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Early versus late discharge from hospital after open appendectomy

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ABSTRACT

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To date there is increasing pressure on surgeons to minimize the time that the patient stays in hospital. Patients with acute appendicitis without perforation or peritonitis are not discharged early due to concern on the part of the surgeon that it would increase surgical wound infection rates. The aim of this study was to compare surgical wound infection rates after open appendectomy (OA) of patients with acute appendicitis without perforation or peritonitis in an early discharge (ED) group and a control group without early discharge (late discharge [LD] group. The study was also to evaluate patient acceptance of ED in comparison to the LD group. A cross sectional study was carried out on adult patients (age >14 years) with acute appendicitis without perforation or peritonitis, who underwent open appendectomy. The results showed that there was no significant difference ($p>0.05$) in surgical wound infection rates in both the intervention (ED) and control (LD) groups. In addition, there was a significant difference ($p<0.05$) in patient acceptance (satisfaction) in both groups, where patients in the ED group were more satisfied than the patients who had not been discharged early. The conclusions of this study are that early discharge from hospital after open appendectomy does not increase surgical wound infection rate and has good patient acceptance.

Keywords : Early discharge, open appendectomy, infection, patient acceptance

INTRODUCTION

At present, many operations have only a one-day length of stay.[1,2] Although length of stay for common operations in various countries tends to decrease, patients undergoing open appendectomy often remain in hospital for 3-5 days after operation.[3,4] In Saudi Arabia, the mean length of stay in open appendectomy was 3.02 ± 1.27 days.[5] To date there is increasing pressure on surgeons to minimize the time that the patients stay in hospital. Therefore, there is a need to establish guidelines for reasonable length of stay standards for common operations.[3]

Patients with acute appendicitis without perforation or peritonitis are not discharged early, due to concern on the part of the surgeon that it would increase surgical wound infection rates[3] and that postoperative pain would inhibit

mobilization of the patient.[6-8] Surgical wound infection is commonly due to contamination of the wound at the time of appendix removal.[9-11] With minimal contamination, prophylactic antibiotic administration would bring the incidence of wound infection to a low level.[12,13] Pain after open appendectomy could be managed with analgesics. After the pain disappears, the patients would be more comfortable, could be mobilized immediately and discharged earlier.[6,8]

Surgical wound infection is affected by several risk factors, i.e. patient, local, environmental, procedural, surgeon/operator, and care factors. Patient factors consist of age, nutritional status (malnutrition, obesity), the presence of other diseases (malignancy, chronic diseases [diabetes mellitus, hepatic cirrhosis], associated infection), the treatment received (corticosteroids, immunosuppresants, radiation) and psychological state of the patient (anxiety, fright, and sleeping difficulty).[10,12] Local factors that participate in surgical wound infection are necrotic tissue, avascular tissue, hematoma, poor hemostasis, foreign material in the wound, suture material and suturing technique, skin infection in the surgical area.[12] Environmental factors consist of sterility of the operating room, number of personnel in operating room, air circulation of operating room, and sterility of instruments. Procedural factors of influence are length of hospital stay before operation, preoperative preparation such as cleansing of the incision site, hair shaving, aseptic and antiseptic techniques for preparation, antibiotics administration, and degree of contamination of the type of surgical procedure, whether categorized as a clean, clean-contaminated, contaminated or dirty operation. Emergency or elective operation and duration of the operation are also included in procedural factors.[10,12] Surgeon/operator factors are knowledge, skill and experience of the surgeon/operator, tissue handling, prevention of the spread of contamination, selection of needles, suture material and suturing technique.[10,12] Care factors that influence surgical wound infection are misevaluation (inexperience/lack of attention), lack of asepsis in wound care, less careful evaluation about progress/healing/symptoms of the patients, less mobilization, incorrect nutritional support.[10,12] Open appendectomy (OA) patients with early discharge (ED) from hospital may be expected to differ in risk factors from those who are not discharged early (late discharged/LD), presumably due to care factors after the operation.

