

# Overview of Diagnosis and Management of Ischemic Colitis

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**Abstract:** Ischemic colitis (IC) is the most typical type of intestinal (GI) ischemia, representing 50 to 60% of all cases and occurring with an incidence of 4.5 to 44 cases per 100,000 individual years. The aim of this Overview paper was to demonstrate brief review of Ischemic colitis from different aspects, However the main aim was to discuss the diagnostic approaches and proper management therapies for Ischemic colitis, through reviewing the evidence based trails. We have conducted literature searching through electronic databases; MEDLINE and EMBASE with language restriction to English, and only human subject articles were included in this review up to December 2016, Our search was performed using the search terms; ischemic colitis, ischaemic colitis, colon ischemia, colonic ischemia, colon ischaemia, colonic ischaemia, colon gangrene, colonic gangrene, colon infarction, colonic infarction, rectal ischemia, rectal ischaemia, ischemic proctitis, ischaemic proctitis, cecal ischemia, cecal ischaemia, ischemic colon stricture, ischaemic colon stricture, ischemic colonic stricture, ischaemic colonic stricture Combined with treatment, therapies, and diagnosis. Ischemic colitis occurs as the result of a compromise in intestinal blood flow that can produce a spectrum of injury from short-term self-limited ischemia to fulminant ischemia or transmural infarction. Its medical diagnosis requires a high index of suspicion, and the clinician needs to think about the diagnosis in patients with acute stomach pain and bloody stools. The majority of patients improve within a number of days with supportive care, others will require laparotomy with bowel resection.

**Keywords:** Ischemic colitis (IC), Diagnosis and Management.

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## 1. INTRODUCTION

Ischemic colitis (IC) is first described by Boley et al in 1963<sup>(1)</sup> and it is the most typical type of intestinal (GI) ischemia, representing 50 to 60% of all cases and occurring with an incidence of 4.5 to 44 cases per 100,000 individual years<sup>(2)</sup>. It represents 1 in 2000 medical facility admissions<sup>(3)</sup>. Colon ischemia was very first referred to as triggered by ligation of the inferior mesenteric artery during aortic reconstruction or colon resection but is now acknowledged to have lots of potential causes<sup>(4,5)</sup>. The diverse causes, variable medical presentations, and severity makes the medical diagnosis and management of ischemic colitis a challenge. perfused by the remarkable mesenteric artery (SMA) (**Figure 1**)<sup>(11)</sup>, the inferior mesenteric artery (IMA), and branches of the internal iliac arteries<sup>(6,7,8)</sup>. The SMA triggers the middle colic, ideal colic, and ileocolic arteries, which provide the right colon and the ideal half of the transverse colon. The IMA branches into the left colic, sigmoid, and superior rectal (hemorrhoidal) arteries, which provide the left half of the transverse colon to proximal anus. The distal anus is supplied by inferior and middle rectal (hemorrhoidal) arteries, which are branches of the internal iliac artery<sup>(7)</sup>. The colon is protected from anemia by a collateral blood supply through a system of anastomoses connecting the two significant arteries. The anatomy is highly variable, however, and particular areas are more vulnerable in some people<sup>(8)</sup>. The splenic flexure and sigmoid colon are areas where two flows meet each other (so-called watershed areas), have more limited security networks and therefore ischemic damage is more typical in these locations. The marginal artery of Drummond is one of the security vessels providing the splenic flexure; 5% of the population has actually a lessened or absent marginal artery of Drummond<sup>(9)</sup>. These patients are at specific risk of ischemia, the ideal

colon may be vulnerable in systemic low-flow states, as the minimal artery of Drummond is inadequately established here in 50% of the population <sup>(10)</sup>.

The aim of this Overview paper was to demonstrate brief review of Ischemic colitis from different aspects, However the main aim was to discuss the diagnostic approaches and proper management therapies for Ischemic colitis, through reviewing the evidence based trails.

