

Comparison of Post-Operative Pain Score Between Open Appendectomy and Laparoscopic Appendectomy on Acute Appendicitis Patient in Siloam Hospital Lippo Village

Mary Christina Elsa¹, Taufik Sudirman²

¹ Department of Medicine, Faculty of Medicine, Pelita Harapan University, Karawaci, Tangerang, Banten, Indonesia

² Department of Surgery, Faculty of Medicine, Pelita Harapan University, Karawaci, Tangerang, Banten, Indonesia

Abstract

Citation: Elsa Mary, Sudirman Taufik. Comparison of Post-Operative Pain Score Between Open Appendectomy and Laparoscopic Appendectomy on Acute Appendicitis Patient in Siloam Hospital Lippo Village. *Medicus*. 2023 February. 11(1):6-11.

Keywords: Acute appendicitis; Post-operative pain; Open appendectomy; Laparoscopic appendectomy.

Correspondance : Mary Christina Elsa
Faculty of Medicine Univ. Pelita Harapan
E-mail: mary.christina@hotmail.com
Online First: February 2023

Background: Appendicitis is inflammation of vermiform appendix which can be caused by luminal obstruction. Appendicitis is one of the most common causes of emergency abdominal surgery, with 11 cases per 10.000 person per year. Until today, open appendectomy is still the gold standard for appendicitis treatment although laparoscopic appendectomy has significantly lower post-operative pain.

Methods: This study uses cross-sectional study design with post-open appendectomy and laparoscopic appendectomy patients in Siloam Hospital Lippo Village as the sample population. The Visual Analogue Scale (VAS) is taken from patient's medical record and processed using Mann-U-Whitney test.

Result: From 70 acute appendicitis patients, 36 underwent open appendectomy and 34 underwent laparoscopic appendectomy. The result showed the median score of VAS 1 day post open appendectomy surgery (median = 3, min/max = 2/6 [95% CI = 2,55 – 3,14]) is higher than post laparoscopic appendectomy (median = 2,25, min/max = 0/4, [95% CI = 1,97 – 2,59]), with adjusted p value against age and surgery duration is 0,024. In pediatric patients, median score of VAS 1 day post open appendectomy surgery is the same with laparoscopic appendectomy (median = 3, p value = 0,863). Multivariate analysis showed that surgery duration affects VAS 1 day post appendectomy surgery in pediatric patients (p value = 0,042).

Conclusions:

This study shows that the median score of VAS 1 day post open appendectomy surgery is higher than laparoscopic appendectomy. This result is statistically significant. However, in pediatric patients the median score of VAS 1 day post open appendectomy surgery and laparoscopic appendectomy is the same. VAS 1 day post appendectomy surgery in pediatric patients is affected by surgery duration.

Introduction

Appendicitis is inflammation of the vermiform appendix which can be caused by luminal obstruction.¹ This disease has been one of the most common causes of abdominal surgery with 11 cases per 10.000 people per year.²

According to *Profil Kesehatan Indonesia*, there were 596.132 cases in 2009 (3,36%) which then increased to 621.435 cases in 2010 (3,53%).³

Appendectomy surgery for acute appendicitis patients can be done in an

open or laparoscopic manner. However, the open appendectomy method has been the gold standard for several decades. Since the founding of laparoscopic appendectomy, this method is now more commonly used since it has better scar healing, faster recovery, better cosmetic result, and a significantly lower post-operative pain according to a lower dose of analgesic used post-surgery.^{4,5}

Pain, as described by the Taxonomy Committee of International Association for the Study of Pain (IASP), is a sensory and emotional experience related to true or possible tissue damage. Post-operative pain is categorized as acute pain caused by inflammation and activation of afferent neurons resulted from operative trauma and can be measured using Visual Analogue Scale (VAS).⁶

It is important to recognize post-operative pain as it can disturb patient's comfort, activities, and suppress the immune system which can lead to an increased risk of post-operative infection and worse scar healing.⁷ Previous studies done by Fatih Çiftçi (2015) and Gokhan Cipe, et al (2014) found that open appendectomy patients have a significantly higher 6-hour post-operative VAS than laparoscopic appendectomy patients ($p = 0,001$).^{8,9} Although there have been several studies that compare post-open appendectomy and laparoscopic appendectomy pain, however the pain is usually measured using post-operative analgesic dose and only several studies use VAS. There are also not many studies that used population samples from Indonesia.

