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Endovascular Management of Acute Gastrointestinal Bleeding: A Single Center Study of Effectiveness and Clinical Outcomes

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ABSTRACT

Objective: To evaluate the clinical as well as technical success of endovascular management in patients of gastrointestinal bleeding.

Study Design: Cross-sectional study.

Place and Duration of Study: Armed Forces Institute of Radiology and Imaging, Rawalpindi, Pakistan, from Feb 2023 to Aug 2023.

Methodology: A total of 40 patients were enrolled with gastrointestinal bleeding treated with unsuccessful endoscopic management or in which endoscopic management was not possible. Study data was recorded on a predesigned proforma. This procedure involved the injection of small particles or coils into the blood vessels to block blood flow to the tumor, a minimally invasive alternative to surgery to control bleeding or shrink tumors.

Results: Duration between angiography and clinical manifestations was 5.92±1.22 days. The pathological angiography was found in 72.5% of patients and embolization in 92.5% of patients. Total technical success was found in 90.0% and clinical success was found in 87.5%. Further, the re-bleeding was noted among 22.5% of patients. Re-bleeding was higher in those having two or more co morbidities.The overall mortality was 27.5%, higher in re-bleeding patients.

Conclusion: Endovascular management is a highly safe and effective treatment option for gastrointestinal bleeding that cannot be treated endoscopically. This method has a high technical success rate and a low level of complications, making it suitable for high-risk patients.

Keywords: Angiography, Embolization, Endovascular management, Gastrointestinal bleeding.

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INTRODUCTION

Gastrointestinal hemorrhage or bleeding is a critical medical condition that requires urgent medical management,[1] as delay in management may cause morbidity or mortality.[2] Esophagitis, peptic ulcers disease, gastritis, inflammatory bowel disease, diverticulitis and tumors can cause of gastrointestinal hemorrhage,[3] with patients usually presenting with vomiting, abdominal pain, bloody diarrhea or black stool.[4] Diagnosis typically involves imaging tests such as endoscopy, colonoscopy, or angiography and computed tomography angiography (CTA). Management of GI bleed can include medical, surgical or endoscopic procedures,[5] while endovascular management involves the use of angiography and selective embolization,[6] as angiography allows for the identification of the bleeding source, and selective embolization can achieve hemostasis by blocking the blood flow to the bleeding site.[7] The main advantage of endovascular management is that it is minimally invasive and can be performed quickly, even in unstable patients with a high success rate, ranging from 70% to 100%.[8] Transcatheter arterial embolization (TAE) is a minimally invasive technique that involves the use of microcatheters and embolic agents to achieve hemostasis or occlusion of blood vessels.[9] but is often used as a last resort in patients who cannot achieve hemodynamic stability or whose endoscopy is ineffective or unfeasible after surgery.[10] The study was designed to provide a comprehensive assessment of the efficacy and clinical outcomes of endovascular management in acute gastrointestinal bleeding within a specific medical center, with the ultimate goal of improving patient care and informing future research and clinical practices.

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METHODOLOGY

This study was conducted at Armed Forces Institute of Radiology and Imaging (AFIRI), Rawalpindi, Pakistan from February to August 2023 lasting 6 months duration. Permission was obtained from hospital board of Ethics Review Committee via

IERB Approval Certificate No. 013. Sample size was calculated by using openepi.com, an online sample size calculator with 95% confidence interval, 80% power of study and 88.5% [11] clinical success.

Inclusion Criteria: Patients of either gender, with age ranging from 20 to 60 years, who presented to Outpatient Department with gastrointestinal bleeding treated with unsuccessful endoscopic management or in which endoscopic management was done.

Exclusion Criteria: Pregnant females were excluded from the study.

Splanchnic angiography is a diagnostic procedure used to examine the blood vessels supplying the abdominal organs. A 6F introducer was used to perform the procedure. Deviation of procedure towards trans-radial or trans-jugular method is possible in cases of advance tumors of rectum. The coaxial system with a guiding catheter was used for embolization. This procedure involves the injection of small particles or coils into the blood vessels to block blood flow to the tumor. It is a minimally invasive alternative to surgery and can be used to control bleeding or shrink tumors. Embolization involves the use of a microcatheter to deliver embolic materials to the target site, which can include coils, liquid embolic agents, microparticles, or Spongostan / Gel foam, to ensure optimal positioning of the microcatheter, operators typically follow a set of guidelines that reflect their individual preferences and expertise. There are two ways of success rate assessment, one is technical success involving determination of success by occlusion of pseudoaneurysm disappearance of embolized pathology and extravasation at completion of embolization process while clinical success is assessed by absence of initial and original bleeding symptoms at completion of endovascular procedure. Other variables like recurrence were labelled as fall of hemoglobin and prolonged hospital stay and surgical involvement are complications. Statistical Package for Social Sciences (SPSS) version 23 was used for analysis purpose, like calculation of Mean±SD of numerical values like age and pre-procedure hemoglobin. Frequency and percentages were calculated for categorical variables like gender, malignancy, hypertension, clinical success and technical success. difference between two numeric variables.

RESULTS

We included 40 patients in this study, of which 27(67.5%) were males and 13(32.5%) were females. The mean age of the patients was 58.47±9.74 years. The mean pre-procedural hemoglobin of the patents was 10.65±1.19 g/dL, most common co-morbidity was hypertension, malignancy and coagulopathy with 25(62.5%), 17(42.5%) and 7(17.5%) patients, respectively and enterorrhagia was the most common clinical presentation with 15(37.5%) patients as shown in Table-I.

