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**Case Series**

# Appendicitis and COVID-19: yet another clinical dilemma

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## ABSTRACT

Acute appendicitis is the most common general surgery encountered in the emergency room worldwide. Management of acute appendicitis in patients who are tested positive for SARS-CoV-2 is still under debate as the full course of this novel disease is not yet mapped out. Here, we report three patients who presented with symptoms of acute appendicitis without any respiratory complaints. Three patients presented to surgical emergency room with classical symptoms and signs of acute appendicitis with modified Alvarado score of more than 6/9. Though they did not have any respiratory symptoms, they tested positive for SARS-CoV-2 by RT-PCR method. All patients underwent open appendicectomy. Open appendicectomy was preferred procedure to minimize aerosol generation and for safety of operating health care workers. Histopathology was suggestive of inflamed appendix and post-operative course was uneventful. Gastrointestinal symptoms like appendicitis could be a varied and sole presentation in patients suffering from COVID-19 infection. Conservative approach can be considered in all patients suffering from acute appendicitis and surgery can be reserved for those not responding to conservative line of management or having complications in form of perforated or gangrenous appendix and appendicular abscess. Further research may elaborate the correlation between COVID-19 and acute appendicitis.

**Keywords:** Acute appendicitis, Gastrointestinal symptoms, COVID-19, Faeco-oral transmission

## INTRODUCTION

Coronavirus disease-19 (COVID-19) is caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), which started in December 2019 as an epidemic in Wuhan, China.[1] On 11 March 2020, the world health organization (WHO) declared it a pandemic after reaching more than 114 countries.[2] Although droplet transmission from an infected person to another is the main way of disease transmission, the possibility of faeco-oral transmission and infection of digestive system is also a possibility.[3,4] This case series raises an alarm regarding the possible correlation between COVID-19 infection and occurrence of acute appendicitis.

## CASE SERIES

### *Case 1*

A 22 years old female presented with pain in right iliac fossa and nausea for 3 days. She had tested positive for COVID-19 by RT-PCR 18 days back and her repeat pre-operative COVID-19 testing was negative. On clinical examination, she was afebrile, with tachycardia. Per abdomen examination revealed tenderness at McBurney's point. Her modified Alvarado score was 6/9 on admission which raised to 8/9 during her course of stay along with antibiotics. Her total leucocyte counts were raised (TLC 18,000/mm$^3$) with neutrophilia. Ultrasound abdomen showed a blind-ended, aperistaltic, non-compressible, tubular structure of 8 cm length and features of

appendicitis. She underwent open appendicectomy for the same and her post-operative course was uneventful.

***Case 2***

A 16 years old female presented in surgical emergency room with severe pain in right iliac fossa, fever, nausea and vomiting for 5 days. She was having tachycardia with maximum tenderness at Mc Burney's point with minimal guarding. She was having leukocytosis (TLC 20800/mm$^3$) with neutrophilia. Ultrasound abdomen showed blind-ended, aperistaltic, non-compressible, tubular structure of 6 cm length and features of appendicitis. Her modified Alvarado score was 7/9. Her throat and nasal swab taken just prior to surgery was positive for COVID-19 with Ct value of 32. All her inflammatory markers-IL-6, serum ferritin and CRP were raised. She was managed conservatively and later taken up for interval appendicectomy. Her post-operative course was uneventful.

***Case 3***

A 23 years old male presented with pain in right iliac fossa and fever for two days. On examination, he was febrile, with tachycardia and tenderness at McBurney's point. His laboratory parameters in form of leucocyte counts and neutrophil counts were raised (TLC 22000/mm$^3$). Ultrasound abdomen showed blind-ended, aperistaltic, non-compressible, tubular structure of 5 cm length with peri-appendicular collection. His modified Alvarado score was 8/9. His pre-operative throat and nasal swab turned out to be positive for COVID-19 by RT-PCR technique with Ct value of 28. The inflammatory markers were normal. Considering the clinical condition of the patient, he was taken up for emergency surgery. Intra-operatively, there was evidence of appendicular perforation with around 20 cc peri-appendicular purulent collection. Appendicectomy was performed and a peritoneal lavage was given with placement of intra-abdominal drain. The post -operative course was uneventful and drain was removed on third post-operative day.

All three were young patients, presenting with appendicitis with a COVID-19 positive status. None of them had any respiratory symptoms in the form of dry cough, sore throat, or shortness of breath. All three patients were having a $SpO_2$ of 98 to 99% on room air, with a normal chest X-ray. The final histopathological report was suggestive of inflamed appendix in all cases.

## DISCUSSION

The spectrum of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) can have varied presentation from respiratory symptoms to gastro-intestinal symptoms, cardiac and neurological symptoms.[5] Patients suffering from SARS-CoV-2 can have gastrointestinal symptoms in the form of loss of taste sensation or altered taste sensation, lack of appetite, diarrhea, vomiting and pain in abdomen.[6] These gastro-intestinal symptoms can appear before manifestation of respiratory symptoms.[4] Moreover, as SARS-CoV-2, uses angiotensin-converting enzyme 2 (ACE2) to gain access into the cell wall membrane for replication, its expression over intestinal mucosal cells can explain affection of gastrointestinal tract.[7]

***Pathogenesis*:**[8]

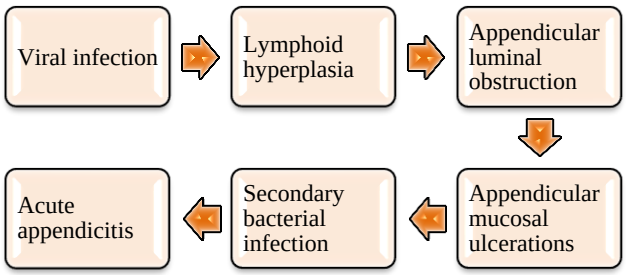


**Figure 1: Pathogenesis.**

Although, uncomplicated appendicitis shows a very low morbidity and mortality rate, an early diagnosis using modified Alvarado score is essential for deciding the management between a conservative approach and surgical intervention. Ultrasound and/or CT abdomen can be useful adjuncts. The impact of COVID-19 and recommendations on surgical aspects are yet to be analyzed. The paradigm shift from surgical management to a more conservative line of treatment for uncomplicated appendicitis is necessary for the safe-guarding of health care professionals involved in managing emergency services.[9]

The theoretical possibility of viral transmission from aerosolization of tissue and peritoneal fluid during laparoscopic procedures is well documented.[10] Therefore, if surgery is necessary for managing acute appendicitis, open access is recommended with healthcare workers donning appropriate personal protection equipment (PPE) and preferably under regional anesthesia.

SARS-CoV-2, a novel corona virus, responsible for this pandemic is presenting mainly with acute respiratory syndrome eclipsing already existing disease and also intersecting in management of common ailments like acute appendicitis.

## CONCLUSION

Gastrointestinal symptoms like appendicitis could be a varied and sole presentation in patients suffering from COVID-19 infection. Conservative approach can be considered in all patients suffering from acute appendicitis and surgery can be reserved for those not

responding to conservative line of management or having complications in form of perforated or gangrenous appendix and appendicular abscess. Further research may elaborate upon the correlation between COVID-19 and acute appendicitis.

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