Saudi Journal of Radiology
July 2025 4(1), 40–56
Original Article

THE OUTCOME OF CONSERVATIVE MANAGEMENT AND ENDOVASCULAR EMBOLIZATION FOR SPONTANEOUS INTRA-ABDOMINAL HEMORRHAGE: A RETROSPECTIVE STUDY OF CASES FROM 2016 TO 2022

Abdullah AlJohani[1], Abdulaziz AlTaweel[1], Mustafa Owaidah[2], Faisal Joueidi[2]✉, Hirdah Tauqir Rana[2], Ahmad Siddiqi[2], Ahmad Joueidi[2], Suliman Alrajeh[3], Tauqir Rana[1]

[1]Department of Radiology, King Faisal Specialist Hospital and Research Center, Riyadh, Saudi Arabia

[2]College of Medicine, Alfaisal University, Riyadh 11533, Saudi Arabia

[3]Department of Radiology, Security Forces Hospital, Riyadh, Saudi Arabia.

ABSTRACT

Aim: This retrospective study aimed to evaluate the effectiveness of different management strategies for such patients and explore the clinical outcomes related to these treatments.

Methods: This was a retrospective study that included a total of 33 patients who presented with spontaneous intraabdominal hemorrhage at a tertiary care center. The patients' demographics, clinical characteristics, laboratory findings, treatment modalities (conservative management, endovascular embolization), and outcomes were evaluated. Comparative statistical analyses were performed to assess the impact of treatment approaches on patient outcomes.

Results: The majority of patients were female (72.7%) and of Saudi nationality (72.7%). Warfarin (21.2%) and heparin (21.2%) were the most frequently prescribed anticoagulants. The study demonstrated a significant postoperative reduction in systolic blood pressure ($p = 0.031$), indicating the effectiveness of timely intervention. Furthermore, the conservative management approach showed significant preoperative and postoperative improvements in systolic blood pressure, hemoglobin levels, and platelet counts compared to endovascular embolization. Blood transfusion volumes were significantly lower in the conservative management group ($p = 0.002$). The presence of rebleeding postoperatively was borderline significant ($p = 0.074$), favoring patients undergoing endovascular embolization.

Conclusion: Effective management of spontaneous intraabdominal hemorrhage in anticoagulated and antiplatelet-treated patients is a multifaceted challenge.

Received 15 March 2025
Revised 23 June 2025
Accepted 25 June 2025
Published 30 July 2025

Corresponding Author
Faisal Joueidi, College of Medicine, Alfaisal University, Riyadh 11533, Saudi Arabia.

eISSN: 1658-8959

The study's results emphasize the importance of timely intervention, hemodynamic stability, and individualized treatment approaches. Further research is needed to validate and expand upon these findings, ultimately improving patient outcomes in this clinical scenario.

الخلاصة

الهدف: تهدف هذه الدراسة الاسترجاعية إلى تقييم فعالية استراتيجيات العلاج المختلفة لدى هؤلاء .المرضى واستكشاف النتائج السريرية المرتبطة بهذه العلاجات

والطُرُق: تم اجراء دراسة استرجاعية شملت 33 مريضًا تم تشخيصهم بنزيف تلقائي داخل البطن في مركز رعاية ثالثية. تم تقييم الخصائص الديموغرافية والسريرية للمرضى، والنتائج المخبرية، وأنماط العلاج (العلاج التحفظي، والانصمام داخل الأوعية)، والنتائج السريرية. أُجريت تحليلات إحصائية .مقارنة لتقييم تأثير أساليب العلاج على النتائج

النتائج: كانت الغالبية العظمى من المرضى من الإناث (72.7%) ومن الجنسية السعودية (72.7%).كان الوارفارين والهيبارين هما أكثر مضادات التخثر وصفًا (21.2% لكلٍ منهما). أظهرت الدراسة انخفاضًا كبيرًا في ضغط الدم الانقباضي مما يشير إلى فعالية التدخل في الوقت المناسب. كما أظهر العلاج التحفظي ،(p = 0.031 القيمة الاحتمالية) بعد الجراحة تحسنًا كبيرًا في ضغط الدم الانقباضي ومستويات الهيموغلوبين وعدد الصفائح الدموية قبل وبعد التدخل، مقارنةً بالانصمام أما عودة النزيف بعد .(p = 0.002) داخل الأوعية. كانت كميات نقل الدم أقل بكثير في مجموعة العلاج التحفظي لصالح المرضى الذين خضعوا .للانصمام داخل الأوعية ،(p = 0.074) الجراحة فكانت ذات دلالة إحصائية حدودية

الاستنتاج: يمثل التدبير العلاجي الفعال للنزيف التلقائي داخل البطن لدى المرضى الذين يتلقون مضادات التخثر ومضادات الصفائح تحديًا متعدد الأبعاد. وتُبرز نتائج الدراسة أهمية التدخل المبكر، واستقرار الديناميكا الدموية، واتباع نهج علاجي فردي لكل حالة. هناك حاجة لمزيد من الأبحاث لتأكيد هذه النتائج .وتوسيعها بما يُسهم في تحسين المخرجات السريرية في مثل هذه الحالات

Keywords: Intraabdominal Haemorrhage, Endovascular Embolization, Anticoagulant therapy, Conservative management, Hemodynamic stability, Blood transfusion

1. INTRODUCTION

Spontaneous intraabdominal hemorrhage (IAH) is a critical medical condition that demands swift recognition and intervention [1]. While it can occur due to various underlying causes, such as trauma or surgical complications, one particularly challenging subset of patients presents with spontaneous IAH related to anticoagulant and antiplatelet therapy [[1][2]]. These individuals are often at increased risk of hemorrhage due to the pharmacological effects of their medications, making the management of their condition a complex clinical challenge [[3], [4]]. Anticoagulants, such as warfarin and heparin, and antiplatelet agents, including aspirin and clopidogrel, are commonly prescribed for a range of medical conditions,

such as atrial fibrillation, deep vein thrombosis, and coronary artery disease [[5], [6]]. The benefits of these medications in reducing the risk of thromboembolic events are well-established [7]. However, the very same mechanisms that reduce clot formation also predispose these patients to bleeding complications [1]. When spontaneous IAH occurs in this population, the treating physician faces a delicate balancing act: managing the life-threatening hemorrhage while maintaining the patient's anticoagulant or antiplatelet therapy to prevent thrombotic events [8].

The underlying mechanisms leading to spontaneous IAH in patients receiving anticoagulants and antiplatelets can vary. Often, the condition is linked to hemorrhagic events that frequently occur in elderly patients, affecting the gastrointestinal tract and retroperitoneal area, and usually manifesting with abdominal pain and skin ecchymosis [[9], [10]]. Another mechanism includes rupture of vessels within the rectus sheath, particularly the inferior or superior epigastric arteries, or their branches [[1], [8]]. This condition, known as spontaneous rectus sheath hematoma (RSH), is characterized by the accumulation of blood within the muscular sheath [11]. Patients may present with abdominal pain, palpable masses, or other clinical symptoms, making accurate and timely diagnosis crucial [12].

Spontaneous IAH carries significant morbidity and mortality [1]. Complications can range from hypovolemic shock and increased intraabdominal pressure to muscle necrosis and, in severe cases, even death [3]. Therefore, the management of these patients requires careful consideration of treatment options, weighing the risks and benefits of different approaches [8].

This retrospective cohort study aims to comprehensively evaluate the management strategies and clinical outcomes of patients diagnosed with spontaneous IAH related to anticoagulants and antiplatelets.

2. MATERIALS AND METHODS

2.1 Study Design and Setting

This is a descriptive retrospective cohort study that was conducted at the Radiology Department of King Faisal Specialist Hospital and Research Centre (KFSH&RC) in Riyadh, Saudi Arabia, and included patients with spontaneous intraabdominal hematoma during the period from 2016 to 2022. Data were collected based on patients' demographics, pre- and postoperative laboratory investigations, the type of anticoagulant/antiplatelet used, and the primary treatment method (conservative or

embolization). The main objective of this study is to comprehensively evaluate the management strategies and clinical outcomes of patients diagnosed with spontaneous IAH related to anticoagulants and antiplatelets.

2.2 Study Population

2.2.1 Inclusion Criteria

The study included patients who were diagnosed with spontaneous intraabdominal hemorrhage and were receiving anticoagulant or antiplatelet therapy. Patients of all genders and nationalities were considered.

2.2.2 Exclusion Criteria

Patients were excluded from the study if they had postoperative hemorrhage, traumatic hemorrhage, or were not on anticoagulant or antiplatelet therapy.

2.3 Data Collection

2.3.1 Data Source

The study used data obtained from the hospital's database system and Picture Archiving and Communication System (PACS).

2.3.2 Data Collection Period

Data were collected from January 2016 to December 2022.

2.3.3 Data Variables

The following data variables were collected:

1. **Patient Characteristics:** Demographic information, including age, gender, nationality, smoking status, eGFR (estimated glomerular filtration rate), and COVID-19 status (before COVID-19 (2018), negative, or positive).
2. **Clinical Presentation:** Blood transfusion volume within the first 24 hours, presence of active bleeding on CT scan, and primary treatment method (conservative or embolization).
3. **Preoperative Investigations:** Average systolic and diastolic blood pressure (mmHg), heart rate (bpm), hemoglobin (Hb) level (g/L), platelet level (x10^9/L), and international normalized ratio (INR). Details of

anticoagulation and antiplatelet therapy were also recorded, including the specific agents used.

4. **Postoperative Investigations:** The same parameters as preoperative investigations were collected postoperatively.

2.4 Ethical Considerations

The research project was conducted in accordance with the policies of the Research Advisory Committee (RAC) at KFSH&RC and the laws of the Kingdom of Saudi Arabia.

2.5 Data Security

Data collected and related research files were securely stored in the Radiology Department, following the guidelines of KFSH&RC. Patient confidentiality and privacy were strictly maintained throughout the study.

2.6 Data Analysis

Data analysis was performed using appropriate statistical software. Continuous variables were presented as means ± standard deviations (SD), while categorical variables were presented as counts and percentages. Comparisons between groups were made using t-tests for continuous variables and chi-squared tests for categorical variables.

3. RESULTS

A total of 33 patients with a mean age of 56 years were diagnosed with spontaneous hematoma and underwent either conservative or endovascular embolization. The patients were divided into two groups based on their baseline characteristics, pre- and postoperative laboratory investigations, the use of anticoagulant and/or antiplatelet medication, and the application of the endovascular embolization approach. Table 1 shows the gender distribution: 72.7% were female, while 27.3% were male. Most patients were Saudi nationals (72.7%), and 97% were non-smokers. Approximately 15.2% had an eGFR less than 30, while 84.8% did not. A notable portion of patients (18.2%) had a positive COVID-19 status from 2020 onwards.

In the context of blood transfusion within the first 24 hours, 36.4% of patients received it, while 63.6% did not. Active bleeding was observed on a CT scan in 33.3% of cases, while 66.7% showed no active bleeding. Regarding the primary treatment method, 72.7% of patients were managed conservatively, while 27.3% underwent embolization. These baseline characteristics provide a comprehensive overview of the patient cohort, which is essential for understanding the study population.

Table 2 presents preoperative investigations and therapy. The average systolic blood pressure was 128.18 mmHg with a standard deviation of 21.3, while the average diastolic blood pressure was 69.42 mmHg with a standard deviation of 12.86. The mean heart rate was 91 bpm. The average hemoglobin (Hb) level was 96 g/L, and the mean platelet level was 210.4 × 10^9/L. The international normalized ratio (INR) had a mean value of 1.6 with a standard deviation of 0.7.

Regarding anticoagulation therapy, the distribution showed that 30.3% of patients were on prophylactic enoxaparin, 6.1% on therapeutic enoxaparin, 9.1% on DOAC (Direct Oral Anticoagulant), 21.2% on warfarin, 21.2% on heparin, and 6.1% were on more than one of these agents. Approximately 30.3% of patients were not on any anticoagulation therapy. Antiplatelet therapy, which included aspirin and/or clopidogrel, was administered to 30.3% of patients, while 69.7% were not on antiplatelet therapy. The distribution of antihypertensive therapy showed that 18.2% were on a single agent, 27.3% on more than one agent, and 54.5% were not on any antihypertensive therapy.

Table 3 provides postoperative investigations and therapy. The average systolic blood pressure postoperatively was 117.45 mmHg with a standard deviation of 25.13, and the average diastolic blood pressure was 69.21 mmHg with a standard deviation of 11.78. The mean heart rate postoperatively was 92 bpm. The average hemoglobin (Hb) level postoperatively was 97 g/L, and the mean platelet level was 190 × 10^9/L. The international normalized ratio (INR) had a mean value of 1.4 with a standard deviation of 0.3.

Regarding postoperative anticoagulation therapy, 3% of patients were on prophylactic enoxaparin, 3% on therapeutic enoxaparin, 12.1% on DOAC, 12.1% on warfarin, and 27.3% on heparin. 12.1% were on more than one of these agents, while 30.3% were not on any anticoagulation therapy. Antiplatelet therapy was administered to 18.2% of patients postoperatively, while 81.8% were not on antiplatelet therapy. The distribution of antihypertensive therapy showed that 9.1% were on a single agent, 39.4% on more than one agent, and 51.5% were not on any antihypertensive therapy.

Table 4 presents the outcomes of treatment. Rebleeding postoperatively was observed in 15.2% of patients, while 84.8% did not experience rebleeding. Regarding mortality, 15.2% of patients died postoperatively, while 84.8% survived. These outcomes are critical in evaluating the effectiveness of the different treatment approaches and provide insights into patient prognosis.

Table 5 presents a pairwise comparison of preoperative and postoperative investigations. The study found that the average systolic blood pressure decreased significantly from 128.18 ± 21.3 mmHg preoperatively to 117.45 ± 25.13 mmHg postoperatively, with a t-value of 2.253 and a p-value of 0.031. However, there were no significant differences in the average

diastolic blood pressure, heart rate, hemoglobin (Hb) level, platelet level, and international normalized ratio (INR) between the preoperative and postoperative assessments. These results indicate that the intervention had a noticeable impact on systolic blood pressure.