The aim of this study was to compare the surgical wound infection rate and patient acceptance after OA in ED and LD patients.

METHODS

Research design

A cross sectional study was carried out from January 1999 to December 2001 at the IRNA A2 and IRNA A3 (3rd class) wards of the Surgery Division of Dr. Kariadi Hospital, Semarang.

Participants

Participants were adult patients (more than 14 years old) with acute appendicitis on whom open appendectomy was performed. The inclusion criteria, determined at OA, were phlegmonous, suppurative or gangrenous appendicitis. Exclusion criteria were: i) patients with malnutrition, obesity (body mass index >25.0),[14] anemia (hemoglobin concentration <11.5 g/dL for women and < 12.5 g/dL for men),[15] malignancy, chronic diseases (diabetes mellitus, hepatic cirrhosis), skin infection on surgical area before operation, patients receiving corticosteroids and/or chemotherapy, patients on radiotherapy; ii) patients who declined to participate in this study and iii) patients with intraoperative findings such as appendiceal mass, perforated appendicitis or normal appendix.[16,17]

Surgery

Gentamycin injection was given as prophylactic antibiotic (80 mg for adults or 2.5 mg/kg body weight). The choice of antibiotic was based on pattern and sensitivity tests of aerobic microorganisms in intraperitoneal fluid of patients with non perforated acute appendicitis in the Surgery Division of Dr Kariadi Hospital, Semarang.[18] The patients were also given one 500 mg metronidazole suppository (15 mg/kg body weight) as prophylaxis against gram negative anaerobic bacteria (including *Bacteroides fragilis*).[19,20] On all of the patients standard appendectomy was performed via a muscle splitting incision under general anesthesia. Closing of muscle layers was done with absorbable material. Skin was closed by interrupted sutures with 4-0 silk.

Postoperative Management

After the operation, an analgesics suppository was administered. In addition the patients received mefenamic acid. Antibiotic administration was continued up to 24 hours post operation.[21,22] No intravenous fluid replacement was done after the operation.

The patients were supported to early mobilization. They were permitted to drink and eat after being free from anesthetic influence. The patients were evaluated on the next day and discharged when their condition was good. Before discharge, the patients and their families received oral and written instructions on the procedure of wound care. Surgical wound care for patients in the ED group was performed by the patients and their families at home. Surgical wound care for patients in the control (LD) group was performed by the attending physician in the ward.

Outcomes

The patients with ED (discharged in 24 hours) and LD (more than 24 hours) were followed up one week later. The surgical wound was examined and all problems such as discharge, bleeding or infection were noted. The definition of surgical wound infection is based on Center for Disease Control and Prevention (CDC) criteria.[10,23] The surgical wound infection that were evaluated were superficial incisional surgical site incision (SSI) and deep incisional SSI. The patients were asked to express their acceptance (satisfied or not satisfied) of their discharge. Then the patients were requested to visit the hospital one week later for reevaluation. Evaluation of the patients discharged after more than 24 hours was performed by the attending physician in the ward.

Sample size

The approximate sample size (n) needed for this study, involving two groups with the outcome is expressed in terms of proportions, was calculated from the following formula:

$$n = \frac{z_{\alpha}\sqrt{2\pi_1)} + z_{\beta}\sqrt{\pi_1(1-\pi_1) + \pi_2(1-\pi_2)^2}}{\pi_1 - \pi_2}$$

The appropriate sample size for our study was calculated before the beginning of the trial, based on an analysis of sample sizes required for each of the main parameters (wound infection and patient acceptance) for an á of 0.05 and a power of 90%. Nandi et al. stated that surgical wound infection rate for clean-contaminated operations ($ð_1$) was 7.7%.[24] Surgical wound infection rate for early discharge after open appendectomy in a study in Royal Berkshire Hospital, London, ($ð_2$) was 6.12%.[3] We determined that we would need at least 89 patients per group for fulfilling the requirements to perform statistical analysis for surgical wound infection rate with Pearson chi square.[25-27] The total number of patients who were included in this study was 208, consisting of 102 patients in the ED group and 106 patients in the LD group, thus meeting the sample size requirement.

