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Surgical site infection rate between the primary and delayed primary closure in patients with complicated appendicitis; a randomized clinical trial

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ABSTRACT

Background: Acute appendicitis is one of the common surgical emergencies. Surgical wounds after complicated (perforated/gangrenous) appendicitis are usually managed with delayed primary closure (DPC) rather than primary closure (PC); however, choosing of the best closure method is controversial. The aim of this study was to compare the rate of surgical site infection between the primary closure and delayed primary closure after complicated appendicitis.

Materials and Methods: This randomized clinical trial was conducted on patients who referred to the emergency department of Loghman Hakim hospital with the chief complaint of acute appendicitis from February 2014 to Feb 2018. The patients were divided randomly into two equal group based on the flipping coin randomization. Demographic features, the rate of surgical site infection and the hospitalization time in the primary closure and delayed primary closure groups were recorded and analyzed by the SPSS software.

Results: Sixty-nine patients include in the final analysis. Thirty-five patients were in the primary closure group and 34 patients were in the delayed primary closure group. Surgical site infection was observed in 6 patients, including 4 patients in the primary closure group and 2 patients in the delayed primary closure group (P value = 0.66). In addition, the hospitalization period was 3.5 ± 0.42 and 5.30 ± 0.21 in the primary closure and in the delayed primary closure respectively (P value = 0.001).

Conclusion: There are no differences between the primary closure and delayed primary closure in the context of surgical site infection. However, the hospitalization time is longer in the delayed primary closure of the complicated appendicitis wound in compare to the primary closure.

INTRODUCTION

Despite the efforts for controlling and several progresses in surgical techniques in addition to the use of prophylactic antibiotics, post-operative infection can be one of the surgical complications after different surgeries [1]. Surgical site infection (SSI) is one of the most common causes of post-operative infections which can occur within 30 days after a surgical operation at the site of incision [2]. It is estimated that approximately 5% of the surgical procedures are associated with SSI; in addition, this type of infection is one of the common types of nosocomial infection with a rate of 38% [3]. SSI can also increase the treatment costs, the hospitalization time and the mortality rate [4].

Appendicitis is one of the most common surgical emergencies [5]. Despite the use of antibiotics to cover both aerobic and

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anaerobic organisms, the rate of post-surgical infection in perforated appendicitis is reported to be 25-50% [6]. The type of wound closure is a critical factor related to the SSI after the appendectomy [7]. In the primary closure (PC), the wound closed by suture just after the surgery but in the delay primary closure (DPC), the surgical site is held open for 3 to 5 days after the surgery and then closed with suture [8]. Various studies have shown that DPC have several advantages including reduction the colonization of organisms in the wound site, increasing the wound stability and, improving the oxygenation and the blood flow of the wound after the surgery [9]. Currently, the preferred method for the wound care in complicated cases of appendicitis is DPC; although, considering the long time for the hospitalization and high treatment costs, there is more willing for using the primary closure [10]. However, the outcome of the primary and delayed primary closure of the wound after complicated appendectomy is different in recent studies.

The aim of this study was to compare the prevalence of SSI in the primary and delayed primary closure in complicated appendectomy patients.

MATERIALS and METHODS

Study design

This randomized clinical trial was conducted in the surgical ward of Loghman Hakim hospital from February 2014 to February 2018. The inclusion criteria of the study were gangrenous and perforated appendicitis that was diagnosed by the surgeon during the surgery and the BMI below the range of 30 kg/m2. In addition, all patients who do not have the clear evidences of the perforation or the gangrenous during the surgery and the patient with BMI higher than 30 kg/m2 in addition to patients with the history of underlying disease were excluded from the study. Convenience sampling was used for the patient selection and the sample size was assumed at least 60 patients considering 5% of the error and 80% of the confidence interval based on a previous similar study [11].

Randomization and intervention

Patients were randomly divided into two groups with a ratio of 1:1 by flipping the coin after the appendectomy. Thirty-five patients underwent primary wound closure and DPC was used for 34 patients. Both groups underwent the same antibiotic regimen until the end of fever, normalization of the WBC level and starting the gastrointestinal function. In DPC group, operation site was covered with a sterile gauze that coated with normal saline and the gauze was changed daily for 5 days. After 5 days, if the surgical site was clean and there was no evidence of wound infection, the wound was closed in the operation room under the local anesthesia; otherwise, changing the dressing continued until the wound site be cleaned. In the PC group, the surgical wound was sutured immediately after the operation by nylon suture.

