

A Prospective Study to Evaluate the Single Layer Hand Sewn Bowel Anastomosis using Hybrid Technique of Interrupted Connell Suture and Traditional Interrupted Suture

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Abstract: Background: Many techniques of intestinal anastomosis have evolved over time but, the hand - sewn suturing technique remains the mainstay because of its easy availability, affordability of suture material and familiarity of the procedure. Recently, single - layer continuous anastomosis using monofilament suture has been adopted by many surgeons due to its reported cost - effectiveness, less time consumption, and leakage rates comparable to double - layer anastomosis. Therefore, the present study was conducted for evaluating the single layer hand - sewn bowel anastomosis using the hybrid technique of interrupted Connell suture and traditional interrupted suture. Material and methods: This Study included 30 patients who underwent single layer hand sewn bowel anastomosis using hybrid technique of interrupted Connell and traditional interrupted suturing using silk suture. Traditional interrupted sutures and modified Connell in the form of interrupted sutures were applied in the pattern of suitability for perfect apposition of the gut and this pattern was recorded in each case. Results: The incidence of bowel anastomosis was lower in females when compared to males. The maximum number of bowel anastomosis (30%) was performed in the age group of 21 to 30 years. 25 patients had small bowel to small bowel (ileoileal) anastomosis, 4 subjects had small bowel to large bowel (ileocolic) anastomosis and only one patient had colocolic (large bowel to large bowel) anastomosis. Elective surgical procedure was performed on 77% of the patients. The mean hospital stay was 10.56 ± 3.56 days. None of the patient had chest infection and fecal fistula after bowel anastomosis. Only one patient had an anastomotic leak, which necessitated re - operation, extending the hospital stay to 25 days. Conclusion: The hybrid anastomotic technique used in this study proved to be highly efficient in providing good intraoperative bowel apposition and post operative surgical outcome.

Keywords: Bowel anastomosis, Connell suture, Traditional interrupted suture, anastomotic leak

1. Introduction

Historically, two - layer continuous bowel anastomosis has been the conventional method for most surgical situations. It is tedious, time - consuming with the potential risk of anastomotic stricture formation. Recently, single - layer bowel anastomosis using monofilament suture has been adopted by many surgeons due to its reported cost - effectiveness, less time consumption, and comparable leak rates to the double - layer method. [1]

Traditional Connell suture is a continuous, inverting suture pattern that penetrates the serosa, muscularis externa, submucosa, and lumen. [2] For all the intestinal anastomosis, the mesenteric edge of the bowel is the most difficult, especially when fatty mesentery is present, therefore the first suture is placed at the mesenteric border with the final sutures being inserted at the antimesenteric border. [3]

Suture bites are taken 3 - 5mm apart depending on the thickness of the bowel.

Healing of a well - constructed anastomosis depends on the preoperative nutritional state of the patient, the intra - abdominal inflammatory reaction at the time of the surgical procedure and the vascular supply of the anastomosis. In case of discrepancy in the size of the proximal and distal

ends of the anastomosing loops, a Cheatle split is given in the antimesenteric border which helps to enlarge the [4] distal collapsed bowel lumen and allow end to end anastomosis. Therefore, the present study was conducted for evaluating the single layer hand - sewn bowel anastomosis using the hybrid technique of interrupted Connell suture and traditional interrupted suture.

2. Materials and methods

This Study included 30 patients who underwent single layer hand sewn bowel anastomosis using hybrid technique of interrupted Connell and traditional interrupted suture. Traditional interrupted sutures and modified Connell in the form of interrupted sutures were applied in the pattern of suitability for perfect apposition of the gut and this pattern was recorded in each case. Leakage proof patency of the anastomosis, inversion for exact apposition and tubular shape of anastomosed bowel was ensured at the end of each case. The study was conducted after approval from Institutional Ethical and Thesis Committee. A written informed consent was taken from all the patients undergoing bowel anastomosis.

In this study, we used hybrid of interrupted Connell suture and traditional interrupted suture technique as a hand sewn single layer for bowel anastomosis. A Connell stitch is an inverting suture which is passed through all the coats of bowel,

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That is it penetrates the serosa, muscularis externa, submucosa and mucosa. It is basically a surface to surface, mucosa to mucosa but loop on mucosa stitch. It was done using a non - absorbable suture silk no.2 - 0 (round body). In this study, first interrupted Connell stitch was placed at the mesenteric border (12'o clock position) of the anastomosing gut loops and the rest of the interrupted Connell sutures along with the traditional interrupted sutures were placed as per the suitability for the perfect apposition of the two ends of the anastomosing gut loops in each individual case.

