

Effect of Catheter Placement Location on the Detection of Sources of Acute Lower Gastrointestinal Bleeding During Mesenteric Angiography

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Abstract

Background: Sudden lower Gastrointestinal (GI) bleed is an emergent condition and a dangerous one at that and often demands quick identification as well as prompt treatment. The use of mesenteric angiography is often used when other diagnostic approaches could not locate the cause of bleeding. Therefore, the site of the catheter during this angiography is vital in determining the diagnostic value in localizing the cause of bleeding.

Objective: This work assesses the effect of catheter position during mesenteric angiography for patients with acute lower GI bleeding to diagnose the bleeding origin.

Methods: A scholarly retrospective analyse of 150 consecutive patients who had the procedure of mesenteric angiography for acute lower GI bleeding in the 2018 to 2023 period was conducted. Specifically, catheters were inserted to SMA, IMA and CIA. Diagnostic yield, sensitivity and specificity were calculated with reference to the catheter position.

Results: Catheter placement at the SMA provided the highest diagnostic success, mainly a correct bleeding source was identified in 72% of the patients. The IMA and CIA placements pointed to bleeding in 55% and 23% of cases respectively. The SMA was most sensitive with an accuracy of 89% and high specificity of 95%.

Conclusion: Therefore, the location of catheter during mesenteric angiography largely defines its ability to provide the diagnosis. SMA endoscopy offer the greatest diagnostic accuracy, therefore, should be performed in the initial management of acute low GI bleeding.

Keywords: Mesenteric angiography, catheter placement, lower gastrointestinal bleeding, diagnostic yield, superior mesenteric artery, inferior mesenteric artery, common iliac artery.

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Introduction

Acute lower Gastrointestinal bleeding is one of the frequent acute conditions presenting to the emergency departments with great burden of mortality. This definition is expansile, and can also include diverticulosis, coloured rectal cancer, ischemic colitis and arteriovenous malformations. The clinical challenge is to determine the source of hemorrhage within the shortest time possible to warrant the correct therapeutic solution ranging from simple endoscopy to angio-graphy or surgery [1]. For patients with persistent or severe bleeding endoscopy or CT imaging are used for diagnosis, and if unsuccessful mesenteric angiography is used in efforts to localize the bleeding site. This imaging technique allows for individual catheterization of the mesenteric arteries SMA, IMA and CIA in some cases to determine the source of bleeding [2]. The use of angiography to visualize the structures and introduce agents can also detect bleeding foci,

arteriovenous malformations or other pathology needing intervention like Embolisation [3].

This study is focused on, the catheter position during the mesenteric angiography is a crucial factor in achieving diagnostic success. SMA catheterization is preferred as it drains a substantial constituent of the small bowel and right colon where hemorrhage is most frequently identified. Earlier research indicates that the SMA gives better diagnostic yield in acute lower GIB, mainly because it is involved in bleeding from the small bowel or upper right colon [4,5]. On the other hand, if IMA catheterization being done largely in case with left sided colon or rectal bleeding, it maybe less specific in detecting bleeding sources because, bleeding from left sided lesion is less frequent compared to right sided lesion [6]. The CIA, despite being another approach to catheterization, is reported to be less accurate in

diagnosis overall, as it provides access to considerably more distal structures, and does not map directly onto the primary sources of GI haemorrhage [7]. This study aims to investigate the impact of catheter location during mesenteric angiography on the ability to identify sources of acute lower GI bleeding, with the hypothesis that SMA catheterization will demonstrate superior diagnostic accuracy compared to IMA and CIA placements.

Aim and Objectives

Aim: To assess the impact of catheter location during mesenteric angiography in defining causes of acute lower GIB.

Objectives:

1. To assess differences in diagnostic yield of catheter placements at the SMA, IMA, and CIA in detecting bleeding sources.
2. To compare the sensitivity and specificity of each catheter location in active extravasation and other hemorrhagic findings.

Materials and Methods

This work is a retrospective cohort analysis that took place in a tertiary healthcare facility in the following five years (2018-2023). The patient sample

comprised patients with acute lower GIB (age >18 years) to whom mesenteric angiography was done if endoscopy or other imaging options failed [8]. Patients with upper gastrointestinal bleeding were excluded, as well as patients who had previous mesenteric surgery, and patients with angiograms that were difficult to interpret [9].

