

Bowel Anastomosis: Adverse Outcome and Health Expenditures in two age groups

HUMAYUN RIAZ UD DIN HAIDER¹, MASOOD AHMED², SHEHZAD BASHIR³, ABDUL REHMAN ALVI⁴, ZUMRA MAHMOOD⁵, MUHAMMAD KAMAL SUBHANI⁶, MUJAHID HUSSAIN⁷

¹Senior Registrar, DHQ, Gujranwala

²Assist Prof., Department of General Surgery, Allama Iqbal Memorial Teaching Hospital (AIMTH), Sialkot

³Professor of General Surgery, AIMTH, Sialkot

⁴Head of Department of Surgery, DHQ Hospital, Gujranwala;

⁵Resident, Deptt of Gynecology, Lady Willingdon Teaching Hospital, Lahore

⁶HO, King Edward Medical University, Mayo Hospital Lahore;

⁷Assist Prof., Deptt of Biology, FG Degree College (M), Kharian Cantt, Pakistan

Correspondence to Dr. Mujahid Hussain, Email: hmujaheed64@yahoo.com, Cell: 03311287630

ABSTRACT

Background: Risk of bowel problems e.g. colorectal cancer increments with increase in age. Same patterns can be seen on post intestinal anastomotic adverse outcomes and associated health expenditures (by families).

Aim: To compare the post bowel anastomosis complications and incurred fiscal costs in two age groups

Place and duration: Surgical Unit 2, DHQ Hospital, Gujranwala; July 2018 - June 2019

Methodology: Sixty six consecutive emergency patients (aged ≥ 41 years) with bowel problems were registered before group A (41-60) or B (≥ 61 years of age) allocation. The bowel resection was followed by stapler sewn anastomosis in open surgery. On 4th day of surgery, patients were assessed for anastomotic failure, deep organ infection, or redo surgery.

Results: One death and two follow up losing cases left 63 patients for data analysis. The population was male dominated ($N = 45$, 71.4%) with two age groups i.e. A ($M = 43$) and B ($M = 64$ years). The rate of bowel necrosis ranked 1st ($n = 16$). Post-anastomotic complications appeared in overall nine (14.3%) patients. A subject of group B had approximately 4 times more likelihood of the complications (OR = 3.91; 95%CI: 0.896-24.8460, $p = .05$) than subjects of other group. The families of seven patients in group B spent Pak Rs. 221, 520 on complication management.

Conclusion: Post bowel anastomosis complications and associated health expenditures are higher in ≥ 60 than 41-60 years old individuals.

Keywords: Age, Bowel anastomosis, Adverse outcome, Health expenditure

INTRODUCTION

An obstruction or anatomical problem e.g., perforation in the bowel impairs the intestinal physiology, and leads to lengthy fiscal pressure-exerting morbidity.^{1,2} Surgical intervention becomes inevitable on failure of medical management. Delay in surgery or post-operative severe complication increases risk of mortality particularly in patients with unstable initial vital signs. In Pakistan, mortality rate on just colorectal malignancy has contacted 3.50 per 100,000 of populace³.

Clinical affirmation of intestinal problems like Crohn's disease^{1,4} helps in surgical modality provided anesthetist is satisfied. Resection of the pathologically affected segment of intestine is followed by anastomosis⁵ in surgery (open/laparoscopic). The selection of the anastomotic technique depends upon target site, bowel's quality, and underlying disease progression. Outcomes⁶. Sometime, adverse outcomes e.g., peritonitis-driving anastomotic leakage (AL) appear even using cautious techniques. Like other complications, AL has equal chances of appearance after anastomosis in both, prepared or unprepared bowel⁷. However, due expertise is required to differentiate between actual postsurgical complications and sustained aberrant vital signs to avoid any mismanagement. No doubt, the

complications enhance financial burden² on the family beside long hospital stay.

