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USE OF COMPUTED TOMOGRAPHY TO DETERMINE IF CT DIFFERENCES EXIST BETWEEN SMALL-BOWEL ISCHEMIA AND INTRAMURAL HEMORRHAGE

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ABSTRACT

Aims & objectives:- To determine if CT differences exist between small-bowel ischemia and intramural hemorrhage

Materials and Methods:- This retrospective study of 13 patients having been evaluated for abdominal pain with two slice spiral CT scanner, somatom, Siemens (Germany) at Tertiary care centre, from August 2016 to October 2017. The series consists of patients in whom imaging revealed features suggestive of bowel wall ischemia and or or and intramural hemorrhage

Reasult:-

1) The peak incidence was noted between 3rd to 5th decades, nearly decade earlier than western countries.
2) Length of involvement was short segments with intramural haemorrhage and relatively long segment in case of ischemia
3) Hemoperitoneum is more common in patient with intramural hemorrhage
4) Short segment involvement with a thickness of 1 cm or more is typical of intramural hemorrhage

KEYWORDS : Intestinal ischemia, Intramural hemorrhage.

INTRODUCTION

The computed tomography (CT) is being used or evaluation of patient with pain in abdomen. CT manifestations are related to the nature of ischemia and the degree of tissue damage. In a arterial occlusive ischemia, paper thin intestinal wall with poor post contrast enhancement with or without intramural gas (pneumatosis intestinalis) is seen. This condition has the worst prognosis of bowel viability and patient survival.

When the mesenteric venous drainage is impaired, the intravascular volume increases and the hydrostatic pressure rises as the arterial blood continues flowing into the capillary bed. Sub mucosa, appearing as sub mucosal and mesenteric edema or haemorrhage on CT.

This study reviewed utility of CT in evaluation of intestinal ischemia due to various causes and to determine if CT differences exist between small-bowel ischemia and intramural hemorrhage .

AIM & OBJECTIVES:

- To evaluated The utility of CT in evaluation of intestinal ischemia due to various causes
- To determine if CT differences exist between small-bowel ischemia and intramural hemorrhage .

MATERIAL AND METHODS:

This retrospective study of 13 patients having been evaluated for abdominal pain with two slice spiral CT scanner, somatom Siemens (Germany) at Tertiary care centre, from August 2016 to October 2017. The series consists of patients in whom imaging revealed features suggestive of bowel wall ischemia. Findings were analyzed by two different radiologists for the degree of wall thickening, location and length of involvement (short,≤ 15 cm; medium, 16–30 cm; or long, >30 cm), presence of hemoperitoneum, and pattern of attenuation. The caliber and patency of the superior mesenteric artery and vein were noted. Diagnosis was confirmed by laboratory findings, clinical parameters, and follow-up examinations, or at surgery. The degree of greatest mural thickening was measured (in millimeters) in a segment of thickened bowel that was oriented either longitudinally or axially in the plane of the image. The location of involvement was defined as being predominantly jejunal, ileal, or jejunoileal. The pattern of attenuation was defined as being a target appearance (alternating concentric layers of differing attenuation), homogeneous attenuation, or decreased attenuation (lower attenuation than that seen in the adjacent loops of bowel). Consensus interpretation of the scans was performed as consensus evaluation was more likely to resolve any ambiguity in the estimation of this parameter

RESULTS

Out of total 13 patients 62% were male (n=8) and 38% female (n=5). The peak incidence was noted between 3rd to 5th decades. Among the 13 patients, 8 examinations shows abnormal segments with intramural haemorrhage and 7 abnormal segments with ischemia were identified. (Two patients with intramural haemorrhage each had two segments involved.) Mean bowel wall thickness was 13.7 mm, (range,6-28 mm) in patients with intramural haemorrhage and 3.0 mm (range, 1–8 mm) in patients with ischemia. Mural thickening was found to be statistically more significant ($p < 0.001$) in the segments with intramural hemorrhage than in those with small-bowel ischemia.

Length of involvement was short segments in 6 patients with intramural haemorrhage and medium in two segments with intramural haemorrhage; none of the segments with intramural haemorrhage had long involvement. Among the segments with ischemia, length of involvement was medium in two and long in five ; none of the ischemic segments had short involvement.. The abnormal segments with intramural hemorrhage were found to have a significantly shorter length of involvement ($p < 0.0001$) than did those segments with ischemia.