Material And Methods

This research was 2 groups unpaired numeric comparative analytic study with cross sectional study design, conducted from January 2021 to March 2021. The sample used in this research is 70 acute appendicitis patient post-open or laparoscopic appendectomy in Siloam Hospital Lippo Village, with the inclusion criteria of same group of post-operative analgetic which is NSAID, VAS 1 day post-surgery, and VAS within 0–7,4 range. Data was collected using purposive

sampling from patient's medical record. Samples who fulfilled the exclusion criteria, namely laparoscopic appendectomy converted into open appendectomy, perforated appendix, peritonitis, pregnant, and history of abdominal surgery, were removed from the research. With the classification of research variables in the form of independent variables, which were knowledge about open appendectomy and laparoscopic appendectomy, and the dependent variable was post-operative pain, as well as confounding variables namely age, sex, pre-operative pain, anxiety, and surgery duration.

Obtained research data was processed and analysed using Statistical Package for the Social Sciences (SPSS) software version 25. Bivariate statistical analysis was performed using Mann-U-Whitney when the data distribution was not normal and independent t-test when the data distribution was normal. The researcher also calculated the median, minimal value, maximal value, and 95% CI. Multivariate analysis was also done to examine the significance of types of surgery toward post-operative pain after being adjusted toward confounding variables. This research has received approval from the ethical committee of the Faculty of Medicine, University of Pelita Harapan with the number 189/K-LKJ/ETIK/XII/2020.

Result

According to table 1, this research subjects were mostly female (65,71%) than male (24,39%). The median of pre-operative VAS for open appendectomy was 3 and for laparoscopic appendectomy was 3,25. This difference was not statistically significant as the p value was more than 0,05 ($p = 0,356$). For the surgery duration, the median for open appendectomy duration was 45 minutes and for laparoscopic appendectomy was 50 minutes. This difference was also not statistically significant ($p = 0,473$).

Table 1. Demographic of Samples

Variable	Open Appendectomy (n = 36)	Laparoscopic Appendectomy (n = 34)	P value
Sex			
Male, n (%)	12 (50,00)	12 (50,00)	0,531
Female, n (%)	24 (52,17)	22 (42,83)	
Age (year), median (min/max)	23,5 (5/76)	24,0 (11/84)	0,265
Pre-operative VAS , median (min/max)	3,00 (1,5/7)	3,25 (1/6)	0,356
Surgery duration , median (min/max)	45 (30/150)	50 (20/140)	0,473

The median age of subjects that underwent open appendectomy was 23,5-year-old, with the youngest age of 5-year-old and oldest of 76-year-old. Median age of subjects that underwent laparoscopic appendectomy was 24-year-old, with the youngest age of 11-year-old and oldest of 84-year-old. Median of pre-operative VAS for open appendectomy was 3,00, with 1,5 being the lowest score and 7 being the highest score. For laparoscopic appendectomy, the pre-operative VAS median was 3,25, the lowest score was 1, and the highest was 6. The surgery duration of open appendectomy had the median of 45 minute, with 30 minutes as the fastest duration and 150 minutes as the longest duration. For laparoscopic appendectomy, the median was 50 minutes, the fastest duration was 20 minutes, and the longest duration was 140 minutes.

Pain 1-day post-surgery was recorded using VAS from 70 subjects. The distribution of post-operative pain was shown in table 2. Median of VAS 1-day post-open appendectomy was 3,00, with lowest score of 2,0 and highest score of 6,0. For the 34 subjects that underwent laparoscopic appendectomy, the median VAS was 2,25. The lowest score was 0,0 and the highest was 4,0.

Tabulation result shown in table 2 showed that the median of VAS 1-day post-open appendectomy was higher than laparoscopic appendectomy. The results were analysed using Mann-U-Whitney test since the data distribution was not normal and showed that the 95% CI for VAS 1-

day post-open appendectomy was 2,55 – 3,14, and for laparoscopic appendectomy was 1,97 – 2,59. The P value for the median difference between open appendectomy and laparoscopic appendectomy was 0,011, which means that the median difference was statistically significant.

