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Original article

Utility of urgent colonoscopy in acute lower gastro-intestinal bleeding: a single-center experience

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Background. The role of urgent colonoscopy in lower gastro-intestinal bleeding (LGIB) remains controversial. Over the last two decades, a number of studies have indicated that urgent colonoscopy may facilitate the identification and treatment of bleeding lesions; however, studies comparing this approach to elective colonoscopy for LGIB are limited.
Aims. To determine the utility and assess the outcome of urgent colonoscopy as the initial test for patients admitted to the intensive care unit (ICU) with acute LGIB.
Methods. Consecutive patients who underwent colonoscopy at our institution for the initial evaluation of acute LGIB between January 2011 and January 2012 were analysed retrospectively. Patients were grouped into urgent *vs.* elective colonoscopy, depending on the timing of colonoscopy after admission to the ICU. Urgent colonoscopy was defined as being performed within 24 hours of admission and those performed later than 24 hours were considered elective. Outcomes included length of hospital stay, early re-bleeding rates, and the need for additional diagnostic or therapeutic interventions. Multivariable logistic regression analysis was performed to identify factors associated with increased transfusion requirements.
Results. Fifty-seven patients underwent colonoscopy for the evaluation of suspected LGIB, 24 of which were urgent. There was no significant difference in patient demographics, co-morbidities, or medications between the two groups. Patients who underwent urgent colonoscopy were more likely to present with hemodynamic instability ($P = 0.019$) and require blood transfusions ($P = 0.003$). No significant differences in length of hospital stay, re-bleeding rates, or the need for additional diagnostic or therapeutic interventions were found. Patients requiring blood transfusions ($n = 27$) were more likely to be female ($P = 0.016$) and diabetics ($P = 0.015$). Fourteen patients re-bled at a median of 2 days after index colonoscopy. Those with hemodynamic instability were more likely to re-bleed [HR 3.8 (CI 1.06–13.7)], undergo angiography [HR 9.8 (CI 1.8–54.1)], require surgery [HR 13.5 (CI 3.2–56.5)], and had an increased length of hospital stay [HR 1.1 (1.05–1.2)].
Conclusion: The use of urgent colonoscopy, as an initial approach to investigate acute LGIB, did not result in significant differences in length of ICU stay, re-bleeding rates, the need for additional diagnostic or therapeutic interventions, or 30-day mortality compared with elective colonoscopy. In a pre-specified subgroup analysis, patients with hemodynamic instability were more likely to re-bleed after index colonoscopy, to require additional interventions (angiography or surgery) and had increased length of hospital stay.

Keywords: acute lower gastro-intestinal bleeding; urgent colonoscopy; elective colonoscopy; outcomes

INTRODUCTION

Lower gastro-intestinal bleeding (LGIB) is a common condition, requiring hospitalization in 21 per 100 000 people [1]. The incidence of LGIB rises steadily with age and, in the elderly, may surpass that of upper gastro-intestinal bleeding (UGIB) [2]. Colonic diverticular bleeding is the most common source of bleeding making up 30–50% of cases reported in the literature [1]. Other lesions (colonic angiodysplasia, rectal or colonic ulcers, colitis, neoplasia, or small intestinal lesions) account for the remaining identifiable causes of LGIB. Endoscopy is the standard of care in the management of UGIB, and urgent esophago-gastroduodenoscopy (EGD) within 12–24 hours of admission has been shown to provide valuable prognostic information, to facilitate the treatment of high-risk lesions, and to improve patient outcomes and resource utilization. In contrast, the role of urgent colonoscopy has not been similarly applied to LGIB and remains controversial. Traditionally, colonoscopy in LGIB is performed electively, due to the need for bowel preparation; however, a major limitation with colonoscopy in this setting has been the low detection rate of bleeding lesions, thus precluding endoscopic hemostasis. A number of studies have indicated that urgent colonoscopy—defined as colonoscopy performed within 12–24 hours of admission—is safe and may facilitate the identification and treatment of bleeding lesions [3, 4]; however studies comparing this approach with elective colonoscopy or with other interventions for LGIB are limited. The aim of this study was to determine the utility—and assess the outcome—of urgent colonoscopy in those with acute lower GI bleeding at our tertiary care center.

