

ANALYSIS OF THE RATE OF WOUND INFECTION AND ITS CONSEQUENCES IN CASES OF STOMA CLOSURE WITH PRIMARY CLOSURE OF THE SKIN AT STOMA SITE COMPARED TO STOMA CLOSURE WITH SECONDARY HEALING OF SKIN AT STOMA SITE

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Abstract

Background: Morbidity after ileostomy or colostomy closure is rather high, with wound infection ranging in the literature from 2% -40%. A more severe wound infection may result in increased morbidity, increased costs, prolonged hospital stay and frequent outpatient follow-up, but also longer term complications, such as incisional hernia. The present study was undertaken to analyse the rate of wound infection and its (late) consequences in case of stoma closure and primary closure of the skin at the stoma site, compared to stoma closure and leaving the skin at the stoma site open for secondary healing. **Methodology:** All consecutive patients who had undergone bowel reconstruction and closure of their (loop) ileostomy or colostomy between June 2016 and December 2017 in the Department of General Surgery, Sir Sayajirao General Hospital & Baroda Medical College were included in this study. During this period 25 colostomies and 19 ileostomies were closed. A hand-sewn anastomosis was performed in all cases. Patients were divided into two groups, according to the operative management of choice, which was different between two participating surgeons. Group I contains patients in whom the skin was primary closed after bowel reconstruction, as was the standard procedure for surgeon I. Group II contains patients in whom skin was left open for secondary healing (surgeon II). Patient's characteristics, comorbidity, medication use, hospital stay and long-term complications were recorded. **Results:** A total of 44 patients, in which 44 stomies were closed, were included in this study. In 22 patients (group I) the skin was primary closed, in the other 22 cases (group II) the skin was left open. Between the two groups no differences were found in age, male female ratio, comorbidity. Major indication for primary surgery was Ileal Perforation (46%). After bowel reconstruction 5 patients of group I developed a wound infection, whereas in group II wound infection was found in 9 cases (22% vs. 41%; p=0.33). Group I and Group II contained almost similar numbers of colostomy and ileostomy closures cases (13/9 vs. 12/10, respectively). Closure of a colostomy resulted 5 times in a wound infection (Irrespective of method). Wound infection after ileostomy closure was seen 9 times (20% vs. 49%, respectively; p=0.10). Ileostomy closure and primary closure of the skin resulted significantly in more wound infection, as compared to delayed closure of skin in case of ileostomy closure (6/9 vs. 3/10, respectively; p=0.018). **Conclusion:** It was found that it is safe to close the skin after stoma closure, especially if time of admission is long enough to encounter its main complication, e.g. wound infection. Although the rate of wound infection is rather high, especially in case of ileostomy closure, management of this complication is easy without (long-term) complications.

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INTRODUCTION

The construction of a temporary stoma is often integral to proper care of patients with complicated colorectal disease. Ideally, a temporary stoma lowers the operative risk, helps to prevent postoperative complications and mortality and is closed as soon as possible without complications.^[1] Unfortunately, morbidity after ileostomy or colostomy closure is rather high, with wound infection as one of the most commonly reported complications, ranging in the literature from 2%-40%.^[2,3,4,5] Although most infections pass without complications, a more severe wound infection may result in increased morbidity, increased costs, prolonged hospital stay,^[2,6,7] and frequent outpatient follow-up, but also longer term complications, such as incisional hernia.^[8]

As it is considered a contaminated operation, it is important to determine the severity and frequency of wound infections after stoma closure. Besides, it is important to oversee the direct and long-term effects of a wound infection. The present study was undertaken to analyse the rate of wound infection and its (late) consequences in case of stoma closure and primary closure of the skin at the stoma site, compared to stoma closure and leaving the skin at the stoma site open for secondary healing.

PATIENTS AND METHODS

All consecutive patients who had undergone bowel reconstruction and closure of their (loop) ileostomy or colostomy between June 2016 and December 2017 in the Department of General Surgery, Sir Sayaji rao General Hospital & Baroda Medical College were included in this study. During this period 25 colostomies and 19 ileostomies were closed. A hand-sewn anastomosis was performed in all cases.

