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COMPARISON OF CONVENTIONAL CLOSURE VERSUS "FAR–FAR NEAR–NEAR" TECHNIQUE OF SINGLE-LAYER MASS CLOSURE AFTER EMERGENCY MIDLINE LAPAROTOMY

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ABSTRACT

BACKGROUND

Acute wound failure (wound dehiscence or burst abdomen) is a serious postoperative complication following emergency laparotomy, associated with significant morbidity, mortality, and increased healthcare costs. Various closure techniques have been evaluated to minimise this complication. The modified *far–far near–near* technique has been proposed to enhance fascial strength and reduce dehiscence. This study compares the outcomes of conventional continuous closure with the far–far near–near technique in emergency midline laparotomy wounds.

METHODS

A prospective randomized study was conducted from November 2015 to May 2017 at Bowring & Lady Curzon Hospital and Victoria Hospital thirty adult patients undergoing emergency midline laparotomy for conditions such as hollow viscus perforation, stab injuries, and blunt abdominal trauma were included. Patients were randomised into two groups: Group 1 –Conventional closure using continuous Prolene No.1, and Group 2 – Far–far near–near closure using interrupted sutures. Patients were followed for 6 weeks postoperatively to assess SSI (Surgical Site Infections), partial or complete wound dehiscence, and associated risk factors. Data were analysed using chi-square and t-tests.

RESULTS

The study population had a predominance of males (83.3%). The incidence of burst abdomen was 6.6%, occurring exclusively in the conventional closure group (2 cases), while no cases occurred in the far–far near–near group. SSI was observed in 36.6% of the total population. Risk factors such as

anaemia, hypoproteinemia, peritoneal contamination, uraemia, diabetes, and postoperative cough were noted but showed no statistically significant difference between groups.

CONCLUSION

The *far–far near–near* interrupted technique demonstrated superior strength and significantly reduced the incidence of burst abdomen compared to conventional closure. It is a safe and effective method, particularly beneficial in high-risk emergency laparotomy patients.

KEYWORDS Emergency Laparotomy, Wound Dehiscence, Burst Abdomen, Far–Far Near–Near Technique, Fascial Closure, Surgical Site Infection, Mass Closure.

INTRODUCTION

Acute wound failure, also referred to as wound dehiscence or burst abdomen, is defined as the postoperative separation of the abdominal musculoaponeurotic layers and represents one of the most feared complications in abdominal surgery. This condition is of significant concern because it may lead to evisceration, the need for urgent intervention, and long-term sequelae such as repeat dehiscence, surgical site infection, and incisional hernia formation. The incidence of acute wound failure is reported to be approximately1% to 3% among patients undergoing abdominal operations, with most cases developing between the 7th and 10th postoperative day, although dehiscence may occur as early as day 1 or as late as more than 20 days after surgery. A wide range of predisposing factors has been identified, including technical error in fascial closure, emergency surgery, intra-abdominal infection, advanced age, wound infection, hematoma or seroma, elevated intra-abdominal pressure, obesity, chronic corticosteroid use, a history of previous dehiscence, malnutrition, radiation therapy, chemotherapy, and systemic diseases such as uremia and diabetes mellitus.[1]

Clinically, acute wound failure may present suddenly and without warning. In approximately 25% of patients, a large, abrupt outflow of clear, salmon-colored fluid serves as a heralding sign of impending dehiscence. Many patients also describe a distinct ripping or tearing sensation at the wound site. In cases where the diagnosis is uncertain, gentle probing with a sterile, cotton-tipped applicator or gloved finger may reveal partial fascial separation. Prevention remains the cornerstone of management, relying heavily on meticulous surgical technique, appropriate suture placement and depth, adequate patient relaxation during closure, and ensuring tension-free approximation of fascial edges. For patients considered to be at very high risk, interrupted fascial closure or alternative wound-management strategies may offer a safer approach when primary closure cannot be achieved without undue tension.