MATERIALS AND METHODS

Patients

A chart review was performed, of a prospectively maintained database of patients who underwent colonoscopy for the initial evaluation of acute lower GI bleeding from January 2011 to January 2012. All patients were required to give informed consent prior to their procedure. The study was approved by the Institutional Review Board (IRB) at our institution.

Demographics and clinical variables

Demographic, clinical and procedural data were collected, including colonoscopy findings and complications. Patients were grouped into urgent *vs*. elective groups, depending on the timing of colonoscopy after admission to the intensive care unit (ICU). Urgent colonoscopy was defined as colonoscopy performed within 24 hours of admission and those performed later than 24 hours were considered elective. Colonoscopies were performed by a gastroenterology fellow, under the supervision of the attending gastroenterologist, after a standard polyethylene glycol preparation administered either orally or via naso-gastric tube. The quality of the preparation was graded as 'excellent' if there was no stool, blood, or clots covering the mucosa, 'fair' if less than 25% of the mucosa was obscured by stool, blood, or clots and 'poor' if there was formed stool or if greater than 25% of the mucosa was obscured by stool or blood.

Outcome measurement

The primary end-point was re-bleeding rates. Endoscopic therapy was considered successful if bleeding ceased at the end of the procedure. Re-bleeding was defined as bleeding occurring after colonoscopy and clinical cessation of index bleeding event during the hospitalization. Secondary end points were blood transfusion requirements, duration of ICU stay, need for angiography or surgery, and 30-day mortality.

Statistical analysis

Descriptive statistics were computed for all factors. These included means and standard deviations for continuous factors, and frequencies and percentage for categorical variables. A univariable analysis was performed to compare urgent with elective procedures. Student's *t*-tests were used to assess differences in continuous variables, and Pearson's χ^2 tests were used for categorical factors. A multivariable logistic regression analysis was performed to assess factors associated with red blood cell transfusion requirements. An automated stepwise variable selection method was performed on 1000 bootstrap samples to choose the final model. The timing of colonoscopy was forced into the model, and age, sex, hemodynamics and medical co-morbidities were considered for inclusion. Factors with an inclusion rate of 20% or more were kept in the final model. Univariable Cox regression analysis was used to assess factors associated with re-bleeding. In addition, a time-to-re-bleeding analysis was performed. Follow-up time was defined as time from index colonoscopy to re-bleed or 30 days if no re-bleeding was observed. A *P*-value of less than 0.05 was considered statistically significant. All analyses were performed using SAS (version 9.2; SAS Institute, Cary, NC, USA).

RESULTS

Fifty-seven patients underwent colonoscopy for the evaluation of suspected lower GI bleeding. The mean age of the patients was 68.0 ± 12.5 years. The demographic and clinical characteristics are shown in Table 1. There were no statistically significant differences between the urgent and elective groups in terms of demographics, co-morbidities, or medication use. Overall, 10.5% of patients were using clopidogrel, and 54.4% were using NSAIDs or aspirin. On

Table 1. Demographics and patient characteristics

Factors	Elective endoscopy ($n=33$)	Urgent endoscopy ($n=24$)	*P*-value
Age (years)	69.3 ± 11.1	66.8 ± 13.8	0.45
Female	13 (39.4)	15 (62.5)	0.085
Caucasian	25 (75.8)	17 (70.8)	0.68
Body mass index	30.7 ± 6.7	27.4 ± 7.5	0.1
Co-morbidities			
Diabetes	11 (33.3)	9 (37.5)	0.74
Hypertension	29 (87.9)	17 (70.8)	0.11
Hyperlipidemia	17 (51.5)	18 (75.0)	0.072
Coronary artery disease	10 (30.3)	11 (45.8)	0.23
Chronic kidney disease	11 (33.3)	5 (20.8)	0.3
Medications			
NSAIDs	3 (9.1)	2 (8.3)	0.92
Warfarin	7 (21.2)	2 (8.3)	0.19
Clopidogrel	2 (6.1)	4 (16.7)	0.2
Aspirin	17 (51.5)	9 (37.5)	0.29
SSRI	6 (18.2)	6 (25.0)	0.53
Labs			
Hemoglobin (g/dL)	9.6 ± 1.4	9.0 ± 1.8	0.2
Platelet count ($x10^3/\mu L$)	137 (82, 188)	175 (136, 267)	0.052
Serum Creatinine (mg/dL)	1.1 (0.63, 2.1)	1.2 (0.70, 1.4)	0.69
INR	1.3 ± 0.27	1.4 ± 1.01	0.47

NSAIDs = non-steroid anti-inflammatory drugs, SSRI = selective serotonin re-uptake inhibitor, INR = international normalized ratio.

