

Imaging technique used for assessment of ischemic colitis

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Abstract:

This article describes the epidemiology of this underdiagnosed condition; reviews the clinical patterns of this disease, which constitute a key diagnostic point in patients who have a thickening of the colonic wall; and describes the ultrasound (US) and CT findings and differential diagnoses of ischemic colitis. We have undertaken an extensive review of the literature using several medical databases; MIDLINE, and EMBASE are the most that we conducted our study through, searched involved studies from time of instance up to the 2017. The evaluation of the bowel wall's stratification, enhancement on CT, flow on shade Doppler, and significance and symmetry of the thickening gives evidence to distinguish ischemic colitis from various other conditions, such as inflammation, infection, or tumor. CT and US are commonly applied to assess patients who have nonspecific abdominal pain or that are presumed of having colitis. Both evaluations have advantages compared to endoscopy or barium enema not only in demonstrating the bowel wall but additionally in outlining the pericolonic soft tissues and nearby structures. The major advantage of CT is the complete demonstration of the abdomen and retroperitoneum without overlying structures and the staging of the mesenteric vessels. Consequently, in clinical practice CT is nearly widely accepted as the primary screening modality for the assessment of patients suspected of having colonic disease. The main finding seen on CT in ischemic colitis is

the thickening of the colonic wall surface. Comparing US to CT, US provides more detailed information on the various bowel wall layers because of the greater resolution and the better soft tissue comparison.

Introduction:

Ischemic colitis (IC) is a common disease [1] and it is considered the most regular kind of intestinal ischemia and the 2nd most constant cause of lower gastrointestinal bleeding [2]. It stands for the consequence of an acute or, much more generally, chronic reduction or clog in the colonic blood supply, which could be either occlusive or non- occlusive in beginning [3]. The original disrespect triggering the ischemic occasion can rarely be established, however regularly takes place in elderly patients with diffuse condition in small segmental vessels and numerous co-morbidities. Today, with the intro of new treatments, medicinal reasons could likewise be thought about [4] The structural damage cause ischemic death of variable severity that could vary from superficial mucosal participation to full-thickness transmural necrosis [5]. The therapy depends upon the acuteness and seriousness of the presentation [3]. Most cases of IC are short-term and resolve automatically and such patients do not require particular therapy, rather extremely light instances can be managed on an outpatient basis with a liquid diet plan, close monitoring and prescription antibiotics [6] IC hardly ever emerges in a gangrenous form (acute fulminant IC).

The incidence of IC is taken too lightly because it frequently has a mild short-term nature, clinical presentation can be nonspecific and very variable, as a result, the medical diagnosis largely depends upon professional suspicion. In this context the function of imaging methods stays debatable [7]. Standard radiology returns non-specific and late findings, while computed tomography (CT), the major technique for the noninvasive diagnosis of mesenteric anemia, is well matched to verify the medical suspicion of IC, to recommend IC when it is unsuspected and

to diagnose difficulties, nonetheless it needs using radiation and an iodinated contrast representative, restricting the possibility to use this technique in a short-term follow-up [8]. Lately Iacobellis et alia [9] has recommended magnetic vibration imaging (MRI) as a substitute for invasive procedures in identifying and grading acute IC, allowing for the very early recognition of pathological findings and by specifying the advancement of ischemic lesions with 7T magnetic resonance imaging (7T-MRI) on an animal design with acute IC.

This article describes the epidemiology of this underdiagnosed condition; reviews the clinical patterns of this disease, which constitute a key diagnostic point in patients who have a thickening of the colonic wall; and describes the ultrasound (US) and CT findings and differential diagnoses of ischemic colitis.

Methodology:

We have undertaken an extensive review of the literature using several medical databases; MEDLINE, and EMBASE are the most that we conducted our study through, searched involved studies from time of instance up to the 2017. We identified studies only which published in English language and with human subjects. This review was concerned to these studies involving the discussion of Imaging technique used for assessment of ischemic colitis.