Table 2. Distribution of VAS 1 Day Post-Open and Laparoscopic Appendectomy

Surgery type	VAS 1-day post-surgery			P value
	Median	Min/Max	95% CI	
Open appendectomy (n = 36)	3,00	2,0/6,0	2,55 – 3,14	0,011
Laparoscopic appendectomy (n = 34)	2,25	0,0/4,0	1,97 – 2,59	

Multivariate linear regression was done to decide the statistical significance of surgery type difference after being adjusted toward the confounding variables. Variables that were included in the linear regression were the one that had p value <0,25 on the bivariate analysis, which were surgery duration, surgery type, and pre-operative VAS. Pre-operative VAS was then removed from model since it had p value >0,05 on the multivariate analysis and only changed beta less than 10% when removed. The final regression model was shown in table 3. It was found that surgery type still causes statistically significant difference in the median of VAS 1-day post-appendectomy after being adjusted with age and surgery duration.

Table 3. Multivariate Analysis of Independent Variable toward VAS 1 Day Post-Appendectomy Surgery

Variable	Beta	P value
Age	-0,259	0,024
Surgery duration	0,233	0,040
Surgery type	-0,257	0,024

As there were some pediatric patients (0-18 years old), a subgroup analysis of pediatric patients was done. There were 9 pediatric patients that underwent open appendectomy and 7 pediatric patients that underwent laparoscopic appendectomy. Result is shown in table 4 and shows that the median of VAS 1 day post open appendectomy and post laparoscopic appendectomy is the same (median = 3,00). This result is not statistically significant according to Mann-U-Whitney analysis (P value >0,05).

Table 4. Distribution of VAS 1 Day Post-Open and Laparoscopic Appendectomy in Pediatric Patients

Surgery type	VAS 1-day post-surgery			P value
	Median	Min/Max	5% CI	
Open appendectomy (n = 9)	3,00	2,0/4,5	,08 – 3,36	0,863
Laparoscopic appendectomy (n = 7)	3,00	1,5/3,0	,01 – 3,13	

Multivariate linear regression was then done to find out whether there are other variables that affect VAS 1 day post-surgery. Variables that were included in the model were pre-operative VAS and surgery duration. Table 5 showed the final regression model and found that the only variable that affected VAS 1 day post-surgery in pediatric patients was surgery duration.

Table 5. Multivariate Analysis of Independent Variable toward VAS 1 Day Post-Appendectomy Surgery in Pediatric Patients

Variable	Beta	P value
Surgery duration	0,513	0,042

Discussion

According to table 1, this research subjects were mostly female (65,71%) than male (24,39%). The median of pre-operative VAS for open appendectomy was 3 and for laparoscopic appendectomy

was 3,25. This difference was not statistically significant as the p value was more than 0,05 (p = 0,356). For the surgery duration, the median for open appendectomy duration was 45 minutes and for laparoscopic appendectomy was 50 minutes. This difference was also not statistically significant (p = 0,473).

Post-operative VAS was then analysed using Mann-U-Whitney test and showed that the median for post-open appendectomy VAS was 3,00 and for post-laparoscopic appendectomy was 2,25, with p value of 0,011. This result means that subjects that underwent open appendectomy had a significantly higher post-operative VAS than subjects that underwent laparoscopic appendectomy.

The result of this research was in line with the researches previously conducted by Gokhan Cipe, et al, and Fatih Ciftci where there were also a statistically significant difference between post-open appendectomy and laparoscopic appendectomy VAS. The research done by Gokhan Cipe, et al, used cohort study design and had 241 subjects. They found that the median of VAS 6-hour post open appendectomy was $4,6 \pm 1,3$ and for laparoscopic appendectomy was $4,0 \pm 1,2$ (p = 0,001).⁹ Fatih Ciftci, who used cross-sectional design and had 243 subjects, found that the median for VAS 6-hour post-open appendectomy was $4,5 \pm 1,2$ and for laparoscopic appendectomy was $3,9 \pm 1,1$ (p = 0,001).⁸

Although the result was in accordance with previous researches, there are slight differences in this research that may affect the result. This research used VAS from 6 hour post-surgery meanwhile the previous researches used VAS from 1 hour post-surgery. Other difference was that the distribution of data was not normal in this research but normal in previous researches. Despite all those differences, this research still suggests that there is a statistically significant difference in post-operative pain between open appendectomy and laparoscopic appendectomy.

