Research Article

DOI: 10.5455/2349-2902.isj20150524

Role of subcutaneous corrugated drain in class IV surgical wound

Bhumika Jayantilal Patel¹*, Kalpesh Himatlal Patel², Ashish Kharadi², Brijesh Panchal²

Received: 04 April 2015 Revised: 16 April 2015 Accepted: 22 April 2015

*Correspondence:

Dr. Bhumika Jayantilal Patel, E-mail: drbhumipatel@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: In class-IV surgical wounds rate of Incisional Surgical Site Infection (SSI) is as high as 30 percent. Subcutaneous drains helps to remove collections and elimination of dead space thus it may result in lowering rate of wound complications. Corrugated drains are inexpensive and readily available as compared to negative suction drains. This study was carried out to assess efficacy of corrugated drains in class-IV (dirty-contaminated) surgical wounds for preventing incisional SSI.

Methods: A retrospective comparative study was carried out; total 62 patients were taken up and divided into two groups. Group I includes study group with 31 cases where red rubber corrugated subcutaneous drain was used and kept for 3-5 days post operatively, group II with 31 cases as control group where no subcutaneous drain used with class-IV surgical wounds were studied. High risk cases with simultaneous risk factors were excluded from study. Standard closure technique was applied in all cases, wound irrigated with normal saline after closure of sheath without any antiseptic solution.

Results: Incisional SSI in study group I was reported in 2 patients (6.45%) whereas rate of Incisional SSI was very high in control group II, 16 patients (51.61%). P value calculated by Fischer's exact test is 0.0002 considered extremely significant. Overall rate of Incisional SSI reported in our study was 29.03%.

Conclusions: Corrugated drain is inexpensive, easy to use and readily available. It should be used in all cases of class-IV (dirty-contaminated) surgical wounds after closure of sheath. It causes significant reduction of wound complications and increases patient compliance, reduces length of hospital stay without increasing nosocomial infection.

Keywords: Incisional SSI, Class-IV surgical wound, Corrugated drain

INTRODUCTION

Class IV surgical wound is defined as old traumatic wound with retained devitalised tissue; procedure with existing clinical infection (purulence already present in wound) or perforated viscera.¹

In cases of perforation peritonitis abdominal closure is challenging to surgeon as patients sometimes present late, bowel is oedematous and there is presence of pus in peritoneal cavity. There will be outpouring of fluid or pus from peritoneal cavity to surgical wound-subcutaneous tissue till infection is controlled, which can lead to wound infection and wound dehiscence. If the wound kept open then there is high risk for developing nosocomial infection.^{2,3}

In class IV surgical wounds, the rate of Incisional Surgical Site Infection (Incisional SSI) is reported in more than 30% cases. Incisional surgical site infection causes delayed wound healing, high patient discomfort,

¹Department of Pharmacology, GMERS Medical College, Sola, Ahmedabad, Gujarat, India

²Department of General Surgery, GMERS Medical College, Sola, Ahmedabad, Gujarat, India

bad cosmetic result, prolonged hospital stay and increased cost of treatment and high risk for developing incisional hernia later on. 4,5

Subcutaneous drain helps to remove collections and elimination of dead space thus it may result in lowering rate of wound complications. There were very few studies on prevention of incisional SSI in surgical wounds classified as III or IV based on US CDC (Centre for Disease Control and Prevention) classification. This study was performed to analyse the interest of the use of corrugated drains in class-IV surgical wounds in reducing and preventing incisional SSI and wounds complications.

METHODS

A retrospective comparative study was done in a tertiary care teaching institute at Ahmedabad over the period of two years from March 2013 to February 2015. In this study, all patients undergoing surgery during this period with dirty-contaminated class-IV wounds in surgeries for perforated bowel repair, peritonitis, perforated gastric ulcer, appendicectomy with perforation were taken up and divided in two groups. Group I (study group) includes patients where subcutaneous drain was placed and group II (control group) includes patients where no subcutaneous drain used. Total 62 patients were included in this study with 31 patients in each group.

In this study, only abdominal surgical cases were taken up. Patients of all age groups and both sexes were included. Sterile India red rubber corrugated drain was used, length of this subcutaneous drain was according to incision length, it was kept throughout the incision length and breadth was 1 cm, brought out through separate skin incision and fixed with monofilament suture with skin (Figure 1-3).



Figure 1: Red rubber corrugated drain.



Figure 2: Corrugated drain in the subcutaneous tissue before wound closure.



Figure 3: Primary closure of wound with corrugated drain *in situ*.

Perioperative injectable antibiotic cover was given in both groups e.g. Injection Ceftriaxone 1gm & injection Metronidazole 500mg/100ml at the time of incision. Injectable antibiotics were continued for 5-7 days after surgery in their regular dosages, in both groups as required. Cases with simultaneous medical diseases e.g. diabetes, arteriopathy, hepatic or renal conditions, severe anaemia, poor nutritional status, immunocompromised status, having malignancy, patients who died within 48 hours of surgery were excluded.

