Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Colorectal Surgery

Risks Factor after Surgical Site Infection with and without Mesh Incisional Hernia

Dr. Shyamal Chandra Barai[1*], Prof Dr. Abu Taher[2], Dr. Mohammad Tanvir Jalal[3], Dr. Md. Shahidul Islam[4], Dr. Zhuma Rani Paul[1], Dr. Mohammad Azim Uddin[5], Dr. Md. Mahmudul Hasan[7], Dr. Md. Asaduzzaman[4]

[1]Medical Officer, 250 Beded General Hospital, Gopalganj, Bangladesh
[2]Professor, Department of Colorectal Surgery, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh
[3]Associate Professor, Department of Colorectal Surgery, Bangabandhu Sheikh Mujib Medical University Hospital, Dhaka, Bangladesh
[4]Resident Surgeon (Colorectal Surgery), Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh
[5]Junior Consultant Surgery, Upazila Health Complex, Kendua, Netrakona, Bangladesh
[6]Junior Consultant, Department of Colorectal Surgery, Bangabandhu Sheikh Mujib Medical University Hospital, Dhaka, Bangladesh

DOI: 10.36347/sjams.2023.v11i04.008 | **Received:** 23.02.2023 | **Accepted:** 08.04.2023 | **Published:** 12.04.2023

***Corresponding author:** Dr. Shyamal Chandra Barai
Medical Officer, 250 Beded General Hospital, Gopalgan, Bangladesh

Abstract **Original Research Article**

Background*:** Systemic problems, mesh infections, and hernia recurrence have all been related to wound infections that appear after a hernia repair. ***Objective*:** To assess the risks factor after surgical site infection with and without mesh incisional hernia. ***Methodology*:** The study was a Prospective interventional study which was conducted in Department of Colorectal Surgery Bangabandhu Sheikh Mujib Medical University from April, 2019- September, 2020 using a semi-structured questionnaire through face to face interview. Data were analysed using a computer programme SPSS 24.0 version. ***Result*:** The mean age of no mesh group was 55.83±8.42 years while the mesh group was 53.29±9.81 years. A majority of male patients in both, no mesh (70.8%) and mesh (66.7%), groups. The mean BMI of no mesh group was 25.13±5.49 while the mesh group was 26.98±4.46. 3 patients at 4th week and 1 patient at 3rd month had infection in no mesh group. And, 7 patients at 4th week, 2 at 3rd month and 1 patient at 6th month had infection in the mesh group. There was no difference statistically between no mesh and mesh groups (p=0.094, p=0.472 and p=0.280 at 4th week, 3rd month and 6th month, respectively. ***Conclusion: Obesity, tobacco use, and diabetes mellitus are the three main patient comorbidities that can be modified and are substantially linked to postoperative surgical site infection in hernia surgery. Weight reduction, quitting smoking, and diabetes management are all part of preoperative optimization.

Keywords: BMI, DM, SSI.

INTRODUCTION

Incisional hernias are described as "abdominal wall defects, with or without a bulge, around post-operative scars, observable or palpable by clinical examination or imaging" by the European Society of Radiology [1]. When clinical and imaging (CT or MRI) assessments were combined rather than clinical or radiological screening alone, a higher incidence of incisional hernias was found [2]. The development of a hernia at the site of an earlier ileostomy or colostomy is an unnoticed, delayed adverse effect of enterostomy reversal [3]. Studies on the prevalence of incisional hernias at the ostomy site after stoma closure have been done, though the percentages range from 0% to 50% [4]. Keeping hernias from developing should enhance patient outcomes over time and reduce the cost of additional follow-up visits and possible reoperations [5]. The use of synthetic mesh reinforcement has been advised to stop herniation in clean incisions. Both main and recurrent hernias can be treated with it. At the sites of stomas, there is a sizable risk of infection and wound breakdown due to contamination from the previously open bowel lumen. Mesh-related issues in the early postoperative stage have limited its use in contaminated incisions like the closure of a stoma site because of worries about infection risk [6]. In this situation, a biologic mesh may present a reduced risk of infection [7]. After biologic mesh is thoroughly incorporated into the host tissue, there is a decreased risk of infection [8], while maintaining structural support during high-risk abdominal wall closure, particularly throughout the healing period. Obesity, tobacco use, and diabetes

mellitus are the three main patient comorbidities that can be modified and are substantially linked to postoperative surgical site infection in hernia surgery. Weight reduction, quitting smoking, and diabetes management are all part of preoperative optimization [9].

