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ORIGINAL ARTICLE

Severe acute lower gastrointestinal bleeding: risk factors for morbidity and mortality

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Abstract
Background Many factors can cause morbidity and mortality in patients with severe acute lower gastrointestinal bleeding (LGIB). The objectives of this study are to analyze three aspects related to severe acute LGIB: (1) indications and prognostic factors for urgent surgery, (2) risk factors for morbidity and mortality, and (3) relapse rates.
Patients and methods A retrospective cohort was collected between 1985 and 2002 in a tertiary referral center. One hundred seventy-one patients with severe acute LGIB were reviewed (LGIB is defined as frank rectal bleeding either with a hematocrit decrease ≥10 points or when a transfusion of at least three units of concentrated red blood cells is needed). The main outcome measures are: (1) indications for urgent surgery and results, (2) morbidity and mortality, and (3) relapse.
Results There were 158 (92%) stable patients, and in 61% of these, the bleeding was identified via colonoscopy. Bleeding was identified using urgent colonoscopy in a higher percentage of patients compared to delayed colonoscopy (68% versus 14%; $p<0.001$). Urgent surgery was indicated in 24 (14%) patients, and the approach was peri-anal in 5 (21%) patients and abdominal in the rest. Local intestinal resection was performed on the 15 patients in which bleeding was identified, whereas a subtotal colectomy was performed on the remaining 4 patients. The presence of hypotension ($p=0.001$; 35 versus 10%) and etiology of LGIB ($p<0.001$) are prognostic factors of urgent surgery. Morbidity was 6.4%, and mortality was 4.7%. The only morbidity or mortality risk factors detected were the presence of associated comorbidities ($p=0.008$) and the need for urgent surgery ($p=0.002$). The most frequent etiology was diverticulosis (25%). After a mean follow-up of 132±75 months, bleeding relapsed in 30% of patients.
Conclusions It is difficult to predict which patients are going to need urgent surgery in severe acute LGIB; only the presence of hypotension on arrival at the emergency ward would lead us to suspect a negative outcome for the hemorrhage. In severe acute LGIB, morbidity and mortality is high, and this is mainly due to the high level of associated comorbidity and the need for urgent surgery. It is necessary for strict hemodynamic monitoring of the patients at risk if we want to improve outcomes. The bleeding relapse rate is high in LGIB, although generally, it is not severe.

Keywords Severe acute lower gastrointestinal bleeding · Diverticulosis · Angiodysplasia · Surgery · Morbidity and mortality · Relapse

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Introduction

Lower gastrointestinal bleeding (LGIB) is a frequent reason for consultation in coloproctology units, and it is calculated

that three out of every seven people suffer from this illness at some time in their lives [1]. However, LGIB syndrome affects a very heterogenous group of patients in which it is difficult to find comparable series [1]. Fortunately, it is not usually very serious, and its cause is often of little importance. Occasionally, it can be severe and the cause of a diagnostic and therapeutic problem, which is difficult to resolve [1, 2]. In these situations, it is necessary to make a quick topographic and etiological diagnosis to be able to carry out the most appropriate treatment, especially if it is cataclysmic and requires urgent surgery [1–3]. What is more, although the prognostic factors are well known in upper gastrointestinal bleeding, these are still not well defined in acute LGIB [4, 5].

The objectives of this study are to analyze the following aspects in patients with severe LGIB: (1) indications and prognostic factors for urgent surgery, (2) the risk factors for morbidity and mortality, and (3) relapse rates after the bleeding has resolved.

Materials and methods

Selection criteria

We have reviewed 171 patients treated for severe acute LGIB in our service between 1985 and 2002. Severe acute LGIB is defined as frank rectal bleeding with a hematocrit decrease of ≥10 points or the need for a transfusion of at least three units of concentrated red blood cells [2, 4]. Exclusion criteria included evidence that rectal bleeding had originated above the ligament of Treitz, evidence of aorto-enteric fistulas or colo-anal surgery in the month before hospital admittance.

