



## Impact of COVID-19 Pandemic on Acute Appendicitis

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### Abstract

**Introduction:** The first wave of COVID-19 challenged the management of surgical emergencies questioning the regular handling of patients. Due to the uncertainty caused by the lack of knowledge about this virus, laparoscopic approach was highlighted and doubts concerning whether or not perform to this approach raised.

**Methods:** This is a retrospective, multicenter study with patients that developed acute appendicitis in our community during COVID-19 scenario.

**Results:** 36 patients were diagnosed with acute appendicitis from 15th March to 15th April and were compared with 58 patients diagnosed the same dates the year before.

No statistically significant differences were found between demographic characteristics, surgical approach or pathological findings. Almost half of the patients were tested before admission, mostly with RT-PCR. One month after discharge, any patient developed COVID-19 infection and only one surgeon was infected.

**Conclusion:** According to our experience, following the recommendations, emergency surgery did not increase the risk of contagion in patients. Laparoscopic approach performed with the correct PPE and proper measures should not increase the risk of contagion in surgeons. Furthermore, surgical approach, either open or laparoscopic, should be adjusted to the patient characteristics regardless COVID-19.

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**Keywords:** Acute appendicitis; Open appendectomy; Laparoscopic appendectomy; COVID-19

### Introduction

COVID-19 was firstly described on December 2019 as a novel pneumonia with unknown etiology [1]. So far, the only known transmission way is through respiratory droplets, with direct human-to-human contact when coughing or sneezing, and also through fomites where the virus can remain from 3 h, in aerosol, and up to several days in plastic or stainless steel [2,3]. The clinical spectrum is wide, varying from asymptomatic to mild non-specific respiratory symptoms, such as dry cough, fever or dyspnea. Some patients also report abdominal pathology like diarrhea, vomiting and/or abdominal pain. Others instead, can develop a severe organ dysfunction with acute respiratory distress syndrome and even death, which is more prevalent when coexisting medical pathologies [4,5]. Bilateral lung infiltrations may be found on chest radiology, but the most sensitive diagnosis test is computed tomography. There are also specific tests detecting virus RNA, like Real Time-Polymerase Chain Reaction (RT-PCR), performed with a swab of the lower respiratory tract, where the viral load is higher. Rapid IgM-IgG antibody test have also been developed but their accuracy is still under debate [1,3].

In Spain, in the beginning of November, with more than 1,000,000 people infected and more than 40,000 deaths, COVID-19 has shaken hospitals up. In this context, several surgical associations such as SAGES and EAES, AEC and the Royal College of Surgeons, have recommended postponing elective surgery and only performing emergency or oncological undelayable procedures [6-8].

In the first wave of the pandemic, two main issues were under discussion. Which was the best

way of testing patients and if it was necessary to perform RT-PCR to everyone that required surgery. Another was whether to maintain the regular surgical handling, switch to open approach or even disperse antibiotics and avoid hospital admission on early stages.

We performed this multicentre study during the first month after the pandemic erupted in our country, to show how this virus outbreak impacted in our surgical work. We reviewed the management of acute appendicitis, in one of the regions with highest infection rate in Spain.

## Material and Methods

### Study design and participants

This descriptive, retrospective, multicentre study was conducted in Spain including the four main hospitals in Navarra. We retrospectively review patients who had developed acute appendicitis since COVID-19 pandemic was declared, from March 15<sup>th</sup>, 2020 to April 15<sup>th</sup>, 2020. The management of these patients was compared with the one performed on the same dates one year before.

### Statistical analysis

The statistical analysis was performed by using SPSS. All data were expressed as mean ± SD. Comparison of the parameters between 2019 and 2020 was made by using tests for independent samples: Chi-squared test for qualitative variables and t Student or Mann-Whitney U for quantitative ones, depending on whether the data showed a normal distribution or not. P<0.05 was considered statistically significant.

