ORIGINAL ARTICLE

Single Layer versus Double Layer Technique for Intestinal Anastomosis: A Comparative Study

Adhikari B

ABSTRACTE

Introduction: Intestinal anastomosis is a surgical procedure executed to ascertain communication between two segments of the intestine, after the removal of pathology affecting the bowel. It depends on factors like anastomosis site, bowel capability and the type of the pathogenesis. **Aims:** To compare single versus double layer method in terms of time taken for anastomosis, hospital stay, post-operative leak and cost effectiveness. **Methods**: This is a comparative hospital based study carried out at the department of surgery Nepalgunj Medical College from September 2017 to August 2020. Patients requiring emergency laparotomy with resection and anastomosis of small bowel were included. Patients requiring colonic anastomosis, diversion stoma and multiple anastomoses were excluded. Patients were divided in to two groups- single layer and double layer group. Each group was compared for outcome measures like time taken to construct the anastomosis, hospital stay, post-operative leak and cost of surgery. **Results:** The total number of patients was 50. The mean age was 45.57±17.42 years for single layer and 48.67±18.16 years for double layer group. Time taken for intestinal anostomosis in single and double layer were 18.28±5.08 and 25.27±6.18 respectively which was statistically significant (p - <0.012). Hospital stay was 10.9±1.43 in single layer and 11.2±1.87 which was statistically not significant (p - >0.342). Similarly, the anastomosis leak was seen in 2 patients in single layer and 3 in double layer. Which was statistically not significant (p - >0.318). While comparing the cost effectiveness single layer technique was cost effective. **Conclusion**: The single layer anastomosis is a preferable, safe and economic technique in comparison to the conventional double layered anastomosis.

Keywords: Anastomotic leak, Double layer anastomosis, Single layer anastomosis, Small bowel

Author:

1. Dr. Bimarsh Adhikari

Address for Correspondence:

Dr. Bimarsh Adhikari
Assistant Professor
Department of Surgery
Nepalgunj Medical College and Teaching Hospital
Kohalpur, Banke
Email: bimarsha10@gmail.com

INTRODUCTION

Intestine plays a critical role in the digestive system being involved in absorption of nutrients, micro-nutrients and water.[1] The word anastomosis has been derived from a Greek word 'ana' referring to without and 'stoma' referring to mouth. Intestinal anastomosis communicates two segments of the intestine, thereby restoring gastrointestinal continuity after the removal of pathology, affecting the bowel.[2] Hippocrates (460 BC) has cited suturing of the intestines in his literature. Celsus (30 BC - 30 AD) illustrated the techniques of suturing of the colon.[3] The decision to perform a particular anastomosis, remains individual's surgical experience and personal preference.[4] Anastomosis can be achieved by the use of sutures, staplers and even compression rings, metal wires and magnets.[5] The success of the procedure depends on sufficient alignment, good vascularity, spaced sutures, devoid of tension and absence of obstruction.[6]

The shortcomings associated with double-layered technique include the risk of stricture formation, failure to oppose clean serosal surfaces, increased chances of leakage, excessive inversion causing narrowing of lumen.[7] The single layer anastomosis technique is known to integrate the toughest layer of gut and minimize damage to the submucosal vascular plexus. It is also associated with minimal tissue damage, minimal chances of obstruction or leakage. Literature reports that the single-layered anastomosis is less time consuming andeconomical.[8]

METHODS

The study was conducted at Nepalgunj Medical College and Teaching Hospital in the department of surgery from September 2017 to August 2020. Patients above 18 years of age of either sex requiring emergency resection and anastomosis of small intestine were included in study. The patients who required proximal diversion or stoma, multiple intestine anastomosis and colonic anastomosis were excluded in the study.

The patients enrolled in the study underwent emergency laparotomy for conditions like intestinal obstruction due to bowel ischemia, strangulated hernia or traumatic bowel injury etc. The included subjects were allotted to undergo single layered anastomosis or double layered anastomosis and were divided into two groups- single layer anastomosis and double

layer anastomosis. The division into two groups was done by lottery method.

For double layered anastomoses, the inner transmural layer was approximated with 2–0 polyglactin suture in continuous manner, whereas the outer seromuscular layer was sutured with 2-0 silk sutures in interrupted manner. For single layer anastomoses, 2–0 polygalctin suture was used to approximate the bowel in continuous manner. Time taken for the surgical procedure was recorded, starting with the placement of first suture till the placement of last suture.

The patients were managed postoperatively in a standard way and were followed up for 30 days. During the hospital stay and follow up patients were observed for the evidence of anastomotic leak. Each group was compared for outcome measures like time taken to construct the anastomosis, length of hospital stay, and cost of procedure. Ethical approval was taken from the institutional review committee and an informed consent was taken for all the patients. The readings were recorded in master chart, and the data analysis was carried out.