Discussion:

- **EPIDEMIOLOGY**

Because it was explained originally by Boley and colleagues [10] in 1963, ischemic injury to the colon is currently recognized to materialize distinctive professional subtypes, which range in extent from short-term segmental colopathy to fulminant gangrenous colitis [11], [12]. Ischemic colitis can be separated into two major types. The initial kind is a spontaneous, self-limiting kind and occurs days or weeks after the first ischemic insult. Colitis usually resolves with conservative treatment, although there could be a stricture throughout healing. On the other hand, some patients create a fulminant form of the condition with transmural gangrenous necrosis of the colon, which is fatal otherwise dealt with early. Management of ischemic colitis depends upon the seriousness of the health problem. Surgical treatment is indicated if there is peritonitis, transmural infarction, failure to respond to medical management, chronic symptomatic colitis, or strictures.

The incidence of colonic ischemia in the general population remains unidentified. Research studies to date have concentrated on the inpatient population, and it is likely that several cases of transient ischemic injury are left undiagnosed [11]. Moreover, in professional method, lots of instances of colonic ischemia are misdiagnosed as inflammatory digestive tract disease [12]. Last, there may be complication in between ischemic colitis and pseudomembranous colitis since they may have the same endoscopic pattern. Ischemic colitis is a reasonably typical entity and because life expectancy is raising, physicians will face this trouble regularly. It makes up one of the most usual type of ischemic injury to the gastrointestinal tract and the second most typical cause of reduced gastrointestinal blood loss [13], [14].

- **CLINICAL FINDINGS**

The clinical presentation differs with underlying reason, level of vascular blockage, rapidity of ischemic disrespect, degree of collateral circulation, and presence of comorbidity. A lot of patients have abdominal discomfort. The pain is frequently local to the left lower quadrant due to the fact that the left colon is most generally impacted. The discomfort is usually sudden in onset, crampy, and moderate, and often accompanied by an immediate wish to defecate. The 2nd crucial finding is gastrointestinal blood loss, generally light and not needing transfusions. Other signs include stomach distension, anorexia, and nausea and throwing up from a linked ileus.

Data on patients hospitalized with a final diagnosis of ischemic colitis are offered to represent the frequency of the different clinical findings. The misdiagnosis of countless cases of short-term ischemic injuries could lead to underestimation of signs associated with this condition. By pooling four recent research studies with a mixed 515 patients, [15], [16] we found that one of the most crucial danger factors were hypertension in 66% of patients, cardiovascular disease in 50% of patients, diabetes mellitus in 29% of patients, chronic renal failing in 22% of patients, and diabetes mellitus in 29% of patients. The mean age of the patients was 70 years and the sex circulation was similar. Both most common medical findings were abdominal discomfort come across in 68% of patients and melena or anal bleeding located in 54% of patients.

Clinical assessment shows moderate to moderate inflammation over the entailed digestive sector, stomach distention, low-grade pyrexia, tachycardia, and fecal occult blood. About 10% to 20% have peritoneal signs from colonic necrosis [17].

The level of laboratory abnormalities parallels the severity of ischemia. Serious anemia materializes with leukocytosis with neutrophilia. Necrosis could trigger metabolic acidosis and elevations of the lotion lactate, phosphate, and alkaline phosphatase degrees. These lab problems are uncommon with light ischemia.

