

# Efficacy of far-near-near-far (Hughes) technique in closure of midline exploratory wound for reducing the incidence of incisional hernia in comparison with conventional mass closure

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## Background

Incisional hernia is the commonest complexity for closure of midline incision after the abdominal surgery, causing morbidity, impaired life quality, and higher costs of health care. Hughes technique merges a standard mass closure with a chain of horizontal and two vertical mattress sutures within a single suture. Theoretically, this will spread the loading over the length of the incision in addition to across it. So, this technique is more effective for preventing the formation of incisional hernia after a closure of the midline incision.

## Aim

The purpose of this investigation was to clarify the performance of Hughes technique in closure of midline exploratory wounds for reducing the incidence of postoperative dehiscence, either burst abdomen or incisional hernia, in comparison with conventional mass closure.

## Patients and methods

Between June 2017 and November 2019, this prospective study was carried out on 100 patients. Patients were categorized randomly into two groups: group A included 50 patients who were closed by simple conventional mass closure, and group B included 50 patients who were closed by simple conventional mass closure along with far-near-near-far (Hughes) technique using vicryl 1 sutures.

## Results

There was no significant difference between groups regarding basic demographic and clinical data. The operation duration and hospital stay were longer in Hughes, but with no significant difference. Furthermore, there was no significant difference regarding infection, but dehiscence was significantly associated more with mass technique. Moreover, Hughes group had significantly higher scores regarding visual analog scal (VAS) at 2 and 4 h, and thereafter the two groups were nearly matched till 24 h. Hughes technique was preferable in reduction of postoperative dehiscence, either burst abdomen or incisional hernia. Furthermore, better surgeon and patient satisfaction was gained.

## Conclusion

The authors can conclude that the Hughes technique is more effective and preferable as a mesh repair for the handling and preventing the formation of incisional hernia after the closure of a midline wound in comparison with conventional mass closure.

## Keywords:

Hughes technique, incisional hernia, mass closure, midline wound

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## Introduction

Incisional hernia is the commonest complexity for closure of midline after the abdominal surgery [1], causing considerable morbidity, impaired life quality, and higher costs of health care [2], and it urgently needs surgery. Despite the modern advancement in mesh technology, repair of the incisional hernia still has elevated repetition rates up to 54% in suture repair and up to 36% in mesh repair [3,4].

Various factors are involved in the pathogenesis of incisional hernias. These involve cachexia, anemia [5], aged older than 45 years [6], obesity [6,7],

diabetes mellitus [7], male sex [6,8], postmenopausal status [9], smoking [8], history of chronic obstructive pulmonary disease [5,10], history of abdominal aortic aneurysm [11], and certain medications, such as corticosteroids [12]. Almost all of these are away from the surgeons' control, and the modifiable factors identified as having a fundamental effect on incisional hernia (IH) rates are the surgical technique and the

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material used to close the abdominal wall musculofascial layer.

'Mass closure' is still the criterion technique for the closure of the abdomen, through the closure for all the abdominal wall layers, excluding the skin, with nonabsorbable sutures [13].

The European Hernia Society instructions on the closing of the abdominal wall incisions (2015) stated that the use of the prophylactic mesh increased for an optional midline exploratory wound in patient with high risk for minimizing the hazard of the incisional hernia. However, first, they determined that the guide base for this was weak, and second in the UK, mesh augmentation closure is rarely utilized; for these causes, it is as yet urgent for other closure techniques to be rigorously assessed for their benefit in incisional hernia prevention.

'Hughes repair' [14], recognized as the 'far-near-near-far' or 'Cardiff repair' [15], merges a standard mass closure with a series of transverse and two vertical mattress sutures within a single suture (1 nylon). Theoretically, this spreads the loading over the length of incision in addition to across it. So, this technique is potent for preventing the formation of incisional hernia after a closure of the midline incision.

The Hughes technique has a potent result as the criterion mesh repair in incisional hernia [16]. In addition, it is utilized in abdominal closure if the patient is at high hazard of incisional hernias, postcomplete abdominal wound dehiscence, and laparostomy [17].

## Aim

The aim of our investigation was to clarify and evaluate the efficacy of the far-near-near-far (Hughes) technique in closure of midline exploratory wounds for reducing the incidence of postoperative dehiscence either burst abdomen or incisional hernia in comparison with conventional mass closure.