METHODOLOGY

The study was a Prospective interventional study which was conducted in Department of Colorectal Surgery Bangabandhu Sheikh Mujib Medical University from April, 2019- September, 2020. Patients aged 18 or over undergoing elective surgery to close a stoma (ileostomy or colostomy; loop or end) were eligible. The stoma may have been constructed by open or laparoscopic technique. Trephine, midline or laparoscopic approaches to the planned stoma closure were all eligible. The exclusion criteris includes large parastomal hernias definitely need mesh repair, Patients took part in another clinical study related to the surgical procedure, Allergic to prolene mesh , history of familial adenomatous polyposis (due to increased risk of cutaneous desmoid tumors) and unable or unwilling to provide written informed consent. . Maintaining all formalities face to face interview was taken by using pre-tested questionnaire with Purposive sampling type of sampling technique. Total 25 patients were enrolled in this study. The detail of the study was explained to each eligible respondent and consent was taken. After collection, the data were checked and cleaned, followed by editing, compiling, coding and categorizing according to the objectives and variable to detect errors and to maintain consistency, relevancy and quality control. Collected data were edited and analyzed according to the objectives and variables by IBM software- Statistical package for Social Science (SPSS 24) version. Ethical clearance was taken from the IRB of the institution. The aim of the study was to assess the risks factor after surgical site infection with and without mesh incisional hernia.

RESULT

This prospective interventional study was carried out in the Department of Colorectal Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka. During the study period, a total no of 45 patients fulfilling the selection criteria and giving consent to participate in the study.

Table 1 shows the mean age of no mesh group was 55.83±8.42 years while the mesh group was 53.29±9.81 years and the difference between both groups was statistically not significant (p=0.354). Majority of the patients from both groups were aged between 40 – 60 years (62.5% and 57.1%).

Table 1: Distribution of patients by their age (N=45)

Age (years)	No Mesh (n=24)		Mesh (n=21)		*p**-value
	n	%	n	%	
< 40	0	0	3	14.3	
40 - 60	15	62.5	12	57.1	
> 60	9	37.5	6	28.6	
Mean±SD	**55.83±8.42**		**53.29±9.81**		**0.354^{ns}**

ns= non-significant.

*p-value reached by Student t-test and was considered significant when p<0.05.

Table 2 shows there were a majority of male patients in both, no mesh (70.8%) and mesh (66.7%), groups. Distribution of patients by their gender among both groups were statistically not significant (p=0.763).

Table 2: Distribution of patients by their gender (N=45)

Gender	No Mesh (n=24)		Mesh (n=21)		*p**-value
	n	%	n	%	
Male	17	70.8	14	66.7	0.763^{ns}
Female	7	29.2	7	33.3	

ns= non-significant.

*p-value reached by Pearson Chi-Square test and was considered significant when p<0.05.

Distribution of patients by their occupation among no mesh and mesh group was statistically insignificant (p=0.976, Table 3).

Table 3: Distribution of patients by their occupation (N=45)

Occupation	No Mesh (n=24)		Mesh (n=21)		*p**-value
	n	%	n	%	
Service Holder	3	12.5	2	9.5	0.976^{ns}
Businessman	3	12.5	4	19.0	
Students	2	8.3	2	9.5	
Housewives	7	29.2	6	28.6	
Others	9	37.5	7	33.3	

ns= non-significant.

**p*-value reached by Pearson Chi-square test and was considered significant when $p<0.05$.

The distribution of patients among assigned groups (no mesh and mesh) by their BMI is shown in the Table 4. The mean BMI of no mesh group was 25.13±5.49 while the mesh group was 26.98±4.46 and the difference between them was not statistically significant ($p=0.227$).

Table 4: Distribution of patients by their BMI (N=45)

BMI	No Mesh (n=24)		Mesh (n=21)		*p**-value
	n	%	n	%	
Underweight(< 18.5)	4	16.7	2	9.5	**0.227^{ns}**
Normal Weight(18.5 – 25)	6	25.0	4	19.0	
Overweight(25 – 30)	6	25.0	7	33.3	
Obese(> 30)	8	33.3	8	38.1	
Mean±SD	**25.13±5.49**		**26.98±4.46**		

ns= non-significant.

