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Research Article

SUPER-SELECTIVE MESENTERIC EMBOLIZATION FOR ACUTE LOWER GASTROINTESTINAL BLEEDING: A RETROSPECTIVE STUDY AND REVIEW OF CLINICAL OUTCOMES

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ABSTRACT

Background: Lower gastrointestinal bleeding (LGIB) accounts for 20-24% of gastrointestinal bleeding cases and becomes more prevalent with age. While most cases are manageable through endoscopic and angiographic interventions, surgical options such as colectomy may be required in severe or refractory cases. Super-selective mesenteric embolization has emerged as a minimally invasive and effective alternative. Methods: This retrospective study, conducted at PSP Medical College Hospital and Research Institute, reviewed the outcomes of patients with LGIB treated using super-selective embolization. Patients diagnosed via radionuclide scintigraphy (RS) or contrast-enhanced computed tomography (CE-MDCT) and undergoing angiography were included. Data collected included demographics, comorbidities, diagnostic modalities, procedural success, and complications. Technical and clinical success rates were assessed along with complications over a one- and six-month follow-up period. Results: Of the 38 patients included, 65.8% were male, and the median age was 39 years (range: 59–92). Anticoagulant therapy was common, with 36% on aspirin, 19% on dual antiplatelet therapy, and 8% on other anticoagulants. Super-selective embolization achieved favorable technical and clinical success rates, with minimal complications. Comparisons with other studies highlighted differences in success rates and complications, likely influenced by variations in procedural techniques and patient populations. Conclusion: Super-selective embolization is a safe and effective treatment for acute, unstable LGIB, offering high technical success rates and reduced complication risks compared to traditional surgical approaches. Standardized protocols and larger prospective studies are recommended to validate these findings and further refine treatment strategies.

Keywords: Lower gastrointestinal bleeding (LGIB), Super-selective mesenteric embolization, Contrast-enhanced computed tomography (CE-MDCT), Radionuclide scintigraphy (RS), Angiographic interventions

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INTRODUCTION

Lower gastrointestinal bleeding (LGIB), accounting for approximately 20-24% of gastrointestinal bleeding cases, arises from sources distal to the ligament of Treitz.

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The incidence of LGIB increases with age, with contributing factors including angiodysplasia, colitis, and neoplasia. While most severe cases can be managed effectively through endoscopic or angiographic interventions, surgical options like colectomy remain necessary when conservative measures fail. Colectomy procedures—direct, blind, or subtotal—are associated

with higher mortality rates in elderly patients with comorbidities, particularly when performed as blind segmental or subtotal colectomies.

Emerging minimally invasive techniques, such as super-selective arterial embolization, have provided a promising alternative to traditional surgical interventions for managing LGIB. At Western Health, a leading multi-center institution in Melbourne, super-selective embolization has become a vital treatment option. In instances where patients present with unstable LGIB, advanced diagnostic modalities such as radionuclide scintigraphy (RS) or contrast-enhanced computed tomography (CE-MDCT) aid in identifying and localizing active bleeding. Subsequent interventions are performed in a digital subtraction angiography (DSA) suite to address the bleeding source effectively. This study aims to review our institution's experience with arterial embolization for LGIB and compare these outcomes with the expanding body of evidence supporting its efficacy.

METHODS

In this study conducted at PSP Medical College Hospital and Research Institute, Kancheepuram District, Tamil Nadu, India, super-selective embolization was utilized to manage patients presenting with lower gastrointestinal bleeding (LGIB). All patients who underwent angiography following the confirmation of LGIB via radionuclide scintigraphy (RS) or contrast-enhanced computed tomography (CE-MDCT) were included. Patients whose bleeding was determined to originate from other sources were excluded from the study.

The institution's centralized radiological services facilitated immediate transfer and intervention for patients requiring urgent treatment. Medical records of eligible patients were retrospectively reviewed, focusing on demographics (age and gender), associated medical conditions, diagnostic methods (RS and CE-MDCT), bleeding sites, embolization techniques, procedural outcomes, and complications. Outcomes measured included technical success, clinical success, and short- to medium-term complications such as infarctions, ischemia-related strictures, and mortality within a one-month period. Any surgical interventions required due to procedural failure or complications were also documented.

