

**THROMBOEMBOLIC COMPLICATIONS FOLLOWING BARIATRIC SURGERY:
LITERATURE REVIEW**

Gulchekhra Dzhumaniazovna Narimova

Doctor of Medical Sciences

Madina Shukrullaevna Yusupova

Candidate of Medical Sciences (PhD)

Firuza Tukhtasinovna Sultanova

Istora Abduvoris kizi Usmanova

Endocrinologist

Republican Specialized Scientific and Practical Medical Center of Endocrinology

usmanovaistora@gmail.com

ORCID: 0009-0000-3740-6512

Annotation: The global obesity epidemic has led to a significant increase in the number of bariatric surgeries, which are the most effective method for long-term weight loss and improvement of comorbidities. However, despite their effectiveness, these interventions are associated with the risk of various complications, among which thromboembolic events hold a special place. Venous thromboembolic complications (VTEs), including deep vein thrombosis (DVT) and pulmonary embolism (PE), as well as portal and mesenteric vein thrombosis (PMVT), represent a serious problem in the perioperative period. Although the overall incidence of VTEs after bariatric surgery is relatively low, ranging from 0.17% to 5%, PE is the leading cause of mortality in this group of patients, with fatality rates reaching 50% in some cases [1]. This emphasizes that even rare complications can have extremely severe consequences, making their prevention a primary objective.

Obesity itself is an independent risk factor for venous thromboembolism (VTE), increasing its likelihood by 2-3 times, which creates a prothrombotic state in bariatric patients even before surgery [2]. A significant proportion of thromboembolic events (up to 67% of deep vein thrombosis/pulmonary embolism cases within 30 days) occurs after the patient's discharge from the hospital, necessitating the use of extended thromboprophylaxis and thorough postoperative monitoring [1]. This literature review systematizes current data on the prevalence and risk factors for VTE, analyzes existing prevention strategies (mechanical and pharmacological methods, perioperative management) and treatment approaches for developed complications. Special attention is paid to Uzbekistan's experience in this area, which demonstrates successful results but indicates the need for further research to develop regional recommendations.

Key words: thromboembolism, bariatric surgery, venous thromboembolism, deep vein thrombosis, pulmonary embolism, postoperative complications, thrombosis prevention, anticoagulant therapy, obesity, extended thromboprophylaxis, laparoscopic bariatric surgery, regional guidelines.

Introduction

Obesity is recognized as a global epidemic that has a significant impact on public health and the economy. It is associated with a wide range of comorbidities such as type 2 diabetes, coronary heart disease, arterial hypertension, and obstructive sleep apnea syndrome, all of which substantially reduce both quality of life and life expectancy [9]. Conservative treatment methods for morbid obesity ($\text{BMI} > 40 \text{ kg/m}^2$ or $\text{BMI} \geq 35 \text{ kg/m}^2$ with serious comorbidities) have demonstrated limited long-term effectiveness, not exceeding 5% [5]. In this context, bariatric and metabolic surgery has proven to be the most effective and sustainable treatment method for morbid obesity, leading to significant and long-term excess weight loss (ranging from 50% to 85%), regression of most obesity-related diseases, and a substantial reduction in the risk of premature death [10].

Despite their high effectiveness, bariatric surgeries, like any other surgical interventions, are associated with certain risks and complications. The overall survival rate after such procedures is 99.9%, and the complication rate within 30 days postoperatively is estimated at 7% [14]. Complications are classified as early (occurring within the first 30 days after surgery) and late (developing after 30 days) [12]. Early complications include anastomotic leaks, bleeding, and surgical site infections [11]. Late complications may include strictures, marginal ulcers, internal hernias, dumping syndrome, as well as nutritional deficiencies requiring lifelong correction [13]. It is important to note that the successful weight loss and improvement of comorbid conditions achieved through bariatric surgery are accompanied by inherent risks, among which thromboembolic complications remain one of the most serious concerns [1].

Venous thromboembolic complications (VTE), including deep vein thrombosis (DVT) and pulmonary embolism (PE), are well-known causes of morbidity and mortality following bariatric surgery [2]. Obesity itself is a strong independent risk factor for VTE, increasing its likelihood by 2 to 3 times in individuals with a body mass index ($\text{BMI} \geq 30 \text{ kg/m}^2$) [2]. This means that patients undergoing bariatric surgery are, by definition, in a hypercoagulable state, making VTE prevention a fundamental aspect of their management that extends beyond standard surgical precautions. PE, in particular, is a common cause of postoperative mortality in this population [4]. Given the increasing number of bariatric procedures performed worldwide, even a relatively low incidence of VTE may result in a significant absolute number of complications.

