



Original Article

# Ischemic colitis: risk factors, diagnosis and prognosis in patients undergoing surgery



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## ABSTRACT

**Objective:** To identify risk factors, diagnosis and prognosis associated with ischemic colitis, focusing mainly on patients undergoing surgery.

**Materials and methods:** This retrospective study included all patients admitted to the Centro Hospitalar de São João – E. P. E., diagnosed with ischemic colitis during the period from 2012 to 2013.

**Results:** The study included 154 patients; 118 were undergoing medical treatment, with a 12% mortality rate, and 36 were undergoing surgery, with a 61% associated mortality rate. Hypertension was the most common risk factor in both groups. The presence of a large number of cardiovascular risk factors in both groups, such as hypertension and dyslipidemia, was recorded, but we still found no direct relationship with development of ischemic colitis. Comorbidities that affect blood flow, such as the presence of thrombi or aneurysms, do provide a worse prognosis and therefore require a more aggressive treatment.

**Conclusion:** The diagnosis of ischemic colitis is not always immediately established due to a nonspecific presentation. Surgical treatment should be reserved for severe cases with a worse prognosis associated.

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## Colite isquêmica: fatores de risco, diagnóstico e prognóstico em doentes submetidos a cirurgia

### RESUMO

**Objetivos:** Identificar fatores de risco, diagnóstico e prognóstico associados à colite isquêmica, incidindo mais em doentes submetidos à cirurgia.

**Materiais e métodos:** O estudo retrospectivo incluiu todos os doentes admitidos no Centro Hospitalar de São João–E. P. E. com diagnóstico de colite isquêmica durante o período de 2012 a 2013.

### Palavras-chave:

Colite isquêmica

Colite

Fatores de risco

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**Resultados:** O estudo incluiu 154 doentes; desses, 118 foram submetidos a tratamento médico, com uma taxa de mortalidade de 12%, e 36 foram submetidos a tratamento cirúrgico, com uma taxa de mortalidade associada de 61%. Hipertensão arterial foi o fator de risco mais comum em ambos os grupos. Foi registrada a presença de grande número de fatores de risco cardiovasculares em ambos os grupos, como hipertensão arterial e dislipidemia, mas ainda não foi encontrada nenhuma relação direta com o desenvolvimento de colite isquêmica. Comorbidades que afetam o fluxo sanguíneo, como a presença de trombos ou aneurismas, fazem prever um pior prognóstico e, por isso, exigem maior agressividade no tratamento.

**Conclusão:** O diagnóstico de colite isquêmica nem sempre é imediato, devido a uma apresentação pouco específica. O tratamento cirúrgico deverá ser reservado para casos mais severos, tendo pior prognóstico associado.

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## Introduction

Ischemic colitis is the most common cause of ischemic change of the gastrointestinal tract.<sup>1</sup> This disease has a wide distribution in different age groups, with an incidence mainly in older people. With the progressive aging of the population, it is estimated a further increase of cases. Mortality rates exceeding 50% are found.<sup>2</sup> These high mortality rates are influenced by several factors, such as the existence of a large number of comorbidities, the late diagnosis of this condition, and inappropriate treatment.<sup>3</sup> Its incidence is unknown.<sup>4</sup>

Ischemic colitis can result from an inadequate irrigation of the colon wall, with a local tissue hypoperfusion and hypoxia,<sup>5</sup> and usually this condition has a segmental distribution affecting mainly the left versus right colon (80% and 20%, respectively). The compromise of the entire colon is a less prevalent condition, affecting less than 10% of cases.<sup>6</sup>

Ischemic colitis can be seen in an occlusive or non-occlusive form, and in most cases the condition is present in the non-occlusive form, with a slower flow state and decreased blood perfusion.<sup>6-8</sup>

There are several risk factors associated with ischemic colitis: age over 65 years, female gender, chronic obstructive pulmonary disease, hypertension, type II diabetes mellitus, dyslipidemia, cardiac arrhythmias (including atrial fibrillation), coronary disease, heart failure, chronic obstipation, renal failure, peripheral arterial occlusive disease, among others.<sup>6,9,10</sup> Some drugs are associated with ischemic colitis; aspirin and digitalis are independent risk factors for the development of this disease.<sup>11</sup> Spasmolytic agents, proton pump inhibitors and H2 antagonists were also associated with ischemic colitis.<sup>12,13</sup>