**p*-value reached by Student *t*-test and was considered significant when $p<0.05$.

Table 5 shows the distribution of patients by their type of ostomy. Nineteen (79.2%) and 15 (71.4%) patients in no mesh and mesh group, respectively had ileostomy while 5 (20.8%) and 6 (28.6%) patients, respectively had colostomy. Statistically there was no difference among group distribution by ostomy type ($p=0.547$).

Table 5: Distribution of patients by type of ostomy (N=45):

Ostomy	No Mesh (n=24)		Mesh (n=21)		*p**-value
	n	%	n	%	
Ileostomy	19	79.2	15	71.4	0.547^{ns}
Colostomy	5	20.8	6	28.6	

ns= non-significant.

**p*-value reached by Pearson Chi-Square test and was considered significant when $p<0.05$.

Presence of hernias – parastomal and midline incisional hernia before ostomy closure are reflected in the Table 6. Both patients with parastomal and midline incisional hernias were distributed among both groups without statistically significant difference ($p=0.807$ and $p=0.632$, respectively).

Table 6: Distribution of patients by presence of hernia (N=45)

Hernias	No Mesh (n=24)		Mesh (n=21)		*p**-value
	n	%	n	%	
Parastomal Hernia	4/24	16.7	3/21	14.3	0.807^{ns}
Midline Incisional Hernia	2/24	8.3	1/21	4.8	0.632^{ns}

ns= non-significant.

**p*-value reached by Pearson Chi-Square test and was considered significant when $p<0.05$.

Table 7 outlines the comparison of duration of surgery among no mesh and mesh groups. The mean duration of surgery of no mesh group (79.88±15.03min) was much less than mesh group (106.05±17.40min) which was statistically highly significant ($p<0.001$).

Table 7: Comparison of duration of surgery among both groups (N=45):

Duration of Surgery	No Mesh (minutes)	Mesh (minutes)	*p**-value
Mean±SD	79.88±15.03	106.05±17.40	<0.001[s]

s= significant.

**p*-value reached by Students *t*-test and was considered significant when $p<0.05$.

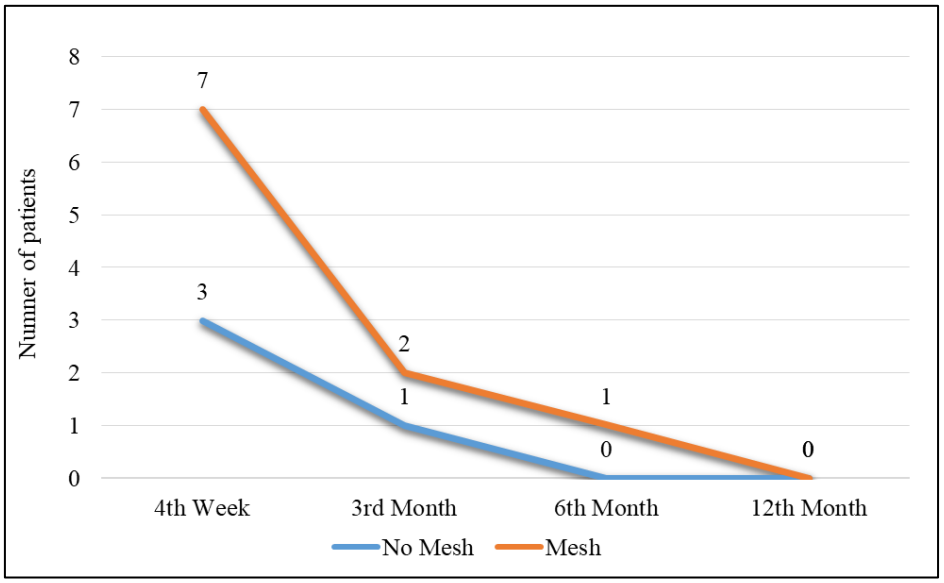

Figure 1: Comparison of infection after ostomy closure at follow up among both groups (N=45)

Figure above shows 3 patients at 4th week and 1 patient at 3rd month had infection in no mesh group. And, 7 patients at 4th week, 2 at 3rd month and 1 patient at 6th month had infection in the mesh group. There was no difference statistically between no mesh and mesh groups (p=0.094, p=0.472 and p=0.280 at 4th week, 3rd month and 6th month, respectively.

Table 8 shows that in no mesh group SSI occurs in 4 patients who all were diabetic, 75% were Obese and all were smoker. In Mesh group 80% SSI patients were diabetic, 90% were Obese and 50% were Smoker.