Wound was irrigated with normal saline (0.09%) adequately before closure every time, no antiseptic was applied locally. Standardized closure techniques for sheath and skin was closed with 2-0 monofilament vertical mattress interrupted sutures used at all times. Subcutaneous drain was kept for 3-5 days in group I patients. All patients of both groups were monitored for wound complications e.g. seroma, hematoma, infection and wound dehiscence. When there was collection in subcutaneous tissue which was identified by presence of redness, cellulitis of overlying skin and fluctuation it was drained through main wound.

Statistical analysis was done by GraphPad InStat Demo version software. P value was calculated by Fischer's exact test.

RESULTS

In this study patient's age ranges from 11-63 years, with highest patients (38.71%) in 21-30 years age group followed by 31-40 years age group (24.19%). There were total 61 patients, 35 patients were male (56.45%) and 27 patients were female (43.55%) having male:female ratio of 1.3:1 (Table 1, Table 2).

Table 1: Age incidence.

Age	Stud	tudy group		Control group		
(years)	No.	Mean \pm SD	No.	Mean ± SD		
11-20	4	16.5 ± 4.36	3	16.67 ± 2.89		
21-30	11	25.45 ± 2.84	13	26.31 ± 3.06		
31-40	8	36.25 ± 3.01	7	35.28 ± 2.98		
41-50	5	45.4 ± 2.88	5	44.2 ± 1.78		
51-60	2	57.5 ± 3.53	3	55.33 ± 4.50		
≥60	1	63	0	0		

Table 2: Gender distribution.

Gender	Study group		Contr	ol group	Total	
Gender	No.	%	No.	%	No.	%
Male	19	61.29	16	51.61	35	56.45
Female	12	38.71	15	48.39	27	43.55

33 patients (53.23%) were having appendicectomy with perforation, followed by 13 patients (20.97%) were having perforated gastric ulcer, 9 patients (14.52%) were having perforated bowel peritonitis and 7 patients (11.29%) patients were having peritonitis during operation. Regarding length of hospital stay in group I patients where subcutaneous drain was kept, 26 patients (83.81%) were discharged within 7 days of surgery; whereas in group II patients - control group where subcutaneous drain wasn't kept, only 11 patients (35.48%) discharged within 7 days, 6 patients (19.35%) discharged between 7-10 days and 14 patients (45.16%) discharged after 11th day onwards. No patient died in our study (Table 3, Table 4).

Table 3: Broad operative findings.

Operative	Study group		Control group		Total	
finding	No.	%	No.	%	No.	%
Perforated bowel peritonitis	5	16.13	4	12.9	9	14.52
Perforated gastric ulcer	7	22.58	6	19.35	13	20.97
Appendicectomy with perforation	15	48.39	18	58.06	33	53.23
Peritonitis	4	12.9	3	9.68	7	11.29

Table 4: Length of hospital stay.

Hospital	Group I		Group II		
stay	No.	%	No.	%	
≤7 days	26	83.87	11	35.48	
7-10 days	3	9.68	6	19.35	
≥10 days	2	6.45	14	45.16	

Table 5: Incidence of incisional SSI after usage and non-usage of corrugated drain*.

	Group I (Study group - with corrugated drain n=31)		- wit	trol group	Tota	Total (n=62)	
	No.	%	No.	%	No.	%	
Incisional SSI	2	6.45%	16	51.61%	18	29.03%	

^{*}P value calculated by Fischer's exact test is 0.0002 considered extremely significant (P value less than 0.05 is considered as statistically significant).

Incisional SSI in study group I was reported in 2 patients (6.45%), one patient with diagnosis of rectal perforation was having wound dehiscence required tension closure and one patient had continuous sero-purulent discharge from drain and main wound and requiring stitches to be opened ultimately required secondary suturing. Whereas rate of Incisional SSI was very high, 16 patients (51.61%) among group II control group. Overall rate of Incisional SSI reported in our study was 29.03% (Table 5).

DISCUSSION

Classification of surgical wounds was initially developed by American College of Surgeons. It was adapted by Centre for Disease Control and Prevention in 1985. According to this classification class IV wound also called as dirty/infected wound, having highest risk of infection of more than 30%. Class IV wounds includes old traumatic wound with retained devitalised tissue, procedures with existing clinical infection or perforated viscera. Examples of class IV wounds includes perforated bowel repair, peritonitis, perforated gastric ulcer, appendicectomy with perforation, incision and drainage of perianal abscess etc. in general surgery. ¹

There is a controversy over the use of subcutaneous drains, in spite of lots of advances in surgical techniques over last 20 years. Benefits are elimination of the dead space and reduction of fluid collection, against risk of facilitating bacterial migration into the wound and thereby increase in the infection rate.⁶