## Results

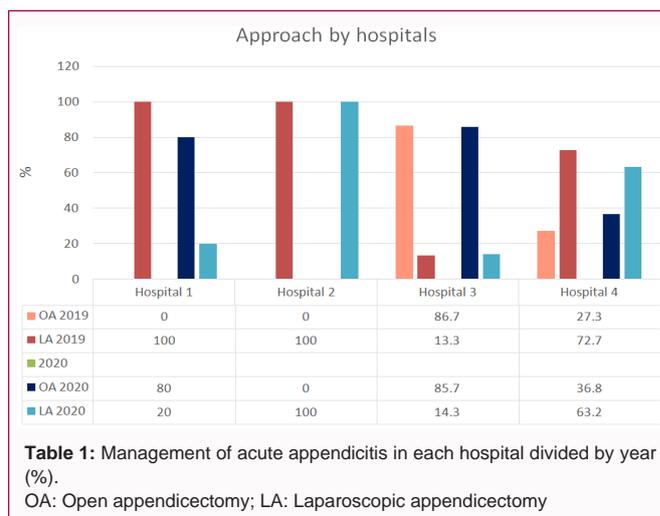
Thirty-five patients underwent appendicectomy on 2020 (48.6% male/51.4% female). Almost half of the patients (44.4%) were tested before admission in order to discard COVID-19: RT-PCR (56%), RT-PCR and chest-CT (25%), chest-CT (13%) or rapid IgG-IgM antibodies test plus RT-PCR (6%). The postoperative follow-up was at least of one month and only one complication was described (Clavien-Dindo II). Furthermore, after discharge any contagious between patients was diagnosed.

Comparing with 2019, when fifty-eight patients underwent appendicectomy, no statistically significant differences were found between demographic characteristics. The mean days of hospitalization (two days), were the same on both years. On Table 1 we show the management of acute appendicitis divided by hospitals and compared by years. Regarding pathological findings, no significant differences were recorded between 2019 and 2020.

## Discussion

Acute appendicitis is one of the most common abdominal emergencies nowadays. However, since Laparoscopic Appendicectomy (LA) was described in 1983, there is still no clear consensus regarding which is the best approach in these patients and with the COVID-19 outbreak, doubts have increased furthermore.

Laparoscopic approach has its own benefits such as less postoperative pain with shorter hospital stay, increasing the availability of beds [9]. The theories of the risk of spreading the virus with the pneumoperitoneum created during laparoscopic surgery have been extended. Besides, virus RNA was found in the stool of infected patients [10]. During laparoscopic surgery, a huge quantity of gas remains stucked in the abdomen and may have virus particles that spread when removing the pneumoperitoneum [11]. Conversely,



laparoscopy represents a contained operative field with no fluid or blood spillage reducing the risk of contagion [12]. In order to solve the gas evacuation during laparoscopy and be able to extract it before removing the trocars or extracting the specimen, smoke filtration devices have proven to be mandatory in this situation.

On the other hand, Open Appendicectomy (OA) is a faster procedure, therefore the anesthetic time with the orotracheal intubation are lower than in laparoscopic approach. Nevertheless, the use of the electronic scalpel is higher with this technique and during COVID-19 pandemic the concern about the transmission of the virus through the smoke of the electrosurgical devices, as seen with other virus, has also been debated [12].

Analyzing the data, during COVID-19 outbreak the management in Navarra differed between centers (Table 1). OA increased notably due to the shorter operative time. Besides, surgery was performed with electronic scalpel with smoke collector, and the spillage of fluids was controlled. Meanwhile, with LA, surgery was performed with low pressures, and using a special smoke extractor to deflate pneumoperitoneum before removing trocars. None early-stage appendicitis was treated with antibiotics, even it is a feasible option; it requires intravenous antibiotherapy during at least one week. On the contrary, performing surgery and discharging in two days, seems a better option for patients. Anyhow, with a minimum follow-up of one month after surgery, patients did not develop COVID-19 neither complications. This may presuppose that if the necessary measures are taken there is no special risk of getting infected undergoing surgery. Regarding surgeons neither did them; almost every surgeon in our community was tested, and only one positive case was found.