Data collection

Age, gender, underlying disease, hospitalization time, operation time and evidences of SSI were collected from the patients. Diagnosis of the SSI in this study was based on CDC criteria [12] by the following evidences: exudate exertion of the wound, positive culture for the presence of microorganisms and, localized inflammation of the wound site. If the patients had CDC criteria within 30 days after the surgery the SSI was confirmed.

Statistical Analysis

Version 16 of SPSS was used for data analyzing. Quantitative data were reported as mean ± SD and qualitative variables were expressed as numbers and percentages. Student t – test and chi – square test were used for assessing the relationship between the quantitative and the qualitive variables respectively. P value less than 0.05 was considered significant.

Ethical Consideration

This study was performed after obtaining the permission from the ethics committee of Shahid Beheshti University of Medical Sciences. (Registration No: IR.SBMU.MSP.REC.1397.122).

RESULTS

In this study, sixty-nine (69) patients were initially diagnosed with perforated or gangrene appendicitis, which 35 of them were assigned to the PC group (A) and 34 were assigned to the DPC group (B). The two groups were matched for the age, the gender and the BMI of the samples.

The results of comparing the variables between the two groups are presented in Table 1.

As seen in table 1, there were no significant differences between the two groups in the context of demographics, SSI and laboratory data. However, the hospitalization time in the PC group was significantly lower than the DPC group ($P < 0.05$).

Table 1. The results of comparing the variables of the two groups

Variables		Primary closure group (A)	Delayed primary closure group (B)	P value
Age (year)		25.2 ± 3.9	24.7 ± 3.8	0.62
time of the operation (minute)		40.7 ± 0.9	40.96 ± 1.3	0.39
BMI (kg/m2)		28.36 ± 1.6	28.46 ± 1.7	0.81
hospitalization time (day)		3.5 ± 0.42	5.3 ± 0.21	0.001
Leukocytosis (*103/µl)		14.8 ± 0.8	16.3 ± 0.1	0.18
Sex	female	17 (48.6%)	19 (55.8%)	0.35
	male	18 (51.4%)	15 (44.2%)	
Surgical Site Infection		4 (11.7%)	2 (5.7%)	0.66

DISCUSSION

The results of this study indicated that the rate of SSI in the PC and the DPC of the surgical; wound were not significantly different. To the best of our knowledge, this is the first study in Iran which evaluate PC and DPC for complicated appendectomy.

The prevalence of SSI can be higher in the perforated or gangrenous appendicitis and the most common cause of SSI in these cases is the contamination of the surgical site by the microbiota of the gastrointestinal tract [13]. There are many controversies over the prevention of the SSI and there have been several different prophylactic antibiotics regimens [7]. Some researchers believe that the use of appropriate antibiotics along with the primary closure of the wounds can control the wound infection, but the results from different studies have diversity.

The delayed primary closure was first introduced in the 1860s by Bilroth and was commonly used during the Second World War and the Korean War [14]. In the 1970s, DPC was considered as the standard method for managing gangrenous and perforated appendicitis wound; however, many studies currently recommend primary closure of these wound in children and adults [15; 16].

Studies were done by Lemieur et al., Yellin et al., Chiang et al and Ahmad et al Showed that the rate of postoperative wound infection after perforation appendicitis is significantly higher in patients with primary closure [17]. The rate of SSI in our study was 11.7% in PC group and 5.7% in DPC group. However, the rate of SSI was higher in PC but the difference was not statistically significant. In contrast, other studies suggest that there was no significant differences in the rate of SSI between the two groups of PC and DPC in perforated appendicitis which is in line with the results of the current study [18]. In these studies, it was suggested that considering the lack of significant differences in the rate of SSI between the PC and DPC, the use of the PC method is better due to lower time of hospitalization and lower therapeutic costs.

It seems that the differences in the results of the recent studies are due to differences in the surgical methods, the underlying diseases and the use of prophylactic antibiotics. It will be better for researchers to consider these factors in future studies.

CONCLUSION

It seems that the use of DPC in the complicated appendicitis does not have any effect on the reduction of SSI; furthermore, the use of DPC can increase the hospitalization period and the therapeutic cost which can increase the possibility of nosocomial infections. It is better to use the PC method for the complicated appendectomy.

CONFLICT of INTREST

There are no conflicts of interest.

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