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## My Thoughts / My Surgical Practice



## Finding a place for non-operative management of acute appendicitis: COVID-19 as an example

## 1. Introduction

Acute appendicitis (AA) is the most common surgical emergency worldwide with an incidence of 1.1 cases per 1000 people per year. The incidence of AA tends to peak in the late teen years and then gradually declines in the elderly. Men are more commonly affected by AA with a male to female ratio of 1.4:1. The diagnosis of AA may be made on clinical basis, yet the use of CT scanning has reduced the rates of negative appendectomy because it has a sensitivity and specificity that exceed 90%. Appendectomy is the gold standard treatment of uncomplicated AA with documented efficacy and safety. However, several clinical trials and meta-analyses<sup>1</sup> examined the efficacy and safety of non-operative management (NOM) of AA and reported that NOM is a feasible treatment option with satisfactory outcomes, at least on the short-term.

## 2. The indications for NOM

Currently, some clinicians are proponents of NOM of AA on the basis that it avoids the possible complications of surgery and preserves the appendix that is not regarded anymore as a vestigial organ since it may have important immunologic functions. On the other end, other clinicians are strict opponents of NOM because they believe appendectomy is the best definitive treatment for uncomplicated AA since NOM is associated with a failure rate of 8.5% and recurrence of symptoms of AA in almost 20% of patients.<sup>1</sup>

Lying in between the two opposing teams, there exists a grey zone in which NOM of AA does have a place, yet in certain conditions and not as a routine practice. NOM can be a viable treatment option in the settings where access to surgery is restricted as in places where well-equipped operation theaters are not available or when the patient is of ASA class IV or V and is not considered fit for surgery. Recently, another setting where NOM of AA may be a feasible treatment option has emerged, the COVID-19 pandemic.

## 3. Impact of COVID-19 on surgical practice and management of AA

The COVID-19 pandemic has affected several aspects of life, and medical and surgical practice is not an exception. The impact of the current pandemic on surgical practice has been observed in various domains, importantly elective surgery cancellation has resulted in a significant decrease down to 55% in the volume of procedures performed which has varied among surgical services.<sup>2</sup> The impact of the hospital lock down secondary to COVID-19 was assessed in a living

systematic review<sup>3</sup> that showed a significant negative impact of lock down on patient outcome and procedure volume. Further negative aspects include the increased rates of pulmonary complications and mortality in patients with perioperative SARS-CoV-2 infection, and shift from minimally-invasive to open surgery.<sup>4</sup>

The current pandemic has impacted the presentation and management of AA in various ways. A significant increase in complicated AA along with a simultaneous reduction in uncomplicated AA during the pandemic may imply that patients are not seeking timely surgical care. When compared to the pre-COVID era, patients with AA presented during the pandemic had a 5.5% decrease in uncomplicated AA and a 21.1% and 29% increase in perforated and gangrenous appendicitis, respectively.<sup>5</sup>

On another hand, the presentation of COVID-19 may mimic the clinical picture of AA, especially in children. Moreover, a recent report assumed a novel association of AA in children infected with SARS-CoV-2. The authors hypothesized that AA in children with SARS-CoV-2 infection may represent a postinfectious hyperinflammatory complication of the infection that can occur two weeks after the early manifestation of the disease.<sup>6</sup>

The impact of COVID-19 pandemic on the management of AA was explored in a population-based analysis in Germany. The analysis found an overall reduction by 12.9% of patients presenting with AA and this reduction was mainly relevant to decreased rates of uncomplicated AA, rather than complicated appendicitis. The treatment methods, rates of extended surgery, complication rates including appendix stump leakage and need for re-operation did not remarkably differ from those before the onset of the pandemic.<sup>7</sup>

One of the important observed effects of COVID-19 on the management of AA was the increased rate of adoption of NOM of AA as compared to the pre-COVID era. A recent meta-analysis included 14 studies entailing 2140 patients, of whom 45% had a trial of NOM of AA. The application of NOM during COVID-19 was more six times more likely than its application before the pandemic. The weight mean failure rate of NOM was 16.4% and failure was more observed in children and patients with complicated appendicitis. Furthermore, NOM had significantly lower odds for complications than appendectomy. The authors concluded that NOM of AA in the setting of COVID-19 may be a safe, short-term alternative to surgery with acceptably low failure and complication rates.<sup>8</sup>

## 4. A new place for NOM of AA

As the number of patients recovering from COVID-19 has been rising, several of these patients may need some kind of surgical intervention

and a relevant question would be when would be safe to have surgery after recovery from the infection. The answer was revealed by a recent multicenter study by the CovidSurg collaborative<sup>9</sup> that included more than 140,000 patients from 116 countries, 2.2% of whom had a pre-operative SARS-CoV-2 diagnosis. When compared to patients without SARS-CoV-2 diagnosis, patients having surgery within 0–2 weeks, 3–4 weeks, and 5–6 weeks had significantly higher odds of mortality and complications (odds ratio = 4.1, 3.9, and 3.6). After a seven-week delay in having surgery after infection, the mortality risk dropped to the baseline similar to patients without SARS-CoV-2 diagnosis. The study, therefore, recommended to delay elective surgery for at least seven weeks following SARS-CoV-2 infection to decrease the higher odds of pulmonary complications and mortality in these patients to become similar to that of patients without prior COVID-19.

Hence, in light of the recent evidence and given that NOM maybe a safe short-term treatment of uncomplicated AA, another question is raised; *can NOM be the first-line treatment for patients with uncomplicated AA who have a history of COVID-19 infection dating less than seven weeks before their current presentation?* The answer of this question warrants conducting well-designed trials or at least controlled studies to verify whether delaying surgery in patients with uncomplicated AA who have a recent history of COVID-19 would be effective and manage to avoid the increased risks of postoperative pulmonary complications documented in these patients.

Finally, it is important to note that although NOM can be effective in resolving the acute condition in the majority of these patients, further long-term follow-up is required as it has been estimated that approximately 20% of these patients will need readmission and interval appendectomy for recurrent symptoms.<sup>1,8</sup>

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## Declaration of competing interest

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