Before surgery, COVID-19 infection was discarded, so if the patient presented consistent symptoms a RT-PCR was requested. Nevertheless, due the time the RT-PCR takes, if the surgery could not be postponed, due to suspected perforation, patient was considered positive and underwent the procedure. On the other side, if the patient was asymptomatic and the chest radiography was normal, the RT-PCR was not considered necessary. Furthermore, in the cases when an abdominal-CT was necessary, it was also performed a chest-CT to discard COVID-19 infection. According to the recommendations given, a special operating room was designated for COVID-19 patients and the entrance was limited to essential members [11,13]. Although the patient had a negative RT-PCR, surgery was performed

with appropriate Personal Protective Equipment (PPE) which consisted on fluid repellent gown, surgical masks (N95 or FFP2/FFP3), double-layer of sterile gloves, disposable hat and goggles or full-face protection [14].

It is also remarkable that acute appendicitis emergencies have decreased from 2019 to 2020. It is known that patients were reluctant to attend to the hospital in order to avoid the contagious, but no statistically significant differences were recorded between anatomopathological findings in favor to more perforated appendix in 2020.

In conclusion, with the outbreak of COVID-19 surgical management have changed, and surgeons have had to make several changes in order to be adapted to this new virus scenario. At the beginning, a switch in favor to open approach was recommended. Later, it was suggested that laparoscopic surgery performed with correct PPE should not increase the risk of contagious in surgeons concluding that the approach, either open or laparoscopic, should be adjusted to the patient characteristics regardless COVID-19. Our experience on the past month is supportive with this belief because it has shown that taking the necessary measures and using the proper PPE there is no special risk added of getting infected.

Thanks to the constant investigation and medical publications, it was feasible perform the finest possible surgery in order to give patients the best surgical option during these times.

## References

1. He F, Deng Y, Li W. Coronavirus Disease 2019 (COVID-19): What we know? *J Med Virol.* 2020;92(7):719-25.
2. van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN, et al. Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. *N Engl J Med.* 2020;382(16):1564-7.
3. Hassan SA, Sheikh FN, Jamal S, Ezeh JK, Akhtar A. Coronavirus (COVID-19): A review of clinical features, diagnosis, and treatment. *Cureus.* 2020;21(3):e7355.
4. Lake MA. What we know so far: COVID-19 current clinical knowledge and research. *Clin Med (Lond).* 2020;20(2):124-7.
5. Rubio-Pérez I, Pérez JMB, Mora-Rillo M, Quirós AM, Rodríguez JG, Balibrea JM. COVID-19: Key concepts for the surgeon. *Cir Esp.* 2020;98(6):310-9.
6. SAGES and EAES. SAGES and EAES Recommendations Regarding Surgical Response to COVID-19 Crisis. 2020.
7. Royal College of Surgeons. Clinical guide to surgical prioritisation during the coronavirus pandemic. NHS. 2020.
8. Narváez JMA, Aguilar LT, Ciuró FP, Martín GM, Sánchez AJG, Simó IR. Emergency surgery and trauma care during COVID-19 pandemic. Recommendations of the Spanish Association of Surgeons. 2020;98(8):433-41.
9. Li X, Zhang J, Sang L, Zhang W, Chu Z, Li X, et al. Laparoscopic versus conventional appendectomy - a meta-analysis of randomized controlled trials. *BMC Gastroenterol.* 2010;10:129.
10. Holshue ML, DeBolt C, Lindquist S, Lofy KH, Wiesman J, Bruce H, et al. First case of 2019 novel coronavirus in the United States. *N Engl J Med.* 2020;382(10):929-36.
11. Zheng MH, Boni L, Fingerhut A. Minimally invasive surgery and the novel coronavirus outbreak. *Ann Surg.* 2020;272(1):e5-6.
12. Vigneswaran Y, Prachand VN, Posner MC, Matthews JB, Hussain M. What is the appropriate use of laparoscopy over open procedures in the current COVID-19 climate? *J Gastrointest Surg.* 2020;24(7):1686-91.
13. Brindle M, Gawande A. Managing COVID-19 in surgical systems. *Ann Surg.* 2020;272(1):e1-2.
14. Di Marzo F, Sartelli M, Cennamo R, Toccafondi G, Coccolini F, La Torre G, et al. Recommendations for general surgery activities in a pandemic scenario (SARS-CoV-2). *Br J Surg.* 2020;107(9):1104-6.