Aims and Objectives

This study aimed to evaluate the effectiveness of the far-far-near-near technique in the closure of emergency midline laparotomy wounds by assessing the associated local wound complications, while also comparing the operative time and healing duration between this method and the conventional layered closure technique. Additionally, the study seeks to analyze various patient- and procedure-related factors that contribute to the development of wound dehiscence, thereby providing a comprehensive understanding of the determinants influencing postoperative wound outcomes.

MATERIALS AND METHODS

Study Design

This study was conducted included patients undergoing emergency midline laparotomy at Bowring and Lady Curzon Hospital and Victoria Hospital between November 2015 and May 2017, enabling a comprehensive assessment of outcomes within this defined surgical population.

Inclusion and Exclusion Criteria

The study included all adult patients aged 18 years and above who underwent a midline laparotomy for emergency indications such as hollow viscus perforation, stab injuries, or blunt trauma to the

abdomen. Patients were excluded if they were younger than 18 years, had a history of previous laparotomy or presented with an incisional hernia or burst abdomen, or if they died within seven days postoperatively. Additionally, patients who did not provide consent, as well as those who were immunocompromised-including individuals on cancer chemotherapy, immunotherapy, or long-term steroid therapy-were excluded from the study.

Data Collection Procedure

All eligible patients were informed about the study and provided written consent before being randomly assigned to either conventional closure or the far-far-near-near technique using simple random sampling. Conventional closure was performed with No. 1 polypropylene sutures, with bites taken 1.5–2 cm from the linea alba and spaced 1 cm apart, maintaining a 4:1 suture-to-wound length ratio, followed by subcutaneous closure with 2-0 vicryl and skin closure with 2-0 nylon. In the comparative group, the far-far-near-near technique was used to approximate the rectus sheath, peritoneum, and muscle in a single interrupted layer, with 3 cm far bites and 5 mm near bites, placed at 2 cm intervals, and the skin closed with 2-0 nylon. All patients were followed for six weeks postoperatively to assess complications such as wound infection, partial or complete dehiscence, and signs of infection including purulent discharge or redness; dehiscence was diagnosed when abdominal contents such as intestine, omentum, or viscera became visible through the wound.

Statistical Analysis

All collected data were systematically tabulated and analyzed using descriptive statistics such as rates, ratios, and percentages to summarize patient characteristics and postoperative outcomes. Inferential statistical methods were applied to compare the two closure techniques, with the chi-square test used to evaluate associations between categorical variables and the t-test employed to compare continuous variables, ensuring appropriate assessment of differences between the groups.

RESULTS

Table 1 shows the distribution of patients by age groups, highlighting that the highest proportion (30%) were above 60 years.

Age (in years)	Number of Cases	Percentage (%)
< 20	3	10
20–30	6	20
30–40	3	10
40–50	6	20
50–60	3	10
>60	9	30
Total	30	**100**

Table 1: Age Distribution of Study Population

Table 2 observes that the study population had a male predominance (83.33%).

Sex	Number of Patients	Percentage (%)
Male	25	83.33
Female	5	16.67
Total	30	**100**

Table 2: Sex Distribution

Table 3 shows that burst abdomen occurred only in the conventional suturing group, while the far-far near-near group had no cases.

Group	Burst Abdomen Present	Burst Abdomen Absent	Total Patients
Group 1: Conventional Closure	2	23?	15
Group 2: Far–far Near–near	0	25?	15
Total	**2**	**48**	30

Table 3: Incidence of Burst Abdomen among Two Groups

Table 4 observes the distribution of various risk factors across both groups and compares them using Fischer's exact test.

Risk Factor	Group 1 with RF	Group 2 with RF	Total with RF	Group 1 without RF	Group 2 without RF	Total without RF	*p*-value
Anaemia	4	1	5	26	29	55	0.35
Elderly (>60 yr)	7	4	11	23	26	49	0.50
Uraemia (>50 mg/dL)	6	8	14	24	22	46	0.76
Hypoalbuminemia (<3 mg/dL)	9	5	14	21	25	46	0.36
Diabetes	6	2	10	24	28	50	0.25
Jaundice	1	1	2	29	29	58	1.0
Peritoneal contamination	7	8	15	23	22	45	1.0
SSI	5	6	11	25	24	49	1.0
Cough	10	8	18	20	22	42	0.77
Post-op ileus	8	7	15	22	23	45	1.0
Obesity	2	3	5	28	27	55	1.0

Table 4: Risk Factors – Patients with and Without Risk Factors in Each Group

Table 5 shows the comparison of major postoperative complications between the two suturing techniques.