RESULTS

There were 50 patients. Each group consisted of 25 patients. The study comprised of 32 males and 18 females (Figure 1). The mean age was 45.57±17.42 years for single layer and 48.67±18.16 years for double layer group. The patients underwent small intestinal anastomosis for following conditions like strangulated inguinal hernia (n=20), post-operative bands and adhesions (n=8), ileoileal and ileojejunal intussusceptions (n=7), strangulated femoral hernia (n=5), traumatic perforation with or without transection of bowel (n=5), acute mesenteric ischemia (n=3), meckel diverticulum (n=2).(Figure 2) The most common anastomosis performed in both the groups was jejuno-jejunal followed by jejuno-ileal and ilieo-ileal anastomosis.

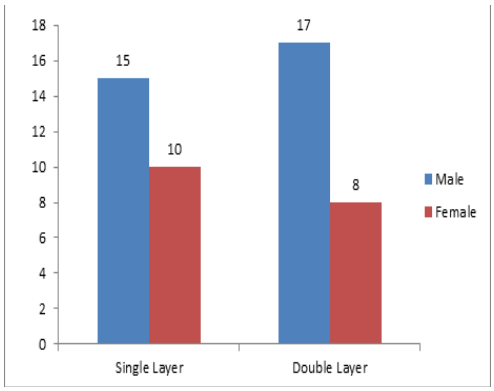

Figure 1: Distribution of Sex in the study

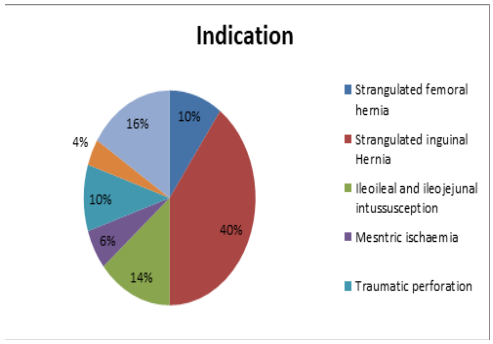

Figure 2: Indications for resection anastomosis

The time taken for single-layered anastomosis was significantly lesser (18.28±5.08 min) than for double-layered (25.27±6.18 min). Length of hospital stay was lesser for the single layer (mean 10.9±1.43 days) than the double layer (mean 11.02±1.87 days). No significant difference was observed in the hospital stay for the single and the double anastomosis group. The expenditure for the double layer anastomosis technique was higher than the single layer technique. (Table I)

Parameters	Single layer	Double layer	P Value
Duration	18.28±5.08 min	25.27±6.18 min	P=0.012
Hospital Stay	10.9±1.43 days	11.2±1.87 days	P=0.342
Anastomosis leak	02 (8%)	03 (12%)	P=0.318

Table I: Comparison of parameters between two groups

Evaluation of the post-operative complication of anastomotic leak did not yield any significant results. 02(8%) in the single layer group and 03(12%) in the double layer group developed anastomotic leak.

DISCUSSION

The double layer anastomosis was first carried out by Travers and Lembert as an element of investigational surgery in the nineteenth century, whereas the single-layered anastomosis was first depicted by Hautefeuille in 1976.[9] Traditionally, double layer anastomosis with interrupted silk sutures the seromuscular layer and a running absorbable suture for a transmural inner layer has been the gold standard.[10] The most significant aspects in the establishment of a bowel anastomosis are a good procedure, less tissue manipulation, passable approximation of bowel ends, good vascularity and absence of tension or distal obstruction.[11] Majority of the patients in our study were male (32 males; 18 females) which is same with other studies which state that the pathologies of gut are predominant in males seeking anastomosis as the therapeutic modality.[12, 13]

In our study, the time taken for single-layered anastomosis was significantly lesser (18.28±5.08 min) than for double-layered (25.27±6.18 min). Our results were in concordance with the study conducted by many such as the one carried out by Kumar et al in 2020 where the time taken by single layer technique

was significantly lesser than the double layer technique.[5] Pathak et al in his study concluded that the time required for single layer bowel anastomosis was less in comparison to double layer bowel anastomosis. Similar results were found in the study conducted by Singh et al.[14]

No significant difference was observed in the hospital stay for the single and the double anastomosis group. Similar results were highlighted in the study carried out by Nema et al where the hospital stay for single layer and double layer anastomosis were 11.46 and 11.57 days respectively.[15] The results of our study were contrary to the one done by Akela et al where the average duration of hospital stay was 5.9 days for single layer whereas for the double layered group was 7.29 days.[16] Our results were also contrary to the one carried out by Kar et al who found that length of hospital stay (5.90±1.43 days in single layer anastomosis versus 7.29±1.89 days in double layer anastomosis) was significantly shorter in single layer anastomosis group.[7] In our study, the expenditure for the double layer anastomosis technique was higher than the single layer technique. This was attributed to the number of suture packets required for the procedure. The single layer technique was managed with one pack of suture whereas the double layer technique required 2-3 packs. It was hereby concluded that single layer technique was cost effective. Our results were in concordance with all other studies quoted in literature.[5, 7, 12]

Anastomotic leak is the most dreaded premature complication of intestinal anastomosis as it is associated with increased morbidity and mortality rates allied to the surgical procedure. It may increase the duration of the hospital stay two fold and increase the mortality by threefold. Local factors that may predispose to development of anastomotic leak are pathologies, vascular supply, radiation, whereas the systemic factors include malnutrition, diabetes mellitus, anemia, vitamin deficient state, etc.[17] 04 subjects in the single layer group and 03 in the double layer group developed anastomotic leak, the result were same as the study done by Burch et al[18] where leak was seen in 3.1% in single and 1.5% in double layer which was lower than our study. Similarly study by T Shah et al showed leak of 7.7% which was same as our study.