Variables to be studied

The following variables were analyzed:

1. Clinical: age, sex, associated comorbidities, follow-up of bleeding, clinical debut, and symptomatology related to the bleeding
2. Evaluation using the APACHE II Illness Severity Classification System
3. Complementary examinations carried out (upper and/or lower gastrointestinal endoscopy, arteriography, scintigraphy) and timing of examination (urgent and semi-urgent [first 48 h], semi-deferred [3–5 days], and deferred [>5 days])
4. Treatment: conservative medical treatment and transfusional needs; non-surgical invasive treatment (embolization by interventional radiology; endoscopic sclerosis); surgery (urgent or programmed, peri-anal or abdominal approach), and surgical therapy (resection of the small intestine, resection of the colon, or anal surgery)
5. Morbidity and mortality
6. Bleeding and identification of the bleeding
7. Outcome: control of the bleeding and relapse

Description of the sample and initial management

The mean age was 68±17 years, and 54% (n=92) were male. Fifty-seven percent (n=98) of patients showed previous episodes of LGIB, some of them needing hospital admittance (n=38). Nine percent (n=15) had previous colo-anal surgery (12 anal and 3 colonic resections). Fifteen percent (n=25) of patients were using platelet-aggregation-inhibiting drugs, and 9% (n=15) were using coagulation-inhibiting drugs. Thirty-six percent (n=62) of patients had at least one associated co-morbidity (50% [n=31] arterial hypertension; 34% [n=21] neuropathies; 23% [n=14] bronchopathies; 19% [n=12] heart disease; 18% [n=11] diabetes; and 16% [n=10] hepatopathies). Two patients who suffered from bronchopathy were corticoid-dependent.

On arrival at the emergency ward, 29 patients (17%) were hemodynamically unstable with hypotension (70–80/30–50 mmHg) and tachycardias (109–135 beats per minute), of which 26 patients were stabilized using conservative measures (Fig. 1). All needed a blood transfusion, with a mean of 7 U of concentrated red blood cells per patient (7±5 U). Plasma was also transfused to 14 (8%) patients and platelets to 5 (3%). There were diagnostic doubts in about 50 (29%) patients, and an upper gastrointestinal endoscopy was carried out but did not identify the etiology of the bleeding. A lower gastrointestinal endoscopy was carried out on 158 (92%) patients (Fig. 1), and it gave an etiological diagnosis in 61% of patients (n=96). When an urgent or semi-urgent endoscopy was carried out, bleeding was identified in 68% of patients. However, in the deferred endoscopy, only 14% were identified (p<0.001). During lower gastrointestinal endoscopy, urgent treatment was carried out on nine patients. Urgent arteriography was carried out on 14 (8%) patients, which allowed for the localization of the bleeding in nine. Scintigraphy was carried out on four (2%) patients: two were normal, one had Meckel's diverticule, and the other a bleeding lesion at the hepatic angle of the colon.

Statistics of the study

A descriptive statistical analysis was carried out on each of the variables. Subgroups were compared using the χ^2 test, complemented by an analysis of the remainders, and

