

# Comparison of laparoscopic and open appendectomy in the treatment of acute appendicitis

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## ABSTRACT

**Introduction:** The laparoscopic method of performing an appendectomy is increasingly used due to advantages such as a faster recovery, decreased length of hospital stay, and minimal scarring. The objective of this study was to compare laparoscopic and open appendectomy methods performed as a result of acute appendicitis.

**Materials and Methods:** The records of patients who underwent an appendectomy between January 2014 and January 2015 at a single center were retrospectively evaluated. Patients who underwent a laparoscopic appendectomy were assigned to Group 1 and those who underwent an open appendectomy were classified as Group 2. Cases of a laparoscopic procedure that was converted to the open method were included in Group 2. Chi-square and Fisher exact tests were used to compare the 2 groups.  $P < 0.05$  values were considered statistically significant.

**Results:** A total of 608 patients were included in the study. Seven patients who underwent a conversion appendectomy were included in Group 2. There were 160 patients in Group 1 and 448 patients in Group 2. There were 92 male and 68 female patients in Group 1, and 279 male and 169 female patients in Group 2 ( $p = 0.29$ ). The mean age was  $27.8 \pm 11.1$  years in Group 1 and  $32.7 \pm 12.3$  years in Group 2. The laparoscopic appendectomy patients were younger ( $p < 0.0001$ ;  $t = 15.00$ ). The median duration of hospitalization was 2 days (range: 1–4 days) in the laparoscopic appendectomy group and 2 days (range: 1–8 days) in the open appendectomy group. No significant difference was found between the groups ( $p = 0.607$ ). In Group 1, 1 patient developed a wound site infection and 1 patient an intra-abdominal abscess, while in Group 2, 6 patients developed a wound site infection and 2 an intra-abdominal abscess. No statistically significant difference was found between the groups in terms of postoperative complications.

**Conclusion:** The results of this study suggest that a laparoscopic appendectomy can be performed as safely as open appendectomy.

**Keywords:** Acute appendicitis; laparoscopic; open appendectomy.

## Introduction

Acute appendicitis is the most common cause of acute abdomen requiring surgery in patients presenting with

the complaint of abdominal pain.<sup>[1]</sup> Open surgery is the most commonly used method among the general surgery procedures. Today laparoscopic appendectomy is used



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in a higher rate with widespread use of minimal invasive surgery.<sup>[1,2]</sup> Laparoscopic appendectomy is an increasingly used method because of its advantages such as a faster recovery, decreased length of stay and minimal scar.<sup>[3-5]</sup> In addition, it provides a better laparoscopic intraabdominal evaluation. However, besides its advantages some studies have reported higher infection rates with this method, laparoscopic surgery reduces intraabdominal abscess and wound infections.<sup>[6,7]</sup> The objective of this study was to compare laparoscopic and open appendectomy methods performed due to acute appendicitis.

## Materials and Methods

Patients who underwent appendectomy between January 2014 and January 2015 were retrospectively evaluated. Patients' demographic data, operation performed, postoperative length of stay, and the complications developed were recorded from the hospital records. Patients who underwent laparoscopic appendectomy were assigned to Group 1 and those underwent open appendectomy as Group 2. Patients who were started with laparoscopic method and converted to the open method were included in group 2. Pregnant patients and those with pathologies except acute appendicitis were excluded from the study.

## Surgical Procedure

McBurney incision was used for open appendectomy. The appendix stump was closed with two rows ligature. Laparoscopic appendectomy was performed with standard 3 ports. The appendix stump was closed with one Endoloop (Endoloop Ligature, Ethicon Endo-Surgery, Somerville, NJ, USA) or Hem-o-lok. In the cases where taking of the specimen out was appropriate, either 10 mm trocar itself or and endobag protective sheath was used. After purulent or reactionary fluids were aspirated, irrigation and aspiration were carried out in a controlled manner. All patients

were preoperatively administered single dose 2 g intravenous ampicillin-sulbactam sodium. All specimens collected were examined histopathologically. Length of stay in hospital and duration of hospitalization were recorded in days.

## Statistical Analysis

Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) version 22.0. Data are expressed as mean, standard deviation, frequency and rate. Chi-square and Fisher exact tests were used in comparison of two groups.  $P < 0.05$  values were considered statistically significant.

## Results

A total of 608 patients were included in the study. Seven patients who underwent conversion appendectomy were included in Group 2. There were 160 patients in Group 1 and 448 patients in Group 2. There were 92 (57.5%) male and 68 (42.5%) female patients in Group 1, and 279 (62.2%) male and 169 (37.8%) female patients in Group 2 (Table 1). No significant difference was found between the groups in terms of gender distribution ( $p = 0.29$ ). The mean age was  $27.8 \pm 11.1$  years in Group 1 and  $32.7 \pm 12.3$  years in Group 2. It was found statistically that laparoscopic appendectomy was performed in a younger group ( $p < 0.0001$ ,  $t = 15.00$ ). Median duration of hospitalization was found as 2 days (range: 1–4 days) in the laparoscopic appendectomy group and 2 days (range: 1–8 days) in the open appendectomy group. No significant difference was found between the groups ( $p = 0.607$ ). One patient developed wound site infection and one patient intraabdominal abscess in Group 1, while 6 patients developed wound site infection and 2 intraabdominal abscess in Group 2. No statistically significant difference was found between the groups in terms of the postoperative complications.

