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Original Article

Comparison of Anastomotic Leakage in Interrupted Versus Continuous Single Layer Extramucosal Anastomotic Techniques in Jejunum

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ABSTRACT

Objective: To compare the frequency of anastomotic leakage in interrupted versus continuous, single layer extramucosal anastomotic techniques in jejunum.
Study Design: Quasi-experimental study.
Place and Duration of Study: Combined Military Hospital, Multan Pakistan, from Feb 2020 to Feb 2021.
Methodology: Patients aged 15-60 years, from the indoor surgical department of the hospital who required jejunal anastomosis were selected. Patients were categorized as Group-A (interrupted single layer extra mucosal anastomosis) or Group-B (continuous single layer extra mucosal anastomosis).
Results: The mean age was 43±9.5 years in Group-A and 41.6±10.1 years in Group-B. Eighteen patients (56.3%) in Group-A and 21(65.6%) in Group-B were male while 14 patients (43.67%) in Group-A and 11(34.4%) in Group-B were females. Frequency of anastomotic leakage was recorded as one patient (3.13%) in Group-A and 3(9.38%) in Group-B while rest of the patients in both groups had no anastomotic leakage (p=0.302). Chi square test was applied, which showed statistically insignificant difference between the two groups (p=0.32)
Conclusion: Comparatively higher frequency of anastomotic leakage was recorded in patients treated with continuous as compared to interrupted suturing but the results were statistically insignificant.

Keywords: Anastomotic leak, Intestine, Surgical anastomosis, Suture techniques.

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INTRODUCTION

Intestinal anastomosis is a common surgical operation performed in both emergency and elective settings, and gut anastomotic leakage is a life-threatening complication. Many factors influence the success of this surgery e.g. the part of gut being anastomosed and the contamination in the peritoneal cavity. In any case, a technically satisfactory repair of the gut is the key to successful outcome of gut surgery.[1,2]

Today, single layer extra-mucosal anastomosis is the most popular and accepted method for gastrointestinal surgery.[3] It causes the least tissue necrosis and minimum luminal narrowing.[4] In contrast to double layered anastomosis, this technique, by employing extramucosal suture, allows for precise apposition, integrates the gut's strongest layer (submucosa), and produces the least amount of damage to the submucosal vascular plexus and lumen disruption.[5] Many international and Pakistani studies have compared the single layer technique with double-layer anastomosis.[6] Nearly all studies have supported adoption of single-layer suturing techniques in terms of complication rate, cost-effectiveness, and time consumed during surgery.[7]

Single layered anastomosis is carried out in two ways; continuous or interrupted. Although it has been stated that continuous single layer approaches are preferable to interrupted techniques, relevant supporting evidence is lacking. Both techniques of single layer suturing have been compared with double layer technique mostly but the comparison between these two techniques of single layer suturing has been studied very sparsely within Pakistan,[8-10] as well as transnationally.

We planned this study to investigate which technique of anastomosis is associated with lesser rate of leakage so that some practical recommendations could be made to reduce morbidity and mortality of

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patients and encourage surgeons to adopt a better technique for jejunal anastomosis.

METHODOLOGY

The quasi-experimental study was conducted at Combined Military Hospital, Multan Pakistan, from February 2020 to February 2021 after approval from the hospital Ethical Review Committee. The sample size calculated by World Health Organization Sample Size calculator taking anastomotic leakage frequency in continuous single layer anastomosis was 1.5% and anastomotic leakage frequency in the interrupted single layer anastomosis was 25%.[11]

Inclusion Criteria: All patients aged 15-60 years admitted in the indoor surgical department of the hospital who required jejunal anastomosis were selected.

Exclusion Criteria: Patients with Diabetes Mellitus, expected carcinomas, autoimmune disease, or gut tuberculosis, those on long term steroid therapy, systolic blood pressure ≤90 mm Hg, patients with hemoglobin ≤10 gm/dL and those with gut contents >1000 mL or pus in peritoneal cavity or any amount of colonic contents in peritoneal cavity were exluded.