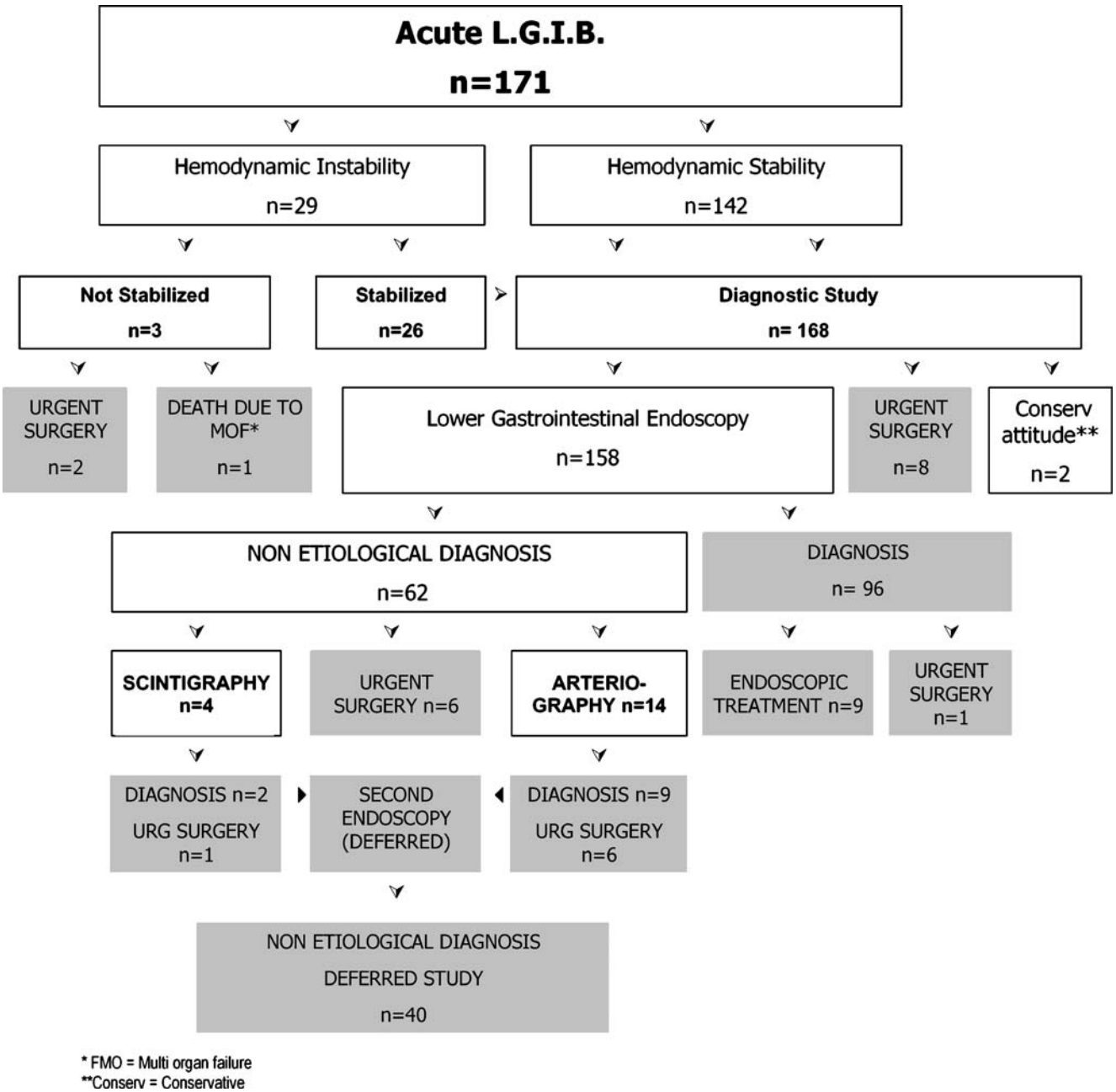

Fig. 1 Anagram of therapeutic diagnostic attitude toward patients with acute LGIB

Fischer's exact test, when necessary. Differences were considered significant at levels of $p<0.05$.

Results

Urgent surgical treatment

Urgent surgery was indicated in 24 (14%) patients due to hypovolemic shock in 13 (54%), persistence of the bleeding in 10 (42%), and in the remaining case, suspicion of mesenteric ischemia. In five patients (21%), the origin was anal–rectal, so the approach used was peri-anal (a hemorrhoidectomy was performed in all of these cases). In the remaining patients ($n=19$), the approach used was abdominal through a supra- or infra-umbilical median laparotomy. In ten patients, an etiological diagnosis was not available at the time of intervention, and the bleeding was identified in six of these during surgery. In the 15 patients in which bleeding had already been identified, local intestinal resection of the affected area was performed (three right hemocolectomies, nine resections of the small

intestine, and three Meckel's diverticulum resections). A subtotal colectomy was performed on the four remaining patients, and bleeding was not identified.

The remaining patients were stabilized using conservative measures, and programmed surgery was indicated in 22 patients (12%) according to the etiology of the bleeding (colorectal cancer, bleeding due to angiodysplasia, etc.).

We compared severe acute LGIB patients that required urgent surgery with those that did not, and only two variables were significantly related to the need for urgent surgery: the presence of hypotension on arrival at the emergency ward (p=0.001; 35 versus 10%) and etiology of the bleeding (p<0.001; Table 1). In this respect, urgent surgery is more frequent when the etiology is angiodysplasia or bleeding is located in the small intestine.