• **ULTRASOUND**

US reveals a hypoechoic coagulation of the colonic wall. This enlarging is circumferential, with bowel wall layers less distinctly distinguished and not always maintained, particularly in transmural kinds. The mean bowel thickness ranges from 8 to 11 mm according to the released research studies [18], [19]. Unexpected change from the normal to the ischemic sector is frequently seen. The distribution and the length of the bowel thickening are diagnostic factors: the distribution is segmental, without discontinuity, and the length of the segment entailed is 10 cm or even more with a mean affected colon length of 19 centimeters in the study of Ripolles and colleagues [18]. The colitis includes the left colon in 80% of instances, and exists in the splenic flexure, descending colon, and sigmoid completely in 50% of instances [18]. Isolated rectal ischemia is extraordinary, whereas separated sigmoid colitis could be come across in 10% of cases making the differential medical diagnosis with diverticulitis difficult. The pericolic fat is typically not modified in the nontransmural colitis, whereas modified pericolic fat and lack of enhancement in follow-up researches are factors related to transmural death [18]. At Doppler examination, color circulation is absent or barely noticeable in 80% of situations. Lack of color flow in the bowel wall could signify death, whereas the evidence of shade flow is an excellent prognostic sign [20]. In comparison to color Doppler, spectral evaluation of proximal mesenteric arteries is not handy because proximal vessels are typically not involved in ischemic colitis and stenosis of mesenteric vessels does not suggest ischemia due to the fact that they are usually determined by Doppler in asymptomatic patients older compared to 65 years.

In recap, an ischemic cause ought to be suspected in elderly patients offering with a segmental wall thickening of a lengthy colon sector (> 10 cm), specifically on the left side, with no haustration seen and with hardly noticeable or no color Doppler signal intensity.

- **CT**

Numerous patients that have inflammatory or infectious kinds of colitis existing with stomach discomfort, and multidetector CT is commonly used as the first imaging examination. As holds true for US, the segmental distribution is a vital diagnostic factor. In the research study by Balthazar and coworkers, [21] a segmental distribution was apparent in 89% of the 54 patients, with the appropriate colon affected in 30%, transverse colon in 9%, left colon in 46%, sigmoid colon in 4%, and the whole colon in 11%. The mean length of participation in patients that had segmental participation as found by CT was 19 centimeters, and circumferential bowel wall thickness differed considerably from 2 to 20 mm, with a mean thickness of 8 mm [21]. The morphology of the enlarging is related to the timing of the examination and to the pathophysiology of the developing anoxic procedure. In the first phases of anoxia, mucosal damage happens first; with extra extreme and prolonged kinds of anoxia, submucosal hemorrhage, edema, and pericolonic congestive and edematous adjustments create later on. Searchings for could deal with at each of the stages or evolve to infarction. CT look is linked to the evolutive stage and might be grouped in three main groups, as shown by Balthazar and associates [21] and extra recently by Romano and associates [22]:

The wet appearance with a wall thickening with heterogeneous enhancement, revealing an acute process. At the initial phase, Romano has defined the " little increased" indicator, attributable to hyperdensity of mucosa and to submucosal edema that is a lot more obvious at the degree of the left colon in the CT axial check [23]. Acute pathologic changes, particularly after reperfusion of the ischemic bowel, may be accountable for concentric rings (dual halo or target indicator) with submucosal edema, which comes to be evident. At the acute phase, there is a shaggy contour of the colon and numerous degrees of pericolonic streakiness. The dry look with concentric and

symmetrical mild mural thickening and uniform depletion of the wall of the colon with a dramatically specified contour and without or with just marginal pericolic streakiness. This finding is the effect of the progression of the ischemic damage without reperfusion. The intramural gas with gas bubbles organized in a straight style and best visualized with the window settings for bone or lung.

Even if most ischemic colitis is nonocclusive, CT looks for thrombosis of the mesenteric arteries or veins, or stenosis of mesenteric arteries, although arterial insufficiency is more frequently in charge of chronic mesenteric ischemia than for colitis. Stenosis or occlusion of at least two of the significant vessels is needed to develop the diagnosis of arterial insufficiency.