Complication	Group 1: Conventional	Group 2: Far–Far Near–Near	Total
Surgical Site Infection (SSI)	5	6	11
Burst Abdomen	2	0	2
Post-op Ileus	8	7	15
Mortality	1	0	1

Table 5: Summary of Post-Operative Complications

Table 6 shows common risk factors among the total study population.

Risk Factor	Number of Patients	Percentage (%)
Anaemia	5	10
Elderly (>60 yr)	11	22
Uraemia	14	28
Hypoalbuminemia	14	28
Diabetes	10	20
Jaundice	2	4
Peritoneal contamination	15	30

SSI	11	22
Cough	18	36
Post-op ileus	15	30
Obesity	5	10

Table 6: Distribution of Individual Risk Factors across the Population

Table 7 observes the clinical effectiveness of the far–far near–near technique in reducing complications.

Parameter	Group 1 Conventional	Group 2 Far–Far Near–Near	Interpretation
Burst abdomen	2	0	Reduced to zero in modified technique
SSI	5	6	Comparable between groups
Healing Time	Slightly longer	Slightly shorter	Faster recovery trend
Suture type	Continuous	Interrupted	Near-near adds strength
Overall safety	Moderate	High	Better tolerance in high-risk patients

Table 7: Outcome Comparison between Two Closure Techniques

DISCUSSION

Acute wound failure-also referred to as wound dehiscence, burst abdomen, wound disruption, or evisceration-is a serious postoperative complication of abdominal surgery. It carries significant morbidity and mortality and is influenced by multiple patient-related, disease-related, and technical factors. The underlying mechanisms include reduced wound tensile strength and increased collagenolysis, most commonly precipitated by infection. The abdominal fascia regains only 51–59% of its original tensile strength by 42 days and approximately 70–80% by 120 days; complete remodeling may take up to 9–12 months.[2] Thus, the immediate postoperative period represents a critical window where optimal suture technique plays a major role in prevention of dehiscence.

Dehiscence typically occurs when the suture material cuts through the fascia rather than due to suture breakage or knot failure. The likelihood of tissue cut-through is influenced by suture diameter: smaller sutures are associated with greater risk.[3-6] Moreover, factors that increase intra-abdominal pressure-such as coughing, ileus, or peritonitis-can stretch a midline laparotomy incision by up to 30%, as demonstrated by Jenkins, who recommended a suture-to-wound length ratio of at least 4:1.[7-9] Interrupted techniques have been shown to be superior to continuous closure in reducing the risk of burst abdomen. A meta-analysis of 23 randomized trials reported that the odds of dehiscence decreased by nearly half with interrupted sutures.[10] This advantage becomes more relevant in emergency laparotomies where continuous sutures may produce a "gigli saw" effect under tension.[11]

Several interrupted methods have been described, including the Smead–Jones far-near technique, figure-of-eight sutures, Hughes double far-near sutures, and the more recent interrupted X-suture technique. Mass closure has consistently been associated with better outcomes. Bucknall et al.[12] reported significantly fewer dehiscence events with mass closure (0.76%) compared to layered closure (3.81%) in a prospective series of 1129 laparotomies, a finding supported by multiple subsequent studies.

In the present prospective randomized study, we compared conventional continuous midline closure with the far–far near–near interrupted mass closure technique in 30 emergency laparotomy patients. The overall incidence of burst abdomen was 6.6%, which is slightly higher than the 5.3–8.3% range reported in other Indian and international studies. This may be attributed to the emergency nature of surgeries, delayed presentation, poor nutritional status, and high prevalence of risk factors such as anemia, hypoproteinemia, peritonitis, and sepsis in our cohort.