Study by Farnell et al. demonstrated that use of antibiotic solution irrigation with catheter closure technique is not superior to antibiotic solution irrigation with primary closure of contaminated subcutaneous tissue. In this study we decided to irrigate the surgical wound with normal saline only. SSI is expected where surgical wound is closed in the setting of gross abdominal contamination and lavage of the wound is unreliable to prevent wound complications.² There are some studies where it was found that subcutaneous drains don't reduce incidence of Incisional SSI.8 But numerous studies have demonstrated efficacy of subcutaneous drain especially negative suction drain in improving wound healing by reducing load, providing moist and protected environment (by removing residual effusion and blood from the wound that could serve as a medium for growth of bacteria), reducing oedema around wound and increasing rate of granulation tissue formation and epithelisation. 9

In this study red rubber corrugated drain was selected because of its easy availability, convenience of use and inexpensiveness and less studied previously as compared to negative suction drains. Negative suction drains having biggest disadvantage of being blocked 48 hours after insertion. Study by Moro et al. states that open subcutaneous drain insertion is associated with retrograde infection. Study by Numata et al. shows that 25%

culture of discharge from subcutaneous Penrose drain after 3 days was positive for skin bacteria. 12

Numata et al. reported that Penrose drain is effective for preventing SSI in high risk patients following gastrointestinal surgery. 12

A total of 31 patient in study group (with drain) who had undergone surgery for perforation peritonitis only 2 patients (6.45%) had wound infection as compared to control group where 16 patient (51.61%) had wound infection.

CONCLUSION

Corrugated drain is inexpensive, easy to use and readily available. It should be used in all cases of class-IV (dirty-contaminated) surgical wounds after closure of sheath. It causes significant reduction of wound complications and increases patient compliance, reduces length of hospital stay without increasing nosocomial infection.

Funding: No funding sources Conflict of interest: None declared Ethical approval: Not required

REFERENCES

- 1. Zinn J, Swofford V. Quality-improvement initiative: classifying and documenting surgical wounds. Wound Care Advisor. 2014;3(1):32-8.
- 2. Farnell MB, Worthington SS, Mucha P Jr, Ilstrup DM, Mcllarth DC. Closure of abdominal incisions with subcutaneous catheters a prospective randomized trial. Arch Surg. 1986;121:641-8.
- 3. Vashist M, Singla A, Malik V, Verma M. Abdominal wall closure in the presence of sepsis: role of negative suction. Internet J Surg. 2013;29(1):5.
- 4. Sumi Y, Yamashita K, Kanemitsu K, Kanaji S, Yamamoto M, Imanishi T, et al. Effects of subcutaneous closed suction drain for the prevention

- of incisional SSI in patients with colorectal perforation. Surg Sci. 2014;5:122-7.
- Konishi T, Watanabe T, Kishimoto J, Hirokazu N. Elective colon and rectal surgery differ in risk factors for wound infection, result of prospective surveillance. Ann Surg. 2006;244:758-63.
- 6. Chowdri NA, Qadri SA, Parray FQ, Gagloo MA. Role of Subcutaneous drains in obese patients undergoing elective cholecystectomy: a cohort study. Int J Surg. 2007;5:404-7.
- 7. Fujii T, Tabe Y, Yajima R, Yamaguchi S, Tsutsumi S, Asao T, et al. Effects of subcutaneous drain for the prevention of incisional SSI in high-risk patients undergoing colorectal surgery. Int J Colorect Dis. 2011:26:1151-5.
- 8. Baier PK, Gluck NC, Baumgartner U, Adam U, Fischer A, Hopt UT. Subcutaneous Redon drains do not reduce the incidence of surgical site infections after laparotomy a randomized controlled trial on 200 patients. Int J Colorect Dis. 2010;25:639-43.
- Subramonia S, Pankhurst S, Rowlands BJ, Lobo DN. Vacuum assisted closure of post-operative abdominal wounds: a prospective study. World J Surg. 2009;33:931-7.
- 10. Numata M, Tanabe H, Numata K, Suzuki Y, Tani K, Shiraishi R, et al. The Efficacy of subcutaneous Penrose drains for the prevention of superficial surgical site infections. Jpn J Gastroenterol Surg. 2010;43:221-8.
- 11. Moro ML, Carrieri MP, Tozzi AE, Lana S, Greco D. Risk factors for surgical wound infections in clean surgery: a multicenter study. Italian PRINOS Study Group. Ann Ital Chir. 1996;67:13-9.
- 12. Numata K, Tanabe H, Numata M. Assessment about discharge from inserted subcutaneous Penrose drain in gastroenterological surgery. J Jpn Soc Surg Infect. 2011;8:291-4.

DOI: 10.5455/2349-2902.isj20150524 **Cite this article as:** Patel BJ, Patel KH, Kharadi A, Panchal B. Role of subcutaneous corrugated drain in class IV surgical wound. Int Surg J 2015;2:252-5.