Table 1 Clinical and epidemiological differentiating variables in acute LGIB patients who require surgery and those who do not

Variable	No surgery (n=147)	Urgent surgery (n=24)	p value
Age			
<40 years (n=13)	10 (7%)	3 (23%)	0.421
40–79 years (n=115)	98 (67%)	17 (71%)	
≥80 years (n=43)	39 (26%)	4 (17%)	
Sex			
Male (n=92)	80 (54%)	12 (50%)	0.687
Female (n=79)	67 (46%)	12 (50%)	
Previous episodes of LGIB			
No (n=73)	64 (43%)	9 (38%)	0.579
Yes (n=98)	83 (57%)	15 (63%)	
Previous colorectal surgery			
No (n=156)	133 (91%)	23 (96%)	0.484
Yes (n=15)	14 (9%)	1 (4%)	
Coagulation-inhibiting drugs			
No (n=156)	134 (91%)	22 (92%)	0.935
Yes (n=15)	13 (9%)	2 (8%)	
Platelet-aggregation-inhibiting drugs			
No (n=146)	125 (85%)	21 (88%)	0.751
Yes (n=25)	22 (15%)	3 (12%)	
Evolution time of bleeding			
≤24 h (n=93)	79 (54%)	14 (58%)	0.675
>24 h (n=78)	68 (46%)	10 (42%)	
Vegetative syndrome			
No (n=96)	85 (58%)	11 (46%)	0.272
Yes (n=75)	62 (42%)	13 (54%)	
Abdominal pain			
No (n=127)	108 (73%)	19 (79%)	0.554
Yes (n=44)	39 (27%)	5 (21%)	
Low blood pressure in emergency ward			
No (n=142)	128 (87%)	14 (58%)	0.001
Yes (n=29)	19 (13%)	10 (42%)	
Definitive etiological diagnosis			
Not found (n=40)	39 (27%)	−1 (4%)	0.000
Diverticulosis (n=42)	41 (28%)	−1 (4%)	
Angiodysplasia (n=20)	14 (10%)	+6 (25%)	
Colon cancer (n=16)	15 (10%)	1 (4%)	
Small intestine (n=12)	−2 (1%)	+10 (42%)	
Benign anal–rectal (n=29)	24 (16%)	5 (21%)	
Other colon disorders (n=12)	12 (8%)	−0 (0%)	

Hospital morbidity and mortality

Overall morbidity was 6.4% (n=11). In the group that required urgent surgery, the rate of morbidity was 17% (n=4—two infections [intra-abdominal and surgical wound], a complete atrioventricular blockage, and a recto-vaginal fistule) compared to 4.7% (n=7—two cases of pneumonia, a urine infection, a case of chest angina, an acute lung edema, a lung thromboembolism, and a coagulopathy) in the group that was controlled with conservative treatment.

The mortality rate was 4.7% (n=8). In the group receiving surgery, it was 8.3% (n=2—a complete atrioventricular blockage and a multi-organ failure), and in the group not treated with surgery, it was 4% (n=6—two septic shocks secondary to pneumonia, an acute lung edema, multi-organ failure in a patient with coagulopathy with generalized bleeding).

On analyzing the factors that affect morbidity and mortality in these patients, we can see that the only associated variables are the presence of comorbidities in those patients admitted into hospital for LGIB (13 versus 2.7%; p=0.008) and the patients that required urgent surgery (20.8 versus 4.1%; p=0.002; Table 2).

Outcome

Regarding definitive etiological diagnosis, 42 patients (25%) had diverticulosis, 20 (12%) had angiodysplasia, 16 (9%) had colorectal cancer, 12 (7%) had pathology of the small intestine (seven leiomyomas, three Meckel's diverticulum, one leiomyoblastoma, and one angioma), 29 (17%) had benign anorectal pathology, and 12 (7%) had other colon disorders. In 40 patients (23%), etiology of the bleeding was not found.

After a mean follow-up of 132±75 months, bleeding relapsed in 30% of patients (n=52). Of these, 46% (n=24) were patients in which the etiology had not been established, but in seven of these patients, etiology was established in this new episode of bleeding (four cases of diverticulosis and three angiodysplasias). In those patients in which etiology was previously known, the most frequent etiology was diverticulosis (n=13) followed by angiodysplasia (n=6) and rectal varicose veins (n=4). None of the patients fulfilled the criteria of acute bleeding, but 50% (n=26) did require hospitalization for observation, and 12 of these required transfusion.