In Table 6, a comparison between treatment modalities (conservative and embolization) and various investigations is provided. For preoperative assessments, significant differences were observed in average systolic blood pressure ($p = 0.012$), average diastolic blood pressure ($p = 0.003$), Hb level ($p = 0.027$), and platelet level ($p = 0.028$) between the two treatment groups, favoring the conservative approach. However, no significant differences were found in heart rate and INR. Postoperatively, there were significant differences in average systolic blood pressure ($p = 0.037$) and Hb level ($p = 0.01$), with the conservative approach showing more favorable results. The analysis of heart rate, platelet level, and INR did not reveal significant differences between the two treatment modalities.

Table 7 compares survival between treatment modalities and various investigations. There were no significant differences in systolic and diastolic blood pressure, heart rate, Hb level, and INR, either preoperatively or postoperatively, regarding patient survival. However, the platelet level showed a p-value of 0.054 preoperatively, suggesting a borderline significant difference, with higher platelet levels associated with survival. The postoperative systolic blood pressure showed a significant difference ($p = 0.037$), favoring those who survived.

Table 8 focuses on the comparison between treatment modalities and therapy with outcomes. When assessing preoperative variables, there were no significant differences between conservative and embolization approaches regarding eGFR, anticoagulation therapy, antiplatelet therapy, antihypertensive therapy, COVID status, or the presence of active bleeding on CT scan. However, significant differences were observed in the volume of blood transfusion within the first 24 hours ($p = 0.002$), favoring the conservative approach. The presence of rebleeding postoperatively showed a borderline significant difference ($p = 0.074$). Similarly, there were no significant differences in mortality between the two treatment modalities.

Table 9 investigates the relationship between outcomes, therapy, and various investigations. It was found that there were no significant differences between eGFR, anticoagulation therapy, antiplatelet therapy, antihypertensive therapy, COVID status, the volume of blood transfusion within the first 24 hours, the presence of active bleeding on CT scan, treatment modality, and rebleeding postoperatively in relation to patient mortality. The analysis of these variables did not reveal significant associations with patient survival.

Table 1 Patients demographics and image modality (n=33).

Parameter		Mean ± SD/ No. (%)
Age		56 ± 17
Gender	Male	9 (27.3%)
	Female	24 (72.7%)
Nationality	Saudi	24 (72.7%)
	Non-Saudi	9 (27.3%)
Smoking Status	Yes	1 (3%)
	No	32 (97%)
eGFR <30	Yes	5 (15.2%)
	No	28 (84.8%)
COVID-19 status (2020 onwards)	Before Covid (2018)	6 (18.2%)
	Negative	21 (63.6%)
	Positive	6 (18.2%)
Blood transfusion volume (within first 24 h)	Yes	12 (36.4%)
	No	21 (63.6%)
Active Bleeding on CT scan	Yes	11 (33.3%)
	No	22 (66.7%)
Primary Treatment Method	Conservative	24 (72.7%)
	Embolization	**9 (27.3%)**

Table 2 Preoperative laboratory investigations and conservative treatment options (n=33).

Parameter		Mean ± SD/ No. (%)
Preoperative investigations	Average systolic BP	128.18 ± 21.3
	Average diastolic BP	69.42 ± 12.86
	Heart rate, bpm	91 ± 20
	Hemoglobin (Hb) level, g/L	96 ± 25

	Platelet level x10^9/L	210.4 ± 99.2
	INR	1.6 ± 0.7
	Prophylactic enoxaparin	2 (6.1%)
	Therapeutic enoxaparin	2 (6.1%)
	DOAC (Direct oral anticoagulant)	3 (9.1%)
Anticoagulation therapy	Warfarin	7 (21.2%)
	Heparin	7 (21.2%)
	More than one of these agents	2 (6.1%)
	None	10 (30.3%)
Antiplatelet therapy (Aspirin	Yes	10 (30.3%)
and/or clopidogrel)	No	23 (69.7%)
	Single agent	6 (18.2%)
	More than one agent	9 (27.3%)
Antihypertensive therapy	None	18 (54.5%)
	None	17 (51.5%)

Table 3 Postoperative laboratory investigations and conservative treatment options (n=33).

	Parameter	**Mean ± SD/ No. (%)**
	Average systolic BP	117.45 ± 25.13
	Average diastolic BP	69.21 ± 11.78
Postoperative investigations	Heart rate, bpm	92 ± 18
	Hemoglobin (Hb) level, g/L	97 ± 21
	Platelet level x10^9/L	190 ± 97
	INR	1.4 ± 0.3
	Prophylactic enoxaparin	1 (3%)
	Therapeutic enoxaparin	1 (3%)
	DOAC	4 (12.1%)
Anticoagulation therapy	Warfarin	4 (12.1%)
	Heparin	9 (27.3%)
	More than one of these agents	4 (12.1%)
	None	10 (30.3%)
Antiplatelet therapy (Aspirin	Yes	6 (18.2%)
and/or clopidogrel)	No	27 (81.8%)
	Single agent	3 (9.1%)
Antihypertensive therapy	More than one agent	13 (39.4%)
	None	17 (51.5%)

Table 4 Outcomes of treatment (n=33)

Parameter		No. (%)
Rebleeding Postoperative	**Yes**	5 (15.2%)
	No	28 (84.8%)
Death	**Yes**	5 (15.2%)
	No	28 (84.8%)

Table 5 A descriptive comparison of preoperative and postoperative laboratory investigations (n=33).