There were 16 pediatric patients in this research, with the youngest age of 5-year-old in open appendectomy and 11-year-old in laparoscopic appendectomy. As children may not understand the pain scale well enough, this may cause inaccurate VAS depiction. For that reason, a subgroup analysis of pediatric patients was done and it was shown that the median score of VAS 1 day post-open appendectomy surgery is the same with laparoscopic appendectomy (median = 3,00). Multivariate analysis of pediatric subgroup showed that the only variable that affect VAS 1 day post-surgery score in pediatric patients was surgery duration. Previous researches did not do a subgroup analysis of pediatric patients.

There are several shortcomings of this research such as the samples were not as many as previous researches which may cause result that does not represent general population. In addition to that, the data used in this research was a secondary data from medical record which means the data accuracy could not be ensured. In spite of these shortcomings, this research excels with the inclusion of multivariate analysis and subgroup analysis of pediatric patients. Confounding variables of age and surgery duration were taken into consideration in the linear

regression model and showed adjusted p value of 0,024, which mean open appendectomy still had a significantly higher VAS 1-day post-surgery.

There are several factors that has not yet been analysed in this study, such as confounding factor anxiety since the data was not found in the medical record, drain usage, and stage of appendicitis which could affect the result, therefore the significancy in this study needs to be researched more in further study with better design such as prospective cohort.

Conclusion

The results showed that the median of VAS 1-day post-open appendectomy was significantly higher than laparoscopic appendectomy. However, in pediatric patients the median score of VAS 1 day post open appendectomy surgery and laparoscopic appendectomy is the same. VAS 1 day post appendectomy surgery in pediatric patients is affected by surgery duration.

Acknowledgment

None.

References

1. Dahdaleh FS, Heidt D, Turaga KK. The Appendix. In: Brunickardi FC, Andersen DK, Billiar TR, Dunn DL, Kao LS, Hunter JG, et al., editors. *Schwartz's Principles of Surgery*, 11e. New York, NY: McGraw-Hill Education; 2019.
2. Jacobs DO. Acute Appendicitis and Peritonitis. In: Jameson JL, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J, editors. *Harrison's Principles of Internal Medicine*, 20e. New York, NY: McGraw-Hill Education; 2018.
3. Soepardi J. *Jendela Data dan Informasi Kesehatan Penyakit Tidak Menular*. Kementerian Kesehatan RI. Jakarta: Kementerian Kesehatan RI; 2012.
4. Biondi A, Di Stefano C, Ferrara F, Bellia A, Vacante M, Piazza L. Laparoscopic versus open appendectomy: A retrospective cohort study assessing outcomes and cost-effectiveness. *World J Emerg Surg*. 2016;11(1):4–9. <https://doi.org/10.1186/s13017-016-0102-5>
5. Goyal DV, Gupta DM, Rhezhi DD. What is gold standard for Appendicectomy? Open or laparoscopic. *Int J Med Res Rev*. 2015; 3(9):1090–5. <https://doi.org/10.17511/ijmrr.2015.i9.198>

6. Gupta A, Kaur K, Sharma S, Goyal S, Arora S, Murthy RSR. Clinical aspects of acute post-operative pain management & its assessment. J Adv Pharm Technol Res. 2010 Apr;1(2):97–108. <https://pubmed.ncbi.nlm.nih.gov/22247838>
7. Wells N, McCaffery CP and M. Improving the Quality of Care Through Pain Assessment and Management. In: Patient Safety and Quality: An Evidence-Based Handbook for Nurses. 2004.
8. Çiftçi F. Laparoscopic vs mini-incision open appendectomy. World J Gastrointest Surg. 2015 Oct 27;7(10):267–72. <https://doi.org/10.4240/wjgs.v7.i10.267>
9. Cipe G, Idiz O, Hasbahceci M, Bozkurt S, Kadioglu H, Coskun H, et al. Laparoscopic versus open appendectomy: Where are we now? Chir. 2014;109(4):518–22.

Author's Statement

The authors declared that all the images and figures in this manuscript is/are author's own work and/or has obtained necessary permission to re-use the content from the authors and publisher of respective materials.



Mary Christina Elsa