LIMITATIONS

There are few limitations of the study. Firstly the number of the patient considered in the study group are small and secondly the follow up of the study is for short duration.

CONCLUSION

Keeping in mind all the outcome measures such as time taken to construct the anastomosis, length of hospital stay, the incidence of complication like anastomotic leak cost of surgery, it may thus be concluded that single layer anastomosis is preferable, safe and economic technique in comparison to the conventional double layered anastomosis. It may thus be the procedure of choice for surgeons.

REFERENCES

1. Goulder F. Bowel anastomoses: The theory, the practice and the evidence base. World J Gastrointest Surg. 2012; 4(9): 208-213. doi:10.4240/wjgs.v4.i9.208

2. Clatterbuck B, Moore L. Small Bowel Resection. [Updated 2021 Mar 2]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-.

3. Shikata, S., Yamagishi, H., Taji, Y. et al. Single- versus two-layer intestinal anastomosis: a meta-analysis of randomized controlled trials. BMC Surg. 2006; 6(2): 1-7. https://doi.org/10.1186/1471-2482-6-2.

4. Indian Society of Gastroenterology. Indian J Gastroenterol. 2018; 37(Suppl 1):A1-A137. Doi: 10.1007/s12664-018-0911-4.

5. Ajit Kumar, Vinod Kumar. Single layer versus double layer intestinal anastomoses: a comparative study. Int Surg J. 2020; 7(9): 2991-2998. DOI: http://dx.doi.org/10.18203/2349-2902.isj20203782.

6. Sheridan CB, Zyromski N, Matter S. How to always do a safe anastomosis. Contemporary Surgery. 2008; 64(2): 64-74.

7. Kar S, Mohapatra V, Singh S, Rath PK, Behera TR. Single Layered Versus Double Layered Intestinal Anastomosis: A Randomized Controlled Trial. J Clin Diagn Res. 2017; 11(6): 1-15. PC01-PC04. doi:10.7860/JCDR/2017/24817.9983.

8. Garude K, Tandel C, Rao S, Shah NJ. Single layered intestinal anastomosis: a safe and economic technique. Indian J Surg. 2013; 75(4): 290-93. doi:10.1007/s12262-012-0487-7.

9. Hautefeuille P. Reflexions sur les sutures digetives: a propos de 570 sutures accomplies depuis 5 ans au surjet monoplan de monobrin. Chirurgie. 1976; 102: 153–65.

10. Lustosa SA, Matos D, Atallh AN, Castro AA: Stapled versus handsewn methods for colorectal anastomosis surgery: a systematic review of randomized controlled trials. Sao Paulo Med J. 2002, 120: 132-36. 10.1590/S1516-31802002000500002

11. Burch JM, Franciose RJ, Moore EE, Biffi WL andOffner PJ. Single layer continuous versus two layer interrupted intestinal anastomosis: a prospective randomized trial. Ann Surg. 2000; 231: 832-37.

12. Shailja C. Shah, Hamed Khalili, Corinne Gower-Rousseau, Ola Olen, Eric I. Benchimol, Elsebeth Lynge et al Sex-Based Differences in Incidence of Inflammatory Bowel Diseases—Pooled Analysis of Population-Based Studies From Western Countries. Gastroenterology 2018; 155(4): 1079-89. Doi: https://doi.org/10.1053/j.gastro.2018.06.043.

13. Zhou C, Wu XR, Liu XH, et al. Male gender is associated with an increased risk of anastomotic leak in rectal cancer patients after total mesorectal excision. Gastroenterol Rep (Oxf). 2018; 6(2): 137-43. doi:10.1093/gastro/gox039.

14. Rajeev Ranjan Singh, Dolly Rani Singh, Hirday Kumar, Harshitta Gangshetty, Hashwardhan. A Comparative Study

between Single versus Double Layered Bowel Anastomosis in a Tertiary Care Hospital. Int J Med Res Prof. 2019; 5(4); 242-44.

15. Archana A Nema. Comparison study of single layer versus double layer anastomosis in bowel surgery in Western India. New Indian J Surg 2018; 9(3): 286-90.

16. Ankur A, Ravi K. A Comparative Study between Single V/S Double Layered Intestinal Anastomosis. International Journal of Current Research 2020; 12(4): 217-18

17. Chen C. The Art of Bowel Anastomosis. Scandinavian J Surg. 2012; 101:238–40.

18. Bruch JM, Franciose RJ, Moore EE, Biffi WL, Offner PJ. Single Layer continuous verses two layer interrupted intestinal anastomosis: A prospective randomize trial. Annals of surgery. 2000; 231(6):832-37.