ORIGINAL ARTICLE ASIAN JOURNAL OF MEDICAL SCIENCES

Herringbone stitch technique versus interrupted suturing technique for rectus closure in emergency laparotomy: A comparative study

Arvind Kumar Shukla[1], Avinash Gautam[2], Saranshi Shrivastava[3], Sagar Arora[4], Ramendra Singh[5], Rishi Kumar Athya[6], Rijul Marwah[7]

[1]Professor, [2]Assistant Professor, [3,5]Senior Resident, [4,6,7]Postgraduate Resident, Department of Surgery, MGM Medical College and M.Y. Hospital, Indore, Madhya Pradesh, India

Submission: 19-01-2024 Revision: 26-02-2024 Publication: 01-04-2024

ABSTRACT

Background: Midline laparotomy incisions provide easy and rapid access to the peritoneal cavity in case of emergency surgery and effective closure of the abdominal wall is crucial for optimal healing and reduced complications. Secure abdominal wall closure after any laparotomy is every surgeon's aim. **Aims and Objectives:** The aim of the study was to choose the better method of rectus closure by comparing the herringbone stitch technique with the interrupted suturing technique for rectus closure in emergency laparotomy. **Materials and Methods:** Fifty patients who underwent midline emergency laparotomy at MGM Medical College and MY Hospital, Indore, between January 2023 and April 2023 were included in our study. In 25 patients (Group A) herringbone stitch technique was used whereas in the other 25 patients (Group B) interrupted suturing technique for rectus closure was used and they were assessed based on the incidence of surgical site infection (SSI), superficial wound dehiscence, fascial dehiscence, and incidence of incisional hernia. **Results:** The incidence of SSI was comparable in both groups but the incidence of superficial wound dehiscence, fascial dehiscence, and incisional hernia is less in Group A. **Conclusion:** The herringbone stitch technique is better as compared to the interrupted suturing technique for rectus closure in emergency laparotomy.

Key words: Rectus; Herringbone; Fascial dehiscence; Incisional hernia

Access this article online

Website: http://nepjol.info/index.php/AJMS

DOI: 10.3126/ajms.v15i4.62022

E-ISSN: 2091-0576

P-ISSN: 2467-9100

INTRODUCTION

The Greek word laparos (soft or loose) was used for the soft part between the ribs and hip, thus the flanks or loins. Although the term defines only the incision, used on its own it often implies "exploration of the abdomen."[1] The success of such procedures heavily relies on meticulous surgical techniques and the subsequent closure of the abdominal wall to promote optimal healing and reduce the risk of complications.[2] The rectus sheath, a critical anatomical structure, has been the key focus of various closure techniques to enhance patient outcomes. By shedding light on the clinical comparison of rectus sheath closure techniques, this study strives to contribute to the existing body of knowledge and enhance surgical practices in emergency abdominal surgery. Further, this study aims to provide a comprehensive clinical comparison between the herringbone stitch technique and with interrupted suturing technique for rectus closure in an emergency exploratory laparotomy.

Aims and objectives

The aim of the study was to choose the better method of rectus closure by comparing Herring Bone Stitch technique

Address for Correspondence:
Dr. Saranshi Shrivastava, Senior Resident, Department of Surgery, MGM Medical College and M.Y. Hospital, Indore - 452 001, Madhya Pradesh, India. **Mobile:** +91-8827993293. **E-mail:** saranshi94@gmail.com

with Interrupted Suturing technique for rectus closure in emergency laparotomy.

Objective of this study is to choose a method of rectus closure to avoid post operative complications like infection and incisional hernia.

MATERIALS AND METHODS

This study was conducted in the Department of Surgery at M.G.M. Medical College and M.Y. Hospital, Indore, Madhya Pradesh a tertiary care teaching hospital in Central India. The study was conducted from July 2022 to April 2022 including 50 patients over 18 years of age undergoing emergency exploratory laparotomy procedures. Patients who underwent elective laparotomy, pre-operative proven malignancy, previous laparotomy for any condition (incisional hernia or burst abdomen), discharge against medical advice, or death before the 10th post-operative day were excluded from the study.