- **DIAGNOSTIC STRATEGY :Ultrasound or CT?**

CT and US are commonly utilized to assess patients who have nonspecific abdominal pain or who are presumed of having colitis [24]. Both exams have advantages compared with endoscopy or barium enema not only in demonstrating the digestive tract wall surface however likewise in detailing the pericolic soft tissues and nearby frameworks. The significant advantage of CT is the full demonstration of the abdomen and retroperitoneum free of superior frameworks and the hosting of the mesenteric vessels. The radiation dose delivered by CT does not make up a problem in patients believed of having ischemic colitis, that are commonly old. Multiplanar CT permits exact multiplanar reformations useful for showing the extent of illness and provides in-depth details on issues, such as strictures. Consequently, in clinical practice CT is virtually globally approved as the primary testing method for the examination of patients believed of having colonic condition. The primary finding seen on CT in ischemic colitis is the thickening of the colonic wall surface. Although this is a nonspecific join CT images and can be seen in inflammatory, ischemic, or neoplastic procedures, some CT functions, such as the quantity of

wall thickening, extent of disease, improvement of the colon wall surface, pericolic reaction, presence of ascites, development of fistulae, and sort of complication can be made use of to narrow the differential medical diagnosis. Comparing United States to CT, US gives extra in-depth information on the various bowel wall layers due to the greater resolution and the much better soft tissue comparison. Furthermore, Doppler color permits a semiquantitative analysis of the vascularization of the colonic wall. We take into consideration using US for the diagnosis of ischemic colitis as a second-look examination after the CT recognition of an enlarging of the colonic wall surface if there is uncertain differential diagnosis with tumor or inflammatory procedure. Ischemic colitis is identified by better increases in wall surface thickness compared to that seen with inflammation, even more regular loss of wall surface stratification, and lack of flow on shade Doppler. By comparison, the thickening is less important, with a more constant conservation of the stratification, and total it is symmetrical and extended on a higher length when compared with tumor.

In recap, US and CT semiology is not accurate to prospectively diagnose patients that need surgery because of the advancement of infarction. The only proven and useful searchings for in practice are the existence of intramural gas, of value if associated with the lack of parietal improvement, [22] or the identification of a colonic wall that stays slim and unenhanced connected with dilatation of the lumen [25]. Because these findings are not consistent in patients who will develop colonic infarction, punctual acknowledgment of persistent illness by a close clinical follow-up is vital to effectively manage ischemic colitis. Serial imaging exam, combined with active professional follow-up, could be an effective technique to monitor the training course of the ischemic process.

Table 1.Ultrasound and CT diagnostic criteria for differential diagnoses.

	Localizatio n	Amount of Thickenin g (mm)	Exten t	Small Bowel Involvemen t	Rectal Involveme nt	CT Target Findin g	US Stratifica tion
Ischemia	Left > Right	8–10	Long	+	-	+	+
Crohn	Right > Left	10–15	Long	+++	+	+++	+++
Ulcerative colitis	Left	6–8	Long	-	+++	+++	+++
Infection	Right > Left	8–10	Long	++	+	+++	+++
Pseudomemb ranous colitis	Left > Right	10–15	Long	-	-	+++	+++
Neoplasia	Predominant ly sigmoid	>10	Short	-	-	-	-

Conclusion:

Whatever the potential of US and CT to analyze the bowel wall surface, the favorable medical diagnosis of ischemic colitis is primarily performed by clinical context and the recognition of a segmental thickening extended on a significant length, without discontinuity, and without anal participation. The evaluation of the bowel wall's stratification, enhancement on CT, flow on shade Doppler, and significance and symmetry of the thickening gives evidence to distinguish ischemic colitis from various other conditions, such as inflammation, infection, or tumor. CT and US are commonly applied to assess patients who have nonspecific abdominal pain or that are presumed of having colitis. Both evaluations have advantages compared to endoscopy or barium enema not only in demonstrating the bowel wall but additionally in outlining the pericolic soft tissues and nearby structures. The major advantage of CT is the complete demonstration of the abdomen and retroperitoneum without overlying structures and the staging of the mesenteric vessels. Consequently, in clinical practice CT is nearly widely accepted as the primary screening modality for the assessment of patients suspected of having colonic disease. The main finding seen on CT in ischemic colitis is the thickening of the colonic wall surface. Comparing US to CT, US provides more detailed information on the various bowel wall layers because of the greater

resolution and the better soft tissue comparison. Furthermore, Doppler color enables a semiquantitative evaluation of the vascularization of the colonic wall.

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