The aim of this literature review is to systematize and summarize current scientific data on the prevalence, risk factors, prevention methods, and treatment strategies for thromboembolic complications following bariatric surgery. Special attention will be given to perioperative patient management, including intraoperative measures and resuscitation procedures, as well as the search for optimal protocols to minimize the risk of VTE. The review also seeks to analyze available data, including studies from authors in Uzbekistan, in order to identify gaps in current knowledge and determine directions for future research and improvement of clinical practice.

Materials and Methods

This literature review is based on the analysis of scientific publications indexed in leading international and national databases. The search was conducted in PubMed, Scopus, Google Scholar, and eLibrary.ru. To ensure comprehensive coverage of the topic, keywords in both

Russian and English were used, such as “bariatric surgery,” “obesity,” “thromboembolic complications,” “venous thromboembolism,” “deep vein thrombosis,” “pulmonary embolism,” “prevention,” “treatment,” “intraoperative measures,” and “resuscitation.”

Inclusion criteria for publications were based on their relevance to the topic of the review, full-text availability, and level of evidence. Preference was given to systematic reviews, meta-analyses, clinical guidelines, and original studies published primarily within the last 10–15 years. Conference abstracts without full texts and publications with a low level of evidence were excluded if higher-quality data were available.

Particular attention was given to identifying publications reflecting Uzbekistan’s experience in bariatric surgery and the prevention/treatment of thromboembolic complications. Materials from Uzbek medical journals and databases were analyzed, including journals of the Tashkent Medical Academy and the Samarkand Branch of the Academy of Sciences of the Republic of Uzbekistan [15]. Although some publications from Uzbekistan address general issues of thrombosis or complications in other surgical fields, as well as references to the development of the bariatric surgery market and clinical trials of new devices within the country, direct studies specifically focused on venous thromboembolic complications following bariatric surgery are limited in the available literature, with the exception of one significant central study [6]. This highlights a current gap in systematized local data on this specific issue.

Results

The overall incidence of venous thromboembolic events (VTE), including DVT and PE, after bariatric surgery varies widely. According to data from several databases, the incidence ranges from 0.17% to 0.4% [17], while other sources report a range between 0.2% and 5% [2]. One study found the cumulative incidence of symptomatic postoperative VTE within three months after bariatric surgery to be 0.64% [2]. Portal and mesenteric vein thrombosis (PMVT) is a rare but potentially serious complication, with an overall incidence of approximately 0.3% [18].

Despite the relatively low overall incidence, VTE remains a leading cause of mortality following bariatric and metabolic surgery [16]. The mortality rate due to PE after bariatric procedures is less than 1% [19]. However, autopsy studies have shown that PE was the cause of death in 3 out of 10 patients who died following Roux-en-Y gastric bypass (RYGB) [4]. This underscores that even with a low overall morbidity rate, the consequences of VTE can be catastrophic, making its prevention critically important.

The incidence of VTE varies significantly depending on the type of bariatric procedure. For example, the VTE rate was 1.1% for gastric bypass, 2.9% for sleeve gastrectomy, and 0.2% for gastric banding. The highest rates of VTE are observed in patients who undergo biliopancreatic diversion and revisional surgeries. Laparoscopic bariatric procedures carry a lower risk of VTE compared to open surgeries [3]. These differences in risk across procedures indicate that not only the patient’s baseline condition but also the extent of surgical intervention, along with the associated anatomical changes and metabolic effects, play a significant role in thrombotic risk. Therefore, the choice of surgical technique should be integrated into an individualized prevention strategy.

It is important to note that the majority of VTE cases (67% in one large study) occur after the patient is discharged from the hospital [8]. According to other data, only 2% of VTE events occur intraoperatively, and 25% occur before discharge, with the majority developing post-discharge [1]. In one study, the median time to VTE development was 4 months [6]. This indicates that short-term in-hospital prophylaxis is insufficient and highlights the need for extended thromboprophylaxis and comprehensive postoperative follow-up for patients.

