



Provocative Mesenteric Angiography: Outcomes and Standardized Protocol for Management of Recurrent Lower Gastrointestinal Hemorrhage

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Introduction

Although most lower gastrointestinal bleeding is self-limited, a minority of patients continue to have recurrent episodes resulting in readmissions, multiple blood transfusions, and potential need for extended resection due to their obscure nature. In this situation, the success of colonoscopy and traditional angiography is inconsistent due to variable rates of hemorrhage.^{1, 2} The role of provocative mesenteric angiography (PMA) has not been well studied likely related to fear of hemorrhagic complications.³ The aim of this study was to review the efficacy and morbidity of PMA in recurrent lower gastrointestinal bleeding. Furthermore, we sought to examine whether in the current, multidisciplinary environment a protocol could be established for the technique.

Methods

After IRB approval, a retrospective review was undertaken of mesenteric angiograms for lower GI bleeding at our institution over a 12-year period (2008 → present) based on CPT code 75726. Of this total, the subset of PMAs was further analyzed and form the study cohort. Exclusion criteria were iatrogenic, surgical, or traumatic causes of lower GI bleeding. The provocation protocol consisted of vasodilation via nitroglycerin, anticoagulation via heparin, and/or thrombolysis via tissue plasminogen activator (tPA). For statistical

analysis, the chi-square test was used for the comparison of percentages and actual numbers. Mean and median values were compared using the *T* test and the Mann–Whitney *U* test respectively. For comparison of categorical variables, Fisher's exact test was employed.

Results

A total of 36 PMAs were performed over the 12-year review period. Of these 36 cases, 16 (44%) had positive PMAs and 20 cases had a negative PMA (56%). There was no significant difference between positive and negative PMA cases with regard to patient demographics, previous history of lower GI bleeding, number of prior admissions, patient morbidity by Charlson comorbidity index, or pre-procedure hematocrit (Table 1). The amount of tPA injected ranged from 0–50 mg. In all positive cases, the bleeding was controlled angiographically via embolization, with no endoscopic or surgical intervention needed during that index hospitalization. No major or minor complications occurred in any patients undergoing PMA. There was a significant difference in recurrent bleeding within 30 days between positive PMA patients (2/16, 12.5%) and negative PMA patients (12/20, 60%, $p=0.01$, Table 1).

Discussion

In this study, provocative angiography allowed identification of bleeding in 44% of cases initially negative on conventional angiography. This led to embolization in 100% of the positive cases with no bleeding complications, no episodes of rebleeding during the index hospitalization, or any ischemic bowel sequelae. Although two patients (12.5%) were readmitted with recurrent bleeding within 30 days, this was significantly less than the 60% who rebled after a

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Table 1 Patient characteristics comparing positive and negative PMA

	Positive PMA (n = 16)	Negative PMA (n = 20)	p value
History of lower GI bleed (%)	13 (81.3)	17 (85.0)	0.63
Number of prior admissions (mean)	1.9	0.8	0.08
Charlson comorbidity index (median)	4	4	0.99
Antiplatelet/anticoagulant therapy (%)	8 (50.0)	8 (40.0)	0.74
Pre-procedure hematocrit (mean)	27.5	28.7	0.39
RBC received (%)	14 (87.5)	12 (60.0)	0.13
RBC units (median)	3.5	2.5	0.15
Re-bleed within 30 days (%)	2 (12.5)	12 (60.0)	0.01
In-hospital mortality	0	0	

PMA, provocative mesenteric angiogram

negative study. The 50-mg maximum dose of tPA described here is greater than most studies suggesting higher doses can be safely given without adverse side effects.

The main limitation of the study is inherent to any retrospective review of a single-institution experience, limiting the ability to minimize existing biases. As such, complication rates may not fully represent true event rates. Furthermore, it is possible that some patients may have been treated at outside institutions with different electronic medical charting in follow-up.

