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Management of Acute Appendicitis in Covid Pandemic- A Prospective Study of 25 Cases

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Abbrevations: CT (Computed Tomography), PPE (Personal Protective Equipment), ULPA (Ultra Low Particulate Air Filteration)

I. Introduction

Acute appendicitis is a surgical emergency. It is the most common cause of acute abdomen in North America, with approximately 1/3rd presenting with perforation at presentation. Incidence is 84/100000 population.[1] CT is gold standard for imaging in acute appendicitis, however associated with increased radiation exposure. Alvarado Score is used to predict the severity of appendicitis, and uses clinical symptoms, signs and laboratory markers and negates the need for radiation exposure.[2] Management of appendicitis is either conservative or surgical. Conservative management can be tried for non complicated appendicitis, whereas presence of complications like perforation, fecolith, abscess dictate surgical management.[3,4] However, the Covid-19 pandemic changes routine surgical management. Operating theatres are high risk areas for transmission, additional strain on the team and resources due to increasing prevalence of Covid-19, risk to operating team has called for a change in protocols to determine essential vs non essential procedures. Proper education of surgical staff regarding use of PPE and decreased exposure of healthcare staff is the key to minimising risk of infection in the team.[5] Uncomplicated appendicitis can be managed with antibiotics and monitored for improvement in symptoms, signs and hemogram for leucocytosis. Complicated cases that cannot be otherwise conserved can be operated taking all the necessary precautions such as pre operative COVID-19 testing, including Personal Protective Equipment (PPE) for operating team, limiting the members of operating team, proper operating room ventilation and air purification, dedicated Covid-19 positive and Covid-19 suspect wards, clear path for transport with limited traffic are the need of the hour. Laproscopic surgeries carry higher risk over open surgeries due to the risk of aerosol transmission.[6].

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II. Material and Method

A Prospective study was done on all patients presenting to Dr. D.Y Patil Hospital, Navi Mumbai, India with clinical features of acute appendicitis during covid pandemic, from 15th March to 30th May.

Inclusion Criteria

1. Patients presenting with clinical features of acute appendicitis, diagnosed clinically and confirmed on ultrasonograpy and evident as leucocytosis on hemogram were included in the study.
2. Patients willing to participate in the study.
3. Patients who followed up for 7 days after discharge.

Exclusion Criteria

1. Patients not willing to participate in the study.
2. Patients who did not follow up after discharge.

All patients presenting with right iliac fossa during the above stated period were evaluated. Following parameters were noted for all patients and compared.

Patients above 15 years of age were included in the study. Thorough history taking and examination was done for the patients. Presenting symptoms of pain in abdomen, nausea/vomiting, fever, loss of appetite, loose stools, urinary frequency were evaluated. History of recent travel, contact with covid positive or covid exposed patients was asked for. Any significant co

morbidities and past surgical histories were noted. *Covid swab was sent for all patients on admission.* Complete physical examination was done for the patients. Pulse rate, Blood Pressure examination, Per abdominal examination was done to look for tenderness and its site, presence of any guarding or rigidity. Chest Xray was done for all the patients to rule out features of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), including atypical or organising pneumonia, often with a bilateral, peripheral, and basal predominant distribution. A hemogram was done for all patients. Ultrasound examination was done for all patients, including diameter of appendix, periappendiceal fat stranding or collection with other features such as presence of appendiculoliths, gas within the lumen of appendix, loculated collection and appendicular phlegmon were noted. Based on ultrasound findings, patients were classified into Group A and B, Group A had cases of uncomplicated appendicitis that were conserved, whereas Group B had cases of Complicated appendicitis including, appendiculolith, appendicular perforation, appendicular abscess. Patients of group A who did not respond to conservative management within 24-48 hours were operated and included in group B.

Conservative management included, keeping the patient nil per oral for 48 hours with intravenous antibiotics for 3-5 days, shifted to oral antibiotics after that.

These patients were regularly examined for worsening of clinical signs including change in abdominal examination findings, with repeat leucocyte count being done at 48 hours. One patient in Group A did not improve after 48 hours and was taken up for surgery.

Patients operated were treated will all precautions and use of PPE and open appendectomy was done. *Laproscopic appendectomy was not done due to increased risk of aerosol exposure to operating team.* Patients were given intravenous antibiotics for 3 days in view of complicated appendicitis, then shifted to orals. Patients were kept nil per oral for two days after surgery, then shifted to orals. Suture removal was done on POD 10.

All patients were tested for Covid-19, and turned out to be negative.

All patients were followed up for 7 days after discharge, with plan to follow up if symptomatic in the future.

Patients with appendicular lump were asked to follow up after 4 weeks, and before that if symptomatic.

III. Result and Discussion

Out of 25 patients, 15 were males and 10 were females.

Age distribution was as follows,

Age distribution (in years)	Number of patients (n=24)
15-25	16 (64%)
26-35	6 (24%)
36-45	3 (12%)
46-55	0
>55	0

Comorbidities- One patient was diabetic and hypothyroid and others had no comorbidities.

Duration of pain in right iliac fossa was compared,

Duration of symptoms (in hours)	Number of patients (n=24)
<24h	2 (8%)
24-48h	10 (40%)
48-72h	6 (24%)
>72h	3 (12%)

Presenting symptoms were compared, including, Pain in right iliac fossa, nausea/vomiting, anorexia, fever, diarrhoea, urinary complaints.

Presenting complaint	Number of patients (n=24)
Pain in right iliac fossa	25
Nausea/ Vomiting	10
Fever	1
Diarrhoea	0
Urinary Complaints	0

Alvarado Score for the patients in both group A and B group were compared.

GROUP A (Conservative Management)- 19 patients

Alvarado Score	Number of Patients (n=19)
1-4	0
5-6	2 (11%)
7-10	17 (89%)

GROUP B (Operative Management)- 6 patients

Alvarado Score	Number of Patients (n=6)
1-4	0
5-6	2 (33.33%)
7-10	4 (66.66%)

Leucocyte count of the patients were compared, 14 patients had leucocytosis (>11,000/L), wheras 11 patients had leucocytes within the normal range.

USG diameter of appendix

Appendix diameter	Number of Patients (n=25)
</= 6mm	3 (12%)
>6mm	18 (72%)

USG evidence of appendicular abscess/ fecolith/ perforation/ appendicular mass

USG Findings	Number of patients
Appendicular abscess/ perforation	2 (8%)
Fecolith	0
Appendicular mass	2 (8%)

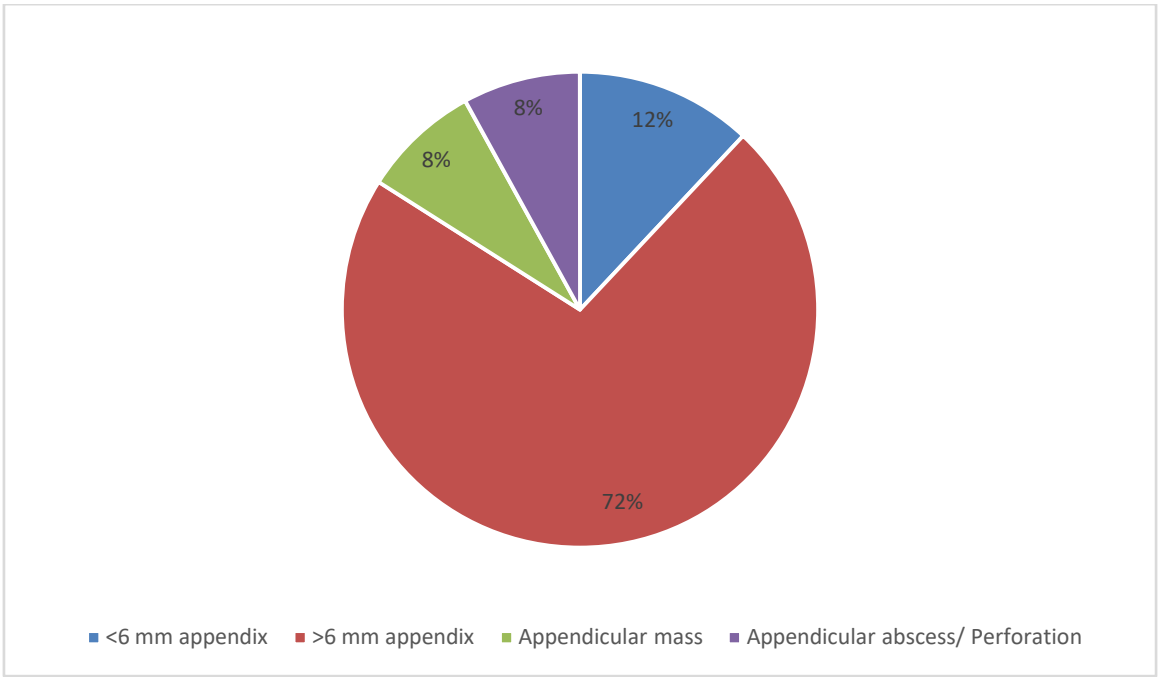

Figure 1: USG FINDINGS

Number of patients operated verus conserved

Treatment	Number of Patients (n=24)
Conservative	19 (76%)
Operative	6 (24%)

Out of the six operated patients, indications for surgery were as follows

Patient (Serial number)	Indication
1	Guarding on presentation, elevated leucocyte count
2	Tender RIF, Elevated leucocyte count, Appendicular perforation on USG
3	Tender RIF, Elevated Leucocyte count Appendicular perforation on USG
4	Worsening of symptoms, abdominal examination findings and leucocytosis
5	Guarding on presentation, elevated leucocyte count
6	Worsening of symptoms, abdominal examination findings and leucocytosis

Antibiotics given: Antibiotics were given depending on clinical severity and leucocytosis. Metronidazole was given to all patients for anerobic coverage. Cefoperazone with sulbactam was given to 14 patients, whereas ceftriazone was given to seven patients and piperacillin tazobactam was given to four patients.