Table 2 Analysis of risk factors for morbidity and mortality in severe acute LGIB

Variable	No morbidity/ mortality (n=160)	Morbidity/ mortality (n=11)	p value
Age			
<40 years (n=13)	12 (7%)	1 (9%)	0.247
40–79 years (n=115)	110 (69%)	5 (46%)	
≥80 years (n=43)	38 (24%)	5 (46%)	
Sex			
Male (n=92)	84 (53%)	8 (73%)	0.193
Female (n=79)	76 (47%)	3 (27%)	
Associated comorbidities			
No (n=110)	107 (67%)	3 (27%)	0.008
Yes (n=61)	53 (33%)	8 (73%)	
APACHE II system			
0–10 (n=42)	41 (26%)	1 (9%)	0.384
>11 (n=129)	119 (74%)	10 (91%)	
Previous episodes of LGIB			
No (n=73)	68 (43%)	5 (46%)	0.848
Yes (n=98)	92 (57%)	6 (54%)	
Previous colorectal surgery			
No (n=156)	147 (92%)	9 (82%)	0.2541
Yes (n=15)	13 (8%)	2 (18%)	
Coagulation-inhibiting drugs			
No (n=156)	147 (92%)	9 (82%)	0.254
Yes (n=15)	13 (8%)	2 (18%)	
Platelet-aggregation-inhibiting drugs			
No (n=146)	135 (84%)	11 (100%)	0.156
Yes (n=25)	25 (16%)	0 (0%)	
Vegetative syndrome			
No (n=96)	92 (58%)	4 (36%)	0.172
Yes (n=74)	68 (42%)	7 (64%)	
Abdominal pain			
No (n=127)	118 (74%)	9 (82%)	0.554
Yes (n=44)	42 (26%)	2 (18%)	
Low blood pressure in emergency ward			
No (n=142)	135 (84%)	7 (64%)	0.076
Yes (n=29)	25 (16%)	4 (36%)	
Urgent surgery			
No (n=147)	141 (88%)	6 (55%)	0.002
Yes (n=24)	19 (12%)	4 (45%)	
Definitive etiological diagnosis			
Not found (n=40)	39 (24%)	1 (9%)	0.122
Diverticulosis (n=42)	40 (25%)	2 (18%)	
Angiodysplasia (n=20)	16 (10%)	4 (36%)	
Colon cancer (n=16)	16 (10%)	0 (0%)	
Small intestine (n=12)	11 (7%)	1 (9%)	
Benign anal–rectal (n=29)	26 (16%)	3 (27%)	
Other colon disorders (n=12)	12 (8%)	0 (0%)	

Discussion

When faced with severe acute LGIB, it is very important to both stabilize and establish the patient's life support measures. Next, an etiological diagnosis should be sought. At this point, it is important to have the patient's complete health history and examination [2, 6]. However, we should be cautious about relating bleeding to a lesion unless bleeding is confirmed. Hemorrhoidal pathology and colonic diverticulosis are very common in the population and can coincide with an etiology that is different from bleeding [2, 7]. Most diagnostic protocols include colonoscopy as the standard diagnostic technique [2, 6, 8–10], as it allows for a diagnosis in between 69 and 80% of cases [6, 11]. Although it is debatable, early colonoscopy seems to be the most useful diagnostic tool [10–15], and our results support this practice. An advantage of its early use is that this technique can be used as a therapy [14, 16] with relatively good results [14, 16, 17]. However, early colonoscopy has some disadvantages [18], and not all authors agree with our findings [19]. Arteriography is reserved for patients in which endoscopy cannot be carried out or is inconclusive and in which bleeding persists [6, 8]. In these cases, it allows for an etiological diagnosis in between 40 and 86% (64% in our series) of cases with low morbidity [20]. The remaining diagnostic examinations have limited value at the acute bleeding time [21]. When a colonic source of bleeding is not identified, the small intestine should be evaluated as a possible source of the etiology [6]. Following this line of thought, in our series, an etiological diagnosis was achieved in 66%, similar to the rates published in other studies [22, 23].

