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Original Article

Early Exposure vs Delayed Exposure of Postoperative Wounds in Elective Inguinal Hernia Surgery: A Longitudinal Study

ATHUL ASHOK[1], SANDEEP ABRAHAM VARGHESE[2]

ABSTRACT

Introduction: Wounds and their management are fundamental aspects of the practice of surgery. A closed wound that heals in a timely fashion is considered to be a good indicator of surgical intervention. Many experimental studies have shown that precisely sutured incision with good haemostasis gets sealed with fibrin within 6 to 24 hours and the wound becomes adequately protected from outside moisture. Hence, early exposure to clean surgical wounds would be a cost-effective measure, especially in a resource-poor country like ours by avoiding unnecessary dressings for a long period of time.

Aim: To assess the effectiveness of early exposure (24 hours) and delayed exposure (72 hours) in wound management after elective inguinal hernia surgery.

Materials and Methods: A longitudinal study was conducted in the Department of General Surgery of Government Medical College, Kottayam, Kerala, India from September 2020 to August 2021. All elective cases (n=200) posted for inguinal hernia of age more than 18 years were consecutively allocated to two groups, group A early exposure of surgical wound site and group B delayed exposure. The wound site examination, on the third day along with white blood cell count was assessed. Wound site examination on 7th day and 30th postoperative day and length of hospital stay were recorded. Southampton wound grading system was used for recording healing parameters. All data were described using means for continuous variables and percentages for categorical variables Chi-square test was used for categorical variables with significance level at $p<0.05$.

Results: Out of the 200 patients studied, 92 (92%) were males in group A and 94 (94%) of them were males in group B. The wound contamination in those patients where postoperative dressing was removed after 24 hours (group A) and 72 hours (group B), it was found that majority of patients had wound Grade-0 irrespective of dressing i.e., 96% and 97%, respectively (p-value=0.395) with reference to wound condition on postoperative day 7. In group A patients had (96 cases in 0-10 days) compared to group B (97 cases in 0-10 days) although statistically, it was not significant (p-value >0.05).

Conclusion: There is not much difference in wound healing and incidence of surgical site infection in patients, whose wounds were kept open 24 hours after surgery when compared to those, whose wounds were dressed daily for the next two days consecutively.

Keywords: Surgical site infection, Skin and soft tissue infection, Wound grading

INTRODUCTION

The skin is colonised by many microorganisms that are capable of causing infections. Surgical site infections most commonly affect the superficial tissues but may also involve the deeper tissues. Surgical site infection is a common postoperative complication. It involves infections occurring at the site of the surgical incision and also the surrounding structures of the wound that come in contact during surgery [1].

Among the healthcare-associated infections, surgical site infections are most responsible accounting for about 31% of it [2,3]. One out of every 25 patients who were admitted in acute care hospitals in the United States had at least one of the healthcare-associated infections. Surgical site infections are found to be the leading causes of healthcare-associated infections in the study conducted by Magill SS et al., [4]. Surgical site infection increases the duration of hospital stay and is two times more in those, who are infected and also doubles the cost of expenditure on healthcare [5]. Surgical site infections also increase the mortality by 2-11 times and may be more [6].

Surgical site infections can be caused either by exogenous or endogenous bacteria. Sources of infection may include contamination from the gut flora of the patient, healthcare providers, hospital environment, other patients, improper dressings, and usage of contaminated instruments [7]. The common risk factors for surgical site infections include improper hand washing and poor skin preparation before surgery, site, duration, and also the type of the surgery adds onto it [8]. Surgical site infections not only cause increased morbidity but also cause great discomfort and dissatisfaction to the patient and financial burden to them and the healthcare system by increasing the duration of hospitalisation [9,10]. It is estimated that about 500,000 surgical site infections occur every year in the United States and its financial impact on the healthcare system ranges from 1 to 10 billion dollars every year [11,12]. Surgical site infection rates in India were found to be higher than those reported by the Centre for Disease Control National Healthcare Safety Network [13] and therefore, the financial burdens caused by it must also be high.

Though it may not be possible to reduce the surgical site infection rate to zero, strict measures can be taken to improve the already implanted measures to bring down the infection rate. Better understanding of the pathogenesis of the infection and biology of the microorganisms will help to reduce the infection rate and also reduces the morbidity and costs associated with surgical site infections. The present study aims to assess the effectiveness of early exposure (24 hours) and delayed exposure (72 hours) in wound management after elective inguinal hernia surgery.

MATERIALS AND METHODS

A longitudinal study was conducted in the General Surgery Department of Government Medical College, Kottayam, Kerala, India, from September 2020 to August 2021. The study was approved by Institutional Review Board Ref no. 45/2020 dated 18/08/2020.

Inclusion criteria: During the study period, cases posted for elective hernia surgery above 18 years of age were included.

Exclusion criteria: All hernia surgeries performed on cases associated with chronic illness like uncontrolled diabetes mellitus, multi-organ failure, or surgeries posted with other bowel pathologies were excluded. The cases where surgeries were repeated due to any reason were avoided to be recruited in the study.