Patients undergoing emergency exploratory laparotomy surgery who fulfilled the inclusion criteria were approached and written informed consent was taken. Patients were divided into two groups of 25 each by block randomization according to the surgeon's closure method; that is herringbone stitch technique method and interrupted suturing technique of rectus closure and were assessed based on the incidence of surgical site infection (SSI), superficial wound dehiscence, fascial dehiscence, and incidence of incisional hernia.

Procedure

In Group A, the patient's rectus was closed using herringbone suture technique using a non-absorbable polypropylene no. 1 suture as shown in Figures 1 and 2. The first stitch is taken so that the knot is placed inside the rectus to reduce post-operative pain. The needle is passed 1 cm from the edge to take a 1 cm long bite parallel to the incision from distal to proximal direction. Next, this suture goes to the opposite side across the midline to take a similar bite parallel to the previous one, again from distal to proximal direction. A similar procedure is repeated for each successive stitch (Figure 1a and b). In this technique, the suture crosses the midline over the anterior rectus sheath in a crisscross manner.

In Group B, the patient's rectus closure was done using an interrupted suture technique using a non-absorbable polypropylene no. 1 suture. Patients were followed up postoperatively at regular intervals: At POD 1, 2, 3, 4, 5, and after discharge 1 week, at 2 weeks, at 6 weeks, at 6 months, and at 1 year. Outcomes were assessed based on the incidence of SSI, superficial wound dehiscence, fascial dehiscence, and incidence of incisional hernia.

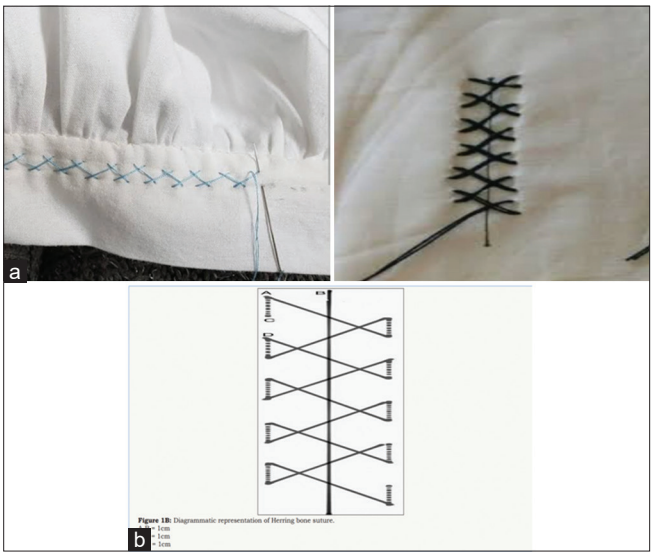

Figure 1: (a) Herringbone stitch done on cloth, (b) diagrammatic representation of herringbone suture

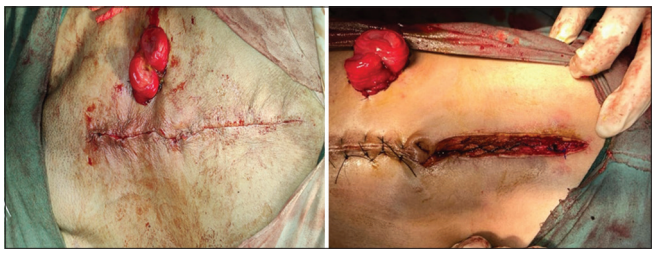

Figure 2: Rectus closure method using herringbone suture technique

RESULTS

In our study, we included 50 patients who underwent emergency exploratory laparotomy and we performed two different approaches of rectus closure in two groups of people, Group A (25 patients) rectus closure was done using the herringbone stitch technique, and Group B (25 patients) rectus closure was done using interrupted suturing technique and following observations were made:

In this study, the aim was to choose the better method of surgery for rectus closure, and as shown in Tables 1-3 results were made:

In Group A including 25 patients, rectus closure was done using the herringbone stitch technique and in Group B including 25 patients, rectus closure was done using the interrupted suturing technique. Out of 50 patients, 31 were males and 19 were female patients. All patients included were of average built with fair nutrition. Post-operative nutrition was taken care of using total parenteral nutrition

and injection of albumin. Four patients developed SSI in Group A whereas 10 patients suffered from SSI in Group B. Two patients had superficial wound dehiscence in Group A whereas 08 patients suffered from superficial wound dehiscence in Group B. One patient had fascial dehiscence in Group A whereas 08 patients suffered from fascial dehiscence in Group B. No case of incisional hernia was reported in Group A during 1 year of follow-up whereas 04 cases of incisional hernia were reported in Group B. The mean operative time was 30 min in the herringbone suturing technique whereas operative time was 20 min in the interrupted suturing technique. However, with practice operative time was reduced with the herringbone suturing technique.

DISCUSSION

A midline incision is frequently used in emergency laparotomy as it provides relatively quick and wide access to the abdominal cavity with minimal damage to the muscle, nerve, and blood vessels as these structures do not cross the midline.[3]

A meta-analysis by Diener et al., to conclude that using a continuous (vs. interrupted) technique (OR: 0.59; P=0.001) with slowly absorbable (vs. rapid absorbable) suture material (OR: 0.65; P=0.009) was best in the elective setting; and no further trials should be conducted for evaluation of technique and available materials for "elective" midline abdominal fascial closure.[4] Currently, a trial is going on using the "Hughes Repair," which combines a standard mass closure with a series of horizontal and two vertical mattress sutures within a single suture but this method has the disadvantage of bowel entrapment.[5] It has been emphasized that it is not the type of suture, but the technique of suturing which determines the outcome as there was no significant difference in IH rate between absorbable and non-absorbable sutures.[6] Polypropylene is found to be associated with more persistent wound pain and more sinus formation as compared to Vicryl.[7] Most common long-term complication was an incisional hernia, so to reduce this, the focus has been on "small tissue bites of 5 mm every 5 mm" and the use of prophylactic mesh placement but there was reluctance to use a foreign body, i.e., a mesh in emergency situations in patients with potentially contaminated cases (perforation peritonitis and intestinal obstruction) led to a theory that a simple "herringbone" stitch repair can provide secure abdominal wall closure and minimize the incidence of IH in high-risk emergency cases. In the present study, the inspiration came from the art of knitting, embroidery, and crochet and led to the use of herringbone stitch for secure abdominal wall closure. Herringbone stitch resembles the bones extending from the spine of a herringfish.

A study conducted by Dr. Dhananjaya Sharma on 230 patients in Government Medical College, Jabalpur concluded that the Vector physics of herringbone stitch showed that any tension on the suture line is preferentially distributed parallel to the wound. The incidence of fascial dehiscence (0.045) and the incisional hernia was less (P=0.009) in patients undergoing single-layer continuous herringbone closure of the rectus sheath.[8] The results in this study were comparable to our study.

The herringbone stitch technique has many advantages. This technique relies on each successive suture to reduce the tension on the stitch for the next suture to be passed and has the advantage of both continuous and cross-suture methods.[8] The suture does not cross the midline on the

Table 1: Demographic profile

Gender	No. of cases
Male	31
Female	19

Table 2: Fifty patients were divided into two groups

Method of rectus closure	No. of cases
Herringbone stitch technique (Group A)	25
Interrupted suture technique (Group B)	25

Table 3: Comparison between the two techniques

Parameters assessed	Rectus closure with herringbone stitch technique Group A (25 patients)	Rectus closure with interrupted suturing technique Group B (25 patients)
SSI	4	10
Superficial wound dehiscence	2	8
Fascial dehiscence	1	8
Incisional hernia (over a period of 1 year)	0	4
Average operative time	30 min	20 min

SSI: Surgical site infection

peritoneal aspect thus avoiding the trauma to the bowel loops by wiring effect. Instead, the suture crosses the midline over the anterior rectus sheath in a crisscross manner making a network of sutures giving the additional advantage of the darning effect. Any tension on the suture line is preferentially distributed parallel to the wound boundary and can better accommodate any increase in the intra-abdominal pressure in the post-operative period. There is an additional advantage of burying the knot inside the rectus sheath as it leads to decreased incidence of stitch granulomas.