## Patients and methods

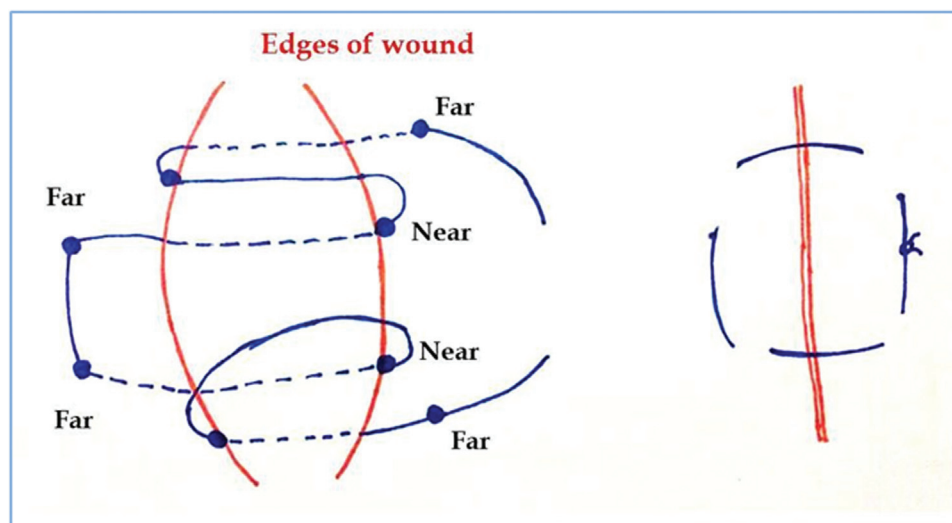
Between June 2017 and November 2019, this investigation was carried out to clarify and evaluate the efficacy of the far-near-near-far (Hughes) technique in closure of midline exploratory wound for reducing the incidence of postoperative dehiscence either burst abdomen or incisional hernia in comparison with conventional mass closure.

The current prospective study was carried out on 100 patients undergoing surgery after different diagnoses like perforated peptic ulcer, diverticulosis coli, and splenectomy and vasoligation.

All patients were categorized randomly into two groups: A and B.

Group A included 50 patients who were closed by simple conventional mass closure. Group B included 50 patients who were closed by simple conventional mass closure, along with far-near-near-far (Hughes) technique using vicryl 1 (Fig. 1).

Figure 1



Exhibiting the far-near-near-far technique in abdominal closure, utilizing a mixing of standard mass closure with a chain of transverse and two vertical mattresses in a single suture. During the closure of sutures to close the defect, the sutures are resting together across and along the incision.

This study was done to minimize the complications resulting from the operation. Follow-up of patients for 6 months by clinical examination and ultrasound was done. All patients were informed about the purpose of the study with ethical aspects, and a written consent was taken.

Data were collected regarding thorough history, basic clinical examination, and routine laboratory investigations (complete blood count, random blood sugar, coagulation profile, renal and liver functions, plus pregnancy test in married patients).

The efficacy in each group was assessed by calculating the *P* value.

#### Inclusions criteria:

The following were the inclusion criteria:

- (1) Both sex.
- (2) Age greater than 35 years.
- (3) BMI greater than 25.
- (4) Patients with comorbidities like diabetes mellitus, chronic liver disease, autoimmune diseases, and cardiovascular disease; on corticosteroid or immunosuppressor drugs; smoking.
- (5) Patients who were willing to participate in this study.
- (6) The most common risk factor for incisional hernia is intestinal obstruction (suspected postoperative distension), peritonitis, and pancreatitis.

#### Exclusions criteria

The following were the exclusion criteria:

- (1) Patients who were not willing to participate in the study.
- (2) Patients refused surgical treatment after primary diagnosis.
- (3) Young patients (aged <35 years).

#### Sample size

As the difference regarding infection and leak between Hughes and mass from a previous paper was 0–7.1% to 14.2, so with power of study 80% and confidence level 95%, a minimum sample size of 100 will be needed, with 50 patients in each group.

#### Statistical analysis

Data were collected from history, clinical examination, and laboratory investigations. The outcomes were estimated coded, entered, and analyzed using

Statistical Package for the Social Sciences (version 20.0). SPSS Statistics is a software package used for logical batched and non-batched statistical analysis. Long produced by SPSS Inc., it was acquired by IBM in 2009. The current versions (2015) are officially named IBM SPSS Statistics. Feb 2, 2017. Companion products in the same family are used for survey authoring and deployment (IBM SPSS Data Collection), data mining (IBM SPSS Modeler), text analytics, and collaboration and deployment (batch and automated scoring services). The software name originally stood for Statistical Package for the Social Sciences (SPSS), reflecting the original market, although the software is now popular in other fields as well, including the health sciences and marketing. Qualitative data were represented as number and percentage, whereas quantitative continuous data were represented by mean±SD. The following tests were used to test significance: difference and association of qualitative variable by  $\chi^2$  test, and differences between quantitative independent groups by independent *t* test. *P* value was set at less than 0.05 for significant results and less than 0.001 for highly significant result.

