ORIGINAL RESEARCH

A comparative study of primary closure versus open skin technique (laparostomy) in emergency laparotomy for perforative peritonitis and blunt abdominal trauma

[1]Dr. Mohit Jhunjhunwala, [2]Dr. Uttam Kumar, [3]Dr. Pankaj Agrawal, [4]Dr. Anmol Agrawal

[1]Assistant Professor, Department of General Surgery, Prasad Institute of Medical Sciences, Banthara, Lucknow, Uttar Pradesh, India
[2]Senior Resident, Department of General Surgery, PIMS, Banthara, Lucknow, Uttar Pradesh, India
[3]Associate Professor, Department of General Surgery, PIMS, Banthara, Lucknow, Uttar Pradesh, India
[4]Junior Resident, Department of General Surgery,PIMS, Banthara, Lucknow, Uttar Pradesh, India

Corresponding Author
Dr. Mohit Jhunjhunwala
Assistant Professor, Department of General Surgery, Prasad Institute of Medical Sciences, Banthara, Lucknow, Uttar Pradesh, India

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ABSTRACT

Aim: The aim of the present study was to assess primary closure versus open skin technique (laparostomy) in emergency laparotomy for perforative peritonitis and blunt abdominal trauma.**Methods:** A comprehensive observational and prospective study of Primary closure and open skin technique with regard to surgical site infections, duration of hospital stay and morbidity following various aetiologies of perforative peritonitis requiring emergency laparotomy. i.e. observation and descriptive study with a sample size of 60.**Results:** Among patients who underwent primary closure, 42.9% developed SSI. This was statistically significant (p = 0.004). Therefore, DPC results in significant decrease in SSI. Among the patients, 6.66% had fascial dehiscence in open skin group and 13.34% in primary closure group. Length of hospital stay was comparable in the two groups (average 13.52 days in DPC group and 14.07 days in PC group; p = 0.586).**Conclusion:** Each SSI, on an average, increases the hospital stay by approximately 5 days. Delayed primary closure significantly reduces the incidence of SSI in perforative peritonitis patients, compared to primary closure. However, it takes quite a while (on an average, 9.2 days) before such wounds become infection-free and appropriate for closure. As a result, the length of hospital stay in delayed primary closure is comparable to that in primary closure patients. Incidence of fascial dehiscence was also comparable in both group.

Key words: Peritonitis, blunt abdominal trauma, primary closure, open skin technique

INTRODUCTION

The open abdomen (OA) procedure is one of the greatest surgical advances in recent times and may have enormous application in the daily management of critically ill surgical patients. The OA may be a useful option for treating patients with abdominal sepsis. On the basis of the source and nature of the microbial contamination, peritonitis can be classified into primary, secondary and tertiary.[1] Primary peritonitis is a diffuse bacterial infection without loss of integrity of the gastrointestinal tract. It is a rare condition occurring mainly in infancy, early childhood and in cirrhotic patients. Secondary peritonitis is the most common form of peritonitis and results from loss of integrity of the gastrointestinal tract due to perforation (e.g. perforated duodenal ulcer) or by direct invasion from infected intra-abdominal viscera (e.g. gangrenous appendicitis).[2]

Tertiary peritonitis is defined as a severe recurrent or persistent intra-abdominal infection >48 h after apparently successful and adequate surgical source control of secondary peritonitis.[3] Although it is less common, it may comprise of a severe systemic inflammation response.[4] Tertiary peritonitis is associated with microbial shift towards nosocomial flora including Staphylococci coagulase-negative, Candida, Enterococci, Pseudomonas, Enterobacter and other opportunistic bacteria and fungi.[3,4] Mortality

rate in tertiary peritonitis is very high, ranging from 30 to 64 %.[4] Abdominal sepsis is the host's systemic inflammatory response to bacterial or yeast peritonitis.[5]

Surgical site infection (SSI) is a major complication after surgical procedures, especially after laparotomy for perforative peritonitis. It increases morbidity, hospital stay, cost of treatment and diminishes patient satisfaction especially in a resource-constraint country like India. Abdominal wall closure in the presence of sepsis is challenging to surgeon. In presence of peritonitis, the gut is oedematous and presence of sepsis in the peritoneal cavity causes exudation. After peritoneal cavity washing, if tight closure of abdominal wall is done, it may lead to compartment syndrome or wound dehiscence or burst abdomen in a significant number of patients. Surgical Site Infections develop as a result of contamination with microorganisms which is mostly patients' flora (endogenous source) commonly 5 to 6 days postoperatively when integrity of the skin and/or wall of a hollow viscus is violated. Surgical wounds can be clean, clean-contaminated, contaminated and dirty. The surgical wound site of laparotomy in cases of perforative peritonitis falls under the category of clean contaminated wound, where the infection rate of wound site is 5-8%.[6] Primary closure can be done in clean contaminated wounds after thorough peritoneal lavage. Another option is delayed primary suture leaving the skin and subcutaneous tissue widely open. The wound is to be dressed with normal saline soaked gauze every day and delayed suturing done usually after about five days if the wound is healthy.[7]

The aim of the present study was to find out the best method of managing laparotomy wounds in cases of Perforative Peritonitis and blunt abdominal trauma among two techniques (Conventional primary closure of skin and subcutaneous tissue and Open skin technique) in terms of

- Incidence of superficial surgical site infections (SSI).
- Incidence of fascial dehiscence.
- Length of hospital stay.

MATERIALS AND METHODS

A comprehensive observational and prospective study of Primary closure and open skin technique with regard to surgical site infections, duration of hospital stay and morbidity following various aetiologies of perforative peritonitis requiring emergency laparotomy. i.e. observation and descriptive study with a sample size of 60.