Type of Bariatric Surgery	Incidence of VTE (%)
Gastric Bypass	1.1
Sleeve Gastrectomy	2.9
Gastric Banding	0.2
Biliopancreatic Diversion	Higher rates
Revisional Surgeries	Higher rates
Laparoscopic Procedures	Lower than open surgeries

Table 1. Comparative characteristics of VTE incidence across different types of bariatric procedures

The risk of developing VTE after bariatric surgery is determined by the complex interaction of multiple factors, which can be divided into patient-related and procedure-related factors. The presence of multiple risk factors significantly increases the likelihood of VTE, requiring a comprehensive assessment.

Primarily, patient-related factors include:

- **High BMI:** A body mass index (BMI) $> 30 \text{ kg/m}^2$ is an independent risk factor for VTE [2]. Each 10-unit increase in BMI is associated with a 37% increase in VTE risk [3].
- **Age:** Age over 40 years [22], as well as over 50 [2] or 55 years [21], is associated with an increased risk of VTE.
- **Sex:** Male sex has been associated with a higher risk of VTE in bariatric patients, according to several studies [3].
- **History of VTE:** A previous episode of venous thromboembolism is one of the strongest predictors of postoperative VTE, increasing the risk fourfold [2].
- **Comorbidities:** The presence of chronic heart failure, respiratory failure, inflammatory bowel disease, nephrotic syndrome, myeloproliferative disorders, and paroxysmal nocturnal hemoglobinuria are all associated with increased VTE risk [19]. Obstructive sleep apnea syndrome is also a significant risk factor [21].

- **Smoking:** A patient's smoking status is identified as a potential risk factor for VTE [3].
- **Thrombophilia:** Both inherited and acquired thrombophilia are important predisposing factors for thrombosis [20].

In addition, there are procedure-related factors:

- **Type of surgery:** Laparoscopic procedures are associated with a lower risk of VTE compared to open surgeries. Roux-en-Y gastric bypass carries a higher risk of VTE compared to gastric banding. Revisional surgeries are also linked to increased VTE risk.
- **Duration of surgery:** Prolonged operative time, particularly beyond 3 hours, is a significant risk factor for VTE.
- **Postoperative complications:** The development of postoperative anastomotic leak significantly increases the risk of VTE. This demonstrates the interrelationship between various types of surgical complications, where preventing one (e.g., anastomotic leak) may reduce the risk of another (VTE).
- **Blood transfusion:** The need for blood transfusion during or after surgery is a significant risk factor for VTE [24].

To assess individual VTE risk, risk calculators such as the Caprini score may be used. These tools assign points for various risk factors and help guide appropriate prophylactic strategies [22]. However, despite their utility, risk calculators specifically validated for bariatric surgery are still lacking [23]. This means that clinical judgment and a comprehensive evaluation of all relevant factors remain essential, even when using such assessment tools.

Category of Factor	Specific Risk Factor	Description of Impact
Patient-related	High BMI (>30 kg/m ²)	Independent risk factor; each +10 units of BMI increases VTE risk by 37%
	Age (>40, >50, >55 years)	Increased risk of VTE
	Male sex	Associated with higher risk
	History of VTE	Strong predictor; increases risk by 4 times
	Comorbidities	CHF, respiratory failure, IBD, nephrotic syndrome, OSA, thrombophilia
	Smoking	Potential risk factor
Surgery-related	Type of surgery	Open > laparoscopic; RYGB >

		banding; revisional > primary
	Duration of surgery (>3 hours)	Significant risk factor
	Postoperative anastomotic leak	Increases risk of VTE
	Blood transfusion	Significant risk factor

Table 2. Major Risk Factors for Venous Thromboembolic Events After Bariatric Surgery

VTE prophylaxis is a cornerstone in reducing morbidity and mortality following bariatric surgery [2]. Virtually all bariatric patients fall into the moderate- or high-risk categories for VTE, making thromboprophylaxis mandatory for everyone [7].

Effective VTE prevention requires a multimodal approach that combines mechanical and pharmacological methods [9]. Such a comprehensive strategy, addressing all aspects of the perioperative period, is the most effective way to minimize risk.

Mechanical methods include:

- **Early ambulation:** Initiating walking and mobilization of patients, usually starting from the first postoperative day, is a fundamental and essential component of VTE prevention.
- **Elastic compression of the lower extremities (ECLL) / Graduated compression stockings (GCS):** Recommended for all patients to enhance venous return and reduce venous stasis [19].
- **Intermittent pneumatic compression (IPC) / Intermittent pneumatic compression devices (IPCDs):** These are the preferred mechanical prophylactic methods, especially for patients at low to moderate risk of VTE, as well as in cases of high bleeding risk where pharmacological prophylaxis is contraindicated or delayed [9].

