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**Original Article**

# Horizetal matress suture for intestinal anastomosis

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## ABSTRACT

***Objective:*** *Investigating the use of a new horizontal mattress suture anastomosis technique for patients who have undergone emergency or elective intestinal anastomosis.*

***Methods:*** *A total of 200 patients were included in the study, 100 managed with horizontal mattress suturing techniq and 100 were treated with traditional double layer method. Main variables of study were anastmosis time, hospital stay, CRP, post operative infection, anastomosis leakage, reintervention and readmission in hospital.*

***Results:*** *A total of 200 patients were included in the study, 100 managed with horizontal mattress suturing techniq and 100 were treated with traditional double layer method. Main variables of study were anastmosis time, hospital stay, CRP, post operative infection, anastomosis leakage, reintervention and readmission in hospital.*

***Conclusion:*** *Horizontal mattress suture is simpler and associated with fewer complications, it may lead to shorter postoperative hospital stays in patients who were planned for intestinal anasmosis/laparotomy either emergency or elective. This could be beneficial for both patients and healthcare providers by reducing costs and the risk of hospital-acquired infections.*

***Keywords:*** *Horizontal mattress anastomosis, Abscess, Anastomotic leakage, Two-layer anastomosis, Intestinal repair*

## 1. INTRODUCTION

Anastomosis is a surgical procedure where two ends of a tubular structure, such as the digestive tract, are connected or joined together[1]. Traditional manual anastomosis and surgical staples are two common methods used for this purpose, but they each have their own advantages and disadvantages[2]. Traditional manual technique has advantage of precise control, low risk of foreign body reaction and disadvantage of potential for leakage[3]. On other hand stapled technique has advantage of fast procedure with consistency and handling with less experience and disadvantages include intestinal fistula, anastomosis leak and limited customization[4].

Compression of soft tissue when using traditional stitching methods, is indeed a valid concern in certain medical and surgical contexts[5]. When sutures are applied with excessive tension or pressure, they can compress and damage the surrounding soft tissues[6]. Partial incisions and tearing during a surgical procedure, particularly in the context of an anastomosis can have serious consequences like leakage, bleeding, impaired healing and infection risk[7].

Another renowned procedure is horizontal mattress suture technique commonly used in various surgical procedures, including intestinal reconstruction[8]. This technique is particularly useful when there is a need to securely approximate tissues with good tension distribution and knot security[9]. In intestinal surgery, it can be used to close intestinal incisions or anastomoses. The advantages of the mentioned approach over other techniques include simplicity; ease of execution, reduced operating time, wide applicability and it is particularly suited for vessel anastomosis in ischemic or edematous tissues[10].

We compared two different methods of gastrointestinal anastomosis in adult patients the whole wall horizontal mattress suture anastomosis and the traditional manual anastomosis method. The aim of the study was to investigate the efficacy of this novel manual method in gastrointestinal anastomosis.

## 2. METHODOLOGY

Study was conducted at department of general surgery Nishtar hospital Multan from 31st July 2022 to 30th June 2023 in one year duration. Study was approved by hospital ethical board after complete investigation and clarification of study purpose. Non probability consecutive sampling technique was used and sample size was calculated by using online sample size calculator with 95% confidence interval, 80% study power and readmission in traditional method was 55% and 46% in horizontal suture method. Patients with liver injury diagnosed intraoperatively or by CT scan, both gender and age 16-60 years were included in the study.

Patients who require primary bowel resection and intestinal anastomosis, age 16-60 years, both genders, normal renal function, no sepsis and administration of immunosupressive and steroid drugs were included. Patients having anastmosis of duodenum, rectum and stomach. Patients managed in intensive care in more than 3 days. Bowel preparation, antibiotic prophylaxis, and a suture technique using a monofilament suture material was done under general anesthesia. This part of the passage refers to the technique used to reconnect the remaining sections of the bowel after the diseased segment has been removed. "End-to-end" and "end-to-side" refer to different methods of creating the

new connection or anastomosis between the two ends of the bowel.

The posterior wall was constructed using a continued horizontal mattress anastomosis, and the anterior wall was sutured with Connell sutures. These techniques are used to ensure a secure and effective closure of tissue layers during surgery. An edge distance of approximately 2 to 3mm means that the needle is inserted about 2 to 3mm away from the edge of the tissue. During surgical connection of two blood vessels or tubular structures (e.g., intestines), ischemia must be avoided by putting low pressure to ensure that the connected tissues receive sufficient blood supply to remain healthy.

Every patient who underwent a surgical procedure followed the same set of postoperative care guidelines or steps including intravenous fluid, nutrition support, antibiotics administration and routine follow up. Collected data was analyzed with SPSS version 24. Test of significance was applied and p value ≤0.05 was taken as significant.

## 3. RESULTS

Overall, 200 patients were included in our study both genders. The patients were equally divided into two groups as horizontal mattress suture 100 (50.0%) and traditional 2 layer 100 (50.0%). The mean age of horizontal mattress suture and traditional 2 layer patients was 45.36±12.69 years and 46.91±11.19 years, respectively. The most common cause of operation in both the groups was intussusception, 34 (34.0%) and 42 (42.0%), respectively. The differences were statistically insignificant, (p>0.010). (Table. I).