INCLUSION CRITERIA

All patients, aged >12 years and <80 years, undergoing surgical intervention for perforative peritonitis after taking informed consent and Institutional Ethics Committee approval.

EXCLUSION CRITERIA

- Immunocompromised patients.
- Age ≤12 years and ≥80 years.
- Patients with pre-existing skin infection.
- Patients having diabetes mellitus, obesity or chronic renal failure.
- Patients taking immunosuppressive therapy for other causes.
- Patients not willing to participate in the study.

THOSE MEETING THE CRITERIA WERE RANDOMLY DIVIDED INTO TWO GROUPS

Group	No. of patients	Percentage (%)
Primary closure group (PCG)	45	75
Open skin group (OSG)	15	25
Total	60	100

The outcome measures assessed were:

- Incidence of SSI.
- Incidence of Fascial Dehiscence.
- Length of Hospital Stay.

STATISTICAL ANALYSIS

The results were analyzed for both groups. The outcome variables were categorical in case of SSIs so, significance calculated using Fischer's exact test was done. Two patients in the PCG and One in the OSG died in the post-operative period and were not included in the calculation of SSI.

RESULTS

Table 1: Distribution of patients based on SSI

SSI	Open Skin group (n=14) n (%)	Primary Closure group (n=45) n (%)	p-value	Significance
Yes	1(7.4)	18 (42.9)	0.004	Significant
No	13 (92.66)	25(57.1)		

Among patients who underwent primary closure, 42.90% developed SSI. This was statistically significant (p = 0.004). Therefore, DPC results in significant decrease in SSI.

Table 2: Distribution of patients based on fascial dehiscence

Fascial dehiscence	Open Skin group (n=14) n (%)	Primary Closure group (n=43) n (%)	p-value	Significance
Yes	1(6.9)	5 (10.7)	0.236	NS
No	13 (93.1)	38 (89.3)		

Among the patients, 6.66% had fascial dehiscence in open skin group and 13.34% in primary closure group.

Table 3: Distribution of hospital stay in the two groups

Parameters	Open Skin group (n=14) Mean ± SD [Range]	Primary Closure group (n=43) Mean ± SD [Range]	p-value	Significance
Length of hospital stay	13.52 ± 2.55 [7-26]	14.07 ± 4.60 [7-25]	0.586	Not significant

Length of hospital stay was comparable in the two groups (average 13.52 days in DPC group and 14.07 days in PC group; p = 0.586).

DISCUSSION

A laparostomy or open abdomen (OA) is a key component of damage control surgery. Indications include trauma, abdominal sepsis, ischaemia where relook is indicated, abdominal compartment syndrome, severe visceral oedema and loss of abdominal wall domain.[8-10] Consequently, patients who require OA are often unstable, high risk and comprise a heterogeneous group. The World Society of Emergency Surgery has produced guidance on OA following a literature review and Delphi consensus process.[11] Before widespread adoption of a new surgical technique occurs, it is important to determine the appropriate indications and technical recommendations, especially when there is a high potential for complications. Recent studies demonstrate an increased risk of complications with OA, most notably the formation of enteroatmospheric fistulas.[12,13] A randomized controlled trial failed to show a survival benefit with planned relaparotomy compared to an "on-demand" approach when secondary peritonitis patients underwent primary fascial closure at initial operation.[14] Even with the pendulum shifting away from routine OA utilization,[15,16] it continues to be performed in a subgroup of critically ill patients with physiologic or anatomical derangements the operative surgeon believes precludes abdominal closure.[17]

Among patients who underwent primary closure, 42.9% developed SSI. This was statistically significant (p = 0.004). Therefore, DPC results in significant decrease in SSI. Among the patients, 6.66% had fascial dehiscence in open skin group and 13.34% in primary closure group. Length of hospital stay was comparable in the two groups (average 13.52 days in DPC group and 14.07 days in PC group; p = 0.586). Surgery in perforative peritonitis patients is associated with the highest rates of post-operative infective complications, especially surgical site infections, because of contamination of the operative field with microorganisms from endogenous sources. These infections occur despite all kinds of measures and may cause wound disruption, fascial dehiscence, patient discomfort, bad cosmesis, prolonged hospital stay and increased cost of treatment.[18,19] The most recent meta-analysis by Bhangu et al, has suggested that DPC may have a role in reducing the rate of SSI in contaminated and dirty abdominal incisions, but no definitive evidence was found as all studies analyzed were found to be at high risk of bias, with deficiency in study design and outcome assessment.[20]

Van Ruler et al[14] demonstrated in a randomized trial of patients with severe peritonitis that following initial emergent laparotomy and abdominal closure, there was no significant difference in mortality or major morbidity with on-demand laparotomy versus planned re-laparotomy. Importantly, the authors noted significant heterogeneity within the secondary peritonitis patient population including operative surgeon, etiology, source of infection, and disease severity. Attempts were made to control for the latter using APACHE-2 scores, ultimately demonstrating no difference in relative treatment effects; however, limitations exist when trying to control for other variables.

CONCLUSION

Each SSI, on an average, increases the hospital stay by approximately 5 days. Delayed primary closure significantly reduces the incidence of SSI in perforative peritonitis patients, compared to primary closure. However, it takes quite a while (on an average, 9.2 days) before such wounds become infection-free and appropriate for closure. As a result, the length of hospital stay in delayed primary closure is comparable to that in primary closure patients. Incidence of fascial dehiscence is comparable in both groups.

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