In addition, there are pharmacological methods of prophylaxis:

- **Low-molecular-weight heparins (LMWH):** Recommended over unfractionated heparin (UFH) due to their more predictable pharmacokinetic profile and better efficacy/safety ratio. LMWH, such as enoxaparin, are considered more effective in preventing VTE.
- **Dosage:** The LMWH dose should be adjusted according to the patient's BMI. For patients at low risk of VTE, a dose of 3,000–4,000 anti-Xa IU every 12 hours subcutaneously is recommended. For high-risk patients, a higher dose of 4,000–6,000 anti-Xa IU every 12 hours subcutaneously is advised. Studies have shown that enoxaparin at a dose of 40 mg twice daily is more effective than 30 mg twice daily with a similar bleeding

risk. Some data suggest that a fixed prophylactic dose may be as effective as weight-adjusted dosing, with fewer bleeding events. However, other meta-analyses indicate that weight-adjusted LMWH dosing (e.g., more than 30 mg of enoxaparin twice daily) results in a reduction in VTE incidence without increasing the risk of major bleeding [26]. The lack of consensus on optimal dosing highlights the need for further research.

- **Duration:** Extended prophylaxis is recommended for patients at high risk of VTE for 10–15 days after hospital discharge [21]. Studies confirm that extended thromboprophylaxis (e.g., 10–14 days of enoxaparin 40 mg twice daily) is an effective and safe strategy for preventing VTE after bariatric surgery. In certain high-risk cases, the duration of prophylaxis may be extended up to 4 weeks.

Timing of Initiation: The first dose of LMWH can be administered 12 hours before surgery or 6–8 hours after its completion. For patients at very high risk of VTE, pharmacologic prophylaxis is recommended 6–12 hours before the procedure.

Anesthetic management plays a key role in perioperative VTE prevention and overall care of patients with morbid obesity. It includes thorough preoperative evaluation, taking into account altered pharmacokinetics in obese patients, ensuring airway patency (which may be difficult), and employing specific mechanical ventilation strategies (e.g., low tidal volumes, positive end-expiratory pressure) [27]. Neuromuscular blockade monitoring and complete reversal (e.g., with sugammadex) are also important for preventing postoperative respiratory complications. Proper patient positioning during surgery, such as reverse Trendelenburg, improves respiratory mechanics and reduces intra-abdominal pressure. Real-time coagulation status monitoring (e.g., using thromboelastography/rotational thromboelastometry and anti-Xa activity) allows for the adjustment of anticoagulant therapy. Additionally, minimizing the duration of surgery is a key factor in VTE prevention [28].

The use of inferior vena cava filters (IVCFs) for primary prevention of VTE in patients undergoing general and abdominal surgery is not recommended. They may be considered on an individual basis only for patients at very high risk of VTE when pharmacological prophylaxis is absolutely contraindicated [30].

Risk Group (Caprini Score)	Type of Prophylaxis	Dosage	Duration	Comments	Source
Very Low (<0.5%)	No specific	-	Early ambulation only	-	22
Low (~1.5%)	Mechanical prophylaxis preferred	-	-	Intermittent pneumatic compression	22
Moderate (~3.0%)	LMWH / UFH / Mechanical	Depends on BMI: 3000–4000	Standard	In the absence of high bleeding risk	21

		anti-Xa IU every 12 hrs (LMWH)			
High (~6.0%)	LMWH / UFH + Mechanical	Depends on BMI: 4000– 6000 anti-Xa IU every 12 hrs (LMWH)	Extended (10–15 days after discharge)	In the absence of high bleeding risk; enoxaparin 40 mg 2x/day more effective than 30 mg 2x/day	²
High with bleeding risk	Mechanical prophylaxis	-	Until bleeding risk decreases	Intermittent pneumatic compression	²²

Table 3. Recommendations for Pharmacological Prophylaxis of VTE after Bariatric Surgery

Diagnosis of VTE in bariatric patients is often challenging. Clinical signs, particularly those of pulmonary embolism (PE), can be nonspecific and easily mistaken for other postoperative respiratory conditions such as atelectasis or pneumonia [5]. Chest X-ray and physical examination are often uninformative.