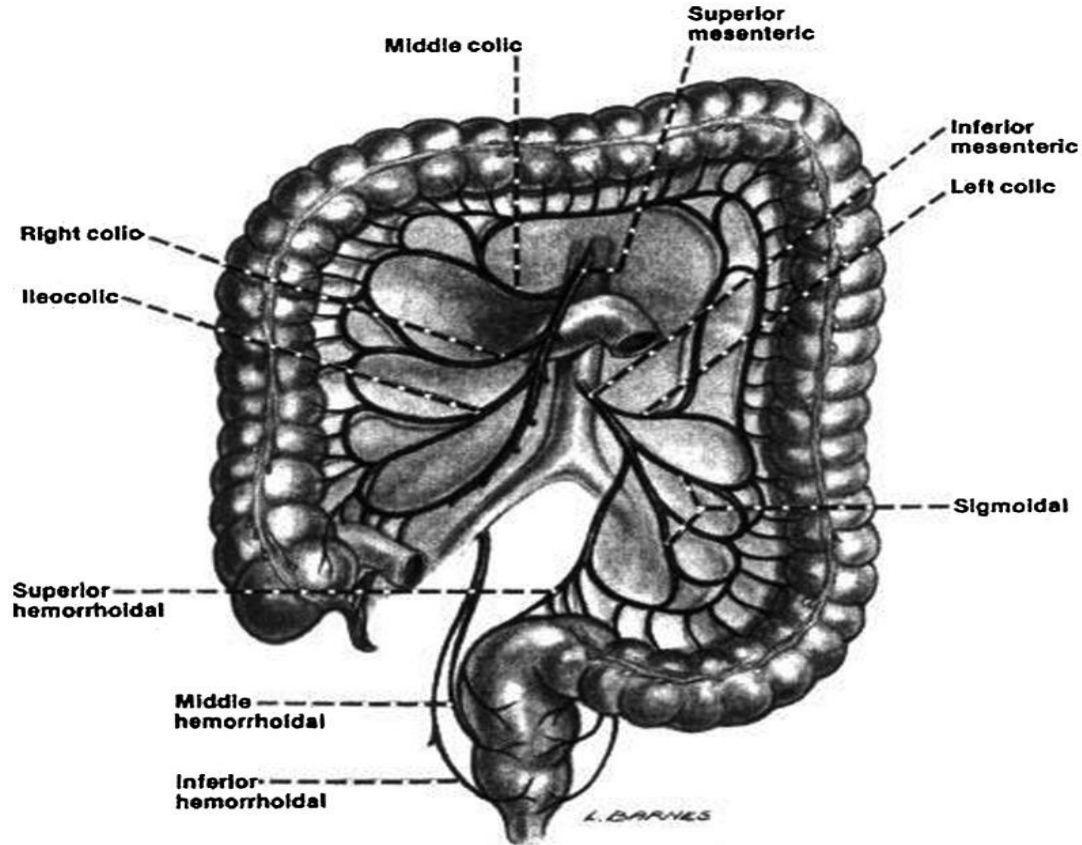


Figure1: Vascular supply of the colon. <sup>(11)</sup>

## 2. METHODOLOGY

We have conducted literature searching through electronic databases; MEDLINE and EMBASE, up to December 2016, with language restriction to English, and only human subject articles were included in this review, Our search was performed using the search terms; ischemic colitis, ischaemic colitis, colon ischemia, colonic ischemia, colon ischaemia, colonic ischaemia, colon gangrene, colonic gangrene, colon infarction, colonic infarction, rectal ischemia, rectal ischaemia, ischemic proctitis, ischaemic proctitis, cecal ischemia, cecal ischaemia, ischemic colon stricture, ischaemic colon stricture, ischemic colonic stricture, ischaemic colonic stricture Combined with treatment, therapies, and diagnosis. The references obtained were reviewed and the best studies were included as evidence to support our review of diagnosis and treatment approaches of ischemic colitis

## 3. RESULTS & DISCUSSION

### Classification of IC:

Clinically, ischemic colitis might be classified into gangrenous and non-gangrenous forms, and can likewise be partitioned into short-term and persistent forms. The non-gangrenous form accounts for 80%-85% of cases <sup>(8)</sup>. The disease is transient, and reversible in about 50% of cases. Persistent types, providing either as chronic segmental colitis or strictures, happen in 20%-25% and 10%-15% of cases, respectively <sup>(3,8)</sup>. Predictive factors of the chronic kind are older age, longer elapsed time from the start of health problem to the termination of subjective signs, and an extended period up until normalization of the leukocyte count or the erythrocyte sedimentation rate <sup>(12)</sup>. Gangrene takes place in about 15% of patients and needs laparotomy as soon as possible <sup>(8)</sup>.