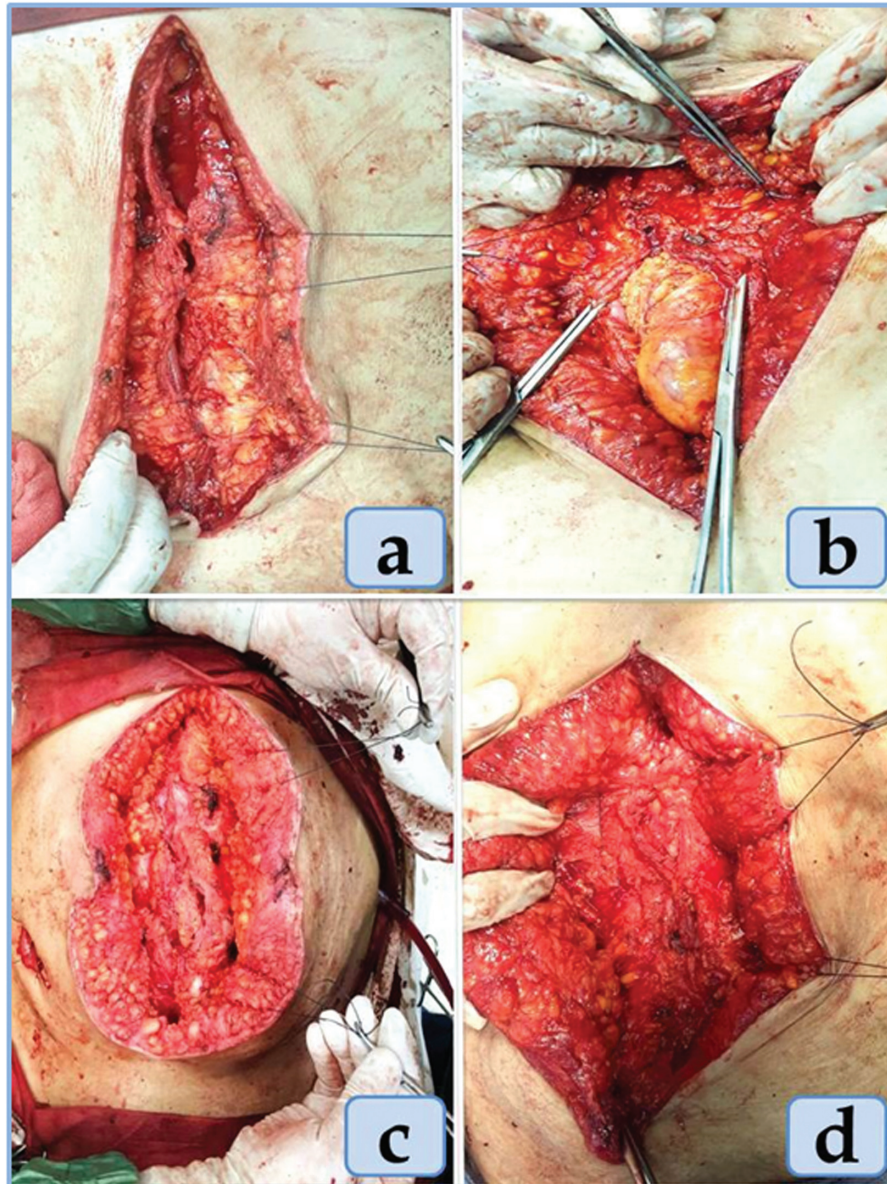
#### Results

The present investigation was done on 100 patients from June 2017 to November 2019 to clarify and evaluate the efficacy of the far-near-near-far (Hughes) technique in closure of midline exploratory wound for reducing the incidence of postoperative dehiscence either burst abdomen or incisional hernia in comparison with conventional mass closure. All 100 patients underwent surgery after different diagnoses like perforated peptic ulcer, as peritonitis is predisposing factor for dehiscence (Fig. 2a); splenectomy and vasoligation to overcome weakness of muscle owing to chronic liver disease (Fig. 2b); after resection anastomoses of left colon and proximal ileostomy in patients with diverticulosis coli, as pus and distention are the most common risk for dehiscence (Fig. 2c); and after right hemicolectomy and ileotransverse anastomoses (Fig. 2d).