Conclusion

This study, the largest in the literature, showed that PMA is successful in eliciting and treating lower GI bleeding in properly selected patients. Furthermore, the procedure was safe with no bleeding or ischemic bowel complications, even with higher tPA doses. A protocol, a modification of existing society guidelines,⁴ is employed at our institution incorporating PMA in lower GI bleeding (Fig. 1).

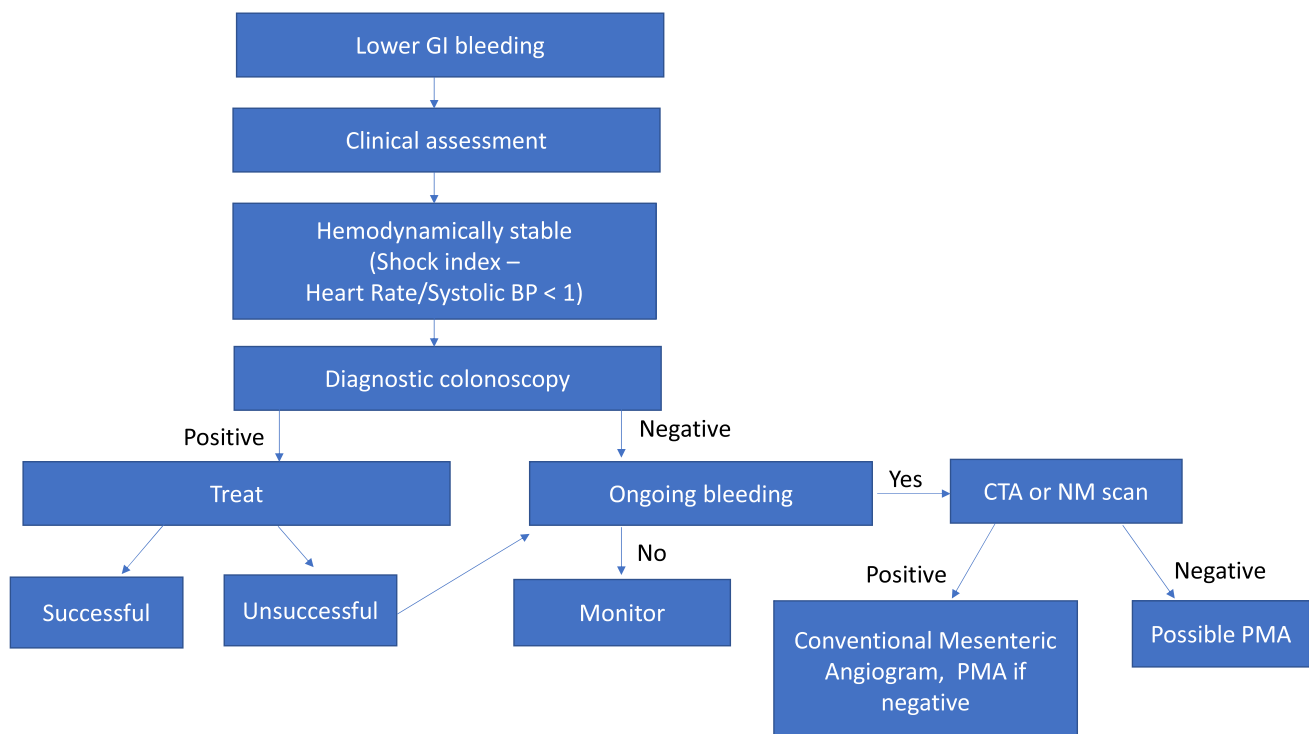


Fig. 1 Proposed protocol incorporating PMA in patients with lower GI bleeding. CTA, computed tomographic angiography; NM, nuclear medicine

Author Contribution All the authors have contributed equally to the conception, design, data acquisition, drafting, and final revisions of the paper.

Declarations

Competing Interests The authors declare no competing interests.

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