Table 2. Source of bleeding and intervention

Factors	Elective endoscopy ($n=33$)	Urgent endoscopy ($n=24$)	*P*-value
Source of bleeding			0.067
Diverticula	1 (3.0)	1 (4.2)	
Angioectasia	4 (12.1)	2 (8.3)	
Colitis	2 (6.1)	0 (0.0)	
Polyp	1 (3.0)	3 (12.5)	
Post polypectomy	0 (0.0)	5 (20.8)	
Malignancy	2 (6.1)	0 (0.0)	
Colonic ulcer	3 (9.1)	4 (16.7)	
Rectal ulcer	11 (33.3)	5 (20.8)	
Hemorrhoids	2 (6.1)	0 (0.0)	
Unknown	7 (21.2)	4 (16.7)	
Intervention			
Injection	15 (45.5)	7 (29.2)	0.21
Heater probe	1 (5.6)	4 (22.2)	0.15
Clips	12 (66.7)	15 (83.3)	0.25
Angiography	2 (11.1)	1 (5.6)	0.55
Surgery	3 (16.7)	1 (5.6)	0.29
Spontaneous hemostasis	12 (36.4)	6 (25.0)	0.36

presentation, 53% of patients were hemodynamically unstable. Markers of hemodynamic instability were defined as GI blood loss anemia or shock, requiring packed red blood cell transfusions or vasopressor therapy, respectively.

The majority of patients received a standard 4 L polyethylene glycol preparation in the urgent (88%) and elective (73%) colonoscopy groups ($P=0.37$). The remaining patients received either MoviPrep® or HalfLytely® and Bisacodyl bowel preparation. The endoscopic view in the urgent and elective groups was rated as excellent in 13% and 9%, good in 44% and 30%, fair in 44% and 39%, and poor in 0% and 21% of patients, respectively ($P=0.076$). Ulcers (post-polypectomy, colon, or rectal), with either active bleeding or stigmata or recent bleeding, were found in 14 patients (42.4%) in the urgent colonoscopy group. Bleeding post-polypectomy ulcers were located as follows: one in the left colon, two in the transverse colon, and two in the right colon. No differences were found between the urgent and elective colonoscopy groups (83% *vs.* 79%; $P=0.067$) in identifying the source of bleed or use of subsequent endoscopic therapies (70% *vs.* 51%; $P=0.14$) to achieve hemostasis.

Visceral angiography was performed in three patients and revealed a putative site of bleeding; in all three, angiodysplasia of the colon was presumed to be the cause of bleeding. The bleeding lesions were located as follows: one in the right colon and two in the cecum. Two patients underwent emergent surgery after elective colonoscopy (one right hemi-colectomy and one sub-total colectomy) for ischemic colitis and fulminant active colitis, respectively. The sources of bleeding and subsequent therapeutic interventions in each group are shown in Table 2.

Rates of re-bleeding did not appear to be different between the urgent and elective colonoscopy groups [five (21%) and nine (28%) respectively; ($P=0.53$)]. The length of stay in the ICU was lower in the urgent colonoscopy group (2.0 days *vs.* 5.0 days, respectively), but it did not reach statistical significance ($P=0.056$) (Table 3). The need for additional interventions, such as angiography or surgery, were no different between the two study groups. Patients who underwent urgent colonoscopy received significantly more blood transfusions ($P=0.003$) and were more likely to be hemodynamically unstable ($P=0.019$). No patients died within 30 days of index bleed in either group.

