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Predictive factors of mortality in severe ischaemic colitis: post-operative analysis of 101 patients

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A B S T R A C T

Introduction: Ischaemic colitis (IC) is the most common form of bowel ischaemia and is often under-diagnosed.
Objectives: To report the results obtained in patients with IC who required surgical intervention in our Hospital, and to evaluate the predictive factors of mortality.
Methods: The data were obtained from the Hospital Gregorio Marañon CI database. The demographic and clinical characteristics, diagnostic methods, surgical techniques employed and mortality were analysed statistically, using the χ^2 and Student *t* test.
Results: One-hundred and one patients with CI were operated on between 1991 and 2006. The majority of them had cardiovascular histories and 35 cases were diagnosed during their hospital stay due to another cause. The signs and the symptoms were non-specific in 40% of the cases. Total morbidity and mortality was 39.6% and 41.6% respectively. In the post-operative IC cases, the death rate increased to 68% ($P<.01$); 93% of the patients who died had transmural necrosis during the surgery ($P<.05$); and 69% had a metabolic acidosis.
Conclusions: The death rate in patients with IC that requires surgery is high, particularly if the diagnosis is made in the post-operative period after surgery for another cause, or if there is evidence of transmural necrosis during the intervention. Early diagnosis is the best tool to improve these results.

Factores predictores de mortalidad en la colitis isquémica grave: análisis de 101 pacientes intervenidos

Palabras clave:
Colitis isquémica grave
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R E S U M E N

Introducción: La colitis isquémica (CI) es la forma más frecuente de enfermedad isquémica digestiva y está infradiagnosticada.
Objetivos: Describir los resultados obtenidos en pacientes con CI que necesitaron de intervención quirúrgica en nuestro centro, y evaluar los factores predictores de mortalidad.

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Métodos: Los datos fueron obtenidos de la base de CI del Hospital Gregorio Marañón. Las características demográficas, clínicas, los métodos diagnósticos, las técnicas quirúrgicas empleadas y la mortalidad fueron analizados estadísticamente empleando la prueba de la χ^2 y la t de Student.

Resultados: Entre 1991 y 2006, se operó a 101 pacientes con CI. La mayoría de éstos tenían antecedentes cardiovasculares y 35 casos fueron diagnosticados durante su ingreso hospitalario por otra causa. Tanto los signos como los síntomas fueron inespecíficos en el 40% de los casos. La morbilidad y la mortalidad total fue del 39,6 y el 41,6%, respectivamente. En los casos de CI postoperatoria, la mortalidad se elevó hasta el 68% ($p < 0,01$); el 93% de los paciente que fallecieron tenían necrosis transmural durante la cirugía ($p < 0,05$) y el 69% tenía acidosis metabólica.

Conclusiones: La mortalidad en pacientes afectos de CI que necesitan intervención quirúrgica es alta, especialmente si el diagnóstico se hace en el postoperatorio de otra cirugía o si se evidencia necrosis transmural durante la intervención. Para mejorar estos resultados el diagnóstico precoz es la mejor arma, y debe basarse en un alto índice de sospecha

Introduction

Ischaemic colitis (IC) is the most frequent type of ischaemia of the digestive system[1,2] and is the result of an imbalance between blood supply to the colon and its necessities. There are multiple causes, from the ligature of the inferior mesenteric artery during an aortic surgery to the vasospasm associated with the shock, although it normally develops without obstructing large vessels and is considered to be a non-occlusive ischaemia. In the majority of cases, it is difficult to establish the trigger. IC may appear at any age, although it is most frequent in persons in their 70s and 80s and in patients with cardiovascular antecedents. Clinical manifestation depends on the degree of hypoxia in the wall of the colon and the length of the segment involved. In mild and moderate cases, which comprise 80% of the total, affected areas are limited to the mucosa and submucosa, and this is reversible with conservative treatment. However, in serious cases, hypoxia progresses in the wall of the colon, and it may affect the muscular layer or even all layers (transmural necrosis). It may manifest a broad spectrum of symptoms. In these cases, the only treatment is surgery for resecting the non-viable segments of the colon, and this is accompanied by high mortality and morbidity rates.