The pattern of the suture placements of this hybrid technique was recorded in each case as:

- 1) Total number of sutures applied
- 2) Number of interrupted Connell sutures applied
- 3) Additional suture required (if any) Inclusion criteria:
 - Patients of all age groups and gender requiring bowel anastomosis for distal continuity of bowel (end to end, end to side, side to side or others.)
 - Ileostomy closure
 - Colostomy closure
 - Intestinal obstruction requiring resection and anastomosis.

Exclusion criteria: none

3. Results

The maximum number of bowel anastomoses (30%) was done in the age group of 21 to 30 years followed by (26.7%) in the age group of 31 - 40 years. Age group from 1 - 10 years and 41 - 50 years had minimum number of bowel anastomosis cases 3.33% each. The mean age was 36.26 +16.09 years. The study population consisted of 20 males (66.7%) and 10 females (33.3%). The maximum percentage of patients undergoing bowel anastomosis were old case of Diversion Ileostomy. The rest of the distribution based on diagnosis included diagnosis of Carcinoma Caecum, Ileocaecal Mass, Ileocaecal Tuberculosis and Strangulated Hernia. (3.3% each). Out of a total of 30 cases, 21 patients were of Ileostomy closure, 5 patients of resection and primary/ secondary anastomosis and remaining 4 patients of right hemicolectomy for bowel anastomosis.

In 10 out of 30 patients the surgical procedure was done under General Anesthesia and remaining 20 were done under Spinal Anesthesia. Out of 30 patients, 25 patients had small bowel to small bowel, 4 patients had small bowel to large bowel and one patient had large bowel to large bowel anastomosis.

The average number of total sutures placed in each patient was approximately 14 and the average number of interrupted Connell sutures were 8 out of 14. Out of a total of 30 subjects, 23 patients underwent elective surgical procedures and the remaining 7 patients were operated under emergency. The results showed that only 2 subjects (6.7%) out of 30 were positive for Diabetes Mellitus and similarly only 2 were positive for Hypertension at the time of preoperative investigations.

23 out of thirty subjects (76.7%) required Blood Transfusion in supportive care therapy with no patient requiring total

parenteral nutrition. Eight patients (26.7%) out of 30 were in intensive care unit after surgical bowel anastomosis. All the patients (100%) were given postoperative Physiotherapy.

The data collected post - operatively revealed, post operatively abdominal distension in two patients (6.7%), guarding/rigidity in one subject (3.3%), bilious drain content in one subject (3.3%), similarly high drain volume in one subject in comparison to low drain volume in remaining subjects. Post operative drain content was serous in 28 subjects while only 1 patient had pus as drain content post operatively. Post operative fever was observed in 5 subjects. None of the patient had chest infection and fecal fistula after bowel anastomosis. However, only in one patient (3.3%) out of 30, anastomotic leak was present as suggested by development of abdominal distension with guarding/rigidity, high drain volume, bilious drain content and post operative fever.

The mean days of bowel sound heard in this study was found out to be 3.21+0.62, the mean days of bowel opening was 3.90+0.90, the mean days of oral feeds started post - operative was 3.83+0.65. it was also observed that the mean drain days post - operatively was 5.55+ 1.45 and the mean Ryle's tube duration days was 3.17+0.65. The result showed that the need for re - operation was non - significant as they showed that that only one patient required the re - operation. The patient's hospital stay was 10.96 + 3.51 days.

4. Discussion

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 in emergency as well as elective setting.

The basic principles of intestinal suture were established more than 100 years ago by Travers, Lembert and Halsted and have since undergone little modification. The present study assessed clinical effectiveness of hybrid technique of interrupted Connell suture and traditional interrupted suture in single layer hand sewn bowel anastomosis as well as to study the incidence of complications of anastomotic failure following anastomosis.

The present study was done on thirty subjects (20 males and 10 females) of different age groups requiring bowel anastomosis for continuity of bowel. The male to female ratio was 2: 1.

In the present study, maximum incidence of bowel anastomosis was in the age group 21 - 30 years followed by 31 - 40 years. The mean age was found out to be 36.26 years. The mean age of patients [5], [6], [7] in other studies was comparable, approximating at about 44 years.

