



SURGICAL SITE INFECTION; COMPARISON OF FREQUENCY AFTER PRIMARY AND DELAYED PRIMARY CLOSURE IN DIRTY ABDOMINAL WOUNDS.

1. MBBS,
Registrar Surgery,
CMH Quetta.
2. MBBS, FCPS (Surg) FRCS
Head of Department
Plastic Surgery and Burn Centre,
CMH Kharian.
3. MBBS, FCPS
Assistant Professor,
Gynae and Obs,
Poonch Medical College, Rawlkot.
4. MBBS, FCPS (Surg),
FCPS (Paeds Surg)
Consultant Surgeon
CMH Nowshera.
5. MBBS
Medical Officer,
Nowshera.

Correspondence Address:
Dr. Asrar Ahmad
MBBS, FCPS (Surgery),
FCPS (Paeds Surg)
Consultant Surgeon,
CMH Nowshera.
drasrar.ahmad@yahoo.com

Article received on:

29/06/2017

Accepted for publication:

20/10/2017

Received after proof reading:

29/11/2017

INTRODUCTION

The abdominal wounds following surgery of a perforated viscus are classified as dirty wounds¹⁻⁶, since these wounds are heavily contaminated by the faeculant material and peritoneal exudates, so risk of developing surgical site infection (SSI) is very high with these wounds.^{1-3,7-9} There are many risk factors influencing postoperative wound infections, the method of skin closure is an important factor amongst them.¹ Delayed primary closure (DPC) and primary closure (PC) are two commonly used methods. Delayed primary closure has long been advocated as the standard method of handling such wounds.^{1,2} Open wounds allows free egress of purulent wound discharge resulting in decreased risk of bacterial colonization.

Nevertheless, even today, there is no consensus on the optimal method of wound closure in this

Syed Muhammad Asar Hussain¹, Saadat Ali Janjua², Amna Fareed³, Asrar Ahmad⁴, Irum Saleem⁵

ABSTRACT... Objectives: To compare the frequency of surgical site infection after primary and delayed primary wound closure in dirty abdominal wounds. **Study Design:** Randomized controlled trial. **Duration and Setting:** This study was carried out over a period of six months from 07-02-2014 to 06-08-2014 in the department of surgery combined military hospital Quetta. **Methodology:** A total of 190 patients were included in this study. wound was observed for development of surgical site infection post operatively within seven days by the assigned investigator who was unaware of the wound study design. surgical site infection was assessed using Southampton wound grading. **Results:** Mean age of the patients was 30.89 ± 10.38 and 32.74 ± 9.52 in group A and B, respectively. in group-A, 73 patients (76.8%) and in group-B 66 patients (69.5%) were male while 22 patients (23.2%) of group-A and 29 patients (30.5%) in group-B were female. in group-A surgical site infection was observed in 29 patients (30.5%) and in group-B 12 patients (12.6%) were having surgical site infection. statistically significant difference was found between two groups ($p=0.003$). **Conclusion:** The frequency of surgical site infection was significantly lower after delayed primary closure of dirty wounds as compared to primary closure.

Key words: Dirty abdominal wounds, surgical site infection, primary and delayed primary closure.

Article Citation: Hussain SMA, Janjua SA, Fareed A, Ahmad A, Saleem I. Surgical site infection; Comparison of frequency after primary and delayed primary closure in dirty abdominal wounds.. Professional Med J 2017;24(12):1770-1774. DOI:10.17957/TPMJ/17.4139

class of wounds. Recent studies performed on dirty abdominal wound closure methods showed no advantage of DPC in terms of decreased wound infection compared with PC.⁵ While some studies associate DPC with lower rates of SSI (42.5 % in primary closure vs 2.7% in delayed primary closure)³, some show that PC has low SSI rates (9.1% in PC group vs 27.3% in DPC group).^{4,8}

Although many studies have been conducted there is controversy in literature regarding method of closure in dirty abdominal wound. A recent systematic review and meta-analysis by Aneel Bhangu et al⁹ of RCTs on the subject has concluded that DPC may reduce the rate of SSI, but current trials fail to provide definitive evidence because of poor design. The rationale of this study is to find out superior closure technique for dirty abdominal wounds that results in decreased

frequency of wound infection post operatively.