Table-I: Demographic and Baseline Characteristics of Patients (n=40)

Variable	n (%)
Gender	
Male	27(67.5%)
Female	13(32.5%)
Age (years)	58.47±9.74
Pre-procedural Hb (g/L)	10.65±1.19 g/dL
Comorbidities	
Malignancy	17(42.5%)
Hypertension	25(62.5%)
Coronary artery disease	13(32.5%)
Heart failure	8(20.0%)
Arrhythmia	1(2.5%)
Respiratory failure	1(2.5%)
Severe Diabetes mellitus	3(7.5%)
Peripheral arterial disease	2(5.0%)
Cirrhosis	1(2.5%)
Coagulopathy	7(17.5%)
Clinical presentation	
Enterorrhagia	15(37.5%)
Hematemesis	9(22.5%)
Melena	7(17.5%)
Melena and Hematemesis	5(12.5%)
Enterorrhagia followed by melena	4(10.0%)

Etiology of gastrointestinal bleeding duodenal ulcer and malignancy was noted in 9(22.5%) and 11(27.5%) patients, with the distribution of iatrogenic, embolic arteries and embolic materials in the patients shown in Table-II.

Table-II: Gastrointestinal Bleed Etiology and Treated Arteries (n=40)

Variable	n (%)
Etiology	
Duodenal ulcer	9(22.5%)
Malignancy	11(27.5%)
Iatrogenic	
Endoscopic drainage	5(12.5%)
Surgery	9(22.5%)
Pancreatic pseudoaneurysm	4(10.0%)
Jejunal dysplasia	3(7.5%)
Mallory–Weiss syndrome	2(5.0%)
Embolized arteries	
Gastroduodenal artery	7(17.5%)
Left gastric artery	5(12.5%)
Superior pancreaticoduodenal artery	4(10.0%)
Inferior pancreaticoduodenal artery	4(10.0%)
Hepatic artery	5(12.5%)
Rectal artery	4(10.0%)
SMA Jejunal branches	5(12.5%)
Splenic artery	3(7.5%)
Great pancreatic artery	2(5.0%)
Embolic materials	
Coils	23(57.5%)
liquid embolic agent (LEA)	6(15.0%)
Microparticles	5(12.5%)
Spongostan	2(5.0%)
Coils + microparticles	1(2.5%)
Coils + LEA	1(2.5%)
Microparticles + LEA	1(2.5%)

Duration between angiography and clinical manifestations was 5.92±1.22 days and pathological angiographic was found in 29(72.5%) patients, whereas, embolization was performed in 37(92.5%) patients. Total technical success was found in 36(90.0%) patients and clinical success was found in 35(87.5%) patients. Further, the re-bleeding was noted in 9(22.5%) patients where re-bleeding was higher in patients having two or more co-morbidities. The overall mortality was 11(27.5%) patients and mortality was higher in re-bleeding patients as shown in Table-III.

Table-III: End Results of Patients (n=40)

Variable	n(%)
Pathological angiography	29(72.5%)
Embolization	37(92.5%)
Technical success	36(90.0%)
Clinical success	35(87.5%)
Re-bleeding	9(22.5%)
Mortality	11(27.5%)

DISCUSSION

Hemodynamically unstable patients with upper gastrointestinal bleeding require immediate attention and management in the intensive care unit (ICU) to stabilize their condition, making TAE a preferred treatment option for many patients who require endovascular or surgical intervention.[11]. Once the patient is stable, an endoscopic examination can be performed to identify the source of bleeding and provide appropriate treatment.[12] Upper gastrointestinal bleeding has a high therapeutic success rate with endoscopic interventions, such as injection therapy, thermal therapy, and mechanical therapy, which can effectively control bleeding and prevent further complications.[13] In one study,[14] clinical success was 88.5% and 30-day mortality was 22%, while another study,[15] reported that hemodynamic instability may pose a risk during the procedure. Endovascular treatment can be considered when the source of bleeding cannot be located using endoscopy and may also be recommended in cases of recurrent bleeding despite a second endoscopic treatment,[16] but this treatment involves the use of coils or Spongostan as embolic material to achieve immediate hemostasis, therefore, the use of LEAs (liquid embolic agents) is preferred as these have been proven successful in treating GIT bleeding, particularly in hemodynamically unstable patients and those with coagulopathy.[17] One study,[18] reported empirical or blind embolization as widely accepted for treating such cases, and published results do not differ from embolization of proven hemorrhage. Based on another study,[19] the technical success rate of using TAE in upper gastrointestinal bleeding was 93%, with a clinical success rate of 67%, which suggests that while TAE can effectively stop bleeding in the short term, there is still a significant risk of re-bleeding and mortality. Although ischemic complications can occur in 4-6% of cases, the benefits of embolization far outweigh the risks in properly selected patients.[20,21] Overall, embolization is a safe and effective treatment option for lower GIT bleeding.

LIMITATIONS OF STUDY

The focus solely on patients for whom endoscopy was unsuccessful or not possible also introduces a selection bias, as the results may not be applicable to all patients with gastrointestinal bleeding. Furthermore, the lack of long-term follow-up data means the durability of the treatment and long-term complication rates remain unknown. Finally, the reported high mortality rate (27.5%), underscores that the study population was high-risk, and the outcomes may not reflect those in a broader, less critical patient group.

CONCLUSION

Endovascular management is a highly safe and effective treatment option for gastrointestinal bleeding that cannot be treated endoscopically as this method has a high technical success rate and a low level of complications, making it suitable for high-risk patients while mortality in these patients often depends on the occurrence of early recurrent hemorrhage and the presence of comorbidities.

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Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

MH & MAS: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

MUA & GA: Conception, data analysis, drafting the manuscript, approval of the final version to be published.

RRH & SA: Data acquisition, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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