Statistical analysis

Nominal or ordinal data were tested by Pearson chi square. Data on a ratio scale were tested for normality of distribution. The analysis was continued with independent t-test for data with normal distribution (skewness approaching 0 and kurtosis approaching 3).[25,28] The proportions of risk factors in both groups were tested for equality. All p values reported are 2-sided, and $p < 0.05$ denotes statistical significance.

RESULTS

Twenty two patients were excluded from 237 acute appendicitis patients. Of the remaining 232 patients 215 (92.68 %) agreed to participate after open appendectomy, among whom there were five patients with perforated appendicitis and two patients with appendiceal mass. The latter were not included in the study, bringing the total number of study subjects to 208.

One hundred and two patients were assigned to the ED group and 106 patients to the LD group (Figure 1).

The values (expressed as mean ± standard deviation) of age, duration of operation, stage of acute appendicitis, and class of operator (e.g. resident) in the ED group and LD group and the probability of each risk factor in both groups is shown in Table 1. Both groups were

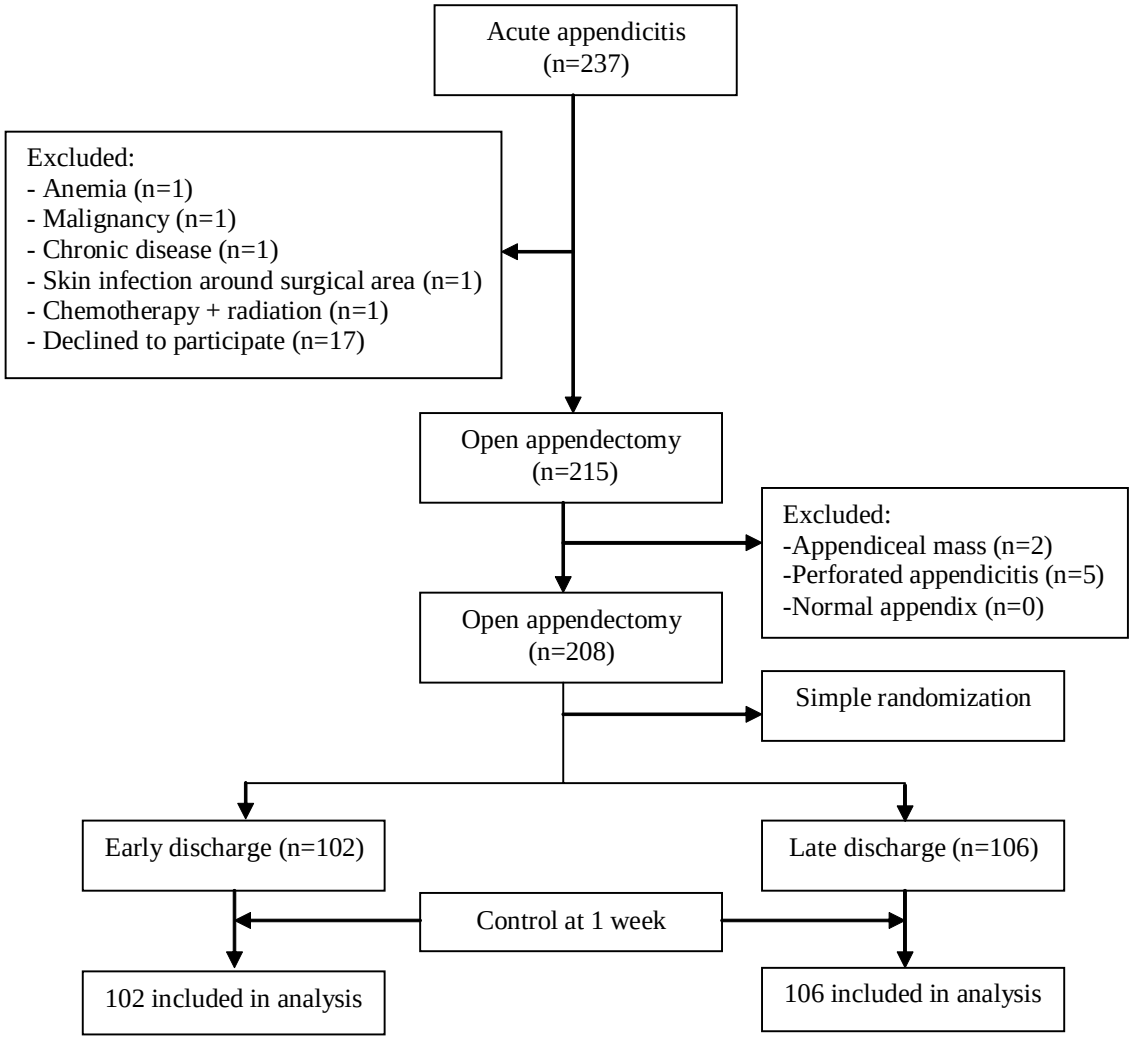

Figure 1. Flow of participants through trial

Table 1. Demographic and operative data of the study groups

	Early discharge (n=102)	Late discharge (n=106)	p value
Age (years)	26.28 ± 8.45	26.45 ± 8.83	0.888
Duration of operation (min)	65.54 ± 21.95	68.21 ± 29.62	0.463
Stage of acute appendicitis :			
Phlegmonous appendicitis	70	66	
Suppurative appendicitis	19	19	
Gangrenous appendicitis	13	21	0.382
Class of operator :			
Second degree	59	60	
Third degree	43	46	0.857

comparable in terms of age and duration of operation ($p>0.05$). The mean operative duration in the ED group was 65.54 ±21.95 minutes compared to 68.2 ±29.62 minutes in the LD group, yielding a statistically non-significant difference ($p=0.463$). Similarly, no significant differences were found between both groups regarding stage of appendicitis and class of operator ($p>0.05$)