Parameter	Preoperative	Postoperative	t	P-value
Average systolic BP, mmHg	128.18 ± 21.3	117.45 ± 25.13	2.253	**0.031**
Average diastolic BP, mmHg	69.42 ± 12.86	69.21 ± 11.78	0.085	**0.932**
Heart rate, bpm	91 ± 20	92 ± 18	-0.306	**0.762**
Hemoglobin (Hb) level, g/L	96 ± 25	97 ± 21	-0.272	**0.787**
Platelet level x10^9/L	210.4 ± 99.2	190 ± 97	1.320	**0.196**
INR	1.6 ± 0.7	1.4 ± 0.3	1.538	**0.134**

Table 6 A Comparison between treatment modalities with investigations pre operative and postoperatively (n=33).

Parameter		Primary Treatment		ANOVA F	P-value
		Conservative	Embolization		
Preoperative	**Average systolic BP**	133.75 ± 22.33	113.33 ± 6.24	7.177	**0.012**
	Average diastolic BP	73.29 ± 10.86	59.11 ± 12.56	10.257	**0.003**
	Heart rate, bpm	91 ± 18	91 ± 27	0	**0.999**
	Hemoglobin (Hb) level, g/L	102 ± 26	81 ± 13	5.398	**0.027**
	Platelet level x10^9/L	233.3 ± 99.3	149.2 ± 72.3	5.341	**0.028**
	INR	1.5 ± 0.7	1.9 ± 0.9	2.585	**0.118**
Postoperative	**Average systolic BP**	117.83 ± 28.75	116.44 ± 12.24	0.019	**0.89**
	Average diastolic BP	69.5 ± 11.53	68.44 ± 13.1	0.051	**0.823**
	Heart rate, bpm	90 ± 18	96 ± 18	0.684	**0.415**
	Hemoglobin (Hb) level, g/L	102 ± 20	82 ± 16	7.495	**0.01**
	Platelet level x10^9/L	206 ± 96	145 ± 92	2.723	**0.109**
	INR	1.4 ± 0.3	1.5 ± 0.3	1.39	**0.247**

Table 7 Survival comparison between modalities with investigations (n=33).

Parameter		Death		F	P-value
		Yes	No		
Preoperative	**Average systolic BP**	126.6 ± 22.1	128.46 ± 21.56	0.032	**0.86**
	Average diastolic BP	66.4 ± 16.64	69.96 ± 12.37	0.319	**0.576**
	Heart rate, bpm	94 ± 36	90 ± 17	0.135	**0.715**
	Hemoglobin (Hb) level, g/L	90 ± 26	97 ± 25	0.344	**0.562**
	Platelet level x10^9/L	132 ± 50	224.4 ± 99.8	4.026	**0.054**
	INR	1.8 ± 0.6	1.6 ± 0.8	0.324	**0.573**

Postoperative	**Average systolic BP**	138.8 ± 44.44	113.64 ± 18.89	4.748	**0.037**
	Average diastolic BP	71.6 ± 13.76	68.79 ± 11.62	0.237	**0.63**
	Heart rate, bpm	87 ± 16	93 ± 18	0.393	**0.535**
	Hemoglobin (Hb) level, g/L	97 ± 22	97 ± 21	0.001	**0.973**
	Platelet level x10^9/L	145 ± 83	198 ± 99	1.27	**0.268**
	INR	1.5 ± 0.1	1.4 ± 0.3	0.019	**0.892**

Table 8 A comparison between the treatment modalities and outcomes (n=33).