Aging⁸ is supposed to have direct association with vulnerability to diseases, medical resistance, and peri/post-surgery complications on account of accumulation of genetic damage over time. This can be seen in cases of intestinal anastomosis where success rate declines with increasing age group⁹.

Authors of present study could discover just a single Pakistani study¹⁰ on impact of age on adverse outcome of intestinal anastomosis for colorectal cancer in two age groups viz. 60 and 65 years. However, there is no precedence showing two age groups (41-60) and (≥ 61 years) with broad range of diseases along with health expenditures. Present study was intended to address the research hole. The objective of the study was to compare the post intestinal anastomosis complications and treatment expenditures in the study groups. The findings will support the surgeons to understand the significance of age (in terms of complications and incurred cost) in bowel anastomosis.

METHODOLOGY

Present prospective cross sectional work was materialized from July 2018 to June 2019 in the Department of Surgery, DHQ Hospital, Gujranwala (Pakistan) after getting approval from the hospital ethics committee.

Received on 29-07-2019

Accepted on 17-11-2019

A total of 66 patients i.e.60 (sample size using z^2pq/d^2 , $p = 18\%$ derived from secondary data of the study setting) +6 (expected drop out @ 10% of the sample)were considered for study. Consecutive patients (aged ≥ 41 years) admitted with intestinal perforation, necrosis, peritonitis, bleeding, enteritis, diverticular disease, Crohn's disease, ulcerative colitis, or unrelieved intestinal obstruction for emergency surgery were registered using purposive sampling technique. However, all those who had history of redo surgery, multi anastomoses or metastasized carcinoma; refused to give participation consent; or assessed as medically unfit for surgery (American Society of Anesthesiologists-adopted category III or above) were excluded. Thirty three patients were enrolled in each of the two study groups i.e. A (41-60) and B (≥ 61 years of age).

Observing antiseptic measures, the bowel resection technique¹¹and anastomosis (with stapler-sewn ligation) varied case to case in open surgery.Hemostasis was secured beside abdominal lavage while abdominal wall was closed with proline 1/0 after placement of close-vacuum drain system at perianastomotic siteto detect(vide leakage score)⁵ any leakage. The skin was closed with proline 2/0 and drain was removed after complete recovery.

The indication of surgery remained same throughout the study while age was not a contraindication for resectional operation. The postoperative follow up sessions remained for six months while complications (early/late) were addressed as per hospital protocols. On 4th day of surgery, patients were shifted to ward and assessed for anastomotic failure, deep organ infection and redo-surgery. Similarly, sociodemographic information and health expenditures(by families) incurred on complications were recorded on appropriate time.

Chi-squared test was applied to see level of difference between rate of a postoperative complication in study groups. Similarly, risk estimates of the adverse outcome were noted to see which group had more likelihood of the complications. A p -value ≤ 0.05 was taken as significant while data was processed in SPSS ver. 25.

RESULTS

Elimination of three subjects i.e. two follow up losing and one death left 63 (i.e. 95.4% of total 66) for data analysis in SPSS. Population was male dominating ($n = 45$, 71.4% of 63) while group wise age statistics were found, as: A ($M = 43$, $SD = 4.48$; range 34-50 years) and B ($M = 64$, $SD = 5.45$; range 54-70 years) after verification from computerized National Identity Card. Similarly, 34 (54%) patients with normal health qualified the American Society of Anesthesiologists-adopted category I and 29 (46%) with mild systemic disease belonged to one step higher category II.On clinical findings, the rate of the cause of colorectal problem was noted, as: 16(25.4%) for necrosis, 13(20.6%) for enteritis/tuberculosis, 11(17.5%) for perforation, and 10(15.9%) for obstruction. Similarly, cases of large bowel were predominant 45(71.4%). All the cases were of intestinal walls as there was no evidence of vascular impairment..