The Pearson chi square test for differences in postoperative surgical wound infection rate between ED group and LD group found no significant difference between both groups ($p=0.431$), as shown in Table 2. However, the Pearson chi square did find a significant difference in patients acceptance (satisfaction) between ED group and LD group (Table 3). There was a significant difference ($p < 0.05$) of patient acceptance (satisfaction) between ED group and LD group, where patients in the ED group were more satisfied with their discharge than the LD patiens.

DISCUSSION

The present study proved that there was no difference in wound infection rates after OA between ED and LD patients. Early discharge was also acceptable to both groups. The results of this study were similar to those of a previous study in another country, stating that early discharge of patients with acute appendicitis without perforation after OA was safe and well accepted by the patients. Surgical wound infection rate was 4.90% in the ED group and 7.41% in the LD group. Statistically there was

Table 2. Surgical wound infection in ED group and LD group

Wound infection	Early discharge (n=102)	Late discharge (n=107)	p value
No	97	98	0.431
Yes	5	8	

Table 3. Patients acceptance in ED group and LD group

Patient acceptance	Early discharge (n=102)	Late discharge (n=106)	p value
Satisfied	78	43	0.000
Dissatisfied	24	63	

no significant difference ($p>0.05$) in surgical wound infection rates between the ED and LD groups.[3] The present results also showed similar surgical wound infection rates as compared to the reference values. According to Gottrup et al. the surgical wound infection rate for clean-contaminated operations was between 6–9%.[13] Nandi et al. declared that surgical wound infection rate for clean-contaminated operation was 7.7%,[24] while surgical wound infection rate for OA in the Royal Berkshire Hospital study in London was 6.12%.[3] Early discharge was also well accepted by the patients. It was found that 76.47% of patients in the ED group were satisfied with their discharge, compared with 39.81% of patients in the LD group. Statistically, there was a significant difference ($p<0.05$) in patient acceptance of their discharge between the ED and LD groups.[25,27] Thus more patients were satisfied with early discharge compared to patients satisfied with late discharge.