Study Procedure

A total of 200 cases after obtaining informed consent were consecutively allotted, 100 cases each to group A early exposure to surgical wound site (24 hours) and group B delayed exposure to surgical wound site (72 hours). All the cases with basic anthropometric measurements, weight in Kilograms, and height in meters were recorded in minimal clothing using standard scale for determining body mass index.

Both the groups, after the initial 24 hours of postoperation were monitored for any surgical site complications, and all cases assigned to group A were cleaned and left open whereas all cases in group B were dressed with standard dressing protocol. The cases were reviewed every day till their discharge and in all group B cases, dressing was stopped after 72 hours of postoperative day, noting the status.

All the cases were followed using Southampton wound grading system for healing and infection as mentioned below [5]:

i. Grade-0: normal healing
ii. Grade-1: bruising/mild erythema
iii. Grade-2: severe erythema with other features of inflammation at or around wound
iv. Grade-3: serous or bloody discharge
v. Grade-4: presence of pus or deep infection or tissue breakdown or significant haematoma wound inspection and condition was recorded on the 7th postoperative day for comparison. The cases were also observed for fever during the stay in the hospital and the total duration of stay in the hospital was also considered.

STATISTICAL ANALYSIS

All data were described using means for continuous variables and percentages for categorical variables. The Chi-square test was used for categorical variables for comparing the two groups to determine the statistical significance level at $p<0.05$. The data obtained were entered in Excel Sheet and analysed using Statistical package for the Social Sciences (SPSS) software version 16.0.

RESULTS

Maximum number of cases were between the ages 51 to 60 years in both groups [Table/Fig-1]. The mean age in group A was 53 and the mean age in group B was 55. Majority patients were male and there was no statistical difference between both groups [Table/Fig-2]. Three patients in group A and 2 in group B were underweight but statistically insignificant [Table/Fig-3]. A 10% in group A and 17% in group B had a high TLC on day 3 showing rate of infection higher in group B but again p-value was not significant [Table/Fig-4]. A 9% in group A and 5% in group B had postoperative fever, but p-value was not significant [Table/Fig-5]. Both groups were similar with respect to the wound grade on day 7 [Table/Fig-6]. Group A patients had (96 cases in 0-10 days) compared to Group B (97 cases in 0-10 days) although statistically, it was not significant [Table/Fig-7].

A total of 99 cases of group A and 100 cases of group B have wound Grade-0 on postoperative day 30 showing no significant difference [Table/Fig-8].

Group		Age (years)							Total	χ^2
		18-20	21-30	31-40	41-50	51-60	61-70	71-80		
Group A	Count	2	1	10	20	31	26	10	100	18.024* *p-value 0.012
	%	2	1	10	20	31	26	10	100	
Group B	Count	1	15	11	14	28	22	9	100	
	%	1	15	11	14	28	22	9	100	
Total	Count	3	16	21	34	59	48	19	200	
	%	1.5	8	10.5	17	29.5	24	9.5	100	

[Table/Fig-1]: Distribution of cases with reference to age in both groups.

Group		Sex		Total	χ^2
		Male	Female		
Group A	Count	92	8	100	0.093* *p-value -0.760 (>0.05)
	%	92	8	100	
Group B	Count	94	6	100	
	%	94	6	100	
Total	Count	186	14	200	
	%	93.5	6.5	100	

[Table/Fig-2]: Distribution of cases with reference to sex in both groups.

Group		Body mass index (kg/m²)			Total	χ^2
		<18	18-25	>25		
Group A	Count	3	92	5	100	1.615* *p-value 0.446 (>0.05)
	%	3	92	5	100	
Group B	Count	2	96	2	100	
	%	2	96	2	100	
Total	Count	5	188	7	200	
	%	2.5	94	3.5	100	

[Table/Fig-3]: Distribution of cases with reference to body mass index in both groups.

Group		Total count of leucocytes on postop day 3		Total	χ^2
		4000-11000 cells/μL	>11000 cells/μL		
Group A	Count	90	10	100	2.119* *- p-value 0.145 (>0.05)
	%	90	10	100	
Group B	Count	83	17	100	
	%	83	17	100	
Total	Count	173	27	200	
	%	86.5	13.5	100	

[Table/Fig-4]: Distribution of cases with reference to the total count of leucocytes on postoperative day 3 in both groups.

Group		Fever		Total	χ^2
		Present	Absent		
Group A	Count	9	91	100	1.245* *p-value 0.265 (>0.05)
	%	9	91	100	
Group B	Count	5	95	100	
	%	5	95	100	
Total	Count	14	186	200	
	%	7	93	100	

[Table/Fig-5]: Distribution of cases with reference to fever during postoperative days in both groups.

DISCUSSION

In the present study, the most common age group was between 51 to 60 years which was similar to what Toon CD et al., found in his meta-analytical study [14], where 280 people were randomly allocated into groups with early exposure and delayed exposure irrespective of age or sex.

