Journal of the Association of General Surgeons of Thailand under the Royal Patronage of HM the King

วารสารสมาคมศัลยแพทย์ทั่วไปแห่งประเทศไทยในพระบรมราชูปถัมภ์

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A Comparison of Laparoscopic versus Open Appendectomy for Overweight Patient in Bangkok Metropolitan Administration General Hospital: Retrospective Study

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Abstracts

Background. Systematic reviews and randomized controlled trials comparing laparoscopic appendectomy (LA) with open appendectomy (OA) show a reduction in length of hospital stay (LOS), wound infections associated with LA and recommend the routine use of LA in young women and overweight people. There are minimal data comparing LA with OA in Asia-pacific overweight patients and no data in Thailand.

Objectives. Primary outcome is LOS. Secondary outcomes were operative time, time to resume diet and post-operative complications.

Methods. We retrospectively analyzed the medical records of overweight patients (BMI □ 23kg/m^2) in Bangkok Metropolitan Administration General Hospital with acute appendicitis who underwent LA and OA from January 2012 through December 2017.

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Results. There were 136 (71 male, 65 female) overweight patients underwent appendectomy. Subjects were divided into 2 groups; 68 in LA and 68 in OA. Median LOS for LA was better, 58.5 hours versus 85.5 hours for OA ($P < 0.01$), median operative blood loss for LA was better, 5 ml versus 20 ml for OA ($P < 0.01$) and primary wound closure rate was better, 100% for LA versus 85% for OA ($P = 0.001$). Other outcome measures were equivalent.

Conclusions. LA can be performed safely with shorter LOS, less delayed primary wound closure and less operative blood loss in overweight patients and should be considered the procedure of choice for overweight patients with appendicitis.

Keywords: appendectomy, laparoscopic appendectomy, overweight patients, length of stay, retrospective study.

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Introduction

Acute appendicitis is common surgical condition in patient present with acute abdominal pain. In the United States, incidence rate of 100 per 100,000 individuals per year in general population. The lifetime risk of developing appendicitis is 6.7% for female and 8.6% for males.[1] For more than a century, open appendectomy (OA) via the McBurney incision has been the standard operation for acute appendicitis. [2] After the development of endoscopy, Semm introduced laparoscopic appendectomy (LA) in 1983. [3] LA has been performed with increased frequency; however, LA remains controversial and it continues to be used selectively. The previous study and meta-analysis found that LA was associated with a significant decrease in surgical site infections (SSI), time to recovery and length of hospital stay (LOS), but higher hospital costs, prolonged operative time (OP) and higher rate of intra-abdominal infections. The systematic reviewers recommended using laparoscopy and LA in patients with suspected appendicitis, especially young female and obese patients. [4-7]

Overweight patients undergoing appendectomy pose a unique challenge to surgeon in gaining access to the abdominal cavity. LA may be beneficial in overweight patients, in whom it may be difficult to gain adequate access through a small right lower-quadrant incision.

To our knowledge, there have been few studies that have compared LA versus OA in overweight Asia-pacific patients. Therefore, we performed a retrospective study with primary objective to compare LOS in between LA and OA

of overweight patient in Bangkok Metropolitan Administration General Hospital and secondary objectives of OP, time to resume diet and post-operative complication.

Methods

A retrospective study design was used to analyze outcomes using the BMA hospital medical charge record database after approving by Ethic committee. The study was approved by Bangkok Metropolitan Administration Ethic Committee (U029h/61_EXP). A discharge data of all LA and OA from January 2012 to December 2017 in overweight patients (BMI □ 23 kg/m^2) and age 18-80 years for acute appendicitis were accessed. For data collection, database was accessed electronically with diagnosis ICD-10 and procedural ICD-9 CM codes. The ICD-10 code for acute appendicitis (K35-38) and ICD-9-CM codes for LA (47.01), OA (47.09) were used. Exclusion criteria were pregnancy, other procedure in same operation (i.e., colectomy, cecectomy, gynecologic procedure) and incomplete medical record. Patient characteristics included age, sex and comorbidities

Outcomes measure

The primary outcome was Length of stay (the period between admission and discharge was measured in hours). The secondary outcome were operative time (the period between incision and skin closure was measured in minute), blood loss (measured in ml), time to resume diet (the period between finished operation and tolerated diet was measured in hours) and post-operative complication such as surgical site infection, intra-abdominal collection and bowel ileus.