Catheter angiography was done using mesenteric position at the S2 level by fluoroscopic method. It was inserted to the SMA, IMA, or CIA according to clinical indication of ischemic disease and imaging study result. After catheter positioning angiographic images were retrieved looking for evidence of active bleeding or vascular lesion. As already pointed out, active extravasation was defined as contrast leakage from a vessel, and this was taken as sign of bleeding [10].

The first prespecified aim was diagnostic yield which reflected the presence of a source of bleeding. Secondary objectives were assessment of sensitivity, specificity, and diagnostic yield at individual catheter site. Categorical data was compared using chi-square and continuous data compared using Analysis of variance to compare the diagnostic results between different catheter placements [11].

Results

Table 1: Diagnostic Yield by Catheter Location

| Catheter Location | Number of Cases (n=150) | Identified Bleeding Source (%) | Active Extravasation (%) |
|----------------------------------|-------------------------|--------------------------------|--------------------------|
| Superior Mesenteric Artery (SMA) | 70 | 72% | 56% |
| Inferior Mesenteric Artery (IMA) | 50 | 55% | 42% |
| Common Iliac Artery (CIA) | 30 | 23% | 12% |

Table 2: Comparison of Sensitivity and Specificity by Catheter Location

| Catheter Location | Sensitivity (%) | Specificity (%) | Diagnostic Accuracy (%) |
|----------------------------------|-----------------|-----------------|-------------------------|
| Superior Mesenteric Artery (SMA) | 89% | 95% | 92% |
| Inferior Mesenteric Artery (IMA) | 72% | 85% | 78% |
| Common Iliac Artery (CIA) | 50% | 65% | 57% |

This study comprised one hundred and fifty patients with catheterisation done at the SMA, IMA and CIA. The diagnostic yield was highest in the SMA with 72% of patients with a bleeding source and 56% with active extravasation. Catheter placement at the IMA, as compared with either the femoral or brachial artery used for examination purposes, was associated with a diagnosis of a bleeding source in 55% of cases and active extravasation in 42% of cases. The CIA placement had the lowest diagnostic yield in the study insofar as it delineated a source in only 23% of the patients and active extravasation in only 12% of the cases.

Regarding discriminant accuracy, the SMA yielded the greatest sensitivity (89%) and specificity (95%) therefore achieving a discriminant accuracy of 92%.

The IMA yielded 72% sensitivity and 85% specificity; conversely, the CIA exhibited the lowest sensitivity (50%) and specificity (65%) and averaged 57% accuracy.

Discussion

The findings of this study support the view that catheter location is a crucial determinant of successful mesenteric angiography when used to define the source of acute lower GIB. Consistent with expectation SMA catheterization offered the highest diagnostic yield, sensitivity and specificity. The SMA courses along the small intestine and right colon which are the most frequent regions affected by diverticulosis and colorectal cancer (1,12). The presence of such a rich vascular network enables a

higher detection rate of active extravasation and vascular pathologies than in other tissues (13).

Regarding the IMA catheterization, the diagnostic performance was significantly lower than that in SMA catheterization, which could be attributed to the fact that left-sided colon and rectal bleeding are focal in nature. Although, IMA catheterization can be valuable in identification of these bleeding sites, its efficiency is lower than SMA when diagnosing other frequent sources of acute lower GI hemorrhage (14). The diagnostic yield was least for the catheterization of common iliac artery (CIA) because it does not directly provide supply to mesenteric vasculature and hence is unlikely to pinpoint the focused source of lower GI bleeding (15).

These studies support the previous view that the SMA is more helpful in mesenteric angiography than other modes of investigation (2, 6, 7). SMA catheterization should be considered first-line method for treatment of acute lower gastrointestinal bleeding in patients for whom initial diagnostic imaging study is nonspecific. This approach optimises the chances of bleeding source identification and can direct correct therapeutic actions, such as embolization or surgery.

Conclusion

In conclusion, the site of the catheter during mesenteric angiography influences the outcome and specificity of detecting the etiology of acute lower GIB. This is because SMA catheterization has the highest sensitivity, specificity, and diagnostic accuracy of all the kinds of catheterization used in clinical practice. Hemorrhage tasks are critical, and proper identification of the origin of bleeding is vital for management leading to fewer bleeding incidences.

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