In a specified sub-group analysis, patients requiring blood transfusions ($n=27$) were more likely to be female ($P=0.016$) and diabetic ($P=0.015$); however, multivariate analysis revealed that only those patients presenting with hemodynamic instability required a significantly increased

number of blood transfusions ($P < 0.001$). Additionally, those with hemodynamic instability were more likely to re-bleed [HR 3.8 (CI 1.06–13.7)], and require additional therapeutic interventions, such as angiographic hemostasis [HR 9.8 (CI 1.8–54.1)] or surgical intervention [HR 13.5 (CI 3.2–56.5)]. The mean duration of stay in the ICU was significantly longer in the group of patients who re-bleed [HR 1.1 (1.05–1.2)] (Table 4)

Table 3. Lower GI bleeding outcomes

Factors	Elective endoscopy ($n = 33$)	Urgent endoscopy ($n = 24$)	*P*-value
Re-bleeding	9 (28.1)	5 (20.8)	0.53
ICU stay (days)	5.0 (2.0, 10.0)	2.0 (2.0, 3.5)	0.056
Hemodynamic instability	13 (39.4)	17 (70.8)	0.019
Total PRBC	0.0 (0.0, 2.0)	2.0 (0.0, 4.0)	0.003
Angiography	2 (11.1)	1 (5.6)	0.55
Surgery	3 (16.7)	1 (5.6)	0.29

PRBC = packed red blood cell.

DISCUSSION

The diagnostic evaluation method of choice in severe LGIB is generally considered to be colonoscopy [5]. Current guidelines recommend early colonoscopy, citing a diagnostic yield of 48–90%; however the timing of colonoscopy in various studies ranged from 12–48 h after presentation [5]. Whilst it is tempting to extrapolate the benefits of urgent endoscopy with hemostatic treatment in acute upper gastro-intestinal bleeding to LGIB [6, 7], it should be emphasized that such extrapolation may not be applicable.

In our study, we found no benefit of urgent colonoscopy in the primary endpoint—re-bleeding during hospitalization—or secondary endpoints including length of hospital stay, number of units of blood transfused, or number of subsequent interventions (i.e. angiotherapy or surgery). There was a trend towards shorter length of hospitalization in the urgent colonoscopy group, without further bleeding, although this difference was not statistically significant ($P = 0.056$). A potential explanation could be the lack of protocol guiding hospital discharge after colonoscopy and efficient triage of low-risk patients. Additionally, studies of UGIB have shown that, when triage is left to the discretion

Table 4. Re-bleeding after index colonoscopy

Factors	No re-bleeding ($n = 42$)	Re-bleeding ($n = 14$)	Hazard ratio (95% CI)	*P*-value
Age (years)	69.0 ± 13.0	66.6 ± 10.2	0.99 (0.95, 1.03)	0.60
Female	19 (45.2)	9 (64.3)	1.9 (0.64, 5.7)	0.24
Caucasian	32 (76.2)	10 (71.4)	0.84 (0.26, 2.7)	0.76
Body mass index	29.2 ± 7.9	29.3 ± 4.8	1.00 (0.93, 1.08)	0.98
Co-morbidities				
Diabetes	15 (35.7)	5 (35.7)	1.00 (0.33, 3.0)	0.99
Hypertension	35 (83.3)	10 (71.4)	0.61 (0.19, 1.9)	0.40
Hyperlipidemia	27 (64.3)	7 (50.0)	0.64 (0.23, 1.8)	0.41
Coronary artery disease	16 (38.1)	5 (35.7)	1.01 (0.34, 3.0)	0.99
Chronic kidney disease	11 (26.2)	5 (35.7)	1.4 (0.48, 4.3)	0.51
Medications				
NSAID	5 (11.9)	0 (0.0)	0.31 (0.02, 5.7)	0.43
Warfarin	8 (19.0)	1 (7.1)	0.39 (0.05, 3.0)	0.36
Clopidogrel	5 (11.9)	1 (7.1)	0.63 (0.08, 4.8)	0.66
Aspirin	20 (47.6)	6 (42.9)	0.85 (0.29, 2.4)	0.76
SSRI	8 (19.0)	4 (28.6)	1.5 (0.46, 4.7)	0.52
Urgent colonoscopy	19 (45.2)	5 (35.7)	0.71 (0.24, 2.1)	0.53
Hemodynamic instability	18 (42.9)	11 (78.6)	3.8 (1.06, 13.7)	0.04
Total PRBC	0.00 [0.00,2.0]	2.0 [0.00,4.0]	1.1 (0.92, 1.4)	0.24
ICU stay (days)	2.5 [1.5,4.5]	6.0 [3.0,15.0]	1.1 (1.05, 1.2)	<0.001
Angiography	0 (0.0)	2 (20.0)	9.8 (1.8, 54.1)	0.009
Surgery	0 (0.0)	4 (40.0)	13.5 (3.2, 56.5)	<0.001