A typical case is a patient of advanced age, with cardiovascular antecedents, who begins having abdominal pain and rectal bleeding.[3-7] Diagnosis begins by suspicion and is confirmed by a colonoscopy.[8-9] In the most serious cases, imaging techniques have been used (simple x-ray of the abdomen, angiography, or computerized tomography) with varied sensitivities and specificities.[10]

We discuss a broad series of patients diagnosed with serious IC who required emergency surgery in our hospital, with the aim of describing the diagnostic process and results and evaluating possible predictive factors for mortality.

Methods

This was an observational retrospective study which included IC diagnosed patients operated on in the Department of Emergency Surgery of the Hospital General Universitario Gregorio Marañón between 1991 and 2006. Data were drawn from the IC database in our centre. Findings from the computerized tomography (CT) considered to indicate IC were thickening of the colon wall, areas of insufficient vascularization of the colon wall and pneumatosis of the colon, or pneumoperitoneum.

For patients who did not require an immediate laparotomy, an abdominal CT, colonoscopy, or both were carried out, with liberal indication. CT findings were considered as diagnosis according to personal history and risk of presenting with colitis from another origin (pseudomembranous, infectious, etc).

We divided the patients into 2 groups, survivors (group A) and non-survivors (group B), and we compared them through the χ^2 test or the Student *t* test according to the variable. We considered $P<.05$ to be statistically significant. The program used for the entire study was SPSS version 14.0 for Windows.

Results

General characteristics of the study are summarized in Table 1. More than 90% of patients had cardiovascular antecedents (high blood pressure [HBP], diabetes mellitus [DM], ischaemic cardiopathy, or arrhythmia); 66 (65%) patients presented with at least 2 of these antecedents. AH was the most frequent, followed by auricular fibrillation. We did not find a relationship with any particular drug or drug family, although almost all patients took medication. The most used drugs were loop diuretics, angiotensin-converting enzyme inhibitors

Table 1 – General characteristics and diagnostic tests (n=101)

Men/women, n	49/52
Age, average (SD), y	73 (12)
Types of manifestation	
Spontaneous	79
Hospital	35
Postoperative	22
After aortic surgery	17
After another surgery	5
Symptoms	
Rectal bleeding	34
Typical abdominal pain	52
Atypical abdominal pain	47
Abdominal examination	
Unspecific	38
Abdominal defence	63
Vital signs	
Hypotension (SBP<90 mm Hg)	19
Fever	18
Tachycardia (>100 bpm)	31
Analytic data	
Metabolic acidosis	62
Leukocytosis	71
Elevation of LDH	32
Elevation of amylase	34
Colonoscopy (n=39)	
Diagnosis	36 (92%)
CT (n=55)	
Diagnosis	18 (33%)

CT indicates computerized tomography; LDH, lactate dehydrogenase; SBP, systolic blood pressure; SD, standard deviation.

(ACEI), and bronchodilators, followed by antiplatelets and oral anticoagulants.

Indication for surgery was based exclusively on clinical symptoms (47 patients) or on additional tests (54 patients). Imaging tests carried out are reflected in Figure. Forty-seven (46%) patients were operated on with the diagnosis of acute abdomen, of which 17 had an imaging test (Figure). These data were not modified in either of the periods; 18 (46%) patients without preoperative diagnosis in the first period and 29 (46%) in the second. The presence of pneumoperitoneum or pneumatosis in the CT and extensive gangrenous lesions in the colonoscopy led to surgical treatment independent from the patient's symptoms.

Table 2 shows surgical treatment and results. At the time of surgery, 67 patients had transmural necrosis. Most common was involvement of more than one segment of the colon; the right colon was affected in 45 cases; the transverse colon in 35 cases; the left colon in 57; the sigmoid in 48; and the rectum in 5 cases.

Surgical complications shown by the patients were necrosis of the stoma, anastomotic dehiscence, prolonged ileum, intraabdominal abscess, infection of the wound, evisceration, pneumonia, and urinary tract infection.

We did not find differences regarding gender, age, antecedents, types of manifestation or time until diagnosis between groups A and B (Table 3). Among patients who died, 20 (47%) were already admitted to the hospital due to another cause when their symptoms began; 15 (36%) of them were in postoperative of another non-related surgery. We observed a tendency of lower figures of blood pressure, bicarbonate and pH, and higher figures of lactate dehydrogenase (LDH), creatine phosphokinase (CPK), cardiac frequency, and temperature among patients who died, although without statistical significance. Average time from the beginning of symptoms to diagnosis is greater in patients who died, without statistical significance (36 h vs 28 h). Ninety-three percent of patients who died had transmural necrosis, along with 49% of patients who survived ($P<.05$). We also found a higher mortality (68%) among patients with IC diagnosed in postoperative ($P<.01$).

