Management of Anticoagulation and Colonoscopy

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Published online: 16 January 2021
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Keywords Colonoscopy • Polypectomy • Dual antiplatelet therapy • Anticoagulation • Warfarin • DOAC

Abstract

Purpose of review Patients undergoing colonoscopy frequently require antithrombotic therapy for underlying cardiovascular disease. Antithrombotic therapy increases the risk of bleeding during or after colonoscopy, particularly when more invasive procedures are required. However, the risk of thrombosis— with possibly devastating consequences—is increased if antithrombotic agents are held. This review will highlight existing data on the balance of procedural and patient risk factors to guide endoscopists on the management of periprocedural antithrombotic therapy.

Recent findings Diagnostic colonoscopy has long been established to be low risk for hemorrhage even in patients on antithrombotic therapy, while colonoscopy with interventions—including polypectomy—is viewed as high risk requiring interruption of antithrombotic therapy when possible. Recent data, however, has challenged these practices and suggests that a more nuanced perspective may be necessary. For example, a recent randomly controlled trial found no difference in immediate or delayed hemorrhage between patients on dual antiplatelet therapy versus aspirin and placebo after polypectomy. Further, increasing data are emerging to suggest that small polypectomy (<1 cm) is safe without interruption of anticoagulation with the use of cold snare polypectomy.

Summary In patients undergoing colonoscopy, the risk of hemorrhage must be weighed against the risk of thrombosis in patients with cardiovascular disease on antithrombotic agents. In general, low-risk procedures do not require interruption of antithrombotic agents, while high-risk procedures in low-risk patients require holding antithrombotic therapy. High-risk procedures in high-risk patients require individualized decision-making with increasing data helping to support which procedures can safely be performed.
antiplatelet agents and anticoagulants, broadly characterized as antithrombotic agents, are widely used in patients with common thromboembolic and cardiovascular diseases. While these agents reduce the risk of vascular events, they increase the risk of hemorrhage, particularly in the setting of invasive procedures such as colonoscopy. Decisions regarding management of antithrombotic agents undergoing colonoscopy depend on a balance of both procedural bleeding risks and patient thrombotic risks. Each patient ultimately requires individual clinical decision-making; however, a growing field of data has provided a groundwork for general principles in considering the risks and benefits for the management of periprocedural antithrombotic agents.

Patient and procedure risk stratification

The risk of colonoscopy in patients on antithrombotic agents depends on a balance of the procedural risk of hemorrhage and the patient risk of thrombosis if antithrombotic agents are held. The American Society of Gastrointestinal Endoscopy (ASGE), the British Society of Gastroenterology/European Society of Gastrointestinal Endoscopy (BSG/ESGE), and the Asian Pacific Association of Gastroenterology/Asian Pacific Society of Digestive Endoscopy (APAGE/APSDE) have all formulated guidelines on the management of antithrombotic management in endoscopy based on procedural and patient risk stratification [1–3].

There is no absolute consensus on the definition of high- versus low-risk procedures. In general, as outlined in the most recent APAGE guidelines, the threshold to consider a procedure low risk is a risk of hemorrhage less than 1% [3]. Hemorrhage risk has been evaluated by numerous studies looking at colonoscopy with multiple types of interventions in patients on anticoagulation [4–6]. For example, diagnostic procedures with or without biopsy have long been shown to have a low risk of hemorrhage [7, 8]. All major practice guidelines are in agreement that diagnostic colonoscopy with or without biopsy should be considered low risk, while colonoscopy with more advanced interventions such as polypectomy, endoscopic mucosal resection (EMR), and endoscopic submucosal dissection (ESD) should be considered high risk. As we will discuss further, however, the risk of polypectomy is more nuanced, and decisions should include factors such as polyp size and polypectomy technique.

Screening and surveillance colonoscopies present a difficult assessment of risk stratification as the need for intervention is unknown and therefore the procedural risk is determined at the time of the procedure. Large studies have found polyps at the time of colonoscopy ranging from in 22.5–32.1% of patients [9, 10]. Given the significant possibility of a low-risk procedure transforming into a high-risk procedure, many endoscopists treat screening and surveillance colonoscopy as an assumed high-risk procedure and manage antithrombotic therapy accordingly. A consideration can be made, however, for high-risk patients in which holding antithrombotic therapy is a particularly high risk for a thrombosis. For these patients, a purely diagnostic procedure may be
favorable, with decisions regarding further procedures and antithrombotic therapy made after the initial findings.

Patient risk stratification, or more precisely, the assessment of the risk of thrombosis in the setting of holding antithrombotic agents, is often more complex due to the interplay of the indication for antithrombotic agents, timing since a thrombotic event, the severity of disease, and other comorbