IRIA-ICRI Guidelines and Recommendations

(INDIAN RADIOLOGICAL AND IMAGING ASSOCIATION- INDIAN COLLEGE OF RADIOLOGY AND IMAGING)

Imaging recommendations for COVID manifestations in

the abdomen



Indian Radiological & Imaging Association

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IRIA-ICRI Guidelines and Recommendations Imaging recommendations for COVID manifestations in the abdomen

Prepared by Indian College of Radiology and Imaging (Academic wing of Indian Radiological & Imaging Association) abdomen sub Specialty group

Disclaimer: We recognize that the situation is fluid and adjustments will be inevitable as more information becomes available. Imaging of abdomen should be undertaken only when it helps in deciding patients' management or for diagnostic dilemma situations.

Prevalence:

- 16 -18% of Covid-19 patients present *primarily with GI symptoms* such as diarrhoea, anorexia, nausea, vomiting. [1-3]. 16% present with **only** GI symptoms [4] rather than fever and dyspnoea at the onset of COVID-19, posing a great challenge for rapid identification of COVID-19 [5].
- These patients may undergo imaging for abdominal complaints without a clinical suspicion of COVID.

Clinical signs :

- Pain abdomen (sudden onset / acute/ dull aching)
- Fever
- Diarrhoea or altered bowel habits
- Bloating/ abdominal wall rigidity
- Peritonitis
- Nausea/ Anorexia/ Vomiting

Role of Imaging [6]:

- 1. Acute abdominal condition in whom a COVID-19 co-infection is detected (Recover better, lower mortality rate (13%), lower ARDS rate (29%), less rates of preoperative invasive ventilation (14.3%)
- Severe COVID-19 infection with an abdominal complication requiring emergency surgery (mortality33.3%, ARDS 50%, pre-op invasive ventilation in 50% and postoperative invasive ventilation 100.0%)

Almost 1/3rd of all proven COVID 19 patients undergo some form of abdominal imaging (USG/ X-ray/ CT) [7]. The most common indications for abdominal CT listed on the imaging requisitions are recorded as: **abdominal pain** in 50%, **fever** 20% and **abdominal infection** in 15-20% [8]. Most often, the abdominal CT scans show no acute abnormalities [9]

Imaging modalities

- Computed tomography (CT)
 - Most commonly used for evaluation.
 - Often sufficient for initial diagnosis

- Ultrasound abdomen (USG)

- Limited use in acute abdomen, ICU setting or in Emergency set up only
- Apt for screening purposes only
- May pick up dilated bowel loops with altered peristalsis according to stage of peritonitis/ infection
- Bowel wall thickening only in distal ileum
- Ascites
- Acute hepatitis/ Gb wall edema/ cholecystitis/ Pancreatitis

- X Ray Abdomen

- Pneumoperitoneum
- Pneumatosis intestinalis or Portal vein air in region of liver/ right hypochondrium

- Magnetic Resonance Imaging (MRI):

- Limited role in acute setting in pregnant females.

CT Technique (modality of choice)

- Thin axial scans of minimum 3mm thickness.
- Portal venous scan may be sufficient in most of the cases
- NCCT/CT angiography may be undertaken depending on the clinical indication, *similar to non-COVID patients*
- Area of coverage-
 - Superiorly from lung bases (preferable) (see Annexure 1)
 - Inferiorly- to include upto pelvis (level of symphysis pubis)
- Standard CT abdominal and pelvis (with or without prolonged oral neutral contrast) in a single phase (portal venous phase) on *atleast a* 4 slice CT scanner, *preferably* > 16 slice scanner for a complete analysis of the small/ large bowel loops and other solid organ abnormalities
- If possible, a separate CT scanner should be designated for known or suspected COVID 19 patients in order to avoid risk of transmission. If not possible, then appropriate sanitisation procedures have to be followed.
- Rectal contrast administration/ CT colonography should be avoided in known or suspected Covid-19 patients, or in those recently (<u>within 21 days</u>) recovered from the infection[BSGAR][28]
- Covid-19 RNA is excreted in faeces at the time of infection and may persist for at least 2 weeks after respiratory samples become negative. Hence, rectal contrast administration (air/ positive/ neutral contrast) should be avoided to protect personnel from potential risk of transmission of Covid-19 through faeces, rectal mucosa and secretions as the risk of disease transmission is described in literature [BSGAR]
- CT Angiography whole abdomen in 2 phases (arterial &venous) using bolus tracking technique, for patients suspected to have ischemia, *pneumatosis on NCCT scan*, deranged coagulation profile, abnormal D dimer tests with acute pain abdomen or any other clinical criteria to suggest ischemic episode, infarction or deep venous thrombosis.

