



Risk Factors for Post-operative Ileus: A Retrospective Study in Tertiary Referral Hospital in Indonesia

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Abstract

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BACKGROUND: Post-operative ileus is a complication that may result in the longer duration of stay and decreases the quality of life of patients. Previous studies have found some factors related to post-operative ileus.

AIM: This study aimed to determine the risk factor of post-operative ileus in laparotomy resection and anastomosis surgery.

METHODS: Patients who underwent laparotomy resection and anastomosis surgery during January 2019–July 2020 were included in the study. Post-operative ileus was diagnosed in fourth day after surgery. The variables included in this study are age, gender, BMI, pathology site, duration of surgery, type of anastomosis, and length of resection.

RESULT: Fifty laparotomy resection and anastomosis surgery patients were included in this study, 50% of subjects are patients with post-operative ileus. The patient aged 65 years old or older had a higher incidence post-operative ileus (68% vs. 28%; RR 2.3 95% CI: 1.23 - 4.33; *P* value: 0.010). The study also found duration of surgery 180 min or longer also had higher incidence post-operative ileus (79% vs. 36%; RR: 2.49 95% CI: 1.20 - 5.15; *P* value: 0.010).

CONCLUSION: This study concludes that age 65 years old or older and duration of surgery 180 min or longer are significant risk factor to post-operative ileus in laparotomy resection and anastomosis surgery patients.

Introduction

Nowadays, post-operative complications are one of the concerns in the medical world, one of which is post-operative pathological paralytic ileus. The incidence of post-operative pathological paralytic ileus is quite common and should be the concern to surgeons. This condition is burden to both the patient and the hospital. The patient feels uncomfortable with the pain caused by the post-operative ileus. The burden of the hospital is regarded of the extended duration of stay of patients. Further, about 1.5 billion USD was used to treat post-operative ileus in USA per year [1].

Post-operative paralytic ileus is a physiological condition of the intestine in response to surgical stress [2]. It is called pathological if it occurs more than 3 days with 2 out of 5 symptoms, including nausea and vomiting; an inability to tolerate solid or semi-liquid diet during the preceding 24 h; no gas or stool for the preceding 24 h; abdominal distension; and radiological evidence of ileus [1]. Post-operative pathological paralytic ileus can also be defined as a condition, where there is no intestinal motility after 3 days of laparoscopic surgery or

after 5 days after laparotomy surgery. This condition can cause pain, nausea, or vomiting. Moreover, it will also cause the increase transition time of food in the intestine which will result in poor wound healing [3].

A meta-analysis conducted in 2016 found that the crude incidence of post-operative ileus is 9.1 to 10.4% [4]. Another study found that 45 from 186 elective colectomy surgery experience post-operative ileus. The main findings of this study are the high readmission (14.6% from all cases; 33% from readmission cases is related to post-operative ileus); longer length of stay in post-operative patients compared to the non-post-operative ileus (8 and 9 days vs. 4 days); longer duration of analgetic (142 h vs. 43 h); and parenteral nutrition (37 - 3 hours) compare to the non-post-operative ileus cases [5].

There are several studies conducted to determine the risk factor of post-operative ileus. Site and type of surgery was found related to post-operative ileus [4]. Other significant factors related to post-operative ileus are age, gender, tumor location, comorbidities (coagulopathy and chronic obstructive pulmonary disease), blood transfusion and fluid infusion intraoperative, type of anesthesia and analgesics, other

post-operative complication and previous history of surgery [1], [6]. However, it is hard to find same study conducted in Indonesia. In the limited setting, focusing on patient's characteristic and intraoperative conditions will help the doctor to anticipate the risk of post-operative ileus. Therefore, the study was conducted to determine the risk factors of post-operative ileus in patient who underwent laparotomic resection and anastomosis surgery in Indonesia. The main variable examined in this study is the demographic of the patient (age, gender, and BMI), the pre-operative condition (pathology site), and intraoperative condition (duration of surgery, type of anastomosis, and length of resection).

Methods

This is a retrospective study with patients who underwent laparotomic resection and anastomosis surgery. The study took place in Surgical Ward, Sanglah National Hospital, Bali, Indonesia between January 2019 and July 2020.

