or everting sutures for bowel anastomosis, an experimental study. *J. Pediatr. Surg.* 1966; 1: 260-5.
13. Jansen A, Becker AE, Brumel Kam WH, Keeman JN. The importance of the opposition of the submucosal intestinal layers for primary wound healing of intestinal anastomoses. *Surg. Gynecol Obstet.* 1981; 152: 51-8.
14. Ravish NM, Canalis F, Wemshelbaun A, Mc Cormick J. studies in intestinal healing: 111. Observation on everting intestinal anastomoses. *Ann Surg* 1967; 166: 670-80.
15. Enoch S, Leaper DJ. Basic science of wound healing *Surgery* 2005; 239 (2): 37-42 (cross reference).
16. Siemonsma-MA, de Hingh-I- H.de Man, B-M; Lomme, R-M, Verhoftad; A-A; Hendriks T. Doxycycline improves wound strength after intestinal anastomosis in the rat. *Surgery* 2003 March; 133 (3): 268-76.
17. Aileen JMC Kinely ZH Krukowski. Intestinal anastomosis: surgery *Int*, 2006; V. 74L 224-228.
18. Khoury GA, Waxman BP, Large bowel anastomosis: healing process and sutured anastomosis; a review. *Br: J. Surg.* 1983; 70: 61-3.
19. Matheson NA, Mc Intosh CA, Krukowski ZH. Continuing experience with single layer appositional anastomosis in the large bowel. *Br. J Sur.* 1985; 72 (Suppl.): 104-6.
20. Irwin ST, Krukowski, Matheson NA. Single layer anastomosis in the upper gastrointestinal tract. *Br. J. Surg.* 1999; 77: 643-4.
21. Stefano Fuleo, MD, Gaetanola Greca MD, Corlo Candiano MD, Gaetono Aronica MD, Gio ANNILI Destri MD, Benianino Scilletta MD, Antonio DC, Catoldo MD. Single layer interrupted anastomosis in the gastrointestinal Tract. *Int J Surg Sci* 1995; Vol. 2, No. 3: 140-142.
22. Jibron H, A honen J, Lindell B, Zederfeldit B. Cardiac output after left colon anastomosis in the rat, *Eur Surg Res.* 1979; 11: 132.
23. Houndart R, Lavergene A, Galin A, Hantefeinlle P. histopathological evolution of single layer anastomoses. A study of 210 colonic anastomoses in the rat, fean 2nd to the 180 days. *Gastroeterol Clin Biol.* 1983; 7: 465-73.
24. Houndart R, Lavergtne A, Valtenr P, Villet R, Hantefemille P. Vascular evolution of single layer end on colonic anastomoses. *Dis Colon Rectum.* 1985; 28: 475.
25. Demortine N, Rothenbuhler J, Harder F. Single layer continuous Suture for gastric anastomosis. *World J. Surg.* 1991; 15: 522-5.
26. Steinke W, Leippold T, Schweizer W. Gastrointestinal extra mucous running suture anastomosis. *Swiss Surg.* 2003; 9 (3): 114-20. *Entrz Pub Med:* 2004.
27. Wu Z, Fruk D, Lange J. Do normal clinical signs and laboratory tests exclude anastomotic leak? *J Am coll Surg.* 2014 Jul; 219 (1): 164.
28. Slicker Jc, Daams F, Mulder IM, Jeekel J, Lange JF. Systemic review of the technique of colorectal anastomosis. *JAMA Surg.* 2013 Feb; 148 (2): 190-201.