



EVALUATION OF MESENTERIC ISCHEMIA USING COMPUTED TOMOGRAPHY AT A TERTIARY CARE INDIAN HOSPITAL – A CROSS SECTIONAL STUDY

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ABSTRACT

Mesenteric ischemia is a life-threatening condition, with reported high morbidity and mortality rate, requiring early diagnosis and treatment. Present study was conducted to assess CT findings of mesenteric ischemia depending on cause and underlying pathophysiology. 25 cases referred to the radiodiagnosis department and demonstrating findings of mesenteric ischemia on CT scan were enrolled retrospectively at Vilasrao Deshmukh government medical college Latur over a year period (February 2021-January 2022). Contrast enhanced CT in various phases (arterial, portal, and venous) was conducted for mesenteric ischemia assessment, with Axial and Multiplanar reformatted images assessed. Majority cases were between 30-60 years' age group (n=14,56%), with male preponderance (n=17,68%). Most cases were acute-onset (n=23,92%), with abdominal pain (n=25,100%), fever (n=19,76%) and raised WBC counts (n=18,72%) being common clinical features. Frequent CT findings included mesenteric fat stranding (n=23,92%), peritoneal free fluid (n=22,88%), bowel wall thickening (n=15,60%), bowel dilatation (n=13,52%) and target appearance (n=10,40%). Bowel wall thickening was noted in 15 cases (60%). Bowel wall enhancement was noted in 12 cases (48%) of mesenteric ischemia because of arterial occlusion, and in 5 cases (20%) with venous occlusion. Both cases of chronic mesenteric ischemia showed SMA stenosis, mesenteric collaterals, and atherosclerotic changes in mesenteric vessels.

KEYWORDS : Mesenteric ischemia, Computed tomography

INTRODUCTION:-

The small intestine is a complex organ with various functions. It is capable of digestion, absorption, secretion, endocrine function and protects the internal environment against noxious ingested substances and luminal bacteria and their toxins. There are wide number of pathologies involving the small bowel. Small bowel remains the challenging anatomical site to image accurately. Nonspecific clinical findings of mesenteric ischemia and wide variety of causes of acute abdomen confound the diagnosis. Radiologic technique remains mainstay in the diagnosis of mesenteric ischemia.

A successful imaging strategy is dependent on using the most appropriate radiological modality to answer the clinical questions. A number of conventional imaging strategies such as X-ray and barium are not so successful to diagnose and characterize mesenteric ischemia. But the newer techniques such as CT, MRI have gained popularity in diagnosing the mesenteric ischemia. Use of neutral and negative contrast agents to distend the bowel loops have led to routine visualization of small bowel lumen, wall and perienteric tissue using CT and MR modalities.

CT helps in diagnosis, localization, etiology, severity and extent of the mesenteric ischemia. It also helps in identifying the extraluminal complications. In the cases, it also provides the alternative diagnosis, further guiding the management. CT remains choice of investigation in the setting of acute conditions like mesenteric ischemia. It allows the rapid, accurate diagnosis. It is noninvasive. Contrast enhancement enables to characterize the mesenteric vessels, mesentery and bowel wall. It also helps in detection of inflammation, tumor and other lesions of small bowel.

METHODOLOGY:-

Inclusion Criteria:

All patients with CT diagnosed mesenteric ischemia who were referred to our department for CT examination will be selected for the study.

Exclusion Criteria:

- Patients with contraindications to intravenous contrast material like severe allergic reactions.

- Patients with renal impairment.
- Pregnant patients.

Study Design:

Descriptive study.

Study Period:

12 months (February 2021 to January 2022)

Study Location:

Vilasrao Deshmukh Government Medical College, Latur in Department of Radiology.

Technique:

Patients who fulfill the eligibility criteria will be requested to participate in the study.

Obtain written informed consent.

Collect relevant clinical history and medical details.

The oral contrast ~1L is given depending upon the requirements, patients condition and clinical history.

Patient Position – Foot first, supine with hands up.

Perform CT abdomen- first plain scan is done.

- Intravenous Contrast of 350 mg/mL of iodine, with a volume of 1.5 mL/kg, through a 18 G I.V. line administered by a power injector at a rate of 3.5 mL/s.
- Contrast scan is performed in arterial and portal venous phases. Early arterial phase (20 s delay after intravenous contrast material infusion and portomesenteric venous phase (70 s delay following intravenous contrast material administration).

Reconstruction of images on workstation and evaluation of CT findings.