PATIENTS AND METHODS

This study was carried out over a period of six months from 07-02-2014 to 06-08-2014 in the Department of Surgery Combined Military Hospital, Quetta. Permission was taken from hospital ethical committee. Sample size (n) of 190 patients was calculated for this study by using WHO Sample Size calculator with confidence level of 95%, Level of significance 5% and Power of test 95%. Patients of either sex presenting between 15-50 years of age with dirty abdominal wounds were included in the study. Penetrating abdominal wounds, abdominal gun short wounds and patients having free gas under diaphragm detected on erect abdominal radiograph were considered as dirty abdominal wounds. Patient with previous laparotomy and with comorbidities such as obese (BMI>30), jaundiced, diabetes mellitus and immune-compromised (on steroids, HIV, cancer) patients were excluded as these are considered to increase the risk of wound infection. Informed consent was taken from all the patients. Patients meeting inclusion criteria were admitted and underwent emergency laparotomy. One hundred and ninety patients were randomly distributed by draw method to two groups: group A and group B.

Group- A underwent primary closure i.e. closure of skin and subcutaneous tissue at the time of surgery using prolene 2/0 without any dead space while Group B underwent delayed primary closure i.e. closure of skin and subcutaneous using prolene 2/0 three days after surgery.

Skin was prepared by 4th year resident with povidone iodine. All operations were performed with mid line laprotomy incision. One gram of ceftriaxone and 500 mg of metrnidazole was given at time of induction and continued 8 hourly post operatively for 5 days. Peritoneal cavity was washed with 4 liters of saline and drains were placed from separate stab incision. Linea alba was closed using prolene-1 suture. Duration of surgery was also recorded from time of incision to dressing of wound by stopwatch. Dressing with normal saline was done in DPC group daily for

three days after which wound was closed under local anesthesia by same surgeon. Whereas on 3rd postoperative day dressing of Primarily closed wound was changed. Wound was observed for development of SSI post operatively within seven days by the assigned investigator who was unaware of the study design. Surgical site infection was assessed using Southampton wound grading scale. Presence of redness, swelling, discharge of serous or purulent material from the wound was considered as SSI (Southampton Wound Assessment Scale I and above).

The data was analyzed by SPSS version 14. Mean and standard deviation for the Quantitative Variable i.e. Age was calculated. Frequency and percentages were presented for all the categorical variables including gender and SSI in both groups. Chi-square test was used to compare the frequency of SSI in two groups keeping the significance level as $P < 0.05$.

Effect modifiers such as age, gender, duration of surgery was controlled through stratification using chi-square test keeping significance level as $P < 0.05$.

RESULTS

One hundred and ninety patients were included in this study. Group A (95 patients) underwent primary closure and Group B (95 patients) underwent delayed primary closure. Majority of the patients were between 21-35 years of age and minimum patients were < 20 years old in both groups. Mean age of the patients was 30.89 ± 10.38 and 32.74 ± 9.52 in group-A and B, respectively. In group-A, 73 patients (76.8%) and in group-B 66 patients (69.5%) were male while 22 patients (23.2%) of group-A and 29 patients (30.5%) in group-B were female. In group-A surgical site infection was observed in 29 patients (30.5%) and in group-B 12 patients (12.6%) were having surgical site infection. Statistically significant difference was found between two groups ($P=0.003$) (Table-I). Majority of the patients were having ≤ 2 hours duration of surgery in both groups. Mean duration of surgery was 2.24 ± 0.50 hours in group-A and 2.33 ± 0.49

hours in group-B. Stratification with regards to age, gender and duration of surgery presented in Tables-II-IV.

Chi square = 8.988
P value = 0.003

Surgical site wound infection	Group-A (Primary closure)		Group-B (Delayed primary closure)	
	No.	%	No.	%
Yes	29	30.5	12	12.6
No	66	69.5	83	87.4
Total	95	100.0	95	100.0

Table-I. Surgical site wound infection

Group	Age	Surgical site infection		Total
		Yes	No	
Group-A Primary closure	< 20	7	11	18
	21-35	13	35	48
	36-50	09	20	29
	Total	29	66	95
	$\chi^2 = 0.865$ P = 0.649			
Group-B Delayed primary closure	< 20	0	13	13
	21-35	4	41	45
	36-50	8	29	37
	Total	12	83	95
	$\chi^2 = 5.160$ P = 0.076			