To confirm deep vein thrombosis (DVT), duplex ultrasonography (DUS) is used [27]. Computed tomography pulmonary angiography (CTPA) is considered the gold standard for diagnosing PE in cases of high clinical suspicion. However, in patients with super obesity (BMI > 50 kg/m²), performing CTPA may be difficult or even impossible due to scanner size limitations. This necessitates a high level of clinical vigilance and, when standard imaging methods are unavailable, the use of alternative diagnostic strategies or broader application of clinical risk assessment algorithms.

Transthoracic and transesophageal echocardiography can be useful for assessing right ventricular function, which is important for risk stratification in pulmonary embolism (PE) [28]. D-dimer may be used to rule out PE in patients with low or moderate probability; however, its low specificity limits its value as a confirmatory test.

The mainstay of deep vein thrombosis (DVT) treatment is anticoagulation. Subcutaneous administration of prophylactic doses of low-molecular-weight heparin (LMWH) or unfractionated heparin (UFH)—potentially at doses exceeding standard prophylactic

levels—is recommended for at least 4 weeks [25]. An alternative may include the use of vitamin K antagonists (VKA) such as warfarin, with a target international normalized ratio (INR) of 2.5 (range 2.0–3.0).

In recent years, direct oral anticoagulants (DOACs) have been recommended as the first-line treatment for acute venous thromboembolism (VTE) in non-pregnant patients due to their efficacy and safety profiles [29]. Rivaroxaban and apixaban can be used as monotherapy, whereas dabigatran and edoxaban require a minimum of 5 days of parenteral anticoagulation before initiation.

The duration of anticoagulation depends on the patient's risk factors for VTE; for proximal deep vein thrombosis (DVT), treatment should last at least 3 months [31].

Local measures such as elastic compression, cold therapy, and topical agents containing heparin or nonsteroidal anti-inflammatory drugs (NSAIDs) may be used to alleviate pain [25]. In severe cases, especially with pronounced symptoms or limb-threatening conditions, interventional approaches such as catheter-directed thrombolysis or thrombectomy may be considered.

The treatment of pulmonary embolism (PE) is based on risk stratification, which categorizes acute PE into low, intermediate, and high-risk groups according to hemodynamic status, imaging findings, and biomarkers [28].

High-risk PE (formerly referred to as massive PE) is defined as acute PE with persistent hypotension or shock. It requires immediate systemic anticoagulation (with low-molecular-weight heparin [LMWH] or unfractionated heparin [UFH]) and systemic thrombolytic therapy in the absence of contraindications.

Intermediate-risk PE (previously called submassive PE) includes hemodynamically stable patients who demonstrate right ventricular dysfunction and/or myocardial necrosis. These patients should receive immediate anticoagulation, with LMWH being the preferred agent [34]. In selected cases, reduced-dose thrombolytic therapy or catheter-directed thrombolysis may be considered.

The evolution of pulmonary embolism (PE) treatment strategies demonstrates a shift from purely pharmacological approaches to more aggressive interventional techniques and multidisciplinary management [36]. Catheter-directed thrombolysis (CDT) involves the direct administration of thrombolytics into the pulmonary artery, allowing for lower doses and targeted infusion, which is associated with reduced mortality and a lower risk of intracranial hemorrhage compared to systemic thrombolysis [43; 46]. Percutaneous mechanical thrombectomy, which enables the physical removal of thrombi without thrombolytics, has shown high efficacy and safety, particularly in high-risk PE. Surgical embolectomy is an alternative for patients at high risk of PE who have contraindications to thrombolysis [35]. In critical situations, such as those involving cardiogenic shock, mechanical circulatory support, including extracorporeal membrane oxygenation (ECMO), may be life-saving. To facilitate rapid and coordinated decision-making in the management of PE patients, Pulmonary Embolism Response Teams (PERTs) have been established, bringing together specialists from various fields [37].

A literature search specific to Uzbekistan revealed several important publications. One study conducted at a high-volume center, which included 901 patients who underwent primary and revisional bariatric surgery between January 2018 and December 2020, reported an overall incidence of VTE of only 0.44% (n=4) [6]. These cases included 2 episodes of DVT, 1 case of PE, and 1 case of combined DVT + PE. The median time to VTE onset was 4 months. Based on their experience, the authors of this study proposed a practical thromboprophylaxis protocol for bariatric patients [6].