Duration of hospital stay in group A vs B

Group	Mean Duration of Hospital Stay
Group A (Conserved)	4.47 days
Group B (Operated)	6.8 days

It was observed that 64% of patients were in the age group of 15-25 years. All 25 patients presented with pain in right iliac fossa, while 10 % had accompanying nausea/ vomiting. 40% patients had a 24-48h history of pain in abdomen, 24% patients had a 48-72h history, 12 % had a history of >72h and 8% had <24h history of pain in abdomen. In Group A, 89% patients had an Alvarado Score of 7-10, 11% had a score of 5-6 and were conserved. Group B that underwent surgical management had an Alvarado score of 7-10 in 66.66% patients and a score of 5-6 in 33.33% patients. Out of 25 patients, 6 patients who underwent operative management had adverse clinical signs on presentation, with leucocytosis or worsening after admission or appendicular perforation as presentation.

The first historical description of appendix and its inflammation dates back to the 16th century. The first appendectomy was described by Amyand in 1736, when he discovered inflamed appendix in a patient of hernia with enterocutaneous fistula.[7] Appendix is a blind muscular tube, with mucosa, submucosa, muscular and serosal layers. It is short and broad at birth, then becomes tubular by 2 years of age. Appendix comes to lie in retrocaecal position as the caecum grows and appendix rotates. Failure of this rotation results in pelvic, subcaecal and paracaecal positions. The base of the appendix, however remains constant, at the confluence of the three tenia, and can help find the appendix intraoperatively by tracing anterior tenia.[8] Appendicitis is inflammation of appendix. Etiology of appendicitis includes decreased dietary fibre, increased consumption of refined carbohydrates and often luminal obstruction by fecolith or stricture. Pathology of appendicitis involves obstruction of lumen, lymphoid hyperplasia, increased intraluminal pressure, oedema and mucosal ulceration, venous obstruction and ischemia of appendix wall leading to gangrene and perforation. Infection may get contained by antibiotics or greater omentum and loops of small bowel become adherent to inflamed appendix and form a phlegmonous mass or paracaecal abscess. Risk factors for appendicular include diabetes mellitus, immunosuppression, extremes of age, fecolith, pelvic surgery, previous abdominal surgery. Diagnosis is based on clinical and radiological findings, with leucocytosis on hemogram. Alvarado score is commonly used to confirm the diagnosis and predict the severity of appendicitis.[9]

Feature	Score
Migration of Pain	1
Anorexia	1
Nausea	1
Tenderness in Right Lower Quadrant	2
Rebound pain	1
Elevated Temperature	1
Leucocytosis	2
Shift to left	1
TOTAL	10

A Score of 1-4, patient can be discharged, 5-6, observation/ admission is advised, whereas for 7-10, treatment is surgical. Surgery can be open appendectomy or laproscopic appendectomy. Conservative management can be tried for uncomplicated cases. However presence of

complication such as fecolith, appendicular abscess, appendicular perforation require surgical management. A third generation cephalosporin and imidazole derivative have been successfully used for conservative management of uncomplicated appendicitis.[10]. Presentation as appendix mass is conserved with antibiotics.[11]

Covid-19 is caused by SARS-COv-2, known commonly as coronavirus. It is responsible for an outbreak beginning in Wuhan in December 2019, then spreading to majority of the world. It causes asymptomatic infection to mild pneumonia like illness, spreading by person to person contact via droplets. Fulminant infection may develop leading to severe pneumonia, renal failure and even death. The existence of this pandemic makes surgical management a challenge as it risks exposing the surgical team to known, suspected or asymptomatic Covid-19 cases. Surgical management has to be limited to cases, that cannot be otherwise conserved or postponed, to limit unnecessary exposure of both the surgical team and the patient to Coronavirus. It also allows diversion of members of the team towards management of Covid-19 pandemic associated increased admissions.[12]. Laproscopic surgery involves creation of pneumoperitoneum which increases risk of aerosol exposure to the operating team. Electrical equipment and harmonic scalpels used in laproscopic surgery generate surgical smoke that cannot effectively deactive cellular component of the virus. Level 3 protection is mandatory for the operating team. Closed smoke evacuation/ filteration systems with ULPA (Ultra Low Particulate Air Filteration) capacity should be used during MIS, minimal use of energy sources, separate cleaning of surgical equipment need to be exercised.[13]

All patients to be considered as COVID-19 positive unless proven otherwise, and operated with proper precautions that need to be exercised for positive patients. Patients have to be explained the risk of aquiring covid-19 during procedure and hospitalisation.

IV. Conclusion

Acute appendicitis, with prevalent Covid-19 and its associated morbidity to the patient undergoing surgical procedures and risk to the operating team can be managed conservatively, even with a higher Alvarado Score on presentation, unless complicated with fecolith, appendicular perforation or abscess or failure to resolve after conservative management. Conservative management decreases the burden on the already overwhelmed hospital resources, medical team due to Covid-19 and limits unnecessary exposure for both patient and the operating team.

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