**Table 1. Demographic findings**

	Group 1	Group 2	p
Male	92	279	=0.29
Female	68	169	
Mean age	$27.8 \pm 11.1$	$32.7 \pm 12.3$	$< 0.0001^*$
Median duration of hospitalization	2 days	2 days	=0.607

\* $P < 0.05$ , statistically significant.

## Discussion

Acute appendicitis are the most common cause of acute abdomen requiring surgery. Laparoscopy, which is the gold standard in cholecystectomy has being widely used for appendectomy because of its advantages.<sup>[8]</sup> Despite successful results of open appendectomy, laparoscopic operations have been introduced in order to increase diagnostic accuracy, decrease complications, and shorten recovery time. Initially, laparoscopic appendectomy has been used to reduce the rate of negative appendectomy. However, today this method has being routinely used as the experience increased. Conversion to open has been reported as 1–2% in the literature.<sup>[9,10]</sup> This rate was higher in our study. Mortality from appendectomy is very low at 0.03–0.05%.<sup>[11]</sup> No mortality occurred in our study. Advantages of laparoscopic appendectomy over open method have been reported including low infection rate, decreased postoperative pain, shortened length of stay in hospital and earlier return to daily activities. In our study, postoperative pain was not evaluated. On the other hand, disadvantages of laparoscopic appendectomy have been reported as long operational time and high incidence of intrabdominal infection. In our study, durations and whether the operations were performed by a physician associate or specialist were not compared.

## Conclusion

Laparoscopic appendectomy can be performed as safe as open appendectomy.

## Disclosures

**Peer-review:** Externally peer-reviewed.

**Conflict of Interest:** None declared.

## References

1. Saia M, Buja A, Baldovin T, Callegaro G, Sandonà P, Mantoan D, et al. Trend, variability, and outcome of open vs. laparoscopic appendectomy based on a large administrative database. *Surg Endosc* 2012;26:2353–9. [\[CrossRef\]](#)
2. Masoomi H, Mills S, Dolich MO, Ketana N, Carmichael JC, Nguyen NT, et al. Does Laparoscopic Appendectomy Impart an Advantage over Open Appendectomy in Elderly Patients? *World J Surg* 2012;36:1534–9. [\[CrossRef\]](#)
3. Golub R, Siddiqui F, Pohl D. Laparoscopic versus open appendectomy: a metaanalysis. *J Am Coll Surg* 1998;186:545–53.
4. Chung RS, Rowland DY, Li P, Diaz J. A meta-analysis of randomized controlled trials of laparoscopic versus conventional appendectomy. *Am J Surg* 1999;177:250–6. [\[CrossRef\]](#)
5. Garbutt JM, Soper NJ, Shannon WD, Botero A, Littenberg B. Meta-analysis of randomized controlled trials comparing laparoscopic and open appendectomy. *Surg Laparosc Endosc* 1999;9:17–26. [\[CrossRef\]](#)
6. Hussain A, Mahmood H, Nicholls J, El-Hasani S. Prevention of intra-abdominal abscess following laparoscopic appendectomy for perforated appendicitis: a prospective study. *Int J Surg* 2008;6:374–7. [\[CrossRef\]](#)
7. Tan-Tam C, Yorke E, Wasdell M, Barcan C, Konkin D, Blair P. The benefits of laparoscopic appendectomies in obese patients. *Am J Surg* 2012;203:609–12. [\[CrossRef\]](#)
8. Kehagias I, Karamanakos SN, Panagiotopoulos S, Panagopoulos K, Kalfarentzos F. Laparoscopic versus open appendectomy: which way to go? *World J Gastroenterol* 2008;14:4909–14. [\[CrossRef\]](#)
9. Pier A, Götz F, Bacher C. Laparoscopic appendectomy in 625 cases: from innovation to routine. *Surg Laparosc Endosc* 1991;1:8–13.
10. Frazee RC, Roberts JW, Symmonds RE, Snyder SK, Hendricks JC, Smith RW, et al. A prospective randomized trial comparing open versus laparoscopic appendectomy. *Ann Surg.* 1994;219:725–8. [\[CrossRef\]](#)
11. Guller U, Hervey S, Purves H, Muhlbaier LH, Peterson ED, Eubanks S, et al. Laparoscopic versus open appendectomy: outcomes comparison based on a large administrative database. *Ann Surg* 2004;239:43–52. [\[CrossRef\]](#)