In the 8 abnormal segments with intramural hemorrhage, 2 (25%) were located in the jejunum, three (38 %) were in the ileum, 2 (25 %) were in the jejunoileal region, and one (12 %) was in the duodenum. Of the 7 ischemic segments, one (14%) were jejunal, two (29 %) were ileal, three (43%) were jejunoileal, and one (14%) involved the ileocolic region. The two patient groups were not significantly different in terms of location ($p = 0.12$)

Regarding the pattern of attenuation, the target sign was present in three (38%) of 8 segments with intramural haemorrhage, and the attenuation was homogeneous in the remaining 5 (62%). The pattern of attenuation in the 7 ischemic segments showed a target appearance in three (47%) and was homogeneous in three (47 %). One case of small-bowel ischemia showed decreased attenuation in the involved small bowel (6%). The two patient groups were not significantly different in terms of the pattern of attenuation of the mural thickening ($p = 0.18$).

Figure-1.Intra mural hemorrhage with target sign.

Five of 6 patients (83 %) with intramural hemorrhage and 2 of 7 segments (28 %) with ischemia had Hemoperitoneum A higher incidence of hemoperitoneum was found in patients with sub mucosal hemorrhage than in those with ischemia ($p < 0.001$)

In Out Of the 8 patients with intramural hemorrhage of the small intestine, proof of diagnosis was based on the clinical evaluation, laboratory findings, and clinical follow-up. All 6 patients had a predisposing factor for bleeding, including anticoagulation therapy and factor VIII deficiency. In the patients receiving anticoagulation therapy, the international normalized ratio level was elevated—greater than 4.0 in all patients.

Figure-2 .Intra mural hemorrhage in a patient with aortic valve replacement on anticoagulant therapy.

In these patients, anticoagulation therapy was discontinued, and no additional therapy was administered. No patient with intramural hemorrhage had an elevated lactic acid level. No patient with intramural hemorrhage underwent surgery. All patients recovered clinically.

In the 7 patients with ischemia of the small intestine, proof of diagnosis was based either on clinical parameters and follow-up findings or on findings at surgery. Three patients had intestinal ischemia confirmed at surgery. One of these three patients had thrombosis of the superior mesenteric artery

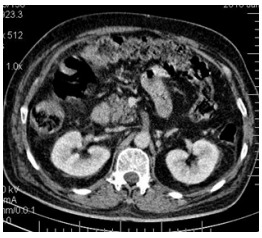

Figure-3 Superior Mesenteric artery thrombosis

Figure- 4 surgical exploration showing intestinal ischemia

Two of the three were found to have non occlusive low-flow mesenteric ischemia at surgery. In one patient, the diagnosis of small bowel ischemia was confirmed at autopsy. This patient had a lack of enhancement of a long segment of the distal ileum on CT, and at autopsy, small-bowel infarction was present

In the remaining three patients, the diagnosis was based on imaging and clinical parameters. One patient had thrombosis of the superior mesenteric vein and was treated with anticoagulation therapy (Fig. 5 & 6).

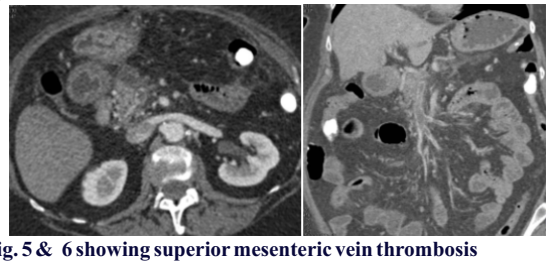

Fig. 5 & 6 showing superior mesenteric vein thrombosis

In the remaining two patients, the diagnosis of non occlusive low flow mesenteric ischemia was based on clinical parameters. These patients had acute cardiac decomposition or an elevated lactic acid level; they experienced improvement in their symptoms after appropriate resuscitation. None of these patients had an alternative condition—such as Crohn's disease or infectious enteritis—that was clinically diagnosed. Moreover, none of these patients had an elevated international normalized ratio.