The mean anastomosis time of traditional 2 layer patients was greater than horizontal mattress suture patients as 19.68±2.01 minutes and 13.67±2.38 minutes, respectively. (p<0.010). Regular diet tolerated within POD 4, CRP at POD 5 and postoperative hospital stay in both the groups were almost equal, (p>0.010). (Table. II).

Postoperative complications occurred in both the groups were presented in figure. I.

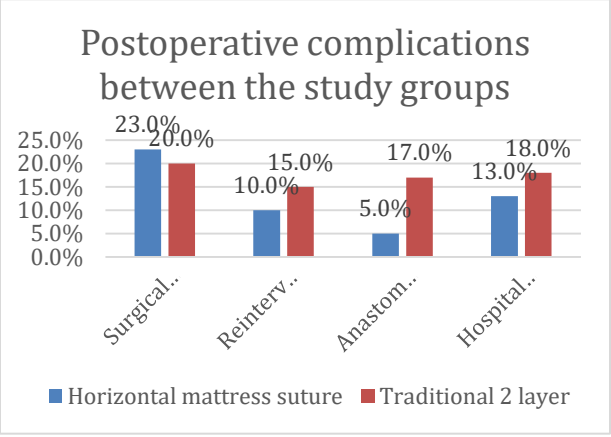
**Table. I**
**Demographic and baseline of the study groups**

| Variable | Propensity matched patients | | p-value |
|---|---|---|---|
| | Horizontal mattresssuture | Traditional 2 layer | |
| Age | 45.36±12.69 | 46.91±11.19 | 0.755 |
| Gender | | | |
| Male | 71 (71.0) | 66 (66.0) | 0.447 |
| Female | 29 (29.0) | 34 (34.0) | |
| Causes of operation | | | |
| Intussusception | 34 (34.0) | 42 (42.0) | 0.058 |
| Trauma | 29 (29.0) | 38 (38.0) | |
| Perforation | 19 (19.0) | 12 (12.0) | |
| Obstruction/strangulation | 18 (18.0) | 8 (8.0) | |

**Table. II**
**Surgical outcome of the study groups**

| Variable | Propensity matched patients | | p-value |
|---|---|---|---|
| | Horizontal mattress suture | Traditional 2 layer | |
| Anastomosis time (min) | 13.67±2.38 | 19.68±2.01 | <0.010 |
| Regular diet tolerated within POD 4 | 22 (22.0) | 28 (28.0) | 0.327 |
| CRP at POD 5 (mg/L) | 16.21±3.41 | 16.83±3.21 | 0.186 |
| Postoperative hospital stay (days) | 10.01±2.23 | 11.38±2.11 | 0.331 |

**Figure. I**



## 4. DISCUSSION

The ability of an intestinal anastomosis technique to heal without leakage is indeed the ultimate test of its suitability. Leakage at the anastomotic site can lead to a range of serious complications including, sepsis, peritonitis, delayed healing, abscess formation, nutritional issues and reoperation[11]. In our study surgical wound infection is common complication found in 23% of patients 20% in horizontal sutures and 23% in traditional suture technique. Second common complication was hospital readmission which was also higher in traditional suture method.

Placer et al[12] conducted a study and concluded that anastomotic leaks present with immediate, dramatic symptoms. Some patients may experience a more insidious or gradual onset of symptoms (low grade fever, failure to thrive and prolonged ileus). In another study Hyman et al[13] reported that postoperative abscess can indeed be caused by a small anastomotic leak. Various reasons, such as infection, poor surgical technique, or inadequate postoperative care are responsible for it.

Yang et al[14] conducted a study on pediatric population and reported that manual anastomosis technique has shown beneficial effects in pediatric patients in terms of reduced anastomotic complications and shorter hospital stays. Pediatric patients and their families may experience improved quality of life due to reduced hospitalization. Basar et al[15] also concluded that continuous horizontal mattress suture technique may reduce the time required for anastomosis compared to other suturing techniques. The horizontal mattress pattern allows for quicker and more efficient suturing in some cases.

By eversion of the tissue and careful placement of sutures, the continuous horizontal mattress suture helps create a smoother, more uniform inner surface (intimal surface) at the anastomotic site[16]. This approach contributes to better patient outcomes in surgeries involving tubular structures like blood vessels and the gastrointestinal tract. This suturing technique with its everting effect provides more perfect microsurgical anastomosis which is an addition to other advantages of this procedurte[17].

Suturing is a fundamental skill in medicine and surgery, and the choice of sutures and suturing techniques can significantly impact the healing process. Horizontal mattress suturing is also promotes healing process and reduced complications proved in dental surgeries[18]. Controversial study findings were also reported by Radad et al[19] who preferred simple interrupted suture technique because of its patency rate. In another study Chung et al[20] reported that the horizontal mattress running stitches with a single monofilament suture, may indeed have been considered safe for certain medical procedures, such as wound closure or surgical suturing. The safety and effectiveness of a specific technique can depend on various factors, including the type of procedure, the patient's individual circumstances, and the surgeon's skill.

## 5. CONCLUSION

Horizontal mattress suture is simpler and associated with fewer complications, it may lead to shorter postoperative hospital stays in patients who were planned for intestinal anasmosis/laparotomy either emergency or elective. This could be beneficial for both patients and healthcare providers by

reducing costs and the risk of hospital-acquired infections.

Limitations: Performing propensity score matching analysis is a valuable statistical technique in research and epidemiology to reduce the impact of potential confounding variables when studying the effects of a particular intervention or treatment, such as a modified anastomotic method.

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