- Patients with ICU admission are in general, at risk of coagulopathy and the bowel findings could potentially be related to the systemic status rather than direct COVID-19 associated coagulopathy. The presence of frank bowel ischemia may also be attributed to COVID-19 associated coagulopathy [31]
- Standard precautions for contrast reactions and previous allergy/ reaction to Contrast media must be kept in mind and specifically asked for from the patient.
- Adequate premedication and well equipped resuscitation drugs/ equipment must be available before contrast enhanced CT.
- Attention should also be paid to renal function test values.
- CT should not be withheld in the pregnant patient if deemed clinically necessary to avoid significant delay in diagnosing life threatening conditions, such as appendicitis, bowel perforation, or sepsis.(ACR Appropriateness Criteria – 2008)
- Acute abdominopelvic CT already includes the lung bases; the incremental benefit of full thoracic scanning where RT-PCR is negative and community prevalence is dropping is likely to be negligible. (see Annexure 1)

Ultrasound and Doppler Technique:

- For patients, who are in ICU or on ventilator or otherwise difficult to transport, a **portable USG** may be required.
- Department should designate **a red area**, the USG examination can be done on a **dedicated USG machine** in the red area in emergency setting to allow evaluation on a superior US system while reducing exposure of the personnel to a high viral load setting.
- In view of the infectiousness of the mutant strain and the increasing severity of viral contagiousness, the *Abbreviated Protocol for USG* is highly recommended.
- Store cine loops, so that measurements and other parameters can be measured later, thereby reducing the time of exposure.
- If Doppler is indicated, then colour flow of the required vessel can be done to look for patency and direction.
- Limited spectral Doppler tracing may be obtained. Care should be given that the Doppler angle is acceptable. This may require scanning from a different direction, Power Doppler or B-flow imaging.

- The infection is now known to be transmitted through aerosols. Since it may be difficult to disinfect the MRI room and designating a separate MR scanner for COVID patients is generally not possible, hence **MR should only be undertaken** when the clinical question in hand can't be answered by other investigative modalities.
- An additional challenge on MR is that COVID 19 patients are often on oxygen.
 Maintaing oxygen delivery and obtaining diagnostic images in sick tachyponeic patients, given the relatively longer imaging times is difficult.
- MRI abdomen may have a limited role in pregnant females.

Abdominal Radiograph Findings

- <u>Supine Prone combination as per indication (Radiographs are recommended only</u> in settings of non-availability of CT (being a one stop shop) and demonstrating greater sensitivity/ specificity in detecting bowel wall pneumatosis, vascular abnormalities etc) Diffuse gaseous dilation of small and large bowel consistent with ileus.
- Pneumatosis intestinalis/ pneumoperitoneum/ ascites

CT findings (maybe identified on other imaging modalities):

- 1. Bowel wall thickening (small and large bowel) in 15-31% associated with hyperaemia and mesenteric thickening. [7, 9-14
- 2. Fluid-filled colon (homogeneous fluid attenuation contents in the lumen of colon without formed stool) without wall thickening or pericolonic stranding.
- 3. Mesenteric ischemia (Enteritis accompanied by ischemia)
- 4. Pneumatosis intestinalis or portal venous gas in approximately 10% [15-17]
- 5. Acute Pancreatitis
- 6. Solid organ infarctions or vascular thromboses (18%) [9]
- 7. Mesenteric stranding
- 8. Ascites [18]
- 9. Gallbladder sludge, Newly found hepatosteatosis, hepatitis, acute liver injury[19]
- Enlarged kidneys, bilateral renal infarcts and other abnormalities of the urinary tract (12%): cystitis, pyelonephritis, renal abscess [20]

- 11. Ileocolic intussusception (in paediatric population) [21-23]
- 12. Nonspecific: Gastritis, equivocal findings of appendicitis, perforated marginal ulcer at the gastro-jejunal anastomosis in a gastric bypass patient, stercoral colitis, and concurrent stercoral colitis and diverticulitis, liver abscess, progression of hepatic metastases

Key Recommendations:

- Radiologists need to be aware that COVID-19 patients present with abdominal symptoms, and that such patients may have *no or only mild pulmonary symptoms* and may not have previous thoracic imaging.
- Majority of these patients will have nil or nonspecific findings on abdominal CT (positive findings on abdominal CT do not exclude COVID-19). Hence a high level of suspicion needs to be maintained in a pandemic situation. *It is hence recommended that radiologists may carefully review the lower thoracic sections in the abdominal CT scans for typical COVID-19 findings [25, 26] in lung window*
- A history of exposure to suspected or confirmed cases of COVID-19 as well as clinical details from the physician to be actively sought for.
- Although, RT-PCR is used to confirm the diagnosis of COVID-19, in emergency situations, it is difficult to rely on viral nucleic acid testing to identify COVID-19 quickly. Hence, CT-scans of the lungsmay be used as an adjunct to screen for COVID-19 in emergency situations, especially before emergency surgery.
- No distinct patterns have emerged that are specific for COVID-19. An intra-abdominal abnormality specific for COVID-19 infection has yet to be determined. [5, 27]
- Hence, it is reasonable to conclude that currently the *characteristic pulmonary findings* of COVID-19, if synchronously present at the lung bases of an abdominal CT, should be the sole abdominal CT abnormality suggesting the possibility of SARS Covid infection.[28]
- Please Refer to the following guidelines regarding cleaning of equipment for ultrasound machines: <u>World Federation for Ultrasound in Medicine and Biology</u> <u>Position Statement: How to Perform a Safe Ultrasound Examination and Clean</u> <u>Equipment in the Context of COVID-19. [31]</u>
- Cleaning of CT scanner: please refer to general guidelines already discussed on <u>ICRI</u>
 <u>portal</u>

The algorithm for inclusion of chest CT with abdominal CT, (from the BSGAR, as illustrated below) is as follows:



*Probability assessment as per PHE & local guidance

**In some cases the patient may have already had a CXR, and this could help guide COVID probability assessment as per the BSTI/NHSE radiology decision tool. See <u>https://www.bsti.org.uk/covid-19-resources/</u>. If no CXR has been performed, as per NELA guidance we would suggest going straight to CT.



BSTI/BSGAR_chestCTinAcuteAbdomen_v1_25.03.2020



Figures and Legends



Figure 1. Coronal CECT angiography in a patient with RTPCR positive Covid , presenting with acute pain abdomen , reveals diffuse long segment small bowel mural thickening and hyper-enhancement (1a, d bold yellow arrows) with mild ascites (yellow arrow, 1b), mesenteric fat stranding (arrow, 1c). Axial CT angiography in the venous phase shows similar findings with ascites and right hemicolon mild thickening (arrow 1e) mesenteric and peri-enteric vascular congestion (arrow 1f) and long segment enhancement of the bulk of jejunal and ileal loops (arrow 1f). Patient was diagnosed to have acute mesenteric ischemia with diffuse edematous bowel although no obvious occlusion of the SMV was found. Coagulopathy profile and D dimer were elevated s/o small vessel bowel ischemia



Figure 2. Covid positive 47 yr old gentleman without any chest symptoms presented with fever and pain abdomen. 2a Coronal CECT shows solitary long segment edematous and thickened jejunal loop in the mid and left abdomen (arrow) 2b, d. Axial section shows edematous loop with enhancing mucosa and stratification (arrow) 2c Mild free fluid is also noted in the pelvis. Diagnosis of early ischemic / inflammatory changes was made.



<u>Figure 3</u>. HRCT Chest sections of a 33 year old gentleman who presented with acute pain in the epigastrium with pain radiating to the back showing small patchy areas of subpleural ground glass opacities (arrows 3a,c) left sided moderate pleural effusion associated with acute pancreatitis was also seen. RTPCR was found to be positive for this patient

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Figure 4. NCCT of the abdomen of the same 33 year old gentleman in Figure 3, showing gross left sided effusion on coronal sections (arrow 4a) with ill-defined collection in the left hypochondrium (arrow4b). Axial sections of the abdomen show hyperdense contents s/o hemorrhage within (arrow 4c), mesenteric stranding and nodularity (arrows 4d, f) and fluid within the abdomen (arrow 4e). A diagnosis of Covid induced primary acute pancreatitis was made.



<u>Figure 5a.</u> Axial section of HRCT chest of a 37 year old lady shows basal GGO opacities (right> left). Chief complaint of the patient was pain in lower abdomen for which NCCT abdomen was performed.



Figure5. Coronal section of the NCCT abdomen of the patient showed

thickened edematous segment of small bowel showing subtle wall stratification (arrow) due to focal? Ischemia. Patient was found to be Covid RTPCR positive with primary abdominal diagnosis of focal mesenteric ischemia.



<u>Figure6.</u> Axial CECT sections of the abdomen of patient with acute pain abdomen and fever with raised leukocyte count showing discontinuity and irregularity of the Gall bladder anterior wall (arrow 6a) with focal area of collection with partial contained rupture (arrow 6b) Associated peripancreatic stranding and mesenteric inflammation (arrow 6c) was also noted. Patient was found to be Covid RTPCR positive without any chest abnormalities and was managed as primary abdominal Covid with diagnosis of Acute acalculous Cholecystitis with partial contained rupture, pre-gangrenous GB and associated acute pancreatitis.

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