An even worse prognosis has been reported in senior patients. There are contrasting results with regard to the relationship in between the case history of patients and the severity of IC. Hypertension, history of cancer, diabetes mellitus, aortic surgical treatment, peripheral vascular disease and participation of the best side of the colon have been suggested by some authors to be inclining factors for an even worse development of the disease<sup>(13,14,15)</sup>. In the study by Anon et al<sup>(16)</sup>, factors anticipating poor prognosis in ischemic colitis were the absence of tachycardia, hematochezia and peritonism, anemia, hyponatremia and colonic stenosis.

Any part of the colon may be affected however the left colon is the primary place in roughly 75% of patients<sup>(12)</sup>. Splenic flexure is associated with approximately one-quarter of patients<sup>(12)</sup> and separated right colon ischemia (IRCI) in about 10% of cases<sup>(3)</sup>. In a recent biopsy-proven research study, IRCI accounted for 26% of cases<sup>(17)</sup>. Its clinical discussion was discovered to be various in patients who presented more frequently with stomach pain without bloody diarrhea. IRCI has actually been reported to be connected with hemodialysis and persistent renal failure and in patients with shock. It is associated with serious colitis and patients have an even worse outcome than those with colon ischemia involving other areas, consisting of a five-fold need for surgery and a two-fold boost in death<sup>(17)</sup>. Patients on hemodialysis who establish IRCI have a particularly undesirable result<sup>(17)</sup>. Insufficient collateralization and blood circulation to the right side of the colon is thought to be the reason for the poor prognosis in these patients. Alternatively, it is possible that the existence of an intense superior mesenteric artery occlusion and thus its result shows that of intense mesenteric ischemia.

#### **Clinical diagnosis of Ischemic colitis:**

Ischemic colitis is viewed generally as a non-occlusive form of intestinal ischemia. Although in some cases a specific anatomic abnormality may be identified (as in ligation of the inferior mesenteric artery during repair of abdominal aortic aneurysms), the precipitating episode often resolves by the time of evaluation. Diagnosis is dependent on a high index of suspicion for the disease. Correct interpretation of the symptoms, signs, and laboratory values that are associated with colonic ischemia must be followed by prompt diagnostic imaging, endoscopy, and/or operative exploration, depending on the severity of disease.

#### **Laboratory tests method in diagnosis of IC:**

Numerous laboratory markers of ischemia have been examined such as: lactate, LDH, CPK, amylase levels, leucocytes, alkaline phosphatase, inorganic phosphate, intestinal fat binding protein and alfa-glutathione S-transferase<sup>(19)</sup>. These markers have been studied generally in intense bowel ischemia, and none has actually been found to be sufficiently particular to identify IC. They are unusual in moderate ischemia and only boost with extreme and sophisticated ischemic damage, late in the course of the disease.

One determined trail<sup>(18)</sup> stated that, all patients with medical suspicion of IC need to have stool cultures for Salmonella, Shigella, Campylobacter and Escherichia coli O157: H7<sup>(18)</sup>. The latter organism has actually been linked in triggering colonic ischemia. Infection with parasites or viruses such as cytomegalovirus ought to likewise be excluded.

#### **Radiological role in diagnosis of IC:**

Plain abdominal radiography can expose nonspecific findings such as thumbprinting, air-filled loops, colonic aperistalsis, mural thickening and exhausted bowel in up to 21% of patients<sup>(3)</sup> It is a helpful evaluation for omitting colon infarction<sup>(20)</sup>. When intra-abdominal air secondary to perforation, air within the bowel wall, or air in the portal vein, is shown by plain radiography, an emergency situation exploratory laparotomy is shown. Barium enema might suggest colon ischemia in as much as 75% of patients with thumbprinting being the most common finding. Ulcers, ridges, edema, eccentric mural defect, succulation and strictures may likewise be seen. Findings are non-specific<sup>(21)</sup>. Barium enema must be avoided in cases where there is a suspicion of gangrene or perforation. Because of recurring contrast representative, barium enema likewise makes the later usage of angiography or endoscopy more tough.