Patients were divided into two groups, according to the operative management of choice, which was different between two participating surgeons. Group I contains patients in whom the skin was primary closed after bowel reconstruction, as was the standard procedure for surgeon I. Group II contains patients in whom skin was left open for secondary healing (surgeon II). All patients received antibiotic prophylaxis during surgery. Preoperative bowel

lavage was not used in any patient.

Postoperative complications, wound infection in particular, in relation to primary closure of the skin, were documented both in the postoperative period and in out-patient follow-up and analysed. Wound infection was defined as per CDC criterion (Discharge, Inflammation, Bacteriology and duration). Patient's characteristics, comorbidity, medication use, hospital stay and long-term complications were recorded. A comparison was made of the postoperative results of procedures performed with or without primary closure of the skin after bowel reconstruction.

RESULTS

Patient characteristics

A total of 44 patients, in which 44 stomies were closed, were included in this study. In 22 patients (group I) the skin was primary closed, in the other 22 cases (group II) the skin was left open. Between the two groups no differences were found in age, male female ratio, comorbidity. In 13 of 25 colostomy closures the skin was primary closed. Of 19 ileostomy closures the skin was primary closed 9 times. Indications for primary surgery and the construction of a diverting stoma are presented Below :

Ileal Perforation: 20(46%), Imperforate Anus : 9(20%), Blunt Abdominal Injury with Perforated Viscus : 5(11%), Pyoperitoneum : 4(9%), Hirschprung's Disease : 3(7%), Penetrating Injury: 3(7%)

Wound infection

After bowel reconstruction 5 patients of group I developed a wound infection, whereas in group II wound infection was found in 9 cases (22% vs. 41%; $p=0.33$). All wound infections in both groups occurred during hospital stay within 5 days (range 2-5). There were no differences in length of hospital stay (group I: 14 ± 16 days vs. group II: 17 ± 19 days; $p=0.20$). Similar results were found when the patients with wound infection of group I were excluded.

Wound infections were managed by partial lay-open and drainage of the wound, conservative treatment with antibiotics or both . Only three wounds in group I had some purulent discharge after opening it

Table 1:

	Group 1, PC(n=22)	Group 2, DPC(n=22)
Men,n(%)	13(59)	16(72)
Age, Years(mean)	31.22	35.13
Type of Stoma		
Colostomy,n(%)	13(52)	12(48)
Ileostomy,n(%)	9(48)	10(52)
Total Infection,n(%)	5(22)	9(41)
Infection rate by Method		
Colostomy,n(%)	3(23)	2(16)
Ileostomy,n(%)	6(66)	3(30)
Culture (n=20),n(%) Immediate Post-Operative	6(27)	14(63)
Klebsiella	2(33)	5(35)
E. Coli	2(33)	4(30)

Staphylococcus aureus	1(17)	5(35)
Pseudomonas	1(17)	0
Culture of patient who subsequently got Infected in PC group	5(22)	-
E. Coli	3(60)	-
Staphylococcus aureus	2(40)	-
Healing of Wound,n(%)		
<14 Days	15(68)	11(50)
15-20 Days	5(22)	4(18)
>20 Days	2(10)	7(32)
Hospital Stay,n(%)		
Average	12.5	17.5
<14 Days	15(68)	11(50)
15-20 Days	6(27)	4(18)
>20 Days	1(5)	7(32)

Type of Stoma

Group I and Group II contained almost similar numbers of colostomy and ileostomy closures cases (13/9 vs. 12/10, respectively). Closure of a colostomy resulted 5 times in a wound infection (Irrespective of method). Wound infection after ileostomy closure was seen 9 times (20% vs. 49%, respectively; $p=0.10$). There were no significant differences in number of infected wounds after primary or delayed skin closure between colostomy or ileostomy closure.

Ileostomy closure and primary closure of the skin resulted significantly in more wound infection, as compared to delayed closure of skin in case of ileostomy closure (6/9 vs. 3/10, respectively; $p=0.018$). After colostomy closure there was no difference in infection rate whether or not the skin was primary closed (3/13 vs. 2/12).