After surgery for bowel, adverse outcome appeared in 9(14.3% of 63; A = 2 and B=7) patients as shown in Table 1.The rate of early (within 30 days) and late (after 30 days

of surgery) complications was found to be 6.3 and 8.0%, respectively. A patient of Group B had approximately 4 time more risk of the complications (OR = 3.91; 95% CI:.896-24.8460, $p = .05$) than patients of group A (23.3 vs. 6.1%, respectively). Similarly, group B was also prominent with 4 subjects of multiple adverse outcomes. However, insignificant difference in the rate was seen with the context of anastomotic leak, wound infection, digestive bleeding, anastomotic stricture or intra-abdominal abscess using 2x2 cross tabulation and Pearson's chi square test ($p > .05$). Three (10%) patients of group B underwent unpleasant experience of redo surgery on development of unmanageable complications. One subject of group B died within 30 days of the operation on account of co-morbidities and not the post activity inconvenience as per hospital record.

Bar diagram (Fig. 1) indicates rate of hospital stay or financial expenditures on adverse outcome. Out of the 5 patients facing long hospital stay on adverse outcomes of the bowel surgery, 4 (80%) belonged to group B. The patients had to bear an additional fiscal burden amounting Rs. 240, 000 on the complications; predominantly i.e. Rs. 221, 520 (92.3% of the total) by seven patients of group B. A patient (with complications) of group B had approximately 9 (95%CI: 15.78–27.34, $p < .001$) time more likelihood of fiscal burden than complicated cases of group A to manage the postoperative problems.

Fig. 1: Rate of long hospital stay or financial expenditures on adverse outcome

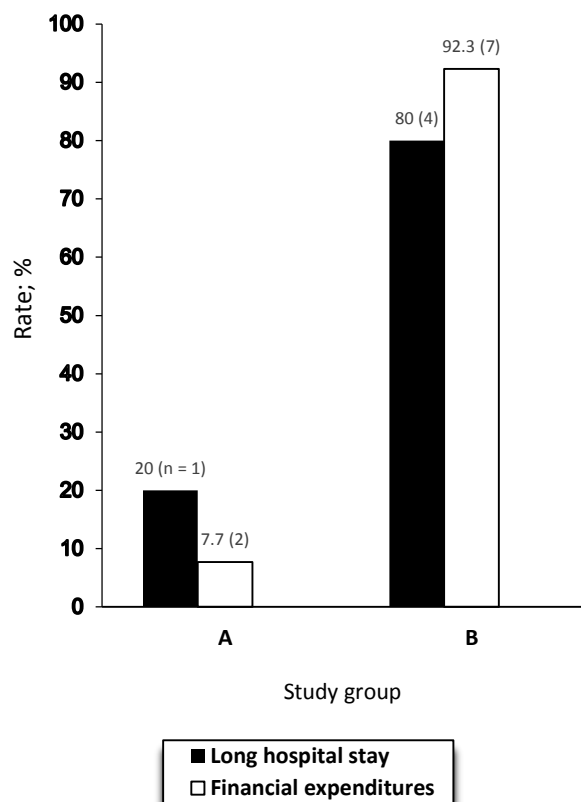


Table 1. Statistics of adverse outcome in patients underwent bowel anastomosis (n=63)

Variable	Rate (n)	p*/risk estimates
Adverse outcome; overall	14.3 (9)	
Adverse outcome (group wise)		
Group A (N = 33)	6.1 (2)**	OR = 3.91; 95%CI: .896- 24.8460, p = .05
Group B (N = 30)	23.3 (7)***	
Anastomotic leak		
A	3.0 (1)	0.15
B	13.3 (4)	
Wound/deep organ infection		
A	3.0 (1)	0.27
B	10 (3)	
Bleeding		
A	0 (0)	0.10
B	10 (3)	
Anastomotic stricture		
A	0 (0)	0.48
B	3.3 (1)	
Intra-abdominal abscess		
A	3.0 (1)	0.46
B	6.7 (2)	
Redo surgery		
A	3.0 (1)	0.27
B	10.0 (3)	