Patients

Inclusion criteria in this study is patients over 18 years old who underwent laparotomic resection and anastomosis surgery, while the exclusion criteria were patients with double primer malignancy, patients with Crohn disease, and patients with history of obstructive ileus or paralytic ileus before surgery. Patients with leakages anastomoses were also excluded from the study. The minimal sample needed in this study was 50 patients. The subjects were chosen with consecutive sampling. Sample needed was calculated with formula below with $\alpha = 95\%$, $\beta = 10\%$, expected OR = 3, and P2 proportion is 10%. The sample calculated by the formula then added with 10% for expectation of drop off.

$$n = \frac{\left(Z_{\alpha} \sqrt{2PQ} + Z_{\beta} \sqrt{P_1Q_1 + P_2Q_2} \right)^2}{(P_1 - P_2)^2}$$

Data collection

Clinicopathological characteristic was recorded before surgery including age, gender, body mass index, and pathological site. Surgery duration, resection length, and anastomoses were recorder during the surgery. All patients were followed up until 4 days after surgery. The pathological post-operative ileus was diagnosed on the 4th days after surgery. The pathological post-operative ileus was diagnosed defined

by the combination of at least two of the following five signs: Nausea and vomiting; inability to tolerate solid or semi-liquid diet during the preceding 24 h; no gas or stool for the preceding 24 h; abdominal distension; and radiological evidence of ileus [1].

All surgeries were done by a digestive surgeon consultant who has been practice as digestive surgeon for minimal 5 years. All the surgery was done electively.

Statistical analysis

Statistical analysis was conducted using SPSS version 22 (Inc., Chicago, IL). Continuous data were presented as mean or median and range based on the distribution of the data. Categorical data were presented as proportion. Univariate analysis was done using Chi-Square test, Mann-Whitney U-test, or Student *t*-test, as appropriate.

Results

Patient's characteristics

A total of 50 patients with laparotomic resection and anastomosis surgery were included in this study. There were 25 patients with post-operative ileus and 25 other patients did not. Subjects were in the age range of 32 - 74 years and were dominated by women (Table 1).

Table 1: Characteristic of patients

Characteristics	Mean ± SD	n (%)
Age (years)	58.58 ± 11.05	
Age group		
65 years old and more		26 (52)
<65 years old		24 (48)
Gender		
Male		19 (38)
Female		31 (62)
Body mass index		
Normal		22 (44)
Overweight		25 (50)
Obesity		3 (6)
Pathological site		
Ileum		24 (48)
Cecum		6 (12)
Colon		20 (40)
Resection length (cm)	13.30 ± 1.85	
Anastomosis		
Colorectal		9 (18)
Colocolonic		12 (24)
Ileocolonic		29 (58)
Surgery duration (minutes)	169.40 ± 37.33	
Surgery duration (min)		
<180		22 (44)
180 or more		28 (56)

SD: Standard deviation

Factors associated with post-operative ileus

The study found that there was an association between the patient's age and duration of surgery to the occurrence of post-operative ileus. The group of patients with age 65 years or older had 2.30 times (95%

CI: 1.23–4.33) risk of pathological paralytic ileus than the younger group (P value: 0.010). In addition, it was also found that patients who had duration of surgery for 180 min or longer had 2.49 times (95% CI: 1.20 - 5.15) risk of having a post-operative ileus surgery ($P = 0.010$) (Table 2).

Table 2: Association between clinicopathological characteristic and surgical finding with post-operative ileus

Characteristic	Post-operative ileus, n (%)	Non-post-operative ileus, n (%)	p
Age (years)	63.88 ± 8.48	53.28 ± 10.89	<0.001 ^a
Age group			
65 years old and more	17 (68)	7 (28)	0.010 ^b
<65 years old	8 (32)	18 (72)	
Gender			
Male	9 (36)	10 (40)	0.771 ^b
Female	16 (64)	15 (60)	
Body mass index			
Normal	2 (8)	1 (4)	0.830 ^b
Overweight	12 (48)	13 (52)	
Obesity	11 (44)	11 (44)	
Pathological site			
Ileum	15 (60)	9 (36)	0.227 ^b
Cecum	2 (8)	4 (16)	
Colon	8 (32)	12 (48)	
Resection length (cm)	13.24 ± 1.67	13.36 ± 2.06	0.822 ^a
Anastomosis			
Colorectal	3 (12)	6 (24)	0.519 ^b
Colocolonic	6 (24)	6 (24)	
Ileocolonic	16 (64)	13 (52)	
Surgery duration (min)	178.40 ± 35.08	160.40 ± 38.02	0.088 ^a
Surgery duration (min)			
180 or more	19 (76)	9 (36)	0.010 ^b
<180	6 (24)	16 (64)	

^aPaired t-test, ^bChi-square test

Discussion

This study was conducted with 50 study subjects, 25 of whom had ileus, and 25 of them did not have post-operative pathological paralytic ileus. The subjects were dominated by women and an age range of 32 - 74 years. As many as, 50% of the subjects were overweight and only 6% of the subjects were obese. This study found that age of 65 years old or older and duration of surgery are the risk factor associated with post-operative ileus with RR of 5.96 and 6.14, respectively. Hirayasa *et al.* found that the risk of post-operative ileus is higher in elderly patients who undergone colorectal surgery (65 years old or older) compare to younger population (1.8 - 19.6 vs. 0.8 - 7.9) [7].