In younger patients, the associated risk factors may be different, for instance, vasculitis, pharmaceuticals and drugs of abuse, extreme physical exercise or air travels. Contrary to what occurs in adults, in young people the right colon is the most affected part, and there is still no explanation for this particular location.<sup>10,14,15</sup>

The ischemia may have a symptomatic presentation and can be of transient nature.<sup>6</sup> Acute abdominal pain, vomiting, diarrhea and/or hematochezia are the most common

presentations. This more benign form of presentation responds well to medical treatment. However, an acute presentation may occur in a more severe form, requiring surgical intervention. Systemic signs of sepsis, and signs of acute respiratory distress and of peritoneal irritation, must prompt the doctor to suspect of severe ischemic colitis. It is not always easy to establish in a first phase the indication for medical or surgical treatment. Additional diagnostic means, for example, computed tomography, CT angiography or colonoscopy, are used to obtain a more accurate diagnosis, and physical characteristics are the cornerstone of this diagnosis.<sup>16</sup>

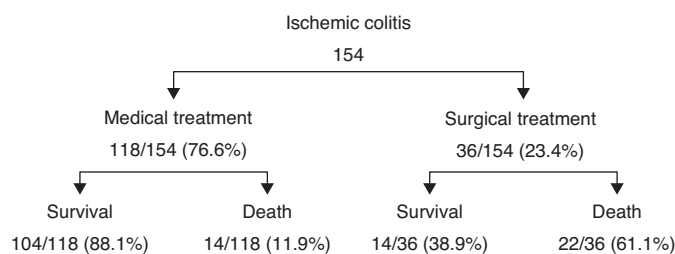
Compared to the more severe forms, a transient ischemic colitis is associated with a better prognosis. The surgical mortality for patients with acute ischemic colitis varies between 10% and 65% of cases, and in patients with a total colitis it can reach 75%.<sup>16</sup> Risk factors that predict a worse prognosis are male gender, hypertension, renal failure, right colon involvement, the presence of peritoneal irritation, lack of hematochezia, and mesenteric atherosclerosis, among others.<sup>17-19</sup>

The aim of this study is to identify risk factors and evaluate the diagnosis established and the associated prognosis, focusing mainly on patients undergoing surgery.

## Materials and methods

The retrospective study included all patients admitted to the *Centro Hospitalar de São João – EPE* diagnosed with ischemic colitis during the period from 2012 to 2013. The identification of those patients was based on the International Classification of Diseases. The study was approved by the Ethics Committee for Health of the *Centro Hospitalar de São João – EPE*. Those patients diagnosed with ischemic colitis caused by volvulus, obstruction or hernia were excluded from the study.

Information about the patients' demographics (age and gender), comorbidities, clinical findings (symptoms and physical examination), auxiliary diagnostic tests (laboratory work-up and imaging studies) and treatment (medical or surgical) provided was obtained. The location of ischemia has been documented based on radiological and surgical findings. The type of surgery carried out and the mortality associated



**Fig. 1 – Results of 154 patients with ischemic colitis.**

were analyzed. This information was provided by a search of each medical record by SClinic program.

All variables were analyzed using SPSS 22.0 for Windows (SPSS, Chicago, IL). In the face of the small number of cases in our sample, only a descriptive analysis was carried out.

The study was complemented by a brief review of the topic based on a search in PubMed, using keywords such as “COLITE ISQUÊMICA/ISCHEMIC COLITIS”, and papers published since 1985.

## Results

The study included 154 patients. The group undergoing medical treatment (group M) consisted of 118 patients (39 men and 79 women) and the group of surgical treatment (group S) consisted of 36 patients (20 men and 16 women) (Fig. 1). The mean age of M and C groups were 74.3 and 70.9 years, respectively. A mean of 10.5 (SD ± 12.4) days of admission for M group and 25.2 (SD ± 24.3) days for group C (Table 1) was obtained.

Hypertension was the most common comorbidity in both groups (group M, 61.0% and group S, 58.3%). In the M group,

we found that dyslipidemia was present in 42.4% of cases and in group C in 27.8% of cases. We looked at other comorbidities present at diagnosis: diabetes mellitus II, coronary disease, presence of thrombus in the superior mesenteric, inferior mesenteric, and abdominal aortic arteries, aneurysm of the abdominal aorta and common iliac artery, diagnostic of chronic kidney failure, colon cancer history and diagnosis of atrial fibrillation (Table 1).