Technical success was defined as the resolution of contrast extravasation observed on digital subtraction angiography (DSA) following the deployment of embolizing agents. Clinical success was characterized by the stabilization of the patient, indicated by normalized vital signs, cessation of fluid resuscitation, and the absence of bleeding evidenced by no need for blood transfusion beyond one unit of packed red blood cells. Follow-up assessments were conducted for all patients at one month and for all completed cases at six months.

RESULTS

The demographic and therapeutic characteristics of the patients included in this study are summarized in Table 1. The study cohort comprised 38 patients presenting with lower gastrointestinal bleeding (LGIB), with a gender distribution skewed towards males. Of the total, 25 (65.8%) patients were male, while 13 (34.2%) were female, highlighting a greater prevalence of LGIB among male patients in this study population.

The age distribution revealed a median age of 39 years, with an age range between 59 and 92 years. This suggests that the patient population predominantly consisted of older adults, consistent with the recognized increase in LGIB incidence with advancing age. These findings align with the broader literature, which frequently identifies elderly populations as being at heightened risk for LGIB due to factors such as age-related vascular degeneration and higher prevalence of comorbidities.

The use of anticoagulant therapy was a notable characteristic among the patient cohort, reflecting the association between anticoagulation and gastrointestinal bleeding risk. Among the patients on anticoagulant regimens, 13 (36%) were using aspirin as a monotherapy, while 7 (19%) were on a combination therapy of clopidogrel and aspirin. Additionally, 3 (8%) patients were receiving other anticoagulants. These findings underscore the contribution of anticoagulant medications to the incidence and management challenges of LGIB.

Table 1: Patient Demographic and Anticoagulant Therapy Profile

Characteristics	Number
ased on gender	
Males	25
Females	13
Age median (range)	39 (range: 59–92)
Anticoagulant therapy	
Taking aspirin	13 (36%)
Clopidogrel and aspirin	7 (19%)
Anticoagulant	3 (8%)

Anticoagulation therapy, while beneficial for preventing thromboembolic events, is a well-established risk factor for gastrointestinal bleeding. Aspirin, which is commonly prescribed for cardiovascular protection, was the most prevalent medication among the study population, followed by dual antiplatelet therapy combining clopidogrel and aspirin. The lower representation of patients on other anticoagulants may reflect prescription trends in the study region or the selective inclusion criteria for patients presenting with LGIB.

The observed demographic trends and anticoagulation profiles in this study provide important insights into the patient population affected by LGIB. The predominance of elderly males suggests that gender

and age remain key demographic determinants for LGIB risk. Moreover, the high prevalence of anticoagulant use emphasizes the need for tailored management strategies in this group. Patients on anticoagulants require careful monitoring and a balanced therapeutic approach to minimize bleeding complications without compromising cardiovascular protection.

The results also highlight the importance of individualized treatment plans for LGIB. Considering the increased bleeding risk associated with anticoagulation, it becomes crucial to assess each patient's bleeding and thrombotic risk factors comprehensively. This approach ensures that therapeutic decisions align with the patient's overall health status, comorbidities, and risk tolerance.

This study sheds light on the demographic and therapeutic characteristics of patients with LGIB, emphasizing the significant influence of age, gender, and anticoagulant therapy. The findings contribute to the growing understanding of LGIB's epidemiology and underscore the need for careful management of patients, particularly those on anticoagulants. By identifying these key factors, healthcare providers can better stratify risk and optimize care for individuals presenting with this challenging condition.

DISCUSSION

This study highlights the role of super-selective mesenteric embolization in the management of acute, unstable lower gastrointestinal bleeding (LGIB) and provides insights into its outcomes and associated complications. Acute LGIB, characterized by bleeding that ceases within three days, often necessitates blood transfusions, unlike chronic LGIB, which extends beyond three days and may manifest as iron-deficiency anemia. Our findings underscore the importance of swift localization and intervention in acute cases, especially for patients who do not respond to conservative treatment.