Written consent was taken from all inductees. Patient underwent surgery under general anesthesia. The surgery was performed by surgeons having ≥2 years of experience in gastrointestinal surgery. Patients were categorized as Group-A or Group-B. Patients in Group A had a single layer extramucosal anastomosis that was interrupted and Group-B included the patients who underwent continuous single layer extramucosal anastomosis of jejunum. A box with similar envelops secretly coded as A and B was presented to each patient to pick one envelope and enter Group-A or Group-B accordingly (Figure). When first patient entered the either group (A or B) after picking the envelop blindly, the next patient was allocated to the opposite group. A proforma was developed to record patient's name, hospital registration number, background variables (age, gender, occupation), group to which patient belonged i.e. A or B, post-operative course, and whether the anastomosis leaked or not.

Data was analyzed using Statistical Package for Social Sciences v 20.0. Categorical variables (gender, number of cases with anastomotic leakage) were expressed in frequencies and percentages. Numerical variable i.e. age was expressed in mean and standard deviation. To compare the anastomotic leakage in both groups, Chi-square test was used. The *p*-value of ≤ 0.05 was considered statistically significant.

RESULTS

The mean age of our subjects was 43±9.5 years in Group-A and 42±10.1 years in Group-B. Age distribution of the patients showed that majority of the patients i.e. 14(43.76%) in Group-A and 16(50%) in Group-B were between 41-50 years (Table-I).

Gender distribution showed that 18(56.3%) patients in Group-A and 21(65.6 %) in Group-B were male while 14(43.7%) patients in Group-A and 11(34.4%) in Group-B were females.

Frequency of anastomotic leakage was recorded as one (3.13%) in Group-A and three (9.38%) in Group-B while rest of the patients in both groups had no anastomotic leakage. On using Chi Square test of association, the *p*-value came to 0.302, which shows insignificant difference (Table-II).

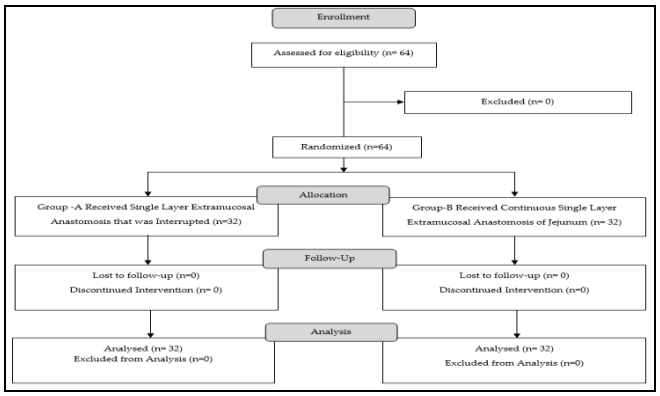

Figure: Patient Flow Diagram (n=64)

Table-I: Age Distribution of the Study Sample (n=64)

Age (in years)	Group-A (Interrupted) (n=32)	Group-B (continuous) (n=32)
	n (%)	n (%)
15-30	3(9.37)	5 (15.62)
31-40	8(25)	6(18.76)
41-50	14 (43.76)	16(50)
51-60	7(21.87)	5(15.62)

Table-II: Frequency of Anastomotic Leakage among the Study Groups (n=64)

Anastomotic leakage	Group-A (interrupted) (n=32)	Group-B (Continuous) (n=32)	*p*-value
	n(%)	n(%)	
Yes	1(3.13)	3(9.38)	0.302
No	31(96.87)	29(90.62)	

DISCUSSION

The use of one or two layers of sutures for anastomosis of the gut, as well as continuous or interrupted approach, are two features of intestinal suturing technique that have stayed contentious over the past two decades. According to some recent research, single-layer continuous anastomosis with monofilament sutures takes less time and funds than other approaches, with no increased risk of leakage10-12 but controversy regarding continuous versus interrupted technique of suturing still exists.