Compared to standard medication taken by patients, we observed that the group that underwent medical treatment uses aspirin (14.4%) and statins (22%) with regularity. In the group undergoing surgery, 25% of the patients use aspirin, and 5.6% use statins (Table 1).

Among symptoms on admission of patients, we found that 66.9% of those in M group had hematochezia and 33.1% were admitted with vomiting. In group S, 30.6% had hematochezia and 30.6% of cases were admitted with vomiting (Table 2).

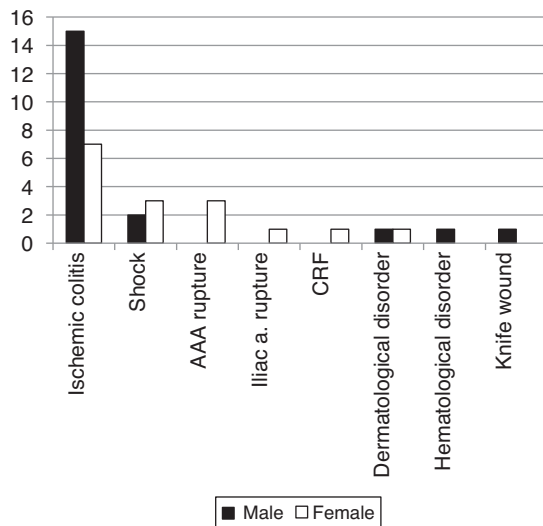
Sigmoid colon was the most affected in the group undergoing medical treatment; this location was noted in 35 cases (29.7%), followed by descending and sigmoid colon in 27 patients (23%), descending colon in 21 (17.8%), ascending and transverse colons and transverse and descending colons, both with 8 cases (6.8% each), rectum in 7 cases (5.9%), involvement of the entire colon in 5 cases (4.2%), transverse colon in 3 cases

**Table 1 – Patient characteristics.**

	Patients, n (%)	
	Medical t.	Surgical t.
Mean age ± SD	74.3 ± 13.1	70.9 ± 13.6
Days of hospitalization, mean ± SD	10.5 ± 12.4	25.2 ± 24.3
Gender		
Male	39 (33.1)	20 (55.6)
Female	79 (66.9)	16 (44.4)
Comorbidities		
Diabetes mellitus II	26 (22.0)	10 (27.8)
Dyslipidemia	50 (42.4)	10 (27.8)
Hypertension	72 (61.0)	21 (58.3)
Coronary disease	31 (26.3)	8 (22.2)
Inf. mesent. a. thrombus	0 (0.0)	1 (2.8)
Sup. mesent. a. thrombus	6 (5.1)	3 (8.3)
Abdominal aorta thrombus	0 (0.0)	1 (2.8)
Abdominal aorta aneurism	1 (0.8)	5 (13.9)
Common iliac a. aneurism	0 (0.0)	2 (5.6)
Chronic renal failure	21 (17.8)	8 (22.2)
Colon neoplasm	2 (1.7)	1 (2.8)
Auricular fibrillation	15 (12.7)	5 (13.9)
Habitual medication		
ASA	17 (14.4)	9 (25.0)
Statins	26 (22.0)	2 (5.6)
ASA and statins	26 (22.0)	4 (11.1)

**Table 2 – Symptoms presented and location of ischemic colitis.**

	Patients, n (%)	
	Medical t.	Surgical t.
Symptoms		
Hematochezia	79 (66.9)	11 (30.6)
Vomiting	39 (33.1)	11 (30.6)
No data	0 (0.0)	1 (2.8)
Location		
Ascending colon	2 (1.7)	4 (11.1)
Descending colon	21 (17.8)	7 (19.4)
Sigmoid colon	35 (29.7)	4 (11.1)
Transverse colon	3 (2.5)	0 (0.0)
Cecum	1 (0.8)	2 (5.6)
Ascending and transverse	8 (6.8)	2 (5.6)
Transverse and descending	8 (6.8)	0 (0.0)
Descending and sigmoid	27 (23)	3 (8.3)
Cecum and ascending	0 (0.0)	0 (0.0)
Cecum, ascnd., transv. and descnd.	1 (0.8)	1 (2.8)
Entire colon	5 (4.2)	7 (19.4)
Cecum and sigmoid	0 (0.0)	4 (11.1)
Rectum	7 (5.9)	1 (2.8)



**Fig. 2 – Reason of hospitalization in patients undergoing surgery.**

(2.5%), ascending colon in 2 cases (1.7%) and cecum and blind, ascending, transverse and descending colons, in 1 case (0.8%), respectively (Table 2).