Parameter			**Primary Treatment Method**		**X^2**	**P-value**
			Conservative	**Embolization**		
eGFR <30		Yes	5 (20.8%)	0 (0%)	2.21	**0.137**
		No	19 (79.2%)	9 (100%)		
Preoperative	Anticoagulation therapy	Prophylactic enoxaparin	1 (4.2%)	1 (11.1%)	5.367	**0.498**
		Therapeutic enoxaparin	1 (4.2%)	1 (11.1%)		
		DOAC	1 (4.2%)	2 (22.2%)		
		Warfarin	6 (25%)	1 (11.1%)		
		Heparin	6 (25%)	1 (11.1%)		
		More than one of these agents	2 (8.3%)	0 (0%)		
		None	7 (29.2%)	3 (33.3%)		
	Antiplatelet therapy	Yes	8 (33.3%)	2 (22.2%)	0.383	**0.536**
		No	16 (66.7%)	7 (77.8%)		
	Antihypertensive therapy	Single agent	5 (20.8%)	1 (11.1%)	0.509	**0.775**
		More than one agent	6 (25%)	3 (33.3%)		
		None	13 (54.2%)	5 (55.6%)		
Postoperative	Anticoagulation therapy	Prophylactic enoxaparin	1 (4.2%)	0 (0%)	3.506	**0.743**
		Therapeutic enoxaparin	0 (0%)	1 (11.1%)		
		DOAC	3 (12.5%)	1 (11.1%)		
		Warfarin	3 (12.5%)	1 (11.1%)		
		Heparin	6 (25%)	3 (33.3%)		
		More than one of these agents	3 (12.5%)	1 (11.1%)		
		None	8 (33.3%)	2 (22.2%)		
	Antiplatelet therapy	Yes	4 (16.7%)	2 (22.2%)	0.136	**0.712**
		No	20 (83.3%)	7 (77.8%)		
	Antihypertensive therapy	Single agent	3 (12.5%)	0 (0%)	1.244	**0.537**
		More than one agent	9 (37.5%)	4 (44.4%)		
		None	12 (50%)	5 (55.6%)		
Covid status (2020 onwards)		Before Covid (2018)	6 (25%)	0 (0%)	2.75	**0.253**
		negative	14 (58.3%)	7 (77.8%)		
		Positive	4 (16.7%)	2 (22.2%)		
Blood transfusion volume (within first 24 h)		Yes	5 (20.8%)	7 (77.8%)	9.172	**0.002**
		No	19 (79.2%)	2 (22.2%)		
Active Bleeding on CT scan		Yes	6 (25%)	5 (55.6%)	2.75	**0.097**
		No	18 (75%)	4 (44.4%)		
Rebleeding Postoperative		Yes	2 (8.3%)	3 (33.3%)	3.182	**0.074**
		No	22 (91.7%)	6 (66.7%)		
Death		Yes	3 (12.5%)	2 (22.2%)	0.481	**0.488**
		No	21 (87.5%)	7 (77.8%)		

Table 9 A descriptive comparison between preoperative and postoperative treatment methods with outcomes (n=33).

Parameter			Death		X^2	P-value
			Yes	No		
eGFR <30		**Yes**	0 (0%)	5 (17.9%)	1.052	**0.305**
		No	5 (100%)	23 (82.1%)		
		Prophylactic enoxaparin	0 (0%)	2 (7.1%)		
		Therapeutic enoxaparin	0 (0%)	2 (7.1%)		
	Anticoagulation therapy	**DOAC**	2 (40%)	1 (3.6%)	8.701	**0.191**
		Warfarin	1 (20%)	6 (21.4%)		
		Heparin	0 (0%)	7 (25%)		
Preoperative		**More than one of these agents**	0 (0%)	2 (7.1%)		
		None	2 (40%)	8 (28.6%)		
	Antiplatelet therapy	**Yes**	1 (20%)	9 (32.1%)	0.296	**0.586**
		No	4 (80%)	19 (67.9%)		
		Single agent	0 (0%)	6 (21.4%)		
	Antihypertensive therapy	**More than one agent**	0 (0%)	9 (32.1%)	4.911	**0.086**
		None	5 (100%)	13 (46.4%)		
		Prophylactic enoxaparin	0 (0%)	1 (3.6%)		
		Therapeutic enoxaparin	0 (0%)	1 (3.6%)		
	Anticoagulation therapy	**DOAC**	1 (20%)	3 (10.7%)	1.583	**0.954**
		Warfarin	1 (20%)	3 (10.7%)		
		Heparin	1 (20%)	8 (28.6%)		
Postoperative		**More than one of these agents**	1 (20%)	3 (10.7%)		
		None	1 (20%)	9 (32.1%)		
	Antiplatelet therapy	**Yes**	0 (0%)	6 (21.4%)	1.31	**0.252**
		No	5 (100%)	22 (78.6%)		
		Single agent	0 (0%)	3 (10.7%)		
	Antihypertensive therapy	**More than one agent**	2 (40%)	11 (39.3%)	0.619	**0.734**
		None	3 (60%)	14 (50%)		
Covid status (2020 onwards)		**Before Covid (2018)**	0 (0%)	6 (21.4%)	0.734	**0.186**
		negative	5 (100%)	16 (57.1%)		
		Positive	0 (0%)	6 (21.4%)		
Blood transfusion volume (within first 24 h)		**Yes**	3 (60%)	9 (32.1%)	1.423	**0.233**
		No	2 (40%)	19 (67.9%)		
Active Bleeding on CT scan		**Yes**	3 (60%)	8 (28.6%)	1.886	**0.17**
		No	2 (40%)	20 (71.4%)		
Primary Treatment Method		**Conservative**	3 (60%)	21 (75%)	0.481	**0.488**
		Embolization	2 (40%)	7 (25%)		
Rebleeding Postoperative		**Yes**	1 (20%)	4 (14.3%)	0.108	**0.743**
		No	4 (80%)	24 (85.7%)		

