



Research Article

## COMPARISON OF SURGICAL SITE INFECTION BETWEEN DELAYED PRIMARY CLOSURE VERSUS PRIMARY CLOSURE OF WOUND IN COMPLICATED APPENDICITIS- A PROSPECTIVE STUDY

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### ABSTRACT

**Background:** Acute appendicitis is the most common emergency surgical condition in the world, in which appendectomy is the standard treatment. In complicated appendicitis after an appendectomy, the method of wound closure has played a major role in surgical site infection. The study aimed to compare the delayed primary closure versus primary closure in patients with complicated appendicitis underwent emergency open appendectomy. **Material and Methods:** A total of 50 patients with complicated appendicitis (gangrenous, abscess, perforated appendicitis with pyoperitoneum) admitted in the surgical ward from October 2018 to September 2019 were included in this study. After open appendectomy the patients were randomly assigned into two groups of Delayed primary closure and primary closure after written and informed consent. All the patients were examined for signs and symptoms of surgical site infection periodically in ward and outpatient on weekly basis for one month and recorded the outcome of wound infection. **Results:** out of 50 patients, In DPC there was 2 patients with positive signs of infection but in PC there were 7 patients with infection. The length of stay in DPC ( $7.22 \pm 2.8$ ) and PC ( $7.24 \pm 3.27$ ) with no significant difference between the two groups. **Conclusion:** In our study, patients with complicated appendicitis underwent emergency open appendectomy, DPC may be the preferable method than PC because of the lower incidence of SSI and related complications.

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### INTRODUCTION

Appendicitis is the most common emergency surgical conditions in the world, in which appendectomy is the standard treatment. In complicated appendicitis underwent emergency open appendectomy, Despite the proper aseptic precaution, routine use of antibiotics, postoperative wound infection remains the most common complication of appendectomy<sup>1</sup> and the rate of post-surgical infection after an appendectomy in complicated appendicitis is reported to 20-50%<sup>2</sup> The method of wound closure is an important factor related to the surgical site infection after open appendectomy<sup>3</sup>. In the primary wound closure, the surgical incision closed by the routine method and in delayed primary closure, the skin and subcutaneous tissue left open for 3 to 5 days which allow routine examination of the contaminated wound in complicated appendicitis, then the wound is closed with suture<sup>4</sup>. Numerous studies have shown that DPC has several advantages including a reduction in the colonization of organism and lower the risk of wound failure ie dehiscence<sup>5</sup>. In recent research suggest that even in complicated appendicitis with PC and antibiotic regimen

gives better results than DPC in terms of cosmetics and treatment tolerability<sup>6</sup>. This study aimed to compare the surgical site infection and effectiveness in DPC versus PC in complicated appendicitis underwent an emergency open appendectomy.

### MATERIALS AND METHODS

A total of 50 patients with complicated appendicitis (Gangrenous, periappendicular abscess, perforated and with pyoperitoneum) were included in this study, the study period was 12 months from October 2018 and September 2019, admitted in the surgical ward. In the study population male was (26) and female were (24), their age ranges from 8-48. patients with uncomplicated appendicitis, uncomplicated perpendicular mass, mass suggestive of appendicular tumors, and patient having diabetes mellitus, history of intake of steroids, and patient with the immunocompromised state were excluded from this study. After the open appendectomy the patient was randomly divided into two groups, group A (PC) patients the wound was closed in layers and group B (DPC) patients, the skin and subcutaneous tissue were left open and packed with diluted sterile betadine-soaked gauze and was

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changed every day, and both the groups were followed postoperatively for surgical site infection and managed accordingly. The intra-operative and postoperative swab was taken for pus culture and sensitive antibiotics were given to control the infection. In DPC group, if the wound appears clean delay primary closure was done on postoperative day 3-5, under local anesthesia in the operating room. In PC group, the wound was observed for signs of SSI (erythema, induration and pus discharge) if SSI present wound opened and treated until the wound became healthy, then secondary suturing was done.