LGIB is generally controlled using conservative measures. If it is not controlled, endoscopy [6, 14, 15, 24–26] and interventional radiology [6, 27–29] can currently be used with good results. However, more experience is needed to establish the value of both techniques. In severe acute LGIB, it is difficult to clinically determine which cases are going to be cataclysmic and which are self-limited [4, 8]. One factor related to urgent surgery in our series is hemodynamic instability on arrival at the emergency ward. In this respect, Strate et al. [4] and Velayos et al. [5] also show that hemodynamic instability is a fundamental prognostic factor of severe bleeding and therefore predicts the possible need for urgent surgery. We have not found any other associated epidemiological clinical factors except etiology of the bleeding. However, this factor cannot be evaluated because etiology is often not known at the beginning of the bleeding. Therefore, initially, it is not going to be useful for determining the patients who might potentially need urgent surgery.

Approximately, 10–25% of patients require urgent surgery [6], and it is important to choose the correct type of approach [11]. Therefore, it is fundamental to have a meticulous anal exploration to avoid carrying out laparotomy during an anal process. In our series, a meticulous anal examination, interoperative in many cases, allowed us to establish which cases needed a peri-anal approach. When

the approach is abdominal and a diagnosis is lacking, the colon should be revised meticulously to look for the source of the bleeding. If the lesion is not localized, the most consensual decision is to perform a subtotal colectomy, as in four of our patients, given that blind segmented colectomies should not be performed due to the high risk of re-bleeding (30–75%) [11]. However, the pathology of the small intestine should first be ruled out, as in these cases a colectomy will not resolve this problem, and it will add to morbidity and mortality [30]. For this reason, although the colon is completely full of blood, the small intestine should be revised, especially if there is blood inside, because in these cases it is possible to locate the bleeding lesion interoperatively. Thus, we avoid operating on the colon and provide ourselves with the etiology of bleeding. When there is suspicion about the presence of lesions in the small intestine during the operative act, as in our patient with angioma, the "gold standard" for exploring the small intestine is intraoperative enteroscopy [31, 32].

Morbidity and mortality are usually high in these patients, generally above 20–25 and 10–15%, respectively. However, in our series, these rates are slightly less (6.4 and 4.7%, respectively). The main risk factor for morbidity and mortality in our series is the presence of associated comorbidity and the need for urgent surgery. In this respect, Kollef et al. [33] stratified this type of patients, and among high-risk factors, they also found the presence of comorbidities, as in our series. As a general rule, morbidity and mortality are higher in the group that requires urgent surgery for LGIB. However, they are lower when the patient has a pathology of the small intestine because these patients are usually younger patients without comorbidities [11, 34], as is also seen in our series. Other risk factors described are the APACHE II system, age, obesity, previous surgery, and treatment with steroids [6, 10–12, 23, 35–37]. In our series, steroid treatment and obesity were not evaluated because only two patients were treated with steroids, and only three patients had a body mass >30 and could be considered obese.

If we really want to improve results, we should carry out a multidisciplinary approach involving the surgeon, the radiologist, and the gastroenterologist to make diagnosis easier and with the intensivist and the anesthetist for a strict therapeutic control. Thus, we will increase diagnostic efficiency, and we will use less aggressive treatment, which will be made earlier and more efficiently. However, the severity of LGIB together with the advanced age of patients and comorbidities in this population group all cause a high level of mortality, which can only be reduced by further improving cardiorespiratory care.

Finally, it should be remembered that there is a problem in patients in whom the bleeding resolves by itself: the high relapse rate ranging between 30 and 50% [2, 38]. In patients who are given surgery, the percentage of re-bleeding is less (5–10%), especially if resective surgery is carried out [11].

To conclude, we could say that it is difficult to predict which patients are going to require urgent surgery in severe acute LGIB; only the presence of hypotension on arrival at the emergency ward leads us to suspect a negative outcome for the hemorrhage. In severe acute LGIB, morbidity and mortality is high, and this is mainly due to the high level of associated comorbidities and need for urgent surgery. Therefore, it is necessary for strict hemodynamic monitoring of patients at risk if we really want to improve results.

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