Table-II. Stratification with regards to age

Group	Gender	Surgical site infection		Total
		Yes	No	
Group-A Primary closure	Male	20	53	73
	Female	09	13	22
	Total	29	66	95
	$\chi^2 = 1.455$ P = 0.228			
Group-B Delayed primary closure	Male	08	58	66
	Female	04	25	29
	Total	12	83	95
	$\chi^2 = 0.051$ P = 0.821			

Table-III. Stratification with regard to gender

Group	Duration of surgery (hrs)	Surgical site infection		Total
		Yes	No	
Group-A Primary closure	≤ 2.0	10	46	56
	2.1-2.5	03	14	17
	2.6-3.0	16	06	22
	Total	29	66	95
	$\chi^2 = 24.042$ P < 0.001			
Group-B Delayed primary closure	≤ 2.0	5	45	50
	2.1-2.5	2	16	18
	2.6-3.0	5	22	27
	Total	12	83	95
	$\chi^2 = 1.199$ P = 0.549			

Table-IV. Stratification with regard to duration of surgery (hrs)

DISCUSSION

Surgical site infection (SSI) following abdominal surgery is not uncommon. When assessed actively and prospectively, it has been found to affect as many as 45% of patients.¹¹ Furthermore, without active post-discharge surveillance, up to 79% of SSI will be missed.¹² Surgical site infection confers significant morbidity, with an additional risk of mortality.¹³

There are further health care-related costs through increased hospital stay, repeated surgery, nursing care costs, and drug treatment.¹⁴ Because of these factors, there is international interest in reducing the rate of SSI.

Delayed primary skin closure (DPC) represents a technique where no specialist equipment is required. It can be used when contaminated or dirty wounds are created, allowing the soft tissues to drain (and preventing accumulation of microorganisms in a confined space) before closing the skin a few days later. It may have a role in reducing SSI not only for civilian practice, but also for austere, military, and developing world practices.

Open-wound management of dirty wounds is a practical measure that has been used for centuries¹⁵ Theodor Billroth was a proponent of open wound management in the 1860s.¹⁶ The use of DPC was popularized by military surgeons, where tremendous experience in wound management was gained during two world wars and the Korean war. At that time DPC was performed only after the appearance of a healthy wound, usually at 3-7 days after surgery.¹⁷ Bacterial contamination of the wound during surgery is the major factor responsible for the development of a subsequent wound infection. Recently, several groups have published updated guidelines for the choice of appropriate prophylactic antibiotics in abdominal surgery.¹⁸

Though surgical site infection affects all age groups its incidence increases with age and is seen frequently in older age group. In our present study, maximum number of cases was in age group 21-35 years. The age incidence in

the present study varied from 15 to 50 years but maximum number of patients belonged to 21 to 35 years age group. Rao et al¹⁹, showed in their study that SSI, incidence in doubled in the older age group 50-70 yrs and the incidence of severe complications is increased in both extremes of ages i.e., <10 years and > 60 years. Both sexes were included, male patients were predominant in both groups who were having SSI. In primary closure group, SSI was developed in 20 males and 9 females (Total: 29) while in delayed primary closure groups there were 8 males and 4 females (Total 12) were having SSI showing a statistically significant difference (p=0.003).

In contrast to our study, Usang et al⁵ advocated that there is no advantage of DPC in terms of decreased wound infection compared with primary closure. Chiang et al³ demonstrated lower rates of SSI in delayed primary closure when compared with primary closure, these results are comparable with our findings. Henry and Moss⁴ observed in their study that primary closure has low SSI rate than delayed primary closure. A very recent study by Mukhtar Ahmed et al²⁰ has also concluded significantly less incidence of SSI after DPC for complicated appendicitis.

CONCLUSION

In conclusion, the frequency of surgical site infection was significantly lower after delayed primary closure of dirty wounds as compared to primary closure.

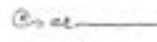
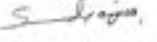

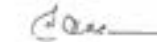
Copyright© 20 Oct, 2017.