Of the 17 cases diagnosed after aortic surgery, 11 began having atypical abdominal pain, and 14 had serious conditions during the examination. We did not find differences in the laboratory data or in postoperative complications. Mortality in this group was 10 (59%) patients.

By dividing the study into 2 equal periods, we observed that between 1991 and 1998, 39 patients were operated on, while between 1999 and 2006 we operated on 62 patients.

Discussion

IC is the most frequent kind of ischaemia of the digestive tract,[1] with an estimated incidence of 6–47 cases per 100 000 residents/year.[2] The increase of its incidence during recent years can be explained by progressive aging of the population, but it should be highlighted that our study only reflects the most serious cases.

Some authors have described studies in which serious IC shows broad clinical manifestation, and they find a clear correlation between findings in the physical examination and seriousness of the disease.[5,11] However, our data differ because they show that even the most serious cases may be detected with an unspecific examination. This emphasizes the importance of carrying out a colonoscopy as soon as one is suspicious of having IC.[12] Consequently, the majority of publications related to IC have been focused on determining risk factors and antecedents which allow early detection.[3,11,13-15] Other studies[6,7] have demonstrated a strong relationship between IC and cardiovascular antecedents, an association confirmed in our study, where more than 90% of patients presented with the given antecedents. We have not found a direct association of any drug or particular drug family and risk of IC, although the majority of our patients were under a type of treatment due to their antecedents. Neither have we found a significant association of IC with other diseases (such as irritable colon syndrome, diverticulosis,[12] colon cancer, stenosis, or colonic volvulus), as indicated in the references[7,16] (approximately 75% of our patients did not present with any of these conditions).

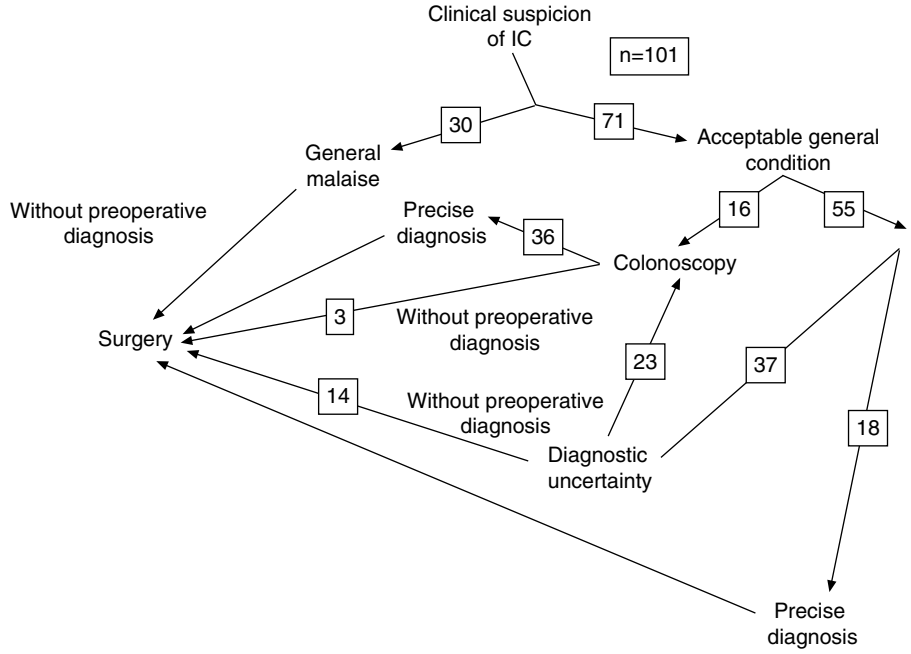

Figure – Imaging tests carried out.

Table 2 – Surgical treatment and results

		n=101
Surgical technique	Right hemicolectomy	
	With anastomosis	17
	With terminal ileostomy	2
	Left hemicolectomy with anastomosis	6
	Hartmann	35
	Sigmoidectomy with anastomosis	2
	Subtotal colectomy	
	With anastomosis	14
	With terminal ileostomy	19
	Exploratory laparotomy	6
Laparotomy for a second look		10
Hospital stay average/median, d		29/17
Time until diagnosis average/median, h		31/20
Recurrence at 3 months		7
Morbidity		40
Mortality		42

Other authors have observed greater seriousness of IC when it affected the right colon,[17] but we have not been able to confirm this in our study.