All patients were categorized into two groups: group A included 50 patients who were closed by simple conventional mass closure, and group B included 50 patients who were closed by simple conventional mass closure in addition to far-near-near-far (Hughes) technique.

There was no significant difference between groups regarding basic demographic and clinical data (Table 1). In addition, the operation duration and hospital stay were longer in Hughes, but with no

Figure 2



The application of Hughes technique in closure of midline exploratory wound. (a) Showing the employment of Hughes technique after repair of perforated peptic ulcer. (b) Showing the Hughes technique after splenectomy and vasoligation. (c) Showing Hughes technique after resection and anastomosis of left colon and proximal ileostomy in patients with diverticulosis coli. (d) Showing Hughes technique after right hemicolectomy and ileotransverse anastomosis.

significant difference (Table 2). Furthermore, no significant difference was found regarding infection, but dehiscence was significantly associated more with mass (Table 3). Moreover, Hughes group had significantly higher scores regarding visual analog scale (VAS) at 2 and 4 h, and then the two groups were nearly matched till 24 h (Table 4 and Fig. 3).

In the present study, smoking and diabetic patients were included, as heavy smokers have lung disease with postoperative cough that may cause incisional hernia, and diabetes may delay the power of healing and was considered as a risk factor for incisional hernia, so we

applied Hughes technique in addition to conventional mass closure for reducing the incidence of postoperative dehiscence, either burst abdomen or incisional hernia.

Our results clarified that far-near-near-far (Hughes) technique in closure of midline exploratory wound was more effective and preferable in reduction of postoperative dehiscence, either burst abdomen or incisional hernia, after closure of midline exploratory wounds. Furthermore, better surgeon and patient satisfaction was gained. However, it has slight disadvantages, such as prolonged operative time, postoperative pain, and longer hospital stay.

**Table 1 Comparisons between the studied groups regarding basic demographic and clinical data**

	Hughes [n (%)]	Mass [n (%)]	$t/\chi^2$	P
Age	42.94±3.96	43.48±4.88	-1.762	0.087
BMI	27.78±2.41	28.06±1.9	0.262	0.850
Sex				
Male	35 (70.0)	33 (66.0)		
Female	15 (30.0)	17 (34.0)	0.18	0.66
Smoker				
No	30 (60.0)	32 (64.0)		
Smoker	20 (40.0)	18 (36.0)	0.17	0.68
DM				
No	39 (78.0)	37 (74.0)		
Yes	11 (22.0)	13 (26.0)	0.18	0.67
Total	50 (100.0)	50 (100.0)		

There was no significant difference between groups. DM, diabetes mellitus.

**Table 2 Operation duration and hospital stay**

	Hughes	Mass	t	P
Suture time (min)	15.16±4.32	12.95±3.36	1.859	0.068
Hospital stay (days)	4.25±1.26	4.85±1.42	0.456	0.654

Suture time was longer in Hughes but not significant.

Outcomes were measured by follow-up through the clinical abdominal examination and abdominal ultrasound within 6 months

Moreover, we are satisfied by adding a new suture technique (tension suture) that protects ordinary suture, hoping to reduce occurrence of burst abdomen or incisional hernia.

## Discussion

The current study was carried out on 100 patients from June 2017 to November 2019, who were categorized into two groups: group A included 50 patients who were closed by simple conventional mass closure, and group B included 50 patients who were closed by simple conventional mass closure in addition to far-near-near-far (Hughes) technique.

This study were done to clarify and evaluate the efficacy of the far-near-near-far (Hughes) technique in closure of midline exploratory wound for reducing the incidence of postoperative dehiscence either burst abdomen or incisional hernia in comparison with conventional mass closure. All 50 patients underwent surgery after different diagnoses like perforated peptic ulcer, diverticulosis coli, and splenectomy and vasoligation.

Our results clarified that far-near-near-far (Hughes) technique in the closure of midline exploratory wound was more effective and preferable in reduction of

**Table 3 Complication distribution between groups**

	Hughes [n (%)]	Mass [n (%)]	$\chi^2$	P
Infection				
No	46 (92.0)	43 (86.0)		
Yes	4 (8.0)	7 (14.0)	0.91	0.33
Dehiscence				
No	48 (96.0)	42 (84.0)		
Yes	2 (4.0)	8 (16.0)	4.25	0.046*
Total	50 (100.0)	50 (100.0)		

No significant difference regarding infection but dehiscence was significantly associated more with mass.