Computed tomography (CT) is frequently utilized as the initial diagnostic test when examining patients with nonspecific abdominal pain. It might recommend the medical diagnosis and area, omit other severe medical conditions, narrow the differential medical diagnosis possibilities and illustrate the issues. Intrinsic colonic abnormalities cannot be utilized to anticipate the development or identify of infarction<sup>(22)</sup>. In non-transmural IC, the initial bowel wall thickening, thumbprinting, and pericolonic stranding, with or without peritoneal fluid, can be seen on CT images. In these cases, CT usually demonstrates the double halo or target sign. After reperfusion of the ischemic bowel wall, the indication might be produced by edema in the submucosa and appear as low attenuation or by hemorrhage and appear as high attenuation. If there is overall vascular occlusion without reperfusion (infarction), the colonic wall stays thin and unenhancing, related to

dilatation of the lumen. In these cases, CT may show a thrombus in the matching mesenteric vessel. If ischemia is transmural, strictures may form. Periodically, a poisonous megacolon establishes. When associated with bowel wall thickening and are due to bowel infarction, pneumatosis and/or gas in the mesenteric veins are ominous indications. Pneumatosis coli or pneumatosis intestinalis can be identified by showing air bubbles in the intestinal or colonic wall. The gas bubbles are set up in a direct style and are best visualized with the window settings for bone or lung<sup>(23)</sup>. Mesenteric angiography normally has no function in the assessment and management of IC since at the time of symptom onset, colon blood circulation has returned to typical. Damage from hypoperfusion is typically at the arteriolar level, whereas mesenteric vessels and games are patent. There are two exceptions where angiography might have some energy: when acute mesenteric ischemia is thought about and cannot be plainly identified from IC by scientific discussion, or when there is separated participation of the best side of the colon, suggesting remarkable mesenteric artery occlusion.

Sonography is a sensitive method for the early detection of modifications in the colon wall arising from ischemia, and it can recommend this cause in the appropriate medical setting. Location and length of the included colonic sector, colon wall thickening, bowel wall stratification and unusual echogenicity of the pericolic fat and peritoneal fluid are a few of the findings on sonography<sup>(24)</sup>.

Color Doppler sonography may work in the differentiation between ischemic and inflammatory bowel wall thickening<sup>(25)</sup>. Sonography may provide data for determining patients who will establish necrosis. In one research study, altered pericolic fat or the absence of improvement in sonographic follow-up studies were factors connected with transmural necrosis<sup>(26)</sup>. Overlying bowel gas, operator-dependent quality and bad level of sensitivity for low circulation vessel disease limit its usage. Scintigraphy has just recently been used in the diagnosis of ischemic colitis. In-111 or Tc-99m-labeled leukocyte scintigraphy has actually been studied and has actually shown successful imaging of bowel infarction while Tc-99m(V) DMSA was just recently discovered to have no function in the detection and diagnosis of IC<sup>(27,28)</sup>.

#### **Colonoscopy as a diagnostic tool for IC:**

In recent years, colonoscopy has changed barium enema as the most typical diagnostic method and the gold standard for confirmation of IC. It is more sensitive and allows visualization of colonic mucosa and histological analysis of biopsies. However, with the exception of colonic gangrene, neither endoscopic nor histological findings specify<sup>(3)</sup> and highly depend on the duration and intensity of ischemic injury. Medical diagnosis requires early colonoscopy (< 48 h). Serial research studies in connection with the medical setting are essential to establish the diagnosis.

Ischemic tissue damage to the colon is thought to be a result of both local hypoperfusion throughout the ischemic duration and reperfusion injury when blood flow returns. When the ischemic duration is short, reperfusion may be substantial and accounts for most of the histologic and endoscopic damage present in IC<sup>(29)</sup>. Reperfusion injury may be connected with the release of oxygen complimentary radicals which trigger lipid peroxidation within cell membranes, resulting in cell lysis and tissue damage. When the ischemic period is of long duration, hypoperfusion denies the involved bowel of oxygen and nutrients, causing hypoxia and direct cell death<sup>(29)</sup>; damage advances from the lumen outwards to the serosa (from the mucosa and submucosa to much deeper layers).

In the early stages only the mucosa and the sub-mucosa are included. Hemorrhagic blemishes may be seen at colonoscopy and represent bleeding into the submucosa. These findings parallel the "thumbprints" or "pseudotumors" found on barium research studies<sup>(8)</sup>. The purple submucosal hemorrhages usually dissipate within 48 h or are followed by ulceration. The preliminary diagnostic study needs to be performed quickly after the beginning of signs. Focal locations of pale and edematous mucosa sprinkled with locations of petechial hemorrhage or superficial ulceration might also be seen in mild cases<sup>(29,30)</sup>. Later on, segmental erythema with or without ulcerations and bleeding may be observed. A single longitudinal ulcerated or irritated colon strip represents the characteristic single-stripe indication<sup>(31)</sup>. In more severe ischemia when transmural infarction of the bowel wall happens, the mucosa appears black or gray-green over a substantial area. Pseudopolyps and pseudomembranes might also co-exist<sup>(8)</sup>. In chronic phases, months or weeks later, stricture, mucosal atrophy and granularity or a mucosal pattern suggestive of "segmental ulcerative colitis" might happen<sup>(29)</sup>.