Table 1: Comparison of CT finding in Hemorrhage and Ischemia

Sr. No.	CT faetures		Intra mural hemorrhage (n= 6)	Ischemia (n= 7)
1	Mural thickening, of involved segment in mm.	Mean (mm)	13.7	3.0
		Range (mm)	6-28	1-8
2	Length of involvement (number of patients)	Short (n)	6	0
		Medium (n)	2	2
		Long (n)	0	5
3	Location of involvement (number of patients)	Jejunum	2	1
		Ileal	3	2
		Jejuno ileal	2	3
		Other	1*	1**
4	Presence Of Hemoperitoneum (number of patients)	5	2	
5	Presence Of Target sign	3	3	

(*- DEODENUM) (**-ILEOCECAL REGION)

DISCUSSION

The clinical presentation of small-bowel ischemia, includes abdominal pain that is out of proportion to the findings at physical examination, nausea, anorexia, vomiting, and bloody diarrhea [2,5,6] Occult blood may be detected in the stool in nearly 50% of patients. Common causes of small-bowel ischemia are poor perfusion resulting from cardiac failure or hypovolemia, arterial embolus or thrombus, and venous thrombosis (7, 11) In recent reviews, approximately 50% of cases of mesenteric ischemia were due to a superior mesenteric artery embolus, 20–25% were due to a superior mesenteric artery thrombosis,20–25% were due to non occlusive mesenteric ischemia, and 5% were due to mesenteric venous thrombosis [10,12]. Indian perspective study [13] revealed that patient due to mesenteric ischemia resent in India, nearly decade earlier than western countries.

The CT findings in bowel ischemia evolve as the process in the bowel wall progresses from ischemia to infarction [3,4,. Initially, the only finding is, intramural edema leading to mural thickening [4]. Later on intramural hemorrhage may be seen [10]. Peri enteric fat stranding and hazy changes noted. A target sign may be seen. However, these early CT findings of intestinal ischemia (mural thickening, peri enteric stranding, and a target sign) are non specific, also seen in crohn's disease; infectious enteritis; radiation changes. [2, 6, 11]. As ischemia progresses, a pale, thin, less enhancing bowel wall seen [10,11]. Additional CT findings like, small-caliber aorta and superior mesenteric artery, collapse of VC.

In CT findings related to the bowel wall, In case of intestinal ischemia mild wall thickening, mean 3.0 mm seen versus a mean of 13.7 mm for intramural hemorrhage. In previous literature, the target sign was seen frequently with significant statistical difference in intestinal ischemia than in patients with intramural hemorrhage [1,3,7,8]. In our study, although a target sign was seen more often in patients with ischemia, no significant statistical difference was found. The 38% of patients with intramural hemorrhage showed the target sign compared with 42 % of patient with ischemia

In our study, 6 out of 8 i.e. 75% of patients with intramural hemorrhage showed short segmental involvement, where as 5 out of 7 i.e., 71 % of patient with ischemia showed long segment involvement.

Hemoperitoneum was present significantly more in patients with intramural hemorrhage. Hemoperitoneum was present in 5 out of 6 i.e. 83 % of patients with intramural hemorrhage but in only 2 out of 7 i.e 28 % of those with intestinal ischemia. The Hemoperitoneum in intestinal ischemia may be related to a secondary intramural hemorrhage and leakage of blood from the serosal surface of the bowel wall. Hemoperitoneum is known to occur in patients with closed-loop small bowel obstruction and, when present, is considered a specific sign for intestinal ischemia in this setting [4,7].

The aim of our study was to determine if CT differences exist between small-bowel ischemia and intramural hemorrhage. Therefore ,we did not determine the sensitivity and specificity of CT in the diagnosis of small-bowel ischemia or intramural hemorrhage. In previous studies, the reported range of sensitivity has been 37–80% [3].This range is likely related to differences in CT technique as well as to the cause and severity of the ischemia. Of the 6 patients with small-bowel intramural hemorrhage, all had predisposing factors for bleeding, including anticoagulation therapy in 5 and factor VIII deficiency in 1. None of these patients had an elevated lactic acid level, and all improved clinically after the correction of the coagulopathy.

In conclusion, although some CT findings of intramural hemorrhage and intestinal ischemia overlap (i.e., location of involvement, presence of hemoperitoneum, and the target sign), we found that short segment involvement with a thickness of 1 cm or more is typical of intramural hemorrhage and long segment involvement with thickening of less than 1 cm is typical of ischemia. Evaluation of the superior mesenteric artery and vein is important because occlusion may be seen on contrast-enhanced CT scans. Finally, a combination of imaging, medical history, findings of physical examination, and laboratory values are all important in establishing the correct diagnosis

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