NSAIDs = non-steroid anti-inflammatory drugs, SSRI = selective serotonin reuptake inhibitor, PRBC = packed red blood cell.

of the admitting team, patients with low-risk findings are frequently not discharged despite the evidence that this is safe and efficient [8].

Early performance of colonoscopy appears to improve diagnostic yield. We found that 83.3% of colonoscopies were diagnostic in the urgent group, compared with 78.8% in the elective group. A study by Laine *et al.* made similar findings, with a definitive bleeding source identified significantly more often in patients with LGIB undergoing urgent colonoscopy *vs*. elective colonoscopy [9]; however, diagnosis alone may have little impact on major clinical outcomes. Stigmata of hemorrhage need to be identified and treated in order to justify urgent interventions. In our study, 17 patients (70%) in the urgent colonoscopy group had endoscopic findings leading to a therapeutic intervention. The proportion of patients undergoing endoscopic therapy in our study is much higher than results from a pooled analysis of case series, which reported that only 12% of patients underwent endoscopic therapy [10]. We speculate that the high incidence of ulcers (post-polypectomy, colonic, and rectal) with active bleeding or stigmata of recent bleeding in our population could explain this disparity. Additionally, the majority of individuals in our study reported NSAID use, which may conceivably have contributed to the high prevalence of ulcers in our study. The mechanisms involved in the induction of GI bleeding by NSAIDs are incompletely understood but may include platelet activity inhibition, as well as concomitant use of warfarin, aspirin, or other anti-platelet agents.

In our study, 25% of patients experienced an episode of re-bleeding while in the hospital. These findings are higher than the results from a pooled analysis of case series [11], which showed a re-bleeding rate for LGIB of 15%. This may in part be due to our patient cohort, which consisted of a predominately older and male-dominant population, as described in the study by Rabeneck *et al.* [12]. Additionally, in a subgroup analysis, patients with hemodynamic instability were more likely to re-bleed, require additional interventions (angiography or surgery) and had increased length of hospital stay.

Our study probably reflects observations at most referral hospitals, as the vast majority of patients were admitted through the emergency department or transferred from the regular nursing floor to the intensive care unit (ICU); however, limitations of the present study include its retrospective design, which may have led to an underestimation of bleeding cases—in particular, referral of patients with severe bleeding for initial radiographic evaluation, rather than colonoscopy by emergency room physicians. The lack of standardization of care makes it difficult to draw conclusions regarding the effectiveness of the procedures. The small number of patients also limited the assessment of differences in outcomes and multiple predictors. This study was performed at a single tertiary care institution and may not be generally applicable to other hospital settings—particularly those without a designated GI bleeding team and on-call support staff, in which urgent procedures are performed at the bedside. Finally, physician preferences were not assessed but clearly contribute to management decisions in LGIB.

In summary, urgent colonoscopy as an initial approach to investigation of acute LGIB did not result in significant differences in length of ICU stay, re-bleeding rates, the need for additional interventions or 30-day mortality, compared with elective colonoscopy. Individuals presenting with hemodynamic instability in the setting of LGIB were more likely to experience a re-bleed after index colonoscopy and may be best served by undergoing urgent angiography in conjunction with surgical consultation. Nevertheless, we believe that urgent colonoscopy potentially could play a role in identification of a definite site with active hemorrhage or stigmata of recent hemorrhage, allowing application of endoscopic therapy or guiding subsequent treatment. Further prospective studies are needed to directly compare the therapeutic efficacy and safety of urgent *vs*. elective colonoscopy for all sources of acute LGIB, so that an evidence-based, standardized approach to acute LGIB can be developed.

Conflict of interest: none declared.

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