The study in Royal Berkshire Hospital, London, on 147 post appendectomy patients (adults and children) without perforation or peritonitis, who were discharged in 24 hours after operation, showed that among patients who consulted general practitioners there were 2 patients (1.36%) with pain at the incision site, 8 patients (5.44%) with serosanguinous discharge, 1 patient (0.68%) with wound abscess and 1 patient (0.68%) with pyrexia and malaise caused by mesenteric adenitis. The patients had a normal appendix, as determined in a previous operation. All of the wound problems appeared in 7–10 days after operation, after the patients had been discharged from hospital. Therefore, a 3–5 day discharge after operation, as was done in the past, was no guarantee that the patients would be free from surgical wound infection.[3] On the contrary, a longer length of hospital stay increased the risk of nosocomial infection.[9,10,11] Early discharge was also well accepted by the patients and their families, as it allowed them to resume their normal activities.[3] Santacroce et al. from State University at Bari, Italy gave early discharge to patients with acute appendicitis without complications, on whom had been performed open appendectomy or laparoscopic appendectomy, with good results.[29]

There is a general tendency in health care for decreasing length of stay in hospitals. Length of stay is one of the clinical performance indicators or the main measure of efficiency.[2] Early discharge from hospital after open appendectomy results in the patients returning more quickly to normal activities. Early discharge also reduces hospital costs compared with late discharge.[2] Ramesh and Galland showed that there was no morbidity caused by early discharge from hospital. Most patients and their families showed good acceptance of early discharge.[3] Currently patient acceptance (satisfaction) has become a part of the clinical database. Patient satisfaction is considered increasingly important in the medical field.[30]

The most common problem faced by the patients after OA was surgical wound infection. There is little question that surgical wound infection contributes significantly to the cost, morbidity, and possible long-term consequences of a surgical procedure.[10,12] Surgical wound infection was more often due to contamination with endogenous microorganisms, rather than exogenous microorganisms.[9,10] The polymicrobial aerobic and anaerobic flora, closely resembling the normal endogenous microflora of the surgically resected organ, are the most frequently isolated pathogens in clean-contaminated operations.[10] In OA, surgical wound infection is mainly due to contamination of the wound at the time of appendix removal.[9,10,11] In minimal contamination, prophylactic antibiotic administration reduced the incidence of complications to a low level.[11-13] Even with a length of stay of 3-5 days in hospital, most surgical wound infection occurred after the

patients were discharged from hospital (7–10 days after the operation).[3] Wound infections may not constitute serious complications per se but represent a major inconvenience to the patient, impacting on convalescence time and quality of life.[31]

This study supports previous studies that declared early discharge from hospital after OA to be safe and well accepted by the patients.[3] Although statistically there was no significant difference in surgical wound infection rate between both groups, there still was an obvious clinical difference, the surgical wound infection rate in the ED versus LD groups being 4.90% and 7.41%, respectively.

The theoretical implication of this study is that late discharge will increase nosocomial infection rates.[12,32,33] The present study has some limitations. The study population consisted of patients with acute appendicitis without perforation in 2nd and 3rd class in the Surgery Division of Dr. Kariadi Hospital, Semarang, having different socio-economic status, ward conditions and hospital care. Therefore, this study may not be representative of the general population in Semarang. Our follow-up was limited to the first week postoperatively.

CONCLUSIONS

Late discharge after open appendectomy is not superior to early discharge. Early discharge from hospital after open appendectomy does not increase surgical wound infection rate and is also well accepted by the patients.

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