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Role of computed tomography in detection of mesenteric ischemia

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Abstract
Background: Acute mesenteric ischemia is a life-threatening condition, with a reported mortality rate of 50–90%, that requires early diagnosis and treatment. The present study was conducted to assess small-bowel ischemia using CT scan.
Materials & Methods: 60 patients with small-bowel ischemia of both genders underwent CT examinations of the abdomen and pelvis by using 5-mm reconstruction thickness and 5-mm intervals through the abdomen and pelvis.
Results: Out of 60 patients, males were 40 and females were 20. Out of 60 patients, 45 (75%) were acute and 15 (25%). Common appearance was pneumatosis in 10 cases, SMA dissection in 12, bowel distention in 18 and bowel wall thickening in 45 patients. The difference was significant ($P< 0.05$).
Conclusion: In patients with acute mesenteric ischemia CT is an effective and efficient diagnostic tool.

Keywords: CT, Mesenteric ischemia, multiplanar reformatted

Introduction
Acute mesenteric ischemia is a life-threatening condition, with a reported mortality rate of 50–90%, that requires early diagnosis and treatment [1]. Acute mesenteric ischemia (AMI) occurs from arterial embolic or thrombotic obstruction, mesenteric venous thrombosis, or a non-occlusive etiology. The mean age of patients with acute mesenteric arterial occlusive ischemia (embolic and thrombosis) is 70 years of age [2]. However, patients younger than 50 years of age may also form occlusive emboli in the setting of atrial fibrillation. Arterial emboli from a cardiac or septic source are the most common cause of acute mesenteric ischemia and comprise 40-50% of the cases. Patients often present with abrupt onset of abdominal pain, diarrhea, and vomiting [3].
Angiography has been the reference standard imaging examination; however, the role of CT in this setting has expanded with the advent of helical CT scanners [4]. In particular, MDCT technology has dramatically improved the performance of CT by allowing rapid volumetric data acquisition to provide increased longitudinal spatial resolution over a large anatomic volume. From the volume data, retrospective thin or thick sections; sagittal, coronal, or curved multiplanar reformatted images; and CT angiograms with 2D or 3D visualization can be obtained [5].
The diagnosis of small-bowel ischemia in the presence of obstruction, however, remains more challenging; reported sensitivities are 75%–100%, and specificities are 61%–93%. The diagnosis of small-bowel ischemia has important implications for patient care because morbidity and mortality increase with delay in diagnosis [6]. The present study was conducted to assess small-bowel ischemia using CT scan.

Materials & Methods
The present study comprised of 60 patients with small-bowel ischemia of both genders. All were enrolled after obtaining their written consent.
Data such as name, age, gender etc. was recorded. A thorough clinical examination was performed in all. CT examinations of the abdomen and pelvis were performed with multi-section CT scanners by using 5-mm reconstruction thickness and 5-mm intervals through the abdomen and pelvis. CT signs of bowel obstruction and segmental ischemia included subjective presence of circumferential bowel wall thickening, presence of submucosal edema with a visible target or halo sign, presence of any intramural gas and extra-alimentary air etc.

Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

Results

Table I: Distribution of patients

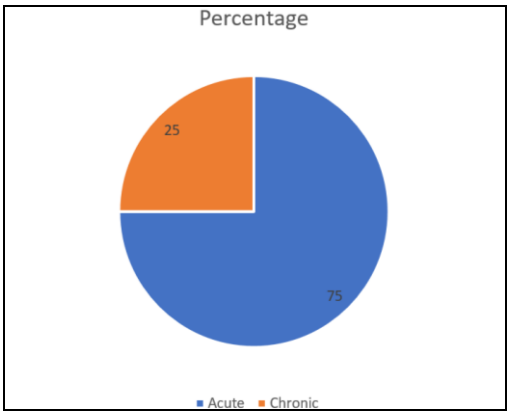
Total- 60		
Gender	**Males**	**Females**
Number	40	20

Table I shows that out of 60 patients, males were 40 and females were 20.