RESULTS:

For 12 months period, a total of 25 cases were evaluated at the Department of Radiodiagnosis at Vilasrao Deshmukh Government Medical College in department of radiology.

Age Distribution Among Cases:

In the present study, the commonest age group was between 30-60 years (56 %). The study comprised of 17 males and 8 females. The overall male to female ratio was 2.1:1.

23 of the enrolled cases (92%) were diagnosed with AMI while 2 cases (8%) with CMI.

Clinical Presentation In Study:

In the cases of mesenteric ischemia, the most common symptom was Abdominal pain (100.0%), followed by fever (82.6%), raised WBC counts (78.2%), nausea/vomiting (61.0%), constipation (47.8%) and hematochezia (34.7%), anorexia (17.3%), cachexia (17.3%), diarrhea (8%).

In the present study, the most common symptom was Abdominal pain (100.0%), followed by fever (76.0%), raised WBC counts (72.0%), nausea/vomiting (64.0%), constipation (44.0%) and hematochezia (32.0%), anorexia (24%), cachexia (24%), diarrhea (16%), postprandial pain (8%).

Age Distribution In Acute Mesenteric Ischemia:

Among the cases of acute mesenteric ischemia, the commonest age group was between 30-60 years (61%).

Gender Distribution For Cases Of Acute Mesenteric Ischemia:

Study comprised of 15 males and 08 females. The overall male to female ratio was 1.8: 1.

Clinical Symptoms Of Acute Mesenteric Ischemia:

In the cases of mesenteric ischemia, the most common symptom was Abdominal pain (100.0%), followed by fever (82.6%), raised WBC counts (78.2%), nausea/vomiting (61.0%), constipation (47.8%) and hematochezia (34.7%), anorexia (17.3%), cachexia (17.3%), diarrhea (8%).

Risk Factors For Mesenteric Ischemia:

The most common associated risk factor is chronic hypertension (52%) followed by alcoholism (44%), smoking (40%), obesity (32%) and diabetes (28%), ischemic heart disease (16%), atrial fibrillation (12%), deep venous thrombosis (12%), coagulopathies (12%), pulmonary thromboembolism (8%), chronic kidney disease (8%) cerebrovascular accident (8%), OC pills (8%), valvular heart disease (4%), vasculitis (4%).

Table: Causes of Acute mesenteric ischemia

Causes of acute mesenteric ischemia	No. of patients	Percentage (%)
Occlusive	17	74
Nonocclusive	6	26
Total	23	100

Among the 23 cases of acute mesenteric ischemia, majority of the cases were occlusive mesenteric ischemia (74%) with nonocclusive mesenteric ischemia being 26%.

Table: Causes of Occlusive mesenteric ischemia

Causes of occlusive mesenteric ischemia	No. of patients	Percentage (%)
Arterial occlusion	12	70.5
Venous occlusion	5	29.5
Total	17	100

Among the cases of acute occlusive mesenteric ischemia in the present study, arterial occlusion was the commonest (70.5%) with venous occlusion being 29.5%.

Table: Causes of arterial occlusion in acute mesenteric ischemia

Causes of arterial occlusion	No. of patients	Percentage (%)
Thrombosis	5	41.6
Embolism	7	58.4
Total	12	100

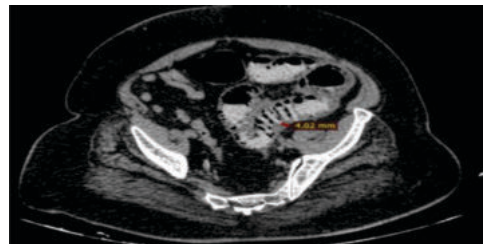
Among the cases of arterial occlusion in acute occlusive mesenteric ischemia in the present study, Embolic arterial occlusion was the commonest (58.4%) with thrombotic arterial occlusion being 41.6%.

CT Findings Of AMI:-

The most common CT findings in Acute mesenteric ischemia are mesenteric fat stranding and free fluid in abdomen and pelvis followed by bowel wall thickening and bowel dilatation.

CT Findings in CMI:-

In the setting of chronic onset of symptoms, predominant findings in chronic mesenteric ischemia included stenosis of SMA, mesenteric collaterals, atherosclerotic changes in mesenteric vessels and other abdominal vessel.