Limitations of the study

Small numbers of patients have been studied in the two groups and the follow-up period is only 1 year. It is known that the incidence of Incisional hernia increases with the duration of follow up period.

CONCLUSION

With the help of our study, we have reached the conclusion that the herringbone technique for rectus closure is better than interrupted suturing for rectus closure in emergency laparotomy. Herringbone stitch technique is easy, reproducible, safe, and can be performed quickly and reduces the incidence of incisional hernia.

ACKNOWLEDGMENT

We would like to acknowledge every person who was involved in the making of this paper, be it in the form of research, guidance, or advice that helped us with this paper.

REFERENCES

1. Singh A, Singh S, Dhaliwal US and Singh S. Technique of abdominal wall closure: A comparative study. Indian J Surg. 1981;43:785-90.
2. Garg S, Yadav MS and Singhal K. A clinical comparative study of rectus sheath closure techniques in emergency exploratory laparotomy: Evaluating “Far-Near-Near-Far” vs. conventional closure approach. Cureus. 2023;15(9):e45655.
   https://doi.org/10.7759/cureus.45655
3. Bucknall TE, Cox PJ and Ellis H. Burst abdomen and incisional hernia: A prospective study of 1129 major laparotomies. Br Med J (Clin Res Ed). 1982;284(6320):931-933.
   https://doi.org/10.1136/bmj.284.6320.931
4. Diener MK, Voss S, Jensen K, Büchler MW and Seiler CM. Elective midline laparotomy closure: The INLINE systematic review and meta-analysis. Ann Surg. 2010;251(5): 843-885.
   https://doi.org/10.1097/SLA.0b013e3181d973e4
5. Cornish J, Harries RL, Bosanquet D, Rees B, Ansell J, Frewer N, et al. Hughes Abdominal Repair Trial (HART)-Abdominal wall closure techniques to reduce the incidence of incisional hernias: Study protocol for a randomised controlled trial. Trials. 2016;17(1):454.
   https://doi.org/10.1186/s13063-016-1573-0
6. Shukla HS, Kumar S, Misra MC and Naithani YP. Burst abdomen and suture material: A comparison of abdominal wound closure with monofilament nylon and chromic catgut. Indian J Surg. 1981;43:487-491.
7. Van’t RM, De Vos Van Steenwijk PJ, Bonjer HJ, Steyerberg EW and Jeekel J. Incisional hernia after repair of wound dehiscence: Incidence and risk factors. Am Surg. 2004;70(4): 281-286.
8. Kothari R, Thakur R, Sharma D and Agarwal P. Herring bone stitch: Knitting to secure abdominal wall closure for emergency midline laparotomy. Gastroenterol C Med Res. 2018; 1(5):1-8.

Authors Contribution:
AKS- Concept and design of the study, interpreted the results, reviewed the literature and manuscript preparation; **AG**- Prepared first draft of manuscript, statistical analysis and interpretation, and manuscript revision; **SS**- Reviewed the literature, manuscript preparation, and preparation of draft; **SA**- Concept of the study and statistical analysis, coordination; **RS**- Reviewed the literature, manuscript preparation, and manuscript revision; **RKA**- Manuscript preparation, statistical analysis, and interpretation; **RM**- Manuscript preparation, statistical analysis, and interpretation.

Work attributed to:
Department of General Surgery, MGM Medical College and M.Y. Hospital, Indore - 452 001, Madhya Pradesh, India.

Orcid ID:
Dr. Arvind Kumar Shukla - https://orcid.org/0000-0001-6441-0701
Dr. Avinash Gautam - https://orcid.org/0000-0002-0644-6965
Dr. Saranshi Shrivastava - https://orcid.org/0000-0002-9790-1811
Dr. Sagar Arora - https://orcid.org/0009-0005-4792-6294
Dr. Ramendra Singh - https://orcid.org/0000-0002-4760-8668
Dr. Rishi Kumar Athya - https://orcid.org/0009-0009-5418-5841
Dr. Rijul Marwah - https://orcid.org/0009-0002-3486-5005

Source of Support: Nil, **Conflicts of Interest:** None declared.