



Changes in the management of acute appendicitis during the COVID-19 pandemic

Johan F. Lock¹ · Armin Wiegering^{1,2,3} 

Received: 18 January 2021 / Accepted: 20 January 2021 / Published online: 3 February 2021
© Springer-Verlag GmbH Germany, part of Springer Nature 2021

The COVID-19 pandemic has had a major impact on health care systems the world over. On the one hand, health care professionals have had to rapidly and fundamentally restructure hospital triage systems in an unprecedented way. On the other hand, it has opened up the possibility to uniquely address many outstanding clinical challenges and questions that would otherwise have been difficult to address under normal circumstances.

In the field of emergency surgery, acute appendicitis (AA) is of particular interest for several reasons. Firstly, it is the most common cause of acute abdominal pain and abdominal emergency surgery worldwide with an estimated incidence of approx. 1/1.000 person-years [1] and affecting 8 million annually. Secondly, the management of AA is intensely debated: from the progression of uncomplicated to complicated appendicitis and what constitutes an acceptable delay time for surgery, to the role of non-operative or antibiotics-first strategies in uncomplicated appendicitis. Just prior to the COVID-19 pandemic, however, comprehensive international and national guidelines for the management of acute appendicitis were released [2, 3].

Three important articles were recently published in *Langenbeck's Archives of Surgery* evaluating the impact of the COVID-19 pandemic on the management of acute appendicitis in Germany [4–6]. Köhler et al. reported data from a German health care insurer (BARMER with 9 million incur-rence holders) on in-house patients with pathologies of the

appendix during March to June 2020 compared with during 2017 to 2019 [5]. In this cohort, the overall incidence of appendix pathologies dropped by 12% in 2020, while the incidence of complicated appendicitis remained unaltered. Interestingly, the frequency of non-surgical management did not change and remained < 10%. Moreover, laparoscopic appendectomy was performed in 94% of surgically treated patients. Maneck et al. reported data from another German health care insurer (AOK with 20 million incur-rence holders) on patients who underwent appendectomy during March 16 to April 26, 2020, in comparison to the preceding and the following 6-week periods [4]. The overall number of appendectomies dropped by 18% after the onset of the COVID-19 pandemic compared with before, contributing to an overall decrease of patients with uncomplicated appendicitis (– 20%) and of non-acute appendicitis (– 67%). Willms et al. reported results from a retrospective multicenter study including 41 centers during a 10-week interval starting between February and March 2020 compared with 2019 [6]. In this cohort, the overall number of appendectomies after the onset of the COVID-19 pandemic compared with before dropped by 13.5%, mainly attributable to a reduction of surgery due to uncomplicated appendicitis and negative appendectomies. Of note, the duration of complaints prior to medical consultation increased by 50% in elderly patients and those at risk of contracting severe COVID-19. However, there was no increase of postoperative morbidity and the postoperative mortality was unaltered at 0.1%.

In conclusion, the COVID-19 pandemic has provided a unique set of conditions to more categorically evaluate the management of acute appendicitis. Restrictions to public life and health care confinement measures have led to delayed or even no presentation of patients with acute abdominal pain and otherwise suspected or perhaps operated patients in health care services. This has resulted in a corresponding reduction of appendectomies although only for uncomplicated AA, whereas complicated AA did not change at all.

✉ Armin Wiegering
wiegering_A@ukw.de

¹ Department of General, Visceral, Transplantation, Vascular and Pediatric Surgery, University Hospital, University of Würzburg, Oberdürrbacherstr 6, 97080 Würzburg, Germany

² Department of Biochemistry and Molecular Biology, University of Würzburg, Würzburg, Germany

³ Comprehensive Cancer Centre Mainfranken, University of Würzburg Medical Center, Josef-Schneiderstr 2, 97080 Würzburg, Germany

In this regard, as a positive aspect, the risk of negative appendectomy declined during the confinement measures. Strikingly, the stable incidence of complicated appendicitis due to delayed presentation suggests that uncomplicated appendicitis does not necessarily progress to complicated or perforated appendicitis. On the other hand, there is an appreciable proportion of patients with unspecific lower abdominal pain or perhaps “mild forms of appendicitis” that recover without medical treatment at all, who had undergone surgery before. Also, non-surgical management was not more frequently applied during the pandemic in Germany.

The reported mortality after appendectomy in Germany is 0.2% [7] and this figure did not increase during the COVID-19 pandemic. Furthermore, the management and surgical approach did not change. Notably, SARS-CoV has not been detected intraperitoneally during appendectomy. [8] Overall, this German national “experiment” is in contrast to other countries such as the UK which was more severely affected during the crisis in spring 2020. For example, English et al. reported a switch to non-operative management in the majority of patients and laparoscopic procedures were omitted [9].

Taken together, the evidence from these three reports suggests a relatively minor impact on the management of acute appendicitis during the first COVID-19 crisis in spring 2020 in Germany. Future studies will elucidate which strategies during the COVID-19 pandemic prove to be most effective and if this experience will substantially change the management of acute appendicitis in the post COVID-19 medical world.

References

1. Ferris M, Quan S, Kaplan BS, Molodecky N, Ball CG, Chernoff GW, Bhala N, Ghosh S, Dixon E, Ng S, Kaplan GG (2017) The global incidence of appendicitis: a systematic review of population-based studies. *Ann Surg* 266:237–241
2. Di Saverio S, Birindelli A, Kelly MD et al (2016) WSES Jerusalem guidelines for diagnosis and treatment of acute appendicitis. *World J Emerg Surg* 11:34
3. Andric M, Kalf J, Schwenk W et al (2020) Recommendations on treatment of acute appendicitis: recommendations of an expert group based on the current literature. *Chirurg* 91:700–711
4. Maneck M, Günster C, Meyer H-J, Heidecke C-D, Rolle U (2020) Influence of COVID-19 confinement measures on appendectomies in Germany—a claims data analysis of 9797 patients. *Langenbecks Arch Surg*:1–7. <https://doi.org/10.1007/s00423-020-02041-4>
5. Köhler F, Acar L, van den Berg A, Flemming S, Kastner C, Müller S, Diers J, Germer C-T, Lock JF, L’hoest H, Marschall U, Wiegeling A (2021) Impact of the COVID-19 pandemic on appendicitis treatment in Germany—a population-based analysis. *Langenbecks Arch Surg*:1–7. <https://doi.org/10.1007/s00423-021-02081-4>
6. Willms A, Oldhafer KJ, Conze S et al (2021) Appendicitis during the COVID-19 lockdown - results of a multicenter analysis in Germany. *Langenbecks Arch Surg* (in press)
7. Baum P, Diers J, Lichthardt S, Kastner C, Schlegel N, Germer CT, Wiegeling A (2019) Mortality and complications following visceral surgery: a nationwide analysis based on the diagnostic categories used in German hospital invoicing data. *Dtsch Arztebl Int* 116:739–746
8. Ngaserin SH, Koh FH, Ong BC, Chew MH (2020) COVID-19 not detected in peritoneal fluid: a case of laparoscopic appendectomy for acute appendicitis in a COVID-19-infected patient. *Langenbeck's Arch Surg* 405:353–355
9. English W, Habib Bedwani N, Smith C, Doganay E, Marsden M, Muse S, Mak WK, Chana M, Eves J, Shatkar V (2020) Suspected appendicitis and COVID-19, a change in investigation and management—a multicentre cohort study. *Langenbecks Arch Surg*: 1–9. <https://doi.org/10.1007/s00423-020-02023-6>

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.