*One-sided on Fisher's Exact test, **One/ ***4 with multiple adverse outcomes

DISCUSSION

Losing the follow up sessions^{4,12} excludes the subject from any study. In contrast to a similar published study¹³ on irritable bowel syndrome, higher rate of males (45 out of 63) in present study marks some differences in underlying determinants like genetics, endocrinology, and/or life style. Preanesthetic assessment¹⁴ acts as pivot of patient's optimization considering only patients with American Society of Anesthesiologists-adopted category I or II. On the other side, diagnosis of intestinal necrosis in comparatively higher awaiting cases (i.e. 16) is inconsistent with life expectancy data with Pakistan's perspective.³ Poor health care aptitude and/or socioeconomic factors might be responsible for this finding. Luckily, none of the patients had intestinal vascular impairment – a predictor¹⁵ for high risk cardiovascular disease(s). The cardiac patients deserve well preparation before emergency open bowel anastomosis.

The rate of early postoperative complications in present study (i.e. 6.3%) on evidence-based operative decision was found lower than a reported finding (i.e. 27.5%).^{6,16} The credit goes to the health care professionals and patients. Recording of 4-time more chance of the adverse outcome in elderly than younger patients is somewhat consistent with age-oriented investigation¹⁷ indicating anastomotic leakage (AL) after anterior resection anastomosis for rectal cancer. However, technique is better with respect to oncologic outcomes.^{11,18,19} Actually, comorbidities, medicinal resistance and ageing^{8,9,10} make the patient vulnerable to the complications. However, post-surgery oral intake has no negative implications including peritonitis-leading leakage.^{7,20} Adverse outcomes especially of multiple nature triggers perception of poor health care in the sufferers especially psychologically compromised

elderly patients. The death of a few patients of present study by comorbidities is opposite to a Pakistani study²¹ showing leakage as the cause of mortality. Sometime colostomy reversal becomes inevitable at high morbidity level²².

Prolong hospital stay increases hospital-acquired infections beside disruption of patient flow and access to care due to bed shortages.^{2,23} Postoperative complications increased the fiscal burden as seen (Rs. 240, 000) in present investigation similar to a Brazilian study²⁴ showing substantial amount incurred on anastomotic leakage. The local pricing mechanism is one of the determinants of the costs.

CONCLUSION

The rate of post anastomosis adverse outcomes and incurred health expenditures are higher in elderly group than younger one. Moreover, anastomotic leakage was found as the most prevalent complication. More studies are necessitated for broad spectrum applicable findings. The age of the patient should be kept in mind before bowel anastomosis.

Grant Support & financial Disclosures: None
Conflict of interest: None

REFERENCES

- Catena F, Simone B, Coccolini F, et al. Bowel obstruction: A narrative review for all physicians. *World J Emerg Surg* 2019; 14:20.
- Tuppini P, Rivière S, Deutsch D, et al. Burden of drug use for gastrointestinal symptoms and functional gastrointestinal disorders in France: a National study using reimbursement data for 57 million inhabitants. *Therap Adv Gastroenterol* 2019;12:1756284819853790.
- World Health Organization (WHO). World Health Report 2017 Colon-rectum cancers; Pakistan. Geneva, Switzerland [Internet]. [Cited 2019 November 29] Available from: <http://www.worldlifeexpectancy.com/pakistan-colon-rectum-cancers>
- Chandra R, Moore JW. The surgical options and management of intestinal Crohn's disease. *Indian J Surg* 2011;73(6):432–438.
- Yang SU, Park EU, Baik SH, et al. Modified Colon Leakage Score to Predict Anastomotic Leakage in patients who underwent left-sided colorectal surgery. *J Clin Med* 2019; 8(9):1450.
- Goulder F. Bowel anastomoses: The theory, the practice and the evidence base. *World J Gastrointest Surg*. 2012;4(9):208–213.
- Tahirkheli MUI, Shukr I, Iqbal RA. Anastomotic leak in prepared versus unprepared bowel. *Gomal J Med Sci* 2013; 11(1):73–77.
- Lim YK, Jackson C, Dauway EL, et al. Risk factors for adverse outcome for elderly patients undergoing curative oncological resection for gastrointestinal malignancies. *ViscMed*. 2017;33(4):254–261.
- Zaimi I, Sparreboom CL, Lingsma HF, et al. The effect of age on anastomotic leakage in colorectal cancer surgery: A population-based study. *J Surg Oncol* 2018;118(1):113–120.
- Khan MR, Bari H, Zafar SN, et al. Impact of age on outcome after colorectal cancer surgery in the elderly - a developing country perspective. *BMC Surg* 2011;11:17.
- Iodice F, Casella G, Laurelli G, et al. Techniques of bowel resection and anastomosis: the way we do it. *CME J Gynecol Oncol* 2003; 8:245–250.