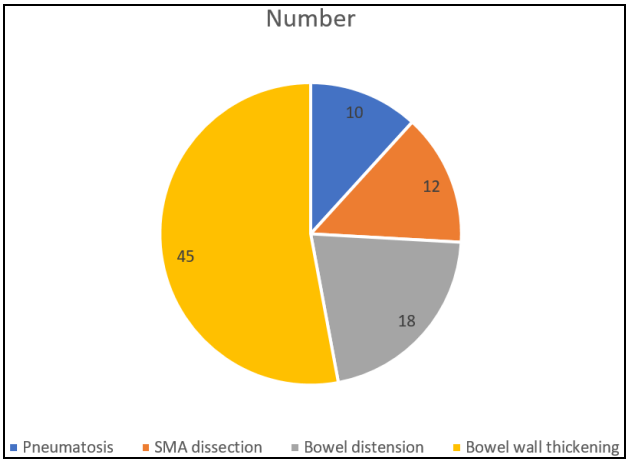
Table II: Nature of ischemia

Nature	Number	Percentage
Acute	45	75%
Chronic	15	25%

Table II, graph I shows that out of 60 patients, 45 (75%) were acute and 15 (25%).



Graph I: Nature of ischemia



Graph II: CT findings in cases

Graph II shows that common appearance was pneumatosis in 10 cases, SMA dissection in 12, bowel distention in 18 and bowel wall thickening in 45 patients. The difference was significant ($P< 0.05$).

Discussion

Acute intestinal ischemia is an abdominal emergency occurring when blood flow to the bowel loops decreases because of mesenteric arterial hypoperfusion, impaired venous drainage or occlusion. It is estimated that nearly 1% of patients presenting with acute abdomen have ischemic intestinal disease involving the small bowel or colon [7]. Bowel ischemia is considered a potentially transient and reversible event; however, it may lead to intestinal infarction that requires surgical or interventional management. For this reason, early diagnosis is important to improve survival rates. In most cases of late or missed diagnosis, the mortality rate from intestinal infarction is very high, with a reported value ranging from 60% to 90% [8]. The present study was conducted to assess small-bowel ischemia using CT scan.

In present study, out of 60 patients, males were 40 and females were 20. Jena *et al.* [9] revealed that MDCT shows SMA dissection in 14 patients, bowel wall thickening in 31, bowel distention in 10 and pneumatosis in 5 cases. The difference was significant ($P< 0.05$).

We found that out of 60 patients, 45 (75%) were acute and 15 (25%). The causes of intestinal ischemia can be occlusive or non-occlusive. Occlusive causes are due to the embolic or thrombotic occlusion of arterial or venous vessels and account for about 80% of all cases of intestinal ischemia. Between 36% to 50% of intestinal infarctions are caused by embolic obstruction of the superior mesenteric artery in patients with cardiac pathology, while in 50%-60% of cases intestinal ischemia is caused by arterial thrombosis. Venous thrombosis accounts for about 10%-15% of all cases of intestinal ischemia. The most frequent cause of venous infarction is secondary to bowel closed-loop obstruction. This event does not lead to vascular thrombosis but to the twisting of the loops on their vascular pedicle which produces severe venous stasis. Another cause of venous intestinal ischemia is bowel obstruction, which causes an overdistension of the bowel wall, preventing the outflow of the venous blood. More rarely, intestinal infarction of the occlusive type can be due to generalized vasculitis or hypercoagulable states [10].

We found that common appearance was pneumatosis in 10 cases, SMA dissection in 12, bowel distention in 18 and bowel wall thickening in 45 patients. Since its introduction into clinical practice, computed tomography (CT) has been used more and more often for recognizing early signs of intestinal ischemia and infarction. While the first results reported in the literature did not to be appear very encouraging, the spread of spiral CT equipment has certainly increased the potential of this investigation [11].

We observed that common appearance was pneumatosis in 10 cases, SMA dissection in 12, bowel distention in 18 and bowel wall thickening in 45 patients. Unenhanced CT is reportedly required for the diagnosis of intestinal ischemia in order to evaluate submucosal hemorrhage, hyperdense/calcified thrombi and atherosclerotic plaque and to obtain a baseline attenuation measurement of the bowel wall for the assessment of the enhancement. The arterial phase is performed for evaluating arterial stenoses, thrombi/emboli and occlusion, while the venous phase is for evaluating venous patency and abdominal organs which may be affected by ischemia [12].

CT is the most sensitive and specific diagnostic tool for AMI and should be used as the first-line imaging modality when AMI is suspected. Findings at multi-detector CT can also help exclude other causes of acute abdominal pain [13]. CT images should be obtained from the dome of the liver to the level of the perineum to cover the entire course of the intestine. Acquisition of both non-contrast material–

enhanced and biphasic contrast-enhanced CT images is necessary. Therefore, routine abdominal imaging should be performed with multi-detector CT to obtain contrast-enhanced CT volume data in the arterial and venous phases, with dynamic injection of contrast material by a power injector after non-enhanced imaging is performed [14].

Conclusion

Authors found that in patients with acute mesenteric ischemia CT is an effective and efficient diagnostic tool.

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