

Appendicitis: In the Times of COVID-19

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Abstract Coronavirus disease -19 (COVID-19) is a novel contagious infection initially thought to be a respiratory pathogen, but there is increasing evidence of multisystem involvement. Here, we report a 43-year-old male who presented with acute abdominal pain associated with fever and chills and was diagnosed with acute appendicitis. He was tested positive for COVID-19, and because of elevated inflammatory markers, the patient was successfully managed non-operatively with remdesivir and intravenous (IV) antibiotics. Our patient had predominantly abdominal findings, and we believe that there is a possibility that appendicitis may be associated with COVID-19.

Keywords: corona virus disease 2019, acute appendicitis, remdesivir

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1. Introduction

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]. Since then, it has been declared a pandemic by the World Health Organization (WHO) in March. The virus is known to affect many organ systems and has a varied presentation. There have been several case reports of gastrointestinal system involvement by COVID-19, with the most common symptoms being nausea, vomiting, loss of appetite, and abdominal pain [2].

Appendiceal obstruction is the primary event leading to appendicitis. Some studies showed that viral infections could cause acute appendicitis in different ways; lymphoid hyperplasia, which leads to appendix obstruction, and mucosal ulcerations, which results in a secondary bacterial infection [3]. We propose that the SARS-CoV-2 can be associated with acute appendicitis through a similar mechanism. Here we presented the first case with the possibility of acute appendicitis due to COVID-19.

2. Case Presentation

A 43-year-old male without any significant past medical history presented to the emergency department with diffuse abdominal pain, fever, and chills for the last three days. One day before the presentation, he started experiencing abdominal pain, which initially started in the periumbilical region but later became more localized in the right lower quadrant (RLQ) of the abdomen associated with nausea and multiple episodes of non-bilious vomiting. He denied any shortness of breath. Upon initial evaluation,

his vital signs were within normal limits, and oxygen saturation was 98% on room air. Abdominal examination revealed tenderness and guarding in the RLQ. Computerized tomography (CT) of the abdomen and pelvis with contrast material showed findings consistent with acute appendicitis (Figure 1).

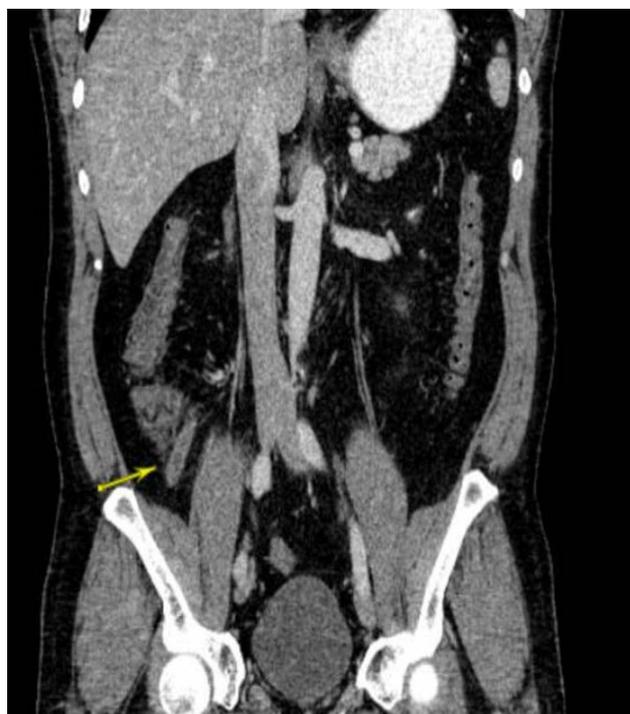


Figure 1. Computed Tomography Scan of the abdomen showing appendiceal thickening suggestive of acute appendicitis

Laboratory results were as following; white blood cell (WBC) count 7.1×10^3 per cubic millimeter with 83% neutrophils, D-dimer assay 173 ng/ml (normal:

0-230 ng/ml), Lactate dehydrogenase (LDH) 571 units/L (normal: 100-190 units/L), C reactive protein 37 mg/L (normal < 5 mg/L), Ferritin 754 ng/ml (normal: 13-150 ng/ml), creatinine 1.1 mg/dl (normal: 0.5-1.5 mg/dl)

The patient was scheduled for laparoscopic appendectomy, but his reverse transcriptase-polymerase chain reaction (RT-PCR) assay for COVID-19 was positive. The chest X-ray did not show any infiltrates. Given the high risk of healthcare staff exposure, he was managed conservatively with IV antibiotics (piperacillin/tazobactam 3.375 gram for five days). He also received remdesivir for five days. The patient showed significant clinical status improvement with conservative management and was discharged home with outpatient surgical follow up.

3. Discussion

The current standard treatment for appendicitis is an appendectomy, which can be performed open or laparoscopically [4]. However, several randomized trials have compared antibiotics with appendectomy for nonperforated appendicitis in adults. Most patients treated with antibiotics respond clinically with a general symptom reduction [5] and avoidance of peritonitis [6]. Nonoperative management of acute appendicitis also has the additional benefits of decreased morbidity, quicker return to work, the requirement of fewer doses of narcotics, and is also cost-effective [7,8].

Management of acute appendicitis in patients with COVID-19 poses a challenge as the operative risks are high. There is a high risk of healthcare professionals exposure if the operative strategy is opted, especially in limited personal protective equipment availability. Simultaneously, if the patient is hypoxemic and has multisystem damage due to severe COVID-19, surgical intervention can pose significant morbidity and mortality. To date, there is a deficiency of randomized clinical trials demonstrating the efficacy of IV antibiotics in the management of acute appendicitis in COVID-19 patients. Our case demonstrates the successful conservative management of acute appendicitis in a patient who was positive for COVID-19.

The mechanism of appendicitis is similar to the inflammation of other hollow intraabdominal organs. It started with localized inflammation, followed by ischemia and, ultimately, perforation. Historically, appendiceal obstruction has been proposed as the primary cause of appendicitis, which can be caused by lymphoid hyperplasia or infectious process (in young population); or benign or malignant tumors (in older population). A study of patients with appendicitis showed elevated intraluminal pressure in only one-third of the patients with nonperforated appendicitis [9].

COVID-19 has been shown to cause gastrointestinal symptoms (Diarrhea in 19 percent, nausea/vomiting in 12

percent, and abdominal pain in less than 10 percent) [10]. We propose that lymphoid hyperplasia in the gastrointestinal tract leading to appendiceal obstruction could be one mechanism for COVID-related appendicitis. Lymphoid hyperplasia could be a response to severe inflammation as patients with COVID-19 have laboratory evidence of an exuberant inflammatory response, similar to cytokine release syndrome, with persistent fevers, elevated inflammatory markers (e.g., D-dimer, ferritin), and elevated pro-inflammatory cytokines [11].

4. Conclusions

Management of acute appendicitis in patients with novel Coronavirus disease 2019 (COVID-19) poses a challenge as the operative risks are high. Clinicians need to weigh risks versus benefits in the case to case basis. Also, there is a need for good evidence (e.g., high quality randomized controlled trial) to assess the association between COVID-19 and appendicitis.

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