Some other studies are in line with the finding of this study. The previous study found that the duration of surgery was a significant factor associated to post-operative ileus. Ay *et al.* found that the incidence of post-operative ileus in patients with duration of surgery <90 min, 90 - 180 min, and >180 min, respectively, was 0%, 34.1% and 84.4% [8].

On the other hand, older age is usually associated with a general decline in body functions, including decreased gastrointestinal function, one of which is a slowdown in gastric emptying. In addition,

increasing age is also associated with decreased mobility, which causes a slowdown in mobility after surgery. Increasing age is also associated with increased comorbidities which can lead to increased length of surgery and an increased risk of surgical complications. These are then hypothesized to explain the effect of age on the incidence of post-operative ileus [9], [10]. While the previous study in agreement with the finding of this study [10], [11], some studies reported that age is not a significant risk factor to post-operative ileus [12].

We found that the duration of surgery is related to post-operative ileus. Longer duration of surgery could be the result of several condition, such as adhesion due to previous abdominal surgery (including obstetric surgery), difficulty of the cases, prolong bleeding during surgery, and other conditions based on patients condition. The patient with duration of surgery for 180 min or more experience post-operative ileus significantly higher than the shorter duration of surgery. The increase duration of surgery is related to duration of manipulation of the gastrointestinal tract during surgery. Studies have found that hand manipulation can lead to decrease of intestinal and gastric motility. In addition, hand manipulation of the gastrointestinal tract decreases mucosal permeability resulting in translocation of bacteria and toxins to the mucosal walls of the gastrointestinal tract. The result is decreased intestinal motility and causes post-operative ileus [13]. This finding is supported by other studies [11], [14], [15].

In contrast to this study, a study conducted by Vather *et al.* in 2014 found that gender is an independent risk factor for post-operative pathological paralytic ileus. Male sex had higher risk for post-operative pathological paralytic ileus when compared to women, about 3 times. The previous study by Vather *et al.* also had subjects with a relatively similar age range to this study, but the study by Vather *et al.* did not find a significant association between age and the incidence of post-operative pathological paralytic ileus (13).

We found no significant association between body mass index, resection length, anastomoses, and pathological site with post-operative ileus. The finding of this study were supported by previous studies [12]. However, study conducted by Svatek *et al.* found that body mass index is related to post-operative ileus. Increase of body mass index is associated with increase of visceral fat and resulted in increase of gut manipulation during the surgery [10]. Increase of gut manipulation is related to post-operative ileus [11], [16].

Study conducted by Moghadamyeghaneh *et al.* found that anastomoses is a significant risk factor to post-operative ileus. This study found that patients with partial colectomy with ileocolonic anastomosis were significantly associated with the incidence of

post-operative pathological paralytic ileus. An increase in the incidence of ileus in patients with ileocolonic anastomosis is associated with an increase in manipulation of the duodenum in the process of making anastomosis [11]. Study conducted by Ay *et al.* found that small bowel manipulation was significantly associated with the incidence of post-operative pathological paralytic ileus [8], [12]. However, the result of this study found that there is no significant relationship between pathological site with post-operative ileus.

There are some limitations of this study that can be improved in the future study. This study is a retrospective study with small number of subjects. The number of subjects can be improved to better represent the population of the study. We also suggest to improve the clinicopathological characteristics, intraoperative variables, and post-operative variables to the analysis to find the risk factors of post-operative ileus. Some other variables related to post-operative ileus that been found in the previous study that not included in this study are the diagnosis of malignancy [8], level of albumin [12], the use of opioid [8], difficulties during operation [16], the use of epidural anesthesia [17], transfusion of blood and crystalloid fluid during duration [12], the use of nasogastric tube after surgery [8], and post-operative infection and anastomoses leakage [11].

Conclusion

This study concludes that age more than 65 years old and surgery duration of more than 180 min are associated to post-operative ileus. However, there are no significant association between body mass index, pathological site, resection length, and anastomoses with post-operative ileus. Further, this finding suggests that surgeon should be aware of post-operative ileus in geriatric patients who underwent laparotomic resection and anastomosis surgery that occur more than 180 min.

Ethical Approval

This study were approved by the Universitas Udayana/Sanglah National Hospital Ethical Committee, no 351/UN14.2.2.VII.14/LP/2020.

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