In our study, the maximum percentage of patients undergoing bowel anastomosis were cases of Diversion Ileostomy (70%). The results were similar to the previous studies by Memon JM et al [8] [9] (2015) and Kar S et al (2017). In our study 70% had ileostomy closure. However,

in the [9] randomized clinical trial conducted by Kar S et al (2017) only 26% patients had ileostomy closure. The reason for higher percentage of ileostomy closure in our study was probably due to the increased frequency of creation of protective loop ileostomy for subsequent healing of distal anastomosis.

In this study, all the patients had end - to - end anastomosis, out of which 25 cases had small bowel to small bowel anastomosis, 4 cases had small bowel to large bowel anastomosis and only 1 case had large bowel to large bowel anastomosis. Out of 25 patients who underwent small bowel to small bowel anastomosis, 21 were ileoileal anastomosis for ileostomy closure and 4 were ileoileal anastomosis following bowel resection. This was due to prevailing pattern of protective loop ileostomy creation for subsequent healing of distal anastomosis. Mesenteric defect was closed in each case of bowel anastomosis. Results were comparable to studies conducted by Abramowitz HB, Butcher HJ [10] and Kusunoki M et al [5] (1971) (1998)

In our study, 23 surgeries were elective and 7 were emergency procedures. Many previous studies have been conducted to assess the effectiveness of sutures techniques in both emergency and elective [11], [12], [13] [14] bowel anastomotic surgical procedures. Herrle F et al (2016) evaluated the incidence of postoperative complications depending on anastomosis technique by enrolling elective cases only.

Patients with co - morbidities like diabetes mellitus, hypertension, Tuberculosis, HIV, HBsAg and HCV were included in this study. Previous studies had anticipated impaired healing in the presence of co - morbidities. [15], [16]

In the present study, 10 out of 30 surgical procedures were done under General Anesthesia and remaining 20 under Spinal Anesthesia. Aitkenhead, Wishart and Peebles Brown (1978) found that the frequency of anastomotic dehiscence following colonic resection in patients receiving general anesthesia using a nitrous oxide oxygen - relaxant technique was 23% compared with 7.4% in patients whose operation had been performed under spinal nerve block and light general anesthesia, although this difference in anastomotic breakdown rate was not statistically significant [17], [18].

In this study, the average number of days after surgery when bowel sounds were heard were 3.21 days, and the average number of days after surgery for bowel opening were 3.90 days. The average number of days for start of oral feeds after surgery was 3.83 days, and the average duration of drain in situ was 5.55 days. When compared to previous studies, our findings showed a lower number of postoperative hospital stay days. Only one patient with anastomotic disruption had a longer hospital stay, which was consistent with earlier studies. [5], [13]

In this study, 23 patients required blood transfusions and all of the patients received postoperative physiotherapy. Many previous studies suggested that good supportive care is essential for better outcomes. [19], [20], [21]

In the present study, only 1 patient (3.3%) who underwent emergency bowel anastomosis procedure had an anastomotic leak and had to undergo reoperation. The leak was diagnosed on the post - operative day 2 when the drain volume was high with bilious content and the patient exhibited fever, abdominal guarding and abdominal rigidity with absent bowel sounds. The age of patient was 65 years. The patient had anemia, septicemia, hypoproteinemia and was malnourished with deranged electrolytes. The possible reason of sepsis in this patient could be attributed to the late presentation to hospital. The patient had multiple peri - operative blood transfusions and was also given intermittent supplemental oxygen due to associated perioperative hypoxia. In contrast, intraoperatively the bowel ends to be anastomosed were healthy with no signs of ischemia, necrosis, gangrene or any intraabdominal collections and therefore bowel anastomosis was performed using combination of interrupted Connell and traditional interrupted sutures in a single layer suitably and confirming proper apposition during surgery. Hence, the various risk factors associated with the patient could be the cause of anastomotic leak in this case rather than the technique of bowel anastomosis used. This hybrid suturing technique of interrupted Connell and traditional interrupted sutures provided excellent outcome in other 29 patients undergoing bowel anastomosis.

Healing process in gastrointestinal tract proceeds through same stages as wound healing elsewhere in body. Several factors like blood supply, less damage to submucosal venous plexus, excessive inversion of tissue may be responsible for good outcome in single layer anastomosis. Bowel anastomosis is only a physical apposition and its healing also depends upon the physiological and biochemical parameters of the patient. Though anastomotic technique is the most important determinant of outcome, but in our study the possible reason for anastomotic leak may be due to the presence of other risk factors and not just the anastomotic technique.

5. Conclusion

We conclude that the hybrid anastomotic technique used in this study proved to be highly efficient in providing good intraoperative bowel apposition and post operative surgical outcome.

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