12. Murakami Y, Lee BW, Duncan M, et al. Racial and ethnic disparities in adherence to glaucoma follow-up visits in a county hospital population. *Arch Ophthalmol*. 2011;129:872–878.
13. Kim YS, Kim N. Sex-gender differences in irritable bowel syndrome. *J NeurogastroenterolMotil*. 2018;24(4):544–558.
14. Levy N, Grocott MPW, Carli F. Patient optimization before surgery: a clear and present challenge in peri-operative care. *Anaesthesia* 2019; **74**(Suppl 1.): 3–6.
15. Gollapudi LA, Mehta D, Yandrapalli S, et al. Tu1416 Chronic vascular insufficiency of intestine and its association with cardiovascular risk factors: Nationwide inpatient sample survey. *Gastroenterol* 2016; 150(4):S899.
16. Gutiérrez A, Rivero M, Martín-Arranz MD, et al. Perioperative management and early complications after intestinal resection with ileocolonic anastomosis in Crohn's disease: analysis from the practicrohn study. *Gastroenterol Report* 2019; 7(3):168–175.
17. Zhou S, Zhou H, Zheng Z, et al. Predictive risk factors for anastomotic leakage after anterior resection of rectal cancer in elderly patients over 80 years old: An analysis of 288 consecutive patients. *World J Surg Oncol* 2019;17:112.
18. Park JS, Park SY, Kim HJ, et al. Long-term oncologic outcomes after neoadjuvant chemoradiation followed by inter-sphincteric resection with coloanal anastomosis for locally advanced low rectal cancer. *Dis Colon Rectum* 2019; 62(4):408–416.
19. Fields AC, Scully RE, Saadat LV, et al. Oncologic outcomes for low rectal adenocarcinoma following low anterior resection with coloanal anastomosis versus abdominoperineal resection: a National Cancer Database propensity matched analysis. *Int J Colorectal Dis* 2019; 34(5): 843–848.
20. Ahmad M, Qayyum A, Akhtar M, et al. Safety of early versus delayed enteral feeding following ileostomy closure: Randomized controlled trial. *Khyber Med Univ J* 2013; 5(4): 195–198.
21. Sultan R, Chawla T, Zaidi M. Factors affecting anastomotic leak after colorectal anastomosis in patients without protective stoma in tertiary care hospital. *J Pak Med Assoc* 2014; 64:166–170.
22. Khan S, Alvi R, Awan Z, et al. Morbidity of colostomy reversal. *J Pak Med Assoc* 2016; 66(9):1081–1083.
23. Toh HJ, Lim ZY, Yap P, et al. Factors associated with prolonged length of stay in older patients. *Singapore Med J* 2017;58(3):134–138.
24. Junior UR, Tayar DO, Ribeiro RA, et al. The Clinical and Economic Burden of Colorectal Anastomotic Leaks: Middle-Income Country Perspective. *Gastroenterol Res Practice* 2019; 2019:7