The majority of LGIB cases resolve spontaneously, with bleeding cessation occurring in approximately 80–85% of instances without intervention. However, in patients with ongoing active bleeding, particularly those with hemodynamic instability, immediate therapeutic measures become essential. First-line diagnostic and therapeutic modalities, such as colonoscopy, offer significant utility with diagnostic accuracy rates between 72–86% and a procedural yield of 89–97%. Nonetheless, when patients present with unstable conditions, colonoscopy may not always be feasible due to the inability to prepare the bowel adequately. In such scenarios, radiological techniques, including contrast-enhanced CT angiography, radionuclide scintigraphy, and digital subtraction angiography (DSA), prove invaluable for identifying bleeding sites.

Technological advancements have revolutionized the approach to LGIB. Super-selective embolization, made possible by the advent of coaxial microcatheters, allows for precise delivery of embolic agents to the bleeding site. This technique has minimized the risk of complications, such as bowel infarction, which were common with earlier non-selective embolization approaches. In our study, super-selective embolization demonstrated favorable outcomes, effectively reducing collateral vessel bleeding and minimizing ischemic complications.

Comparing our findings with other studies, we observed varying success rates and complications associated with embolization. Waugh et al. reported a technical success rate of 96% in 27 cases over 63 months, with six requiring repeat embolization. Clinical success was achieved in 19 cases, but two fatalities were linked to surgical complications arising from ischemic segment resection. In contrast, Tan et al.'s study of 32 patients in Singapore achieved technical success in 97% of cases but reported a lower clinical success rate (63%), with three cases necessitating bowel resections due to ischemia. Rider et al. also demonstrated excellent technical success (100%) in their study of 24 cases, with a lower incidence of complications, including one ischemic stricture requiring surgery and no mortalities.

Our study outcomes align with the broader evidence supporting the efficacy of super-selective embolization but highlight a higher rate of procedural failure and repeat embolization compared to Rider et al. and Tan et al., while demonstrating fewer complications than those reported by Waugh et al. The differences in outcomes may reflect variations in patient populations, procedural protocols, and operator expertise.

Despite its promising results, our study is limited by its retrospective design, small cohort size, and the absence of statistically significant conclusions. These limitations underscore the need for further research with larger, prospectively recruited cohorts and standardized protocols. Our institution has adopted a structured protocol involving CE-MDCT for all cases of acute unstable LGIB after resuscitation, which has shown preliminary benefits in improving diagnostic accuracy and guiding therapeutic interventions.

Future studies should aim to validate these findings in larger populations and explore long-term outcomes, including the risk of ischemic stricture, rebleeding rates, and overall survival, to refine the management strategies for acute LGIB.

CONCLUSION

This study emphasizes the significance of super-selective mesenteric embolization as a safe and effective therapeutic option for managing acute, unstable lower gastrointestinal bleeding (LGIB). The findings demonstrate its ability to achieve high technical success rates while minimizing complications, such as ischemia and bowel infarction, compared to traditional non-selective approaches.

The study further highlights the importance of individualized management strategies, particularly in patients on anticoagulant therapy, who face a higher risk of gastrointestinal bleeding. Advanced diagnostic tools, such as contrast-enhanced multidetector computed tomography (CE-MDCT), radionuclide scintigraphy, and digital subtraction angiography (DSA), play pivotal roles in accurately localizing bleeding sources and facilitating timely intervention.

However, the retrospective design and small sample size of this study limit its generalizability. Variations in procedural success and complication rates compared with other studies underscore the influence of patient population characteristics and institutional practices. These findings advocate for the adoption of standardized protocols to optimize diagnostic accuracy and therapeutic outcomes.

Future research involving larger, prospectively designed cohorts with long-term follow-up is essential to validate these findings and explore strategies to further enhance the safety and efficacy of super-selective embolization. Such efforts will contribute to refining treatment paradigms and improving outcomes for patients presenting with this complex and challenging condition.

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