In the group undergoing surgery, the descending colon was the most affected; this location was noted in 7 cases (19.4%), followed by the entire colon also in 7 cases (19.4%), ascending colon, sigmoid and cecum and sigmoid in 4 cases, respectively (11.1%), descending and sigmoid colons in 3 cases (8.3%), transverse and blind colons with 2 cases (5.6%), respectively, rectum and blind, ascending, transverse and descending colons in 1 case (2.8%), respectively (Table 2).

A series of analyses was carried out focusing only in the group undergoing surgery, including reason for admission (Fig. 2), imaging changes in abdominal-pelvic CT and rectosigmoidoscopy that led to the diagnosis of ischemic colitis and type of surgery performed and associated mortality (Table 3).

Ischemic colitis was not the only cause for hospitalization in the group submitted to surgery. Twenty-two admitted patients had ischemic colitis, including 15 males and 7 females. Shock was also one of the admission diagnoses, with development of ischemic colitis following the clinical picture

in 5 patients (2 males and 3 females). Other admission diagnoses were noted, such as abdominal aortic aneurysm rupture (3 cases, 100% female patients), ruptured aneurysm of the common iliac artery (1 female), acute renal failure (1 female), dermatological pathology (1 male and 1 female), a hematological disorder (1 male) and a knife injury (1 male) (Fig. 2).

With regard to imaging changes that led to the diagnosis of ischemic colitis in patients undergoing surgery, we sought the presence of air and/or fluid in the abdominal-pelvic computed tomography. Aerocolia was observed in 1 patient, presence of free liquid in 24 patients, and the common presence of air and liquid in 3 patients. In the remaining 8 patients in this group, these changes were not observed.

Regarding the type of surgery performed, hemicolectomy was carried out in 6 patients with 50% of associated mortality, left hemicolectomy in 7 patients with a mortality rate of 2/7 (28.6%), total colectomy in 6 patients with a mortality rate of 66.6%, sigmoidectomy in 5 cases, of which 80% died, subtotal colectomy in 3 cases with a 66.7% mortality rate, and ileum-cecal removal in only 1 patient who survived. Arteriography was effective in 1 patient, and laparotomy was performed in 7 cases, with an associated mortality rate of 100% (Table 3).

## Discussion

Our retrospective study found similar results to those of previous studies showing higher prevalence of female gender.<sup>20</sup> However, we have noted more men undergoing surgery, compared to women, although without statistical significance. The incidence also was higher in the left colon, namely: descending colon (in the group that underwent medical treatment) and sigmoid (in the group undergoing surgery), which is in line with what is described in literature.<sup>10</sup> This occurs because of an anatomical decrease of blood flow, especially in the sigmoid colon – an area where the inferior mesenteric artery and rectal arteries meet, and this exposes the colon to a more sensitive area of ischemia. Contrary to what is described, namely, that the rectum is one of the most richly irrigated areas (and therefore less affected by ischemia),<sup>10</sup> in our study that was not the place least affected by ischemic rectitis. This is probably because the number of samples was not large enough to observe this fact. In the medical and surgical treatment groups, the mean ages were 74.3 and 70, 9 years, respectively. With increasing age, colic arteries begin to exhibit more tortuosity, thus reducing the local blood flow. In this study, we did not observe ischemic colitis in young people.