Our study results indicated that both groups were observed to have underweight cases showing that surgical site infection was common among underweight population. Van Ramshorst GH et al.,

Group		Wound grade on postoperative day 7					Total	χ^2
		Grade-0	Grade-1	Grade-2	Grade-3	Grade-4		
Group A	Count	96	1	1	2	0	100	2.979* *p-value -0.395 (>0.05)
	%	96	1	1	2	0	100	
Group B	Count	97	0	0	3	0	100	
	%	97	0	0	3	0	100	
Total	Count	193	1	1	5	0	200	
	%	96.5	0.5	0.5	2.5	0	100	

[Table/Fig-6]: Distribution of cases with reference to wound grade on postoperative day 7 in both groups.

Group		Duration of hospital stay			Total	χ^2
		0-10 days	11-15 days	16-20 days		
Group A	Count	96	3	1	100	1.391* *p-value 0.499 (>0.05)
	%	96	3	1	100	
Group B	Count	97	3	0	100	
	%	97	3	0	100	
Total	Count	193	6	1	200	
	%	96.5	3	0.5	100	

[Table/Fig-7]: Distribution of cases with reference to duration of stay in hospital in both groups.

Group		Wound grade on day 3		Total	χ^2	Wound grade on day 30		Total	χ^2
		Normal	Grade-1			Normal	Grade-4		
Group A	Count	96	4	100	0.149* *p-value 0.700	99	1	100	1.391* *p-value -0.238 (>0.05)
	%	96	4	100		99	1	100	
Group B	Count	97	3	100		100	0	100	
	%	97	3	100		100	0	100	
Total	Count	193	7	200		199	1	200	
	%	96.5	3.5	100		99.5	0.5	100	

[Table/Fig-8]: Distribution of cases with reference to wound grade on day 3 and day 30 postoperative in both groups.

in the study to find out the prevalence of abdominal wound dehiscence with different risk factors, suggested that malnutrition, anaemia plays a significant role in determining body mass index as a contributor to delayed wound healing and infection [15].

A study conducted by Bansal A et al., evaluated the clinical outcome of clean minor surgical wounds without using surgical dressing. There was only one case of wound infection which subsequently developed wound dehiscence as well. The results suggest that in clean surgical wounds where good haemostasis, optimal coaptation of wound margins, and gentle handling of tissue are achieved, there is no increase in wound complications with respect to wound infection and wound dehiscence when the dressings are removed early and wounds were allowed to heal [16].

The present study showed that wound healing was not affected by wound dressing, a study by Law NW and Ellis H who observed 170 consecutive patients, admitted for either an inguinal hernia repair or high saphenous ligation, were randomly allocated to one of three surgical dressing options (dry gauze, operative site, and immediate exposure). From the study, it was found that there was no difference in dressing comfort or dressing preference between the different groups and the quality of the final scar was also not different [17].

In the present study, there were no significant differences between both groups with regard to surgical site infection as evidenced by the wound grade on day 3 and day 30 as can it can be seen in [Table/Fig-9] which shows a case of group A where the wound is clean, just as a case of group B in [Table/Fig-10]. In a study by Weiss Y, out of a total of 3674 wounds, 2525 were treated with the early exposure method where the wounds were left exposed 24 hours after surgery. The incidence of infection was 1.7% in clean wounds and 7.9% in clean-contaminated wounds [18]. Since, the present study was concerned with a clean wound (hernia surgery), where a wound infection of about 1% on day 30 was seen, which was similar to Weiss Y [18]. The authors had four cases of SSI in group A and three in group B, an example of which is seen in [Table/Fig-11].

A study by Ajao OG, where 100 post-surgical patients were divided into two groups with one group being conventionally dressed daily for 7-10 days and the other group kept open after 24 hours, showed that the time-consuming aseptic method of dressing wounds 24-36 hours after surgery did not cut down the rate of wound infection [19]. This corresponds to the present study as well, as there was no statistical significance between both groups in terms of wound infection.

[Table/Fig-9]: Group A- postoperative wound without dressing.

[Table/Fig-10]: Group B postoperative wound with dressing.

[Table/Fig-11]: Group B case where pus is draining from the surgical wound.

Limitation(s)

Relatively small sample size and limited to only open hernia repairs, it would be difficult to come to a conclusion on whether early exposure of postoperative wounds is preferred compared to the time-tested daily dressing of postoperative wounds. More randomised controlled trials would need to be done.

CONCLUSION(S)

Despite improvements in the surgical and sterilisation techniques and the use of antibiotic prophylaxis, postoperative surgical site infection continues to be a cause of major healthcare issue, leading to significant morbidity for patients and economic burden for the healthcare system. There is no advantage to daily dressing of wounds; by avoiding daily dressings, one could improve patient comfort and also, reduce the cost of healthcare.

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PARTICULARS OF CONTRIBUTORS:

1. Senior Resident, Department of General Surgery, Government Medical College, Kottayam, Kerala, India.
2. Associate Professor, Department of General Surgery, Government Medical College, Kottayam, Kerala, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Sandeep Abraham Varghese,
Associate Professor, Department of General Surgery, Government Medical College,
Kottayam-686008, Kerala, India.
E-mail: sandeepavarghese@yahoo.com

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