**RESULTS**

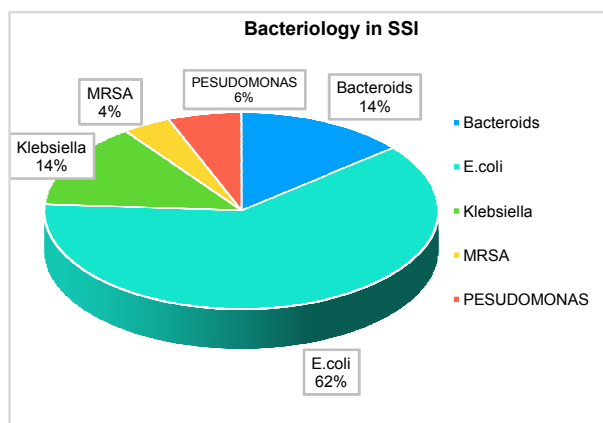
A total of 50 patients the male is to female ratio was 1.7:1 and the mean age of the patient of DPC group were 18.98± 9.17 and in PC group were 18.39± 8.53. All patient was followed up till the end of the study and there was no peri-operative mortality and two patients ended up with Enterocutaneous fistulae and intra-abdominal abscess in delayed primary closure group and both the patients were diagnosed early and treated. In the study, the total incidence of SSI was 18 % out of which 4% in DPC and 14% in the PC group. In complicated appendicitis, the symptom duration was longer and the patients were presented late to the ED. The symptom duration was correlated with SSI in this study and found that there was a positive trend in the occurrence of SSI in complicated appendicitis and the mean value of symptom duration was (54.44±19.4). The most common organism cultured from the wound were Escherichia coli(62%), *Bacteroides fragilis* (14%), *Klebsiella pneumonia*(14%), *Pseudomonas aeruginosa* (6%), and MRSA (4%). On analyzing, the duration of hospital stay was not significant between both groups with a mean duration of stay was in DPC (7.22±2.8) and PC was (7.23±3.2). Obesity is associated with an increased risk of SSI in the clean and clean-contaminated surgical wound. In this study out of 9 patients with SSI 7 patient was managed with PC out of the 7 patients, 3 patients were overweight BMI (25-29.9) and 2 patients were in class I obesity (30-34.9). SSI is caused by many factors, obesity is one of that, patients having more BMI are at more risk than with less BMI. The risk factors can be reduced by some factors like maintaining the proper sterilization and reduced the use of electrocautery in an obese patient (as it causes saponification of fat cells) cause seroma formation later<sup>14</sup>

**Table 1** Duration of symptom and SSI

	SSI (+)	SSI (-)	Total
< 24 hrs	0	1	1
24-48 hrs	2	17	19
48-72 hrs	5	17	22
72-96 hrs	1	6	7
>100 hrs	1	0	1
Total	9	41	50

**Table 2** Post-operative SSI in study population

	SSI (+)	SSI (-)	Total
PC	7 (14%)	18 (36%)	25 (50%)
DPC	2 (4%)	23 (46%)	25 (50%)
Total	9 (18%)	41 (82%)	50 (100%)



**Fig. 1** Bacterial culture from wound discharge

**DISCUSSION**

Appendicitis becomes recognized as a surgical disease when the Harvard University pathologist Reginald Hebert Fitz read his analysis. Among his classic observation of disease was the emphasis on the “vital importance of early recognition” and “it eventual treatment on laparotomy.”<sup>7</sup> This study found that the presence of complicated appendicitis was the most important factor for the development of SSI. Some author considered that preoperative antibiotics administration allows PC of appendectomy wound despite data suggesting that contaminated wound have a higher rate of SSI.<sup>8</sup> Open wound management of contaminated wound is a practice that has been used for centuries. Theodor Billroth was a proponent of open wound management in the 1860s and it was popularized by a military surgeon during world war.<sup>9</sup> The incidence of SSI after appendectomy increases with complicated appendicitis (gangrenous, perforated and pyoperitoneum) and duration of preoperative symptoms increases the incidence of complicated appendicitis also increases and cause SSI, The mean symptom duration of complicated appendicitis were (54.44±19.142 hours). Our study found that the positive correlation in prolonged symptom duration leads to complicated appendicitis and SSI. The overall incidence of SSI was 18% and with PC was 14% and the DPC was 4% in our study, which was comparable to other studies, Duttaroy *et al* found that infection was significantly more in PC group (42.5%) than DPC(2.7%)<sup>10</sup> Similarly Chiang RA. found that the PC group had a higher chance of SSI (38.9%) than DPC group (2.9%)<sup>11</sup> In this study two pediatric patient presented late with perforated appendicitis with pyoperitoneum and involvement in the base of the appendix, the symptom duration was (96 hrs) (>120 hrs) both of them managed with DPC, developed Enterocutaneous fistula, both of the patients were diagnosed early because of the open wound and treated in which we agreed with Mohammad A<sup>12</sup> post appendectomy fecal fistula formation, though a rare complication, is associated with significant morbidity. Early diagnosis is essential to initiate proper treatment at the early stage of the disease. Most of the entero-cutaneous fistula treated conservatively in the absence of underlying pathology and distal obstruction. One case with involvement of base was treated with purse-string suture of the stump leads to stump leak and fecal fistula formation which was agreed with Baldwin JF<sup>13</sup> purse-string treatment includes that may predispose to the development of a fecal fistula. colonic bacterial contamination of the wound during surgery is the major factor responsible for the development of subsequent wound infection<sup>11,14</sup>. In our study Escherichia coli (62%) is