DISCUSSION

The management of the stomal site wound remains controversial. Multiple factors influencing the morbidity of stoma closure have been described, such as surgeon's experience, type of perioperative treatment and timing, obesity of the patient, smoking, corticosteroid use, primary disease and the operative technique.^[2,9,10,11,12]

As closure of a stoma is considered a contaminated operation, it is suggested to leave the skin of the stoma-wound open for secondary healing. It is believed that closure of the skin will lead to more wound infections,^[2,3,4,5] which can lead to more late complications, such as incisional hernia. On the other hand, experienced technical skills and adequate antibiotic bowel preparation, has lead to lower infection rates.^[9] and therefore primary closure of the skin could be safely performed, resulting in a decreased hospital stay.^[2] A prospective study of Lahat *et al.*^[5] comparing primary closure and delayed closure showed no advantages of the delayed closure of stoma site wounds concerning wound infection or hospital stay.

In our hospital all patients received perioperative antibiotic prophylaxis. Bowel preparation was not used. There was a significant difference in number of wound infections between primary closure of the skin and leaving the skin open for delayed primary closure after bowel reconstruction (22% vs. 41% respectively). This complication rate is rather high, but comparable with those of other reports.^[2,3,4,5] All infections occurred within five days and could be easily managed by partially opening the wound for controlled drainage and secondary healing and/or antibiotic treatment. Only 3 patients of primary closure group had purulent discharge after treating

the wound infection by lay-open for drainage the wound. The remainder were superficial infections without abscess formation. Antibiotics probably could have treated the latter, instead of opening the wound. In other words only 14% of the wounds that were primary closed needed to be opened in order to treat postoperative wound infection with abscess formation.

The advantage of a non-complicated procedure in which the skin at the stomal site is closed after bowel reconstruction, is the presumed short outpatient follow up for wound inspection. When the wound is left open for secondary healing, frequent wound inspection and professional supportive wound care at home is needed in some cases. It can take months for the skin at the stomal side to close and frequently an ugly scar is left, that needs to be corrected sometimes. This was the main reason why the closed skin was only partly opened in case of a wound infection. Besides this, the healed skin of stoma closure site should be suitable to be re-used in the future.

According to the existing literature it is expected that colostomy closure is more likely to be associated with infected wounds than ileostomy closure.^[13,14] In this study, ileostomy closure resulted in more postoperative wound infection, compared to colostomy closure (48% vs. 20%), but this difference was not statistically significant. It is similar with Lahat *et al.*^[5], ileostomy closure with primary closure of the skin at stoma site resulted in significant more wound infections compared to delayed closure of the skin. This difference was not found in case of colostomy closure. Although not proven, this phenomenon could probably be the result of micro-leakage of small bowel contents in the wound before skin closure, as small bowel contents is thought to leak more easily compared to the more thickened large bowel contents.

The occurrence of a wound infection is suggested to be associated with longer hospital stay and therefore increased costs.^[5,6] In our study hospital stay between the two groups did not differ significantly. Besides, it seems that the presence of a wound infection did not lead to a longer hospital stay. Hospital stay in this study was rather long. This may be due to the fact that preventive stomas are usually selected for older patients. However, even among older patients, with the increasing emphasis to limit duration of admission and promotion of fast-tract colorectal surgery, hospital stay will certainly decrease within the nearby future. If the fast-tract strategy is the strategy of choice in your hospital, early discharge and leaving the skin open could well be defended as proper treatment, since late-onset of abscess formation after discharge might be prevented in this case. It is presumed that in this case long term out-patient follow up for wound control is needed, especially in older patients. Primary closure of the skin might prevent this out-patient follow up and hence patients can be relieved from intensive wound care. Therefore, patients should be informed carefully about the advantages and disadvantages of primary closure of the skin after stoma closure. Closure of the skin was not associated with a higher number of other complications, such as incisional hernia, anastomotic leakage and fistula formation. In conclusion, in our opinion it is safe to close the skin after stoma closure, especially if time of admission is long enough to encounter its main complication, e.g. wound infection. Although the rate of wound infection is rather high, especially in case of ileostomy closure, management of this complication is easy without (long-term) complications.

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