Table 8: Distribution of patients by Risk factor

Risk factor	SSI	
	No mesh n(%)	Mesh n(%)
Diabetes Mellitus (DM)	4(100%)	8(80%)
Obesity	3(75%)	7(90%)
Smoking	4(100%)	5 (50%)

DISCUSSION

This prospective interventional study had been designed to assess the risks factor after surgical site infection with and without mesh incisional hernia. Total 45 patients were selected who were candidates for ostomy closure and presented at the Department of Colorectal Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU) from April 2019 to September 2020.

In this study, the mean age of no mesh group was 55.83±8.42 years while that of the mesh group was 53.29±9.81 years and the difference between both groups was statistically not significant (p=0.354). Warren *et al.*, found the mean age of no mesh group was 54.8 ± 15.7 years and of mesh group was 57.3 ± 11.3 years [3]. In the present study, there were a majority of male patients in both, no mesh (70.8%) and mesh (66.7%), groups (p=0.763). Study conducted by Liu, Banham and Yellapu (2013) found 58.3% in no mesh group and 63.8% in mesh group were male [10]. In the following study, the mean BMI of no mesh group was 25.13±5.49 while the mesh group was 26.98±4.46 and the difference between them was not statistically significant (p=0.227). BMI was classified as per WHO BMI index (<18.5 as under weigt, 18.5 – 25 as normal, 25 – 30 as overweight and >30 as obese). In the study of Maggiori *et al.*, mesh group BMI was 25±4 while mesh group BMI was 26±4 [11]. In this series, 19 (79.2%) and 15 (71.4%) patients in no mesh and mesh groups, respectively had ileostomy while 5 (20.8%) and 6 (28.6%) patients, respectively had colostomy.

Statistically there was no difference among group distribution by ostomy type (p=0.547).

In our study, patients with parastomal and midline incisional hernias were distributed among both groups without statistically significant difference (p=0.807 and p=0.632, respectively). ROCSS study stated 24% in no mesh and 28% in mesh group had parastomal hernia and 4% in no mesh and 6% in mesh group had midline incisional hernia [12]. In our series, surgeries were performed by three experienced surgeons in the field (colorectal surgeons). The mean duration of surgery of no mesh group (79.88±15.03min) was much less than mesh group (106.05±17.40min) which was statistically highly significant (p<0.001). Warren *et al.,* found mean duration of surgery was 133.5±87.5 min versus 255±106 min in no mesh and mesh group, respectively [3]. In this series, 3 patients at 4th week and 1 patient at 3rd month had infection in no mesh group. And, 7 patients at 4th week, 2 at 3rd month and 1 patient at 6th month had infection in the mesh group. There was no difference statistically between no mesh and mesh groups (p=0.094, p=0.472 and p=0.280 at 4th week, 3rd month and 6th month, respectively. These results are consistent with the results of Warren *et al.*, [3] and Wijeyekoon *et al.*, [13]. Our study revealed that in no mesh group SSI occurs in 4 patients who all were Diabetic, 75% were Obese and all were smoker. In Mesh group 80% SSI patients were diabetic, 90% were Obese and 50% were Smoker. Repairing incisional hernias is difficult when there is a history of/current infection, loss of domain, bowel involvement, and commonly when there are significant co-morbidities present [14]. Hernia operations are traditionally regarded as clean operations due to the anticipated, low likelihood of infection at the site of surgical intervention (SSI). The frequency of SSI following hernia surgery is higher than is generally believed. Although the effects of a mesh infection could be serious, using the mesh does not increase the frequency of SSI [15].

CONCLUSION

After ostomy reversal, incisional hernias frequently happen. Incisional hernias at the site of a prior stoma closure can result in considerable morbidity, decreased quality of life, hernia imprisonment or strangling that poses a life- threatening risk, and they can place a significant financial burden on healthcare systems. Despite this, there is not much evidence to support the claim [16]. Obesity, tobacco use, and diabetes mellitus are the three main patient comorbidities that can be modified and are substantially linked to postoperative surgical site infection in hernia surgery. Weight reduction, quitting smoking, and diabetes management are all part of preoperative optimization.