In our study, frequency of anastomotic leakage was recorded in 1(3.13%) in Group-A and 3(9.38%) in Group-B while rest of the patients in both groups had no anastomotic leakage. Though there were more patients in Group-B but it did not show any significant difference, as the calculated *p*-value was 0.302. The findings of our study are in disagreement with most of the similar studies published earlier. Mahboob *et al*.[8] compared the two suturing techniques in Sahiwal and observed that continuous suturing was better than interrupted suturing in terms of duration of surgery (12.15±1.40 versus 20.98±1.38 minutes), wound dehiscence (6.7% and 13.3%), wound infection (16.7% and 20%), and mortality (3.3% and 6.7%.). Hussain *et al*.[9] reviewed and compared the two methods and found a favorable results for continuous suturing in terms of duration of surgery (10.04 minutes versus 19.2 minutes) and wound dehiscence (4.2% versus 7.7%). Mirza *et al*.[12] reported that single layer continuous serosubmucosal gut anastomosis was observed with less incidence of anastomotic leakage and septic complications and this suturing technique was safe and effective at various sites of gut anastomosis. The continuous suturing group had considerably decreased mean operation time, postoperative drainage quantity, stay in the hospital after operation, and entire expenses on the treatment, according to Ramalingam *et al*.[13] (186 min versus 219 min, 108 mL versus 175 mL, 2.7 days versus 4.6 days, and 1031 USD versus 1101 USD respectively). On the contrary, Memon *et al*.[10] described greater incidence of anastomotic leakage in continuous single layer suturing (8.4% versus 6.89%) similar to our results. The most of these reports did not show a substantial difference in the observed frequencies except the study by Ramalingam *et al*.[13] therefore, to arrive at a strong conclusion is not appropriate at this point in time based on previous results, nevertheless, we suggest a continuous single-layer suturing technique for gut anastomosis if wound dehiscence is the primary priority.

Intestinal anastomosis is used to restore bowel continuity after the removal of an unhealthy intestine and to sidestep an unresectable damaged gut. Appropriate exposure and approach, careful manipulation of the intestine, proper hemostasis, approximation of well-vascularized gut, nonexistence of stress during anastomosis, competent surgical competence, and avoidance of fecal contamination are the principles of effective intestinal anastomosis.[14] The failure of the anastomosis is the most feared early outcome of intestinal anastomosis. Systemic illnesses that enhance the likelihood of anastomotic escape include anemia, diabetes mellitus, malnutrition with hypoalbuminemia, vitamin deficiencies, and steroid treatment.[15] Poor healing and anastomotic leak are linked to local variables as well such as irradiation of the bowel, anastomosis including disease-affected gut, poor suturing technique, and insufficient blood supply.[16] Patients may develop fever, abscess, septicemia, metabolic abnormalities, or multiple organ failure if the luminal contents leak into the abdominal region. As a result, anastomotic leakage is one of the leading reasons of death and ill health following surgery.

Simple (continuous) or interrupted sutures can be used to create an intestinal anastomosis. A continuous suture takes less time and results in a more watertight suture line with superior hemostasis.[17-21] The whole suture line, on the other hand, is made up of a single stitch. According to animal research, anastomotic blood flow and perianastomotic oxygen pressure are low after a continuous suture, ensuing in slower healing and greater complication rates.[8]

The findings of this study and the related literature thus supports the impression that continuous suturing technique is relatively similar in terms of side effects to interrupted suturing technique, however, it should be favored over the interrupted suturing technique for gut surgery because of relatively lesser anastomotic leakage. Relatively contradictory results in our study in contrast to other Pakistani studies highlight the possibility of marked variation in results and thus demand further exploration with large samples and strict patient selection criteria to minimize the influence of confounders.

LIMITATION OF STUDY

Long-term follow up was required to assess the late complications of intestinal anastomosis, such as bowel stenosis, stricture or obstruction.

CONCLUSION

Comparatively higher frequency of anastomotic leakage was recorded in patients treated with continuous suturing as compared to interrupted suturing but the results were statistically insignificant.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MAK & ZH: Data acquisition, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

SBA & ZAS: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

FAM & SMW: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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