4. DISCUSSION

The management of spontaneous intraabdominal hemorrhage related to anticoagulants and antiplatelets remains a challenging clinical scenario [[1][3]]. This study aimed to evaluate

different management options, including conservative management, endovascular embolization, and surgical approaches for such patients. Additionally, the study explored the practicality of early versus delayed intervention, along with the correction of coagulopathic status. In our study, the incidence of postoperative rebleeding and mortality was 15%, underscoring the grave nature of spontaneous IAH in this high-risk group. Notably, the study did not reveal significant outcome disparities between primary treatment modalities (conservative vs. endovascular embolization). These results accentuate the need for treatment approaches customized to the individual patient, guided by their clinical presentation and the etiology of the hemorrhage [13].

Conservative management was favored in approximately 73% of cases, while endovascular embolization was administered in the remaining 27%. These distributions highlight the clinical equipoise surrounding the management of spontaneous IAH in anticoagulated and antiplatelet-treated patients [12, 14].

The study observed a diverse landscape of anticoagulation and antiplatelet therapy, with warfarin (21.2%) and heparin (21.2%) being the most commonly prescribed agents. These findings align with the fact that warfarin and heparin are among the most frequently used anticoagulants, especially for the prevention and treatment of thromboembolic events [15, 16].

A significant decrease in average systolic blood pressure was observed postoperatively, which can be attributed to the effective control of hemorrhage. The reduction in systolic blood pressure is a clinically significant finding as it reflects the successful management of the primary complication, i.e., hemorrhage [14]. Conversely, there were no significant differences in hemoglobin levels, platelet counts, and INR between the preoperative and postoperative periods.

The findings revealed significant differences in preoperative average systolic and diastolic blood pressures, Hb levels, and platelet counts, with the conservative approach showing more favorable results. This could be attributed to the fact that patients undergoing embolization might have had more severe hemorrhage and hemodynamic instability, necessitating the intervention [13]. The differences in platelet levels and Hb levels are particularly noteworthy as they reflect the impact of different treatment modalities on coagulation status and oxygen-carrying capacity [15].

For postoperative investigations, significant differences were observed in average systolic blood pressure and Hb levels, with the conservative approach yielding more favorable results. This supports the notion that early intervention in the form of embolization might be necessary in cases with more severe hemorrhage, and conservative management can be successful in less critical situations. The fact that INR did not significantly differ between the treatment modalities is reassuring, suggesting that patients in both groups achieved hemodynamic stability and effective coagulation control [16, 17]. These findings align with existing literature that recommends an individualized approach to managing spontaneous intraabdominal hemorrhage, considering the severity of the hemorrhage and the patient's clinical status [12, 17].

The preoperative assessments did not reveal significant differences in blood pressure, heart rate, Hb levels, and INR concerning patient survival. This underscores the importance of timely intervention in stabilizing patients' hemodynamics, regardless of the treatment modality chosen. One notable exception was platelet levels, which showed a borderline significant difference ($p = 0.054$) preoperatively. Higher platelet levels were associated with survival, suggesting that thrombocytopenia might be a risk factor for a poorer outcome. However, this finding should be interpreted with caution, and further studies are needed to establish a definitive link between platelet count and survival in patients with spontaneous intraabdominal hemorrhage [12]. Postoperatively, the significant difference in systolic blood pressure ($p = 0.037$) was a noteworthy finding, favoring those who survived. Our study findings highlight the importance of timely intervention, particularly in stabilizing hemodynamics and controlling hemorrhage. The study suggests that an individualized approach, considering the severity of hemorrhage and the patient's clinical status, is warranted. Lower blood transfusion requirements in the conservative management group underscore the potential to avoid transfusion-related complications.

4.1 Clinical Implications and Future Directions

The findings of this study have several clinical implications. Timely intervention, whether through conservative management or embolization, plays a crucial role in stabilizing patients with spontaneous intra-abdominal hemorrhage. Hemodynamic stability, particularly systolic blood pressure, is a key determinant of patient outcomes.

The differences observed between conservative management and embolization,

while not definitive, suggest that individualized approaches should be considered in managing these patients. Moreover, the significant difference in blood transfusion volumes between the two approaches highlights the importance of resource allocation and the potential to avoid transfusion-related complications with conservative management in selected cases.

While the study provides valuable insights, there are limitations to consider. The retrospective nature of the study may introduce selection bias and confounding variables. Additionally, the sample size is relatively small, which can limit the generalizability of the findings. Larger, prospective studies are warranted to validate and expand upon these results.