Histologic modifications in IC consist of edema, distorted crypts, mucosal and submucosal hemorrhage, inflammatory infiltration in the lamina propria, granulation tissue, intravascular platelet thrombi and necrosis. In the phase of stricture, inflammation is minimal and fibrosis predominates<sup>(8)</sup>.

Utilizing carbon dioxide as the insufflating agent which is quickly taken in, and has the advantage of vasodilation and direct enhancement in colonic perfusion, may minimize these risks<sup>(8)</sup>. When signs of peritonitis exist, endoscopy should be prevented. Colonoscopy ought to be stopped and laparotomy performed as quickly as possible when endoscopy reveals findings of gangrene.

Overall colonoscopy when it is considered safe, is preferred because 30% of IC cases take place proximal to the left flexure<sup>(32)</sup>. Provided the high morbidity and mortality of IRCI and the unclear presenting symptoms, early diagnosis and aggressive management is important.

#### **Treatment approaches of IC:**

Treatment of the patient is dictated by the intensity of the ischemia. In the absence of colonic gangrene or perforation, helpful care is appropriate. Patients ought to be put on bowel rest and given intravenous fluids to ensure appropriate colonic perfusion. Optimization of heart function and oxygenation is important. Empiric broad-spectrum antibiotics are frequently administered in patients with moderate to extreme colitis to minimize bacterial translocation and sepsis. There is an absence of prospective, medical data on people, this practice is normally warranted since of the trouble in predicting who will advance to gangrenous colitis<sup>(29)</sup>.

Regular scientific follow up of the abdominal area, cautious monitoring of essential indications and serial radiographic and colonoscopic examinations are required. Scientific suspicion of colonic infarction validating an emergency situation laparotomy might occur if there are signs of scientific degeneration in spite of conservative therapy, such as sepsis, relentless fever and leukocytosis, peritoneal irritation, drawn-out pain, diarrhea or bleeding, protein-losing colopathy for more than 14 d, complimentary intra-abdominal air, or endoscopically-proved substantial gangrene<sup>(8)</sup>.

About 20% of patients with severe IC will require surgical treatment with an associated death rate of approximately 60%<sup>(14)</sup>. At laparotomy, the medical diagnosis is confirmed and all impacted bowel resected. It is essential to ensure typical surgical margins. The external look of the bowel may be normal throughout laparotomy given that the serosa may be unaffected, regardless of substantial mucosal damage. The level of resection should be assisted by the distribution of disease seen on preoperative research studies. Some authors have reported on intraoperative techniques such as Doppler ultrasonography, intraoperative colonoscopy, evaluation of the antimesenteric serosal surface area by hand-held photoplethysmography, pulse oximetry or transcolonic oxygen saturation and intravenous fluorescein for evaluation of colonic practicality<sup>(33,34)</sup>. In general, the resected section should be analyzed in the operating room for mucosal injury. If required, extra colon must be removed. Questionably practical areas of colon are generally resected. A colectomy is followed by colostomy or ileostomy. Patients with left-sided IC undergo resection with a proximal stoma and a distal mucous fistula or Hartman pouch. Primary anastomosis is uncommon. Rarely, an ileocolostomy may be performed in patients with right-sided IC and viable ileum and transverse colon. In a series by Longo et al<sup>(35)</sup>, the stoma was closed in 75% of patients with IC who went through segmental resection vs just a 3rd of those with total colonic involvement.

#### **4. CONCLUSION**

Ischemic colitis occurs as the result of a compromise in intestinal blood flow that can produce a spectrum of injury from short-term self-limited ischemia to fulminant ischemia or transmural infarction. Its medical diagnosis requires a high index of suspicion, and the clinician needs to think about the diagnosis in patients with acute stomach pain and bloody stools. The majority of patients improve within a number of days with supportive care, others will require laparotomy with bowel resection. The medical diagnosis is based upon a combination of scientific suspicion, histological and endoscopic findings. Treatment and result depend on the intensity of the disease. The majority of cases of the non-gangrenous type are transient and solve spontaneously without issues.

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