



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



## Letter to Editor

## Effect of the COVID-19 pandemic on surgical treatment of acute appendicitis: A single-center retrospective study



## Keywords:

Acute appendicitis  
 COVID-19  
 SARS-CoV-2  
 Appendectomy  
 Postoperative complication

## To the Editor,

In these unprecedented times of COVID-19, antibiotics alone might be an option for uncomplicated appendicitis.<sup>1–4</sup> However, early appendectomy should be performed to achieve a shorter hospital stay than that required during conservative management and to avoid complications after failed conservative management.<sup>5</sup> Therefore, in our hospital, patients presenting with acute appendicitis have undergone surgery after we obtained the results of their COVID-19 tests because our hospital does not have a unit for treating COVID-19. However, there have been no reports on differences in surgical outcomes when surgery was performed with the same

protocol as our hospital. Therefore, we aimed to determine changes in the clinical variables of acute appendicitis, its overall effect on surgery, and postoperative complications.

Patients admitted for acute appendicitis during the same period in 2019 and 2020 were enrolled in the study. We divided patients into two groups: pre-corona outbreak (May 11 to July 1 in 2019) and corona pandemic period (May 11 to July 1 in 2020) for comparison during the same period. Clinical variables including demographics and operative and postoperative factors were analyzed. Statistical analyses were performed for the two groups. The primary end point was postoperative complication.

A total of 200 consecutive patients (127 from 2019 to 73 from 2020) were included in this study. There was no statistically significant difference in demographics between the groups. The duration of the symptoms before presenting at the hospital was 20 h in 2020, which was about 7 h longer than it was in 2019; however, this was not statistically significant ( $p = 0.086$ ). Additionally, there was no significant difference in the laboratory findings of both groups of patients.

In the analysis of the surgery and postoperative factors of patients who underwent surgery, it took a longer time from admission to surgery (6.3 vs 14.4 h,  $p < 0.001$ ) in 2020 compared to 2019. There was no significant difference in the type of surgery,

**Table 1**  
 Factors related to operation between the two groups.

	2019 (n = 120)	2020 (n = 70)	p-value
Admission to OR (h)	6.3 (IQR 4.35–9.4)	14.4 (IQR (9.558–18.4))	<0.001
Duration of Operation (min)	35.0 (IQR 30–50)	42.0 (IQR 30–62.5)	0.26
Operation			0.595
Appendectomy	117 (97.5%)	64 (91.4%)	
Cecectomy	0	6 (8.6%)	
Ileocectomy	2 (1.7%)	0	
Right hemicolectomy	1 (0.8%)	0	
Laparoscopy			>0.999
Open	1 (0.8%)	0	
Laparoscopy	119 (99.2%)	19 (100%)	
Appendix pathology			0.902
Hyperemic	7 (5.8%)	3 (4.3%)	
Suppurative	60 (50.0%)	37 (52.9%)	
Gangrenous	39 (32.5%)	21 (30.0%)	
Perforated	14 (11.7%)	9 (12.9%)	
Postoperative Complication	11 (9.2%)	6 (8.6%)	0.890
Clavien-Dindo classification			0.918
1	8 (72.7%)	3 (50%)	
2	1 (9.1%)	3 (50%)	
3a	1 (9.1%)	0	
3b	1 (9.1%)	0	

Abbreviations: IQR, interquartile range; OR, operating room.

appendix pathology, or postoperative complications (Table 1). In detail, postoperative complications occurred in 11 (9.2%) and 6 (8.6%) cases in 2019 and 2020, respectively ( $p = 0.890$ ). There was no difference in the severity of complication according to the Clavien-Dindo classification ( $p = 0.918$ ).

In conclusion, it is safe to delay performing surgery for acute appendicitis until the COVID-19 test results have been obtained, provided that the delay is not more than 8 h. Furthermore, if the COVID-19 PCR result is negative, laparoscopic appendectomy is a procedure that can be safely performed in the severity of complication according to the Clavien-Dindo classification.

### Ethical approval

This study was approved by the institutional review board (IRB) of the Catholic University of Korea (IRB number: UC20RIS10124).

### Funding

None.

### Authors' contributions

KYL and JIL designed the study. KYL and JIL collected the data and performed the statistical analysis. KYL, JIL, YYP and STO interpreted the results of the analysis and prepared the manuscript. All authors contributed extensively to the work presented.

### Consent to participate

Informed consent for participation was waived under IRB approval from the institutional review board of the Catholic University of Korea.

### Declaration of competing interest

None.

### Acknowledgements

None.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.asjsur.2021.03.012>.

### References

1. Collard M, Lakkis Z, Loriau J, et al. Antibiotics alone as an alternative to appendectomy for uncomplicated acute appendicitis in adults: changes in treatment modalities related to the COVID-19 health crisis. *J Vis Surg.* 2020;157:S33–S42.
2. Podda M, Gerardi C, Cillara N, et al. Antibiotic treatment and appendectomy for uncomplicated acute appendicitis in adults and children: a systematic review and meta-analysis. *Ann Surg.* 2019;270:1028–1040.
3. Di Saverio S, Podda M, De Simone B, et al. Diagnosis and treatment of acute appendicitis: 2020 update of the WSES Jerusalem guidelines. *World J Emerg Surg.* 2020;15:27.
4. Collaborative C, Flum DR, Davidson GH, et al. A randomized trial comparing antibiotics with appendectomy for appendicitis. *N Engl J Med.* 2020;383:1907–1919.
5. Scott C, Lambert A. Managing appendicitis during the COVID-19 pandemic in the UK. *Br J Surg.* 2020;107:e271.

Kil-yong Lee, Jaeim Lee\*, Youn Young Park, Seong Taek Oh  
 Division of Coloproctology, Department of Surgery, Uijeongbu St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Republic of Korea

\* Corresponding author. Division of Coloproctology, Department of Surgery, Uijeongbu St. Mary's Hospital, College of Medicine, The Catholic University of Korea, 271, Cheonbo-ro, Uijeongbu, Gyeonggi-do, 11765, Republic of Korea.  
 E-mail address: [lji96@catholic.ac.kr](mailto:lji96@catholic.ac.kr) (J. Lee).

9 March 2021