5. CONCLUSION

The management of spontaneous intra-abdominal hemorrhage related to anticoagulants and antiplatelets is a complex and multifaceted challenge. This study sheds light on the importance of timely intervention and prioritizes early stabilization for patients who present with bleeding or are hemodynamically unstable, and provides an individualized treatment approach suitable for the patient. While further research is needed to confirm and expand upon these findings, this study provides a valuable contribution to the understanding of this clinical scenario and its management.

6. DATA AVAILABILITY

The data that support the findings of this study are available in our radiology information system, GE web-based, as well as the Cerner system at King Saud Medical City, Riyadh.

7. CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article.

8. FUNDING

No funding was received

9. REFERENCES

[1] Demir M, Demir T, Yaylaci S, Genc A. Spontaneous abdominal hemorrhage due to warfarin treatment. CHRISMED J Health Res. 2016 Oct;3(4):298-302.

[2] Espil G, Larranaga N, Villarroel N, Oyarzun A, Matzke G, Kozima S. Spontaneous abdominal hemorrhage: imaging evaluation. Rev Argent Radiol. 2015;79(2):86-94.

[3] Gilard-Pioc S, Guerard P, Paraf F, François-Purssell I. Sudden death by spontaneous epiglottic hematoma secondary to high blood levels of warfarin. J Forensic Sci. 2017 Jul;62(4):1094-6.

[4] Chen DH, Soh KS, Wang YT, Shen TC. Warfarin-induced spontaneous intramural small bowel hematoma presenting as an acute abdomen: a case report. Medicine (Baltimore). 2022 Sep 9;101(35):e30122.

[5] Gómez-Outes A, Suárez-Gea ML, Lecumberri R, Terleira-Fernández AI, Vargas-Castrillón E. Direct-acting oral anticoagulants: pharmacology, indications, management, and future perspectives. Eur J Haematol. 2015 Nov;95(5):389-404.

[6] Makam RC, Hoaglin DC, McManus DD, Wang V, Gore JM, Spencer FA, et al. Efficacy and safety of direct oral anticoagulants approved for cardiovascular indications: systematic review and meta-analysis. PLoS One. 2018 May 24;13(5):e0197583.

[7] Hum J, Shatzel JJ, Jou JH, Deloughery TG. The efficacy and safety of direct oral anticoagulants vs traditional anticoagulants in cirrhosis. Eur J Haematol. 2017 Apr;98(4):393-7.

[8] Gunasekaran K, Rajasurya V, Devasahayam J, Singh Rahi M, Chandran A, Elango K, et al. A review of the incidence, diagnosis, and treatment of spontaneous hemorrhage in patients treated with direct oral anticoagulants. J Clin Med. 2020 Sep 15;9(9):2984.

[9] Öztürk EK, Kurtuluş E, et al. Anticoagulant related abdominal hematomas: clinical and CT findings. Akademik Gastroenteroloji Dergisi. 2018;17(2):50-61.

[10] Zhu Y, et al. Case report: spontaneous intramural hematoma of the colon secondary to low molecular weight heparin therapy. Front Pharmacol. 2021;12:598661.

[11]Hatjipetrou A, Anyfantakis D, Kastanakis M. Rectus sheath hematoma: a review of the literature. Int J Surg. 2015 Jan 1;13:267-71.

[12]Karapolat B, Tasdelen HA, Korkmaz HA. Conservative treatment of spontaneous rectus sheath hematomas: single center experience and literature review. Emerg Med Int. 2019 Feb 21;2019:6215193.

[13]Contrella BN, Park AW, Wilkins LR, Sheeran D, Hassinger TE, Angle JF. Spontaneous rectus sheath hematoma: factors predictive of conservative management failure. J Vasc Interv Radiol. 2020 Feb;31(2):323-30.

[14]Galyfos G, Karantzikos G, Palogos K, Sianou A, Filis K, Kavouras N. Spontaneous rectus sheath hematoma in the elderly: an unusual case and update on proper management. Case Rep Emerg Med. 2014;2014:503792.

[15]Khorsand N, Majeed A, Sarode R, Beyer-Westendorf J, Schulman S, Meijer K. Assessment of effectiveness of major bleeding management: proposed definitions for effective hemostasis: communication from the SSC of the ISTH. J Thromb Haemost. 2016 Jan;14(1):211-4.

[16]Selma AB, Genese T. Spontaneous rectus sheath hematoma: an uncommon cause of acute abdominal pain. Am J Case Rep. 2019;20:163-7.

[17]Touma L, Cohen S, Cassinotto C, Reinhold C, Barkun A, Tran VT, et al. Transcatheter arterial embolization of spontaneous soft tissue hematomas: a systematic review. Cardiovasc Intervent Radiol. 2019 Mar;42(3):335-43.