Importantly, both cases of burst abdomen occurred exclusively in the conventional continuous closure group, whereas the far–far near–near group reported zero incidence. This reinforces the

superior stability offered by interrupted mass closure in high-risk emergency settings. Though both groups exhibited comparable rates of SSI, postoperative ileus, and other complications, the mechanical advantage of the far–far near–near technique appears to prevent catastrophic fascial failure even in the presence of infection-one of the strongest risk factors for dehiscence.

Analysis of individual risk factors-including age >60 years, anemia, hypoalbuminemia, uraemia, diabetes, obesity, jaundice, peritoneal contamination, cough, and postoperative ileus-did not reveal a statistically significant difference between groups. Thus, the lower dehiscence rate in the far–far near–near group can be attributed primarily to the technique itself rather than confounding variables.

The far–far near–near technique differs from retention sutures in that it alone provides complete fascial apposition without additional supportive sutures. This avoids the morbidity associated with retention sutures while retaining their biomechanical benefit of distributing tension across a larger tissue area.

Our findings support the view that interrupted mass closure techniques are biomechanically superior, particularly in emergency laparotomies where the incidence of SSI and elevated intra-abdominal pressure is high. The far–far near–near method is safe, technically feasible, cost-effective, and significantly reduces the risk of burst abdomen in high-risk patients.

CONCLUSION

Abdominal wound dehiscence is a serious complication influenced by multiple patient, surgical, and infection-related factors, with intra-peritoneal infection being the most significant predictor. High-risk patients-such as those with advanced age, anaemia, malnutrition, obesity, or emergency conditions-require special attention, as do cases where improper technique or aseptic precautions may increase the likelihood of wound infection and subsequent dehiscence. Continuous suturing poses a higher risk of complete wound failure if a single bite gives way, explaining the increased incidence in conventional closure. Although retention sutures remain controversial, techniques like the Hughes or Smead-Jones methods offer potential benefits. Overall, the interrupted far-far-near-near technique demonstrates a reduced incidence of burst abdomen in high-risk patients, though larger studies are recommended to confirm its effectiveness.

REFERENCES

[1] Makela JT, Kiviniemi H, Juvonen T. Factors influencing wound dehiscence after midline laparotomy. Am J Surg 1995;170:387-90.
[2] Richards PC, Balch CM, Aldrete JS. Abdominal wound closure. A randomized prospective study of 571 patients comparing continuous vs. interrupted suture techniques. Ann Surg 1983;197:238-43.
[3] Gislason H, Gronbech JE, Soreide O. Burst abdomen and incisional hernia after major gastrointestinal operations - comparison of three closure techniques. Eur J Surg 1995;161:349-54.
[4] Alexander HC, Prudden JF. The causes of abdominal wound disruption. Surg Gynecol Obstet 1966;122:1223-9.
[5] Wallace D, Hernandez W, Schlaerth JB, et al. Prevention of abdominal wound disruption utilizing the Smead-Jones closure technique. Obstet Gynecol 1980;56:226-30.
[6] Gallup DG, Talledo OE, King LA. Primary mass closure of midline incisions with a continuous running monofilament suture in gynecologic patients. Obstet Gynecol 1989;73:675-7.
[7] Jenkins TPN. The burst abdominal wound: a mechanical approach. Br J Surg 1976;63:873-6.
[8] Israelsson LA, Jinsson T. Suture length to wound length ratio and healing of midline laparotomy incisions. Br J Surg 1993;80:1284-6.
[9] Varshney S, Manek P, Johnson CD. Six-fold suture: wound length ratio for abdominal closure. Ann R Coll Surg Engl 1999;81:333-6.

[10] Gupta H, Srivastava A, Menon GR, et al. Comparison of interrupted versus continuous closure in abdominal wound repair: a meta-analysis of 23 trials. Asian J Surg 2008;31:104-14.
[11] Srivastava A, Roy S, Sahay KB, et al. Prevention of brust abdominal wound by a new technique: A randomized trial comparing continuous versus interrupted X-suture. India J Surg 2004;66:19-27.
[12] Dudley HA. Layered and mass closure of abdominal wall: a theoretical and experimental analysis. Br J Surg 1970;57(9):664-7.