**Table 4 Complication distribution between groups**

VAS	Hughes	Mass	t	P
2 hpostoperative	6.5±1.85	4.21±1.55	2.859	0.008*
4 hpostoperative	6.8±1.42	4.47±1.25	3.156	0.001**
6 hpostoperative	5.91±1.42	5.21±1.55	1.854	0.0712
8 hpostoperative	3.54±0.98	3.32±1.25	0.212	0.8742
12 hpostoperative	2.54±0.75	2.50±1.12	0.107	0.941
24 hpostoperative	1.2±0.4	1.0±0.33	0.152	0.912

Hughes group had significantly higher scores regarding VAS at 2 and 4 h and then the two groups were nearly matched till 24 h. VAS, visual analog scal.

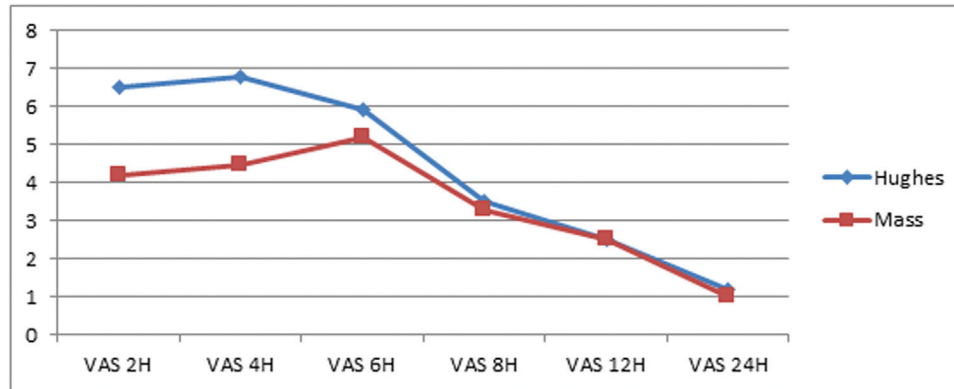
postoperative dehiscence either burst abdomen or incisional hernia after closure of midline exploratory wound. Furthermore, better surgeon and patient satisfaction was gained. However, it has slight disadvantages, such as prolonged operative time, postoperative pain, and longer hospital stay.

Other study reported that the Hughes repair was carried out to have a potent result as the criterion mesh repair in IH [16]. Moreover, it is used in the abdominal closure if the patient is in high hazard of IHs, postcomplete abdominal wound dehiscence, and laparostomy [17].

Other authors reported that a feasibility trial was done to confirm either a randomized controlled trial to compare Hughes technique with criterion mass closure for preventing of midline IHs, in patients subjected to colorectal cancer resectional surgery, may be considered favorable to patients, gain sufficient mobilization or induction and outcome in no early safety concerns [18]. Moreover, it added the feasibility trial found no early safety concerns and claimed that the trial was favorable to patients. Development to the pilot and fundamental stages of the trial has now commenced following approval by the independent data monitoring committee [18].

There were different investigations to clarify the most preferable technique for closure of the abdominal wall; until now, there is still doubt about this. The meta-analyses of van't Riet *et al.* [4], Weiland *et al.* [19], and

Figure 3



The Hughes group was significantly higher regarding VAS at 2 and 4 h, and thereafter the two groups were nearly matched till 24 h. VSA, visual analog scal.

Hodgson *et al.* [20], concluded that the nonabsorbable sutures minimize IH hazard. The more recent meta-analysis by Diener *et al.* [3] demonstrated that the absorbable sutures were accompanied with minimal hazards. This conflict may claim different inclusion or exclusion criteria. Moreover, several investigations employed in these meta-analyses recruited few patient numbers and lacked adequate strength to determine a considerable statistically difference between groups [3].

A probability stage has been completed. The outcomes of the current investigation will be utilized to notify present and future practice and vigorously minimize the hazard of incisional hernia following midline incisions.

## Conclusion

We can conclude that the Hughes technique is more effective and preferable as mesh repair for the handling and preventing the formation of incisional hernia after the closure of a midline wound in comparison with conventional mass closure. Subsequently, reducing the incidence or preventing the advancement of the incisional hernia will allow serious benefits for both patients and health care system by saving funds.

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Nil.

## Conflicts of interest

The authors report no any proprietary or commercial interest in any product mentioned or concept discussed in this paper.

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