Notably, the VTE rate reported in this study is among the lowest ever documented [7]. This reflects the presence of effective protocols and the high level of expertise of healthcare professionals in Uzbekistan, enabling outcomes comparable to or even exceeding the best international standards.

Overall, active research on the prevention of thromboembolic complications in surgery is being conducted in Uzbekistan, although not always specifically in the field of bariatric surgery (e.g., more commonly in orthopedics) [32]. Uzbek medical journals, such as the Moscow Surgical Journal and the journals of the Tashkent Medical Academy, regularly publish articles on complications and thrombosis, including DVT and PE, indicating ongoing scientific activity in this field [33]. Despite these positive trends, there is a lack of systematic reviews or meta-analyses specifically focused on Uzbekistan's experience with VTE following bariatric surgery. Most existing studies address general aspects of thrombosis or are related to other surgical specialties [47].

Obesity is a powerful and independent risk factor for VTE, which automatically places bariatric patients in a high-risk category, requiring aggressive and carefully planned prophylaxis [45]. Effective VTE prevention is achieved through a multimodal approach, combining mechanical methods, such as early mobilization and intermittent pneumatic compression, with pharmacological agents, primarily low-molecular-weight heparins [9].

Despite significant progress in the development and implementation of prophylactic strategies, VTE remains a leading cause of mortality after bariatric surgery [38]. This underscores the need for continuous improvement of existing protocols and the search for new, more effective approaches. Special attention should be given to the fact that a significant portion of VTE events occur after patient discharge, making extended prophylaxis (lasting 10–15 days) critically important, especially for high-risk patients [42]. This highlights that while short-term in-hospital prophylaxis is essential, it is not sufficient to fully cover the period of risk.

The lack of consensus on the optimal dose and duration of pharmacological prophylaxis [39] represents one of the key unresolved challenges in managing bariatric patients. In the absence of clear universal guidelines, an individualized approach—based on a careful assessment of the thrombosis-to-bleeding risk balance for each specific patient—becomes particularly important [22].

Anesthetic management plays a key role in perioperative VTE prophylaxis, including the proper selection of anesthetic agents, optimal patient positioning during surgery, and careful monitoring of coagulation status. These measures aim to minimize procoagulant shifts induced by surgical stress and prolonged immobilization [40].

Diagnosis of thromboembolic events (TEEs) in bariatric patients can be challenging due to the nonspecific nature of clinical symptoms and technical limitations of imaging methods, particularly in patients with super obesity [5]. This necessitates a high degree of clinical vigilance from physicians and a readiness to employ alternative diagnostic approaches. Treatment of TEEs ranges from conservative anticoagulation to invasive procedures such as thrombolysis and thrombectomy [41]. For high-risk pulmonary embolism (PE), risk stratification and a multidisciplinary approach—implemented through Pulmonary Embolism Response Teams (PERTs)—are gaining increasing importance, reflecting an evolution in the management of acute, life-threatening thromboembolic events. It is important to note that the approach to VTE treatment should be tailored to the specific location of thrombosis, as illustrated by iliofemoral DVT, where conservative anticoagulation is often the first-line therapy, and interventional procedures are reserved for strict indications [30]. Experience from Uzbekistan, presented in one study, demonstrated an impressively low incidence of VTE following bariatric surgery, indicating effective clinical practice and protocols [44]. This outcome, comparable to the best international benchmarks, serves as important confirmation of the successful implementation of prophylactic measures in the regional context.

Conclusion

Bariatric surgery is a highly effective method for treating morbid obesity and its associated comorbid conditions, significantly improving patients' quality of life and longevity. However, it is associated with a risk of thromboembolic complications, which—despite their relatively low overall incidence—remain a leading cause of postoperative mortality. A comprehensive approach to VTE prevention, combining mechanical methods (early mobilization, intermittent pneumatic compression) and pharmacological agents (low-molecular-weight heparins), along with mandatory extended prophylaxis after hospital discharge, is crucial to ensuring patient safety.

The optimal strategy for prevention and treatment must be strictly individualized, taking into account each patient's unique risk factors, the type of bariatric procedure performed, and a careful balance between the risk of thrombosis and potential bleeding complications.

Future studies should aim to clarify the optimal thromboprophylaxis regimens, develop and validate more accurate risk assessment tools, and explore the role of new anticoagulants in this patient population. Continued attention to this issue and collaboration across various medical specialties are essential for further progress in enhancing the safety of bariatric procedures.

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