the most common organism cultured from the wound followed by *Bacteroides fragilis*, *Klebsiella pneumoniae*, pseudomonas and MRSA which was similar to Chiang *et al*<sup>11</sup> who found that *E.coli* was the most common organism and our results were different from the study done Siribimrungwong *et al*<sup>15</sup> the most common organism were pseudo no as followed *E.coli*. Obesity is an independent risk factor for SSI across wound classes<sup>16</sup> in our study, it was observed that in a total infected population (55.5%) were overweight and class I obesity and this risk factor can be minimized by vigilant use of electrocautery which prevents seroma formation and infection<sup>17</sup>.

**Table 3** Length of hospital stay

	DPC (n=25)	PC (n=25)
SSI (+)	2(8%)	7(28%)
SSI (-)	23(92%)	18(72%)
LOS (d)	7.22±2.87	7.23±3.27

DPC = delayed primary closure; LOS = length of stay; PC = primary closure; SSI= surgical site infection.

## CONCLUSION

Our study suggested that patient with complicated appendicitis underwent an emergency open appendectomy. Delayed primary wound closure should be considered as a strategy of wound management to prevent SSI and its complications.

## References

- Williams RS, Wilson SE. Appendicitis. In: Howard RJ, Simon's RL, eds *Surgical infection disease 3 Rd edition*. Norwalk, CT: Appleton and Lange, 1995:1167-77.
- Weigelt JA, Lipsky BA, Tabak YP, Derby KG, Kim M, Gupta V. *Surgical site infection: causative pathogens and associated outcomes*. American journal of infection control 2010; 38(2):112-30.
- Lewis SS, Moehring RW, Chen LF, Sexton DJ, Anderson DJ. Assessing the relative burden of hospital-acquired infection in a network of community hospitals. *Infection Control & Hospital Epidemiology*.2013; 34(11):1229-30.
- Kusachi S, Kashimura N, Konishi T, Shimizu J, Kusunoki M, Oka M, *et al*. Length of stay and cost for surgical site infection after abdominal and cardiac surgery in Japanese hospitals: multi-centre surveillance. *surgical infection*.2012;13(4):257-65.
- Urban JA, Cost analysis of surgical site infection. 2006; 7 supply 1:S 19 -22.
- Sookpotarom P, Khampiwmar W, Termwattanaphakdee T. vigorous wound irrigation followed by subcuticular skin closure in children with perforated appendicitis. *J Med Assoc Thai*:2010 mar;93(3):318-23.
- McBurney C. The incision made in the abdominal wall in case of appendicitis, with the description of a new method of operating *Ann Surg* 1894;20:136-43.
- McLachlin AD, wall W. Delayed primary closure of the skin and subcutaneous tissue in abdominal surgery.can *J Surg*(internet) 1976 Jan;19(1):37-40.
- Hepburn H.Delayed primary closure of wounds. *British Medical Journal*.1919;1(3033):181.
- Duttaroy DD, Jitendra J, Duttaroy B, Bansal U, Dhameja P, Patel G, *et al* Management of dirty abdominal incision, primary or delayed primary closure? A Randomised Trial *Surg Infect (Larchmt)* 2009; 10:129-36.
- Chiang RA, Chen S-L, Tsai Y-C. Hair MJ. Comparison of primary wound closure versus open wound management in perforated appendicitis. *Journal of the Formosan Medical Association*. 2006;105.
- Mohamad A. Fecal fistula, the Most Unfortunate Sequelae of Appendectomy- Case Report. *The internet journal of surgery*.2010 volume 27 Number 2.
- Baldwin JF: The prevention faecal fistula after appendectomy. simple ligature versus precarious purse string. *Ann Surg*;1932;95(5):704-714.
- Raahave D, Friis-Moller, Bjerre-Jepsen B, *et al*. The infective dose of aerobic and anaerobic bacteria in postoperative wound sepsis. *Arch Surg* 1986; 121:924-9.
- Siribumrungwong B, Noorit P, Wilasrusmee C, Thakkinstian A. A systematic review and meta-analysis of randomized controlled trials of delayed primary closure in contaminated abdominal wounds. *World journal of emergency surgery*, 9:(1):49,2014.
- Robert D Winfield, Stacey Reese, Kelley Bochicchio, Jhon E Mazuski, Grant V Bochicchio. Obesity and the Risk for surgical site infection in abdominal surgery. *Am Surg* 2016; 82(4):331-6.
- Qingqing He, MD, PhD, Department of thyroid and breast surgery, Jinan Military General hospital of PLA No.25 Shifan Road, Jinan 250031 peoples of the Republic of China.

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