REFERENCES

1. Muysoms, F. E., Miserez, M., Berrevoet, F., Campanelli, G., Champault, G. G., Chelala, E., ... & Kingsnorth, A. (2009). Classification of primary and incisional abdominal wall hernias. *Hernia*, *13*, 407-414.
2. Bhangu, A., Fletcher, L., Kingdon, S., Smith, E., Nepogodiev, D., & Janjua, U. (2012). A clinical and radiological assessment of incisional hernias following closure of temporary stomas. *The surgeon*, *10*(6), 321-325.
3. Warren, J. A., Beffa, L. R., Carbonell, A. M., Cull, J., Sinopoli, B., Ewing, J. A., ... & Cobb, W. S. (2018). Prophylactic placement of permanent synthetic mesh at the time of ostomy closure prevents formation of incisional hernias. *Surgery*, *163*(4), 839-846.
4. Sharp, S. P., Francis, J. K., Valerian, B. T., Canete, J. J., Chismark, A. D., & Lee, E. C. (2015). Incidence of ostomy site incisional hernias after stoma closure. *The American Surgeon*, *81*(12), 1244-1248.
5. Reinforcement of Closure of Stoma Site (ROCSS) Collaborative and the West Midlands Research Collaborative, Bhangu, A., Ives, N., Magill, L., Futaba, K., Forde, C., ... & West Midlands Research Collaborative. (2018). Randomized controlled trial of standard closure of a stoma site vs biological mesh reinforcement: study protocol of the ROCSS trial. *Colorectal Disease*, *20*(2), O46-O54.
6. Choi, J. J., Palaniappa, N. C., Dallas, K. B., Rudich, T. B., Colon, M. J., & Divino, C. M. (2012). Use of mesh during ventral hernia repair in clean-contaminated and contaminated cases: outcomes of 33,832 cases. *Annals of surgery*, *255*(1), 176-180.
7. Shankaran, V., Weber, D. J., R Lawrence Reed, I. I., & Luchette, F. A. (2011). A review of available prosthetics for ventral hernia repair. *Annals of surgery*, *253*(1), 16-26.
8. Lalezari, S., Caparelli, M. L., & Allamaneni, S. (2017). Use of biologic mesh at ostomy takedown to prevent incisional hernia: A case series. *International journal of surgery case reports*, *41*, 107-109.
9. Wilson, R. B., & Farooque, Y. (2022). Risks and prevention of surgical site infection after hernia mesh repair and the predictive utility of ACS-NSQIP. *Journal of Gastrointestinal Surgery*, *26*(4), 950-964. Liu, D. S. H., Banham, E., & Yellapu, S. (2013). Prophylactic mesh reinforcement reduces stomal site incisional hernia after ileostomy closure. *World journal of surgery*, *37*, 2039-2045.
10. Maggiori, L., Moszkowicz, D., Zappa, M., Mongin, C., & Panis, Y. (2015). Bioprosthetic mesh reinforcement during temporary stoma closure decreases the rate of incisional hernia: a blinded,

case-matched study in 94 patients with rectal cancer. *Surgery*, *158*(6), 1651-1657.

11. Bhangu, A., Nepogodiev, D., Ives, N., Magill, L., Glasbey, J., Forde, C., ... & Docherty, J. G. (2020). Prophylactic biological mesh reinforcement versus standard closure of stoma site (ROCSS): a multicentre, randomised controlled trial. *The Lancet*, *395*(10222), 417-426.
12. Wijeyekoon, S. P., Gurusamy, K., El-Gendy, K., & Chan, C. L. (2010). Prevention of parastomal herniation with biologic/composite prosthetic mesh: a systematic review and meta-analysis of randomized controlled trials. *Journal of the American College of Surgeons*, *211*(5), 637-645.
13. Skipworth, J. R. A., Vyas, S., Uppal, L., Floyd, D., & Shankar, A. (2014). Improved outcomes in the management of high-risk incisional hernias utilizing biological mesh and soft-tissue reconstruction: a single center experience. *World journal of surgery*, *38*, 1026-1034.
14. Zuvela, M., Milićević, M., Galun, D., Lekić, N., Basarić, D., Tomić, D., ... & Palibrk, I. (2005). Infection in hernia surgery. *Acta Chirurgica Iugoslavica*, *52*(1), 9-26.
15. Harries, R. L., & Torkington, J. (2018). Stomal closure: strategies to prevent incisional hernia. *Frontiers in surgery*, *5*, 28.
16. Harries, R. L., & Torkington, J. (2018). Stomal closure: strategies to prevent incisional hernia. *Frontiers in surgery*, *5*, 28.