REFERENCES

1. Paiboon S, Wasana K, Tanapron T. **Vigorous wound irrigation followed by subcuticular skin closure in children with perforated appendicitis.** J Med Assoc Thai 2010; 93:318-23.
2. Chiang RA, Chen SL, Tsai YC. **Delayed primary closure versus primary closure for wound management in perforated appendicitis: a prospective randomized control trial.** J Chin Med Assoc 2012; 75:156-9.
3. Duttaroy DD, Jitendra J, Duttaroy B, Bansal U, Dhameja P, Patel G, et al. **Management strategy for dirty abdominal incisions: primary or delayed primary closure? A randomized trial.** Surg Infect (Larchmt) 2009; 10:129-36.

4. Henry MC, Moss RL. **Primary versus delayed wound closure in complicated appendicitis: an international systematic review and meta-analysis.** *Pediatr Surg Int* 2005; 21:625-30.
5. Usang UE, Sowande OA, Ademuyiwa AO, Bakare TI, Adejuyigbe O. **Outcome of primary closure of abdominal wounds following typhoid perforation in children in Ile-Ife, Nigeria.** *Afr J Pediatr Surg* 2009; 6:31-4.
6. Sangrasi AK, Leghari AA, Memon A. **Surgical site infection rate and associated risk factors in elective general surgery at public sector medical university in Pakistan.** *Int Wound J* 2008; 5:74-8.
7. Varik K, Kirsimagi U, Varimae EA, Eller M, Loivukene R, Kubarsepp V. **Incidence and risk factors of surgical wound infection in children: a prospective study.** *Scand J Surg* 2010; 99:162-6.
8. Chatwiriyacharoen W. **Surgical wound infection post-surgery in perforated appendicitis in children.** *J Med Assoc Thai* 2002; 85:572-6.
9. Misteli H, Kalbermatten D, Settelen C. **Simple and complicated surgical wounds** *Ther Umsch* 2012; 69:23-7.
10. Bhangu A, Singh P, Lundy J, Bowley MD. **Systemic Review and Meta-analysis of Randomized Clinical Trials Comparing Primary vs Delayed Primary Skin Closure in Contaminated and Dirty Abdominal Incisions.** *JAMA Surg.* 2013; 148:779-86.
11. Anthony T, Murray BW, Sum-Ping JT. **Evaluating an evidence-based bundle for preventing surgical site infection: a randomized trial.** *Arch Surg* 2011; 146:263-9.
12. Manniën J, Wille JC, Snoeren RL, van den Hof S. **Impact of postdischarge surveillance on surgical site infection rates for several surgical procedures: results from the nosocomial surveillance network in the Netherlands.** *Infect Control Hosp Epidemiol* 2006; 27:809-16.
13. Astagneau P, Rioux C, Golliot F, Brückner G; **INCISO Network Study Group. Morbidity and mortality associated with surgical site infections: results from the 1997-1999 INCISO surveillance.** *J Hosp Infect* 2001; 48:267-74.
14. Coello R, Charlett A, Wilson J, Ward V, Pearson A, Borriello P. **Adverse impact of surgical site infections in English hospitals.** *J Hosp Infect* 2005; 60:93-103.
15. Stone HH, Hester TR. **Incisional and peritoneal infection after emergency celiotomy.** *Ann Surg* 1973; 177:669-78.
16. Meissner K, Meisner G. **Primary open wound management after emergency laparotomies for conditions associated with bacterial contamination: reappraisal of a historical tradition.** *Am J Surg* 1984; 148:613-7.
17. Stone HH, Hester TR. **Topical antibiotic and delayed primary closure in the management of contaminated surgical incisions.** *J Surg Res* 1972; 12:70-6.
18. Nathens AB, Rotstein OD. **Antimicrobial therapy for intraabdominal infection.** *Am J Surg* 1996; 172:1-6.
19. Rao AS, Harsha M. **Postoperative wound infection.** *J India Med Assoc* 1975; 44:90-3.
20. Ahmad M, Ali K, Latif H, Naz S, Said K. **Comparison of primary wound closure with delayed primary closure in perforated appendicitis** *J Ayub Med Coll Abbottabad* 2014;26(2):153-7.

AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Syed M. Asar Hussain	Data collection.	
2	Saadat Ali Janjua	Overall supervision.	
3	Amna Fareed	Literature search.	
4	Asrar Ahmad	Data analysis.	
5	Irum Saleem	Referncing / Write up	