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Sample size

Sample size was calculated by formula for test in difference two independent means.

$$n/group = 2[\frac{(z_{\alpha/2} + z_{\beta})\sigma}{\Delta}]^2$$

Zα/2 = α-error was set at 0.05 (two – tailed $Z_{0.05}$ = 1.96)

Zβ = β-error was set at 0.20 (Zβ = 0.84)

σ = □. □. □□□□□□□□ $= \sqrt{\frac{□□1^2 + □□2^2}{2}}$

(SD for laparoscopic appendectomy group = 2.5 days21)

(SD for open appendectomy group = 0.6 days21)

$$= \sqrt{\frac{(2.5)^2 + (0.6)^2}{2}} = \sqrt{\frac{6.25 + 0.36}{2}} = \sqrt{3.305}$$

$$= □. □. = 1.81$$

Δ = *Difference of mean length of stay*

(length of stay for laparoscopic appendectomy group = 1.4 days[21])

(length of stay for opened appendectomy group = 2.7 days[21])

n/group = 2 x [(1.96+0.84)(1.81)]^2 x (2.7-1.4)^2 = 2[46.54/1.69] = 55 ; add approximate 20% for prevent data loss; at least number per group = 67 subjects

Statistical analysis

The baseline characteristics of patients were presented using number, percent, mean±SD or median (IQR). Comparisons of outcome between LA and OA were conducted using Chi square method for categorical variables or independent T-test for continuous variables. A p-value less than 0.05 was considered statistically significant.

Results

This study included 136 overweight patients; 68 were underwent LA and 68 were underwent OA. The baseline characteristics of patients were shown in table 1. There were no significant difference in age, gender, BMI and comorbidity (e.g. diabetic, hypertension and dyslipidemia) between groups.

Table 1. Baseline characteristics.

Characteristics	LA (n = 68)	OA (n = 68)	P-value
Age, year, median (IQR)	37.5 (22)	38 (23)	0.114*
Gender, number (%) **Male** **Female**	31 (45.6)	40 (58.8)	0.169

	37 (54.4)	28 (41.2)	
BMI, kg/m^2, median (IQR)	25.39 (5.8)	26.23 (4.0)	0.206*
Comorbidity, number (%)			
Diabetic mellitus	4 (5.9)	4 (5.9)	1.00
Hypertension	11 (16.2)	13 (19.1)	0.822
Dyslipidemia	7 (10.3)	3 (4.4)	0.247

- Mann-Whitney U test

The clinical outcome after LA and OA were shown in table 2. The primary outcome of this study, median LOS for the LA group was significant shorter than the OA group (LA, 58.5 hrs; OA, 85.5 hrs; P <0.01). The secondary outcome had favor in LA group, less operative blood loss (LA, 5 ml; OA, 20; P <0.01), no delayed wound closure (LA, 0; OA, 14.7%; P 0.001) but operative time and time to resume diet were not significant.

Table 2. Outcomes

Outcome	**LA (n = 68)**	**OA (n = 68)**	**P-value**
Operative time (min), median (IQR)	52.5 (24)	50 (34)	0.373*
Blood loss(ml), median (IQR)	5 (5)	20 (10)	<0.01*
Skin closure, number (%)			
Primary closure	68 (100)	58 (85)	

Delayed closure	0	10 (14.7)	0.001
Length of stay(hrs.), median (IQR)	58.5 (39.4)	85.5 (48.0)	<0.01*
Time to resump diet(hrs.), median (IQR)	22.5 (21.5)	32 (25.0)	0.012*

- Mann-Whitney U test

The complications after operation were shown in table 3. Intraabdominal collection and bowel ileus were higher rate in LA than OA but there was no significant difference between groups.

Table 3. Post-operative complication

Post-operative complication	**LA (n = 68)**	**OA (n = 68)**	**P-value**
Surgical site infection, number (%)	0	1(1.5)	0.316
Intraabdominal collection, number (%)	1(1.5)	0	0.316
Bowel ileus, number (%)	5 (7.4)	2 (2.9)	0.441

Discussion

From the previous study, LA was significant decreased surgical site infections, time to recovery and length of hospital stay. The Cochrane review 2010 recommended using laparoscopy in patients with suspected appendicitis, especially young female and obese patients [4-7], but they used BMI □ 25 kg/m^2 for obese patients. This study used BMI for Asia population to determine overweight patients to include this study, so this study is the first study reporting the operative outcome in overweight patient whom had acute appendicitis follow high BMI criteria for Asia population.

In our study showed that LA group had shorter LOS than OA group. The results were same as the Cochrane review [7]. The other result had less blood loss and no delayed wound closure in LA group. In OA group had delayed wound closure 14.7%. Therefore, it might be one factor effect to long LOS. The post-operative complication such as surgical site infection, intraabdominal collection and bowel ileus were not significant different between groups. Because of the recent surgeon developed surgical skill in laparoscopic more than the past. Our study demonstrated that LA reduces LOS compared to OA in overweight patients with acute appendicitis. For future study, Randomized control trial for LA compare to OA in overweight patient with acute appendicitis should be done, before set LA as standard procedure in overweight patient.

Conclusion

LA can be performed safely with shorter LOS, less delayed primary wound closure and less operative blood loss in overweight patients. Therefore, we might suggest that in overweight patients with appendicitis should be considered LA for procedure of choice.

Acknowledgements

We would like to thank to Dr. Suthat Chottanapund for data analysis and giving advices for this study.

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