The diagnostic test of reference is the colonoscopy.[8,9] The high prevalence of typical symptoms, the mild character of the majority of cases and the reduced availability of a colonoscopy in many emergency departments make it where many patients with mild or moderate IC are discharged without a definitive diagnosis, and this may cause a delay of diagnosis in serious cases. Unfortunately, a specific laboratory marker has still not been found for intestinal ischaemia, a reason why colonoscopy continues to be the diagnostic method of choice in cases of clinical suspicion of IC. Some authors have given much importance to CT, both in diagnosis and in prognosis of IC,[10] but in our study its sensitivity was very low, which causes us to doubt the utility of CT in detecting IC. In any case, this may change with future technological development.

The continual measurement of intramucosal pH of the sigmoid with a tonometer is another aspect. The fact that the sensor explores a specific area and that it measures local conditions of the area where pathological changes probably originate may help to make an earlier diagnosis.[18,19] This has been used intraoperatively in aortic surgery[20] to detect anastomotic dehiscence in colorectal surgery[21] and to evaluate necrosis of the plasty after oesophagectomy in our centre.[22]

The most used surgical technique was the Hartmann intervention. Given the difficulty of ensuring the extension of the affected area during surgery, we believe that a left colectomy, with resection of the critical area of vascularization of the splenic angle, should be carried out when the IC only apparently affects the sigmoid colon,[23] another possibility is carrying out a second look to evaluate vascularization of the colon 24 to 48 hours after the first intervention, as we did in 10 patients. In 6 cases, intervention was limited to an exploratory laparotomy because of a generalized area of the colon affected and in patients with a critical general condition; all of them died a few hours after the surgery. We did not observe differences regarding mortality or the number of reinterventions according to the technique used (Table 3). Therefore we considered that the decision to carry out a stoma (colostomy or ileostomy) or a primary anastomosis, such as one which leaves a laparotomy for an early second

Table 3 – Factors related to mortality

	Deaths (n=42)	Survivors (n=59)	P
Age, mean (SD), y	73 (12)	72 (11)	.83
Women/men	23/19	29/30	.57
Cardiovascular disease history			.82
None	3	5	
One	17	25	
Two or more	22	29	
Symptoms			.59
Typical	19	29	
Atypical	23	30	
Abdominal examination			.19
Unspecific	12	25	
Defence	30	34	
Leukocytes/μL, average	16 700	16 800	.97
Acidosis			.17
Present	29	33	
Absent	13	26	
Time until diagnosis, h	36 (9)	28 (6)	.5
Transmural necrosis	39 (93%)	29 (49%)	<.05
Postoperative/spontaneous	15/27	7/52	<.01
Surgical technique			>.5
Right hemicolectomy	5	14	
Left hemicolectomy	6	13	
Hartmann	8	14	
Sigmoidectomy	0	2	
Subtotal colectomy	17	16	
Exploratory laparotomy	6	0	

look, should be made by the surgeon basing this on the macroscopic shape of the mucosa of the colon and the clinical situation of the patient. We did not carry out a prophylactic cholecystectomy, as proposed by Menegaux et al in cases of IC after aortic surgery, basing this on the physiopathology shared with alithiasic cholecystitis (microthrombosis and mural lesion),[23] although neither did we register any case with complication due to acute gallbladder involvement in postoperative.

General mortality in our study was 42%, and this coincides with figures found in the references.[2,5,9,11] Only a high rate of suspicion can improve these results, which supposes a challenge for the clinical practice of any surgeon, especially if we take into account that 66% of patients from this study did not have rectal bleeding, and 47% presented with atypical abdominal pain.

One of the limitations of our retrospective study regarding CT sensitivity was that during the study period, different equipment was used, including a new generation CT, during the last 5 years. Furthermore, the surgical technique used also varied according to the general conditions of the patient, with faster interventions (for example, Hartmann) in more affected patients.

Conclusions

Serious IC has a poor prognosis, its diagnosis tends to be late and its incidence seems to be increasing. Most of patients are elderly and have a history of cardiovascular disease. The intraoperative finding of transmural necrosis and the development of IC in immediate postoperative of other surgeries are predictors for mortality. Tachycardia, acidosis, and fever indicate a more serious case, although these data were not statistically significant. Taking into account the absence of new treatments, early diagnosis seems to be the only way to improve results.

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