With regard to risk factors, our findings are in line with what is described in the literature. We noted the presence of a large number of cardiovascular risk factors, such as hypertension and dyslipidemia; yet no association between these factors and ischemic colitis – an essentially fatal condition – was found.<sup>11</sup> It was noted that those comorbidities that acutely affect blood vessels, such as thrombi or aneurysms, are more common in patients who required surgery, revealing the great impact of blood flow changes in the development of the ischemic process. Some authors reported that chronic kidney disease is a risk factor that deserves attention in patients with ischemic colitis, because of its association with a worse

**Table 3 – Mortality associated with different types of surgery.**

Procedure	Mortality		Total
	Yes	No	
Right hemicolectomy	3	3	6
Left hemicolectomy	2	5	7
Total colectomy	4	2	6
Sigmoidectomy	4	1	5
Subtotal colectomy	2	1	3
Ileocecal removal	0	1	1
Arteriography	0	1	1
Exploratory laparotomy	7	0	7

prognosis.<sup>21</sup> In our study, we noted that this comorbidity is more often present in the group that required surgery, which supports the hypothesis of the greater severity of the disease and of more aggressiveness in the treatment. History of colon neoplasm was also recorded, which can be explained by the change of morphology and in colonic irrigation, in the presence of a neoplastic process, with colic obstruction and a consequent decrease in perfusion, distension and colic motility.<sup>22</sup> Studies have shown that atrial fibrillation is an independent risk factor for ischemic colitis.<sup>23</sup> In our study, we found that this comorbidity is present both in the group that received medical treatment as in the surgical group at similar rates, which may suggest that the comorbidity has no impact on the severity of the disease and on the treatment to be adopted.

We have found that a portion of our sample had, as normal medication, acetylsalicylic acid, which corroborates the relationship of anti-inflammatory agents with lesions of the colon, including the development of erosions or ulcerations, which may lead to an infectious process and to ischemic necrosis.<sup>24</sup> Several adverse effects of statins already were described, including a case of ischemic colitis.<sup>25</sup> In our study, we observed that statins are part of the normal pharmacological profile of patients.

Within the symptoms most often presented, we found that it was not always easy to diagnose ischemic colitis based on these symptoms, because they are often nonspecific. The group that was submitted to medical treatment showed a higher prevalence of hematochezia at admission; and in the group that underwent surgery, hematochezia and vomiting had the same percentage at presentation. It may be worth remembering that patients who were admitted without these two symptoms were subsequently submitted to surgery, which may indicate that the symptoms did not predict treatment or the prognosis.

With a higher incidence in the group that underwent surgery, we found that ischemic colitis was the most frequent reason for hospitalization, but not the only one. Ischemic colitis followed admissions for septic shock, according to the expected, because with a systemic imbalance in the presence of shock, the body undergoes changes, particularly in terms of irrigation, and the ischemic events occur at the level of the colon, mainly due to a mesenteric vasospasm. This picture of colitis after shock is described in the literature as a rare relationship, and that primarily involves the right colon,<sup>26</sup> which was not the case in our study. One can expect that the rupture of aneurysms in the abdominal aorta can later cause an ischemic event in the colon, by increasing the susceptibility to hemodynamic imbalance.

Given the type of surgery performed and the mortality rate, we found that most of the procedures had a poor prognosis associated, resulting in the death of the patient. In cases of more aggressiveness, for instance, a total or subtotal colectomy, we found that the mortality rate is higher, which is to be expected. In cases where the patient went to the operating room and underwent laparotomy without any intervention by other prohibitive conditions, the mortality rate was total. We only observed a single case in which the surgeon decided in favor of an arteriography, with a 100% success rate. We anticipate that less invasive techniques for the patient, and applied at the right time, can have a better prognosis.

Overall, the mortality rate was lower in cases that underwent medical treatment, which is explained by the fact that there is no necrosis; besides, the disease has a more benign nature and a chance to evolve more favorably.

In cases of severe ischemic colitis, surgical treatment is the best option to consider, in order to not to worsen or prevent a clinical deterioration of the patient.<sup>27</sup>

Our study has limitations, especially as regards to an insufficient sample size to allow an extrapolation of results. In a future study, more factors present in both groups will be studied.

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## Conclusion

Ischemic colitis is a common cause of ischemia of the gastrointestinal tract, accounting for a significant number of hospital admissions. This disease is associated with well-defined risk factors. The diagnosis is not always immediately established, due to some unspecific presentations, and in many cases this results in a diagnosis based on suspicion. Low digestive endoscopy and angiotomography are critical studies that help in the diagnosis and therapeutic decision. Medical treatment is the best choice for patients with a less severe disease and a more favorable prognosis. Surgical treatment is reserved for patients who present with irreversible ischemia or for those who did not respond to medical treatment. The mortality rate is higher in the group submitted to surgery.

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## Conflicts of interest

The authors declare no conflicts of interest.

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