**Figure 1-** Axial MDCT of abdomen showing the mildly thickened ileal loop with pneumatosis intestinalis in patient with SMA thrombosis.**Figure 3-** Arterial phase Coronal MIP image showing SMA thrombus**DISCUSSION:**

Computed Tomography is an important modality in the evaluation of mesenteric ischemia. Ability of CT to optimally display vasculature, soft tissue, and air facilitates accurate definition of regional anatomy.⁽²⁾

In the present study an attempt has been made to study the CT findings of mesenteric ischemia and its demographic factors. This includes studying the usefulness of CT scan in delineating the various appearances depending upon the cause and pathophysiology. The computed tomographic scans of 25 patients who were found to have mesenteric ischemia were analyzed with available similar studies.

This study evaluated frequency and distribution of data on risk factors, clinical presentation and CT findings in a patients diagnosed with mesenteric ischemia by MDCT, later confirmed surgically during the period of February 2021-January 2022.

Age And Sex Distribution In Present Study:

In the present study, the commonest age group was between 30-60 years (56 %). The average age is 49.5 years.

In the present study, male to female ratio is 2.1:1.

Age And Sex Distribution Of Cases Of Acute Mesenteric Ischemia:

As per the observations in the studies conducted by Mohamad A. Amin et al, C.K. Chou et al, A.J. Aschoff et al and Hsien-Hao Huang et al, the age ranged from young to old with male predominance.

In this study, predominant clinical presentation was abdominal pain, however it is nonspecific since many acute abdominal conditions present with pain. Abdominal pain combined with fever or/and diarrhea/constipation or/and nausea/vomiting remained major clinical presentations. In study by Hsien-Hao Huang et al 2020, abdominal pain, diarrhea, bloody stools were predominant symptoms. Due to these nonspecific symptoms, role of CT becomes more valuable in mesenteric ischemia.

Risk Factors For Mesenteric Ischemia:

In The Present Study, the most common associated risk factor is chronic hypertension (52%) followed by alcoholism (44%), smoking (40%), obesity (32%) and diabetes (28%), ischemic heart disease (16%), dysrhythmias (12%), deep venous thrombosis (12%), coagulopathies (12%), pulmonary thromboembolism (8%), chronic kidney disease (8%) cerebrovascular accident (8%), OC pills (8%), valvular heart disease (4%), vasculitis (4%). chronic hypertension (52%) followed by alcoholism (44%), smoking (40%), obesity (32%) and diabetes.

In study by Hsien-Hao Huang et al 2020, univariate analysis demonstrated that hyperamylasemia, hepatic and renal impairment, and metabolic acidosis were more frequently noted in non-survivors than survivors. Thus, degree of multiple organ responses may be correlated with the severity of mesenteric ischemia or infarction.

In our study, the mortality among the risk factors is not studied. The most common risk factors like chronic hypertension, alcoholism, smoking, obesity and diabetes are intern independent risk factors for cardiovascular disease which is responsible for the acute mesenteric ischemia due to increased incidence of thromboembolic.

In the present study, occlusive mesenteric ischemia was more common than the nonocclusive mesenteric ischemia.

Most common cause of acute mesenteric ischemia was vascular occlusion which is mainly due to arterial thrombosis or embolism originating from the pre-existing cardiovascular condition. Most common vessel involved is superior mesenteric artery and its branches. Arterial obstruction (thrombus or embolus) can be detected even in peripheral branches by MDCT combined with adequate fast intravenous contrast. CT can adequately detect the atherosclerotic changes and calcifications in vessels.

According To Our Study, commonest part involved is distal part of main trunk followed by ileocolic branches, proximal part of main trunk. In our study involvement of IMA was 13%.

According to Mohamed A. Amin et al 2014, SMA proximal part was most commonly involved (41.7%) followed by SMA distal part (25%). Involvement of IMA was 8.3%.

CONCLUSION:

- In conclusion, multidetector Computed Tomography of abdomen along with intravenous contrast and neutral oral contrast has improved the visualization of mesenteric vessels, bowel anatomy, mucosal details and other abdominal organs has allowed greater accuracy in evaluating mesenteric ischemia.
- Accurate delineation of pathology and microanatomy

located by CT scan provides a reliable pre-operative road map.

- Recently developed multidetector CT (MDCT) enables us to obtain 1 mm collimation scans and subsequent high quality multiplanar reformations.
- As CT is now considered mandatory in the diagnostic evaluation of mesenteric ischemia for early diagnosis of mesenteric ischemia thus preventing the morbidity and mortality.
- MDCT is an excellent diagnostic modality for fast and accurate detection and localization of acute mesenteric ischemic changes. It has several advantages as it is fast, reproducible, and non-invasive. It can be performed instantly, without time-consuming patient preparation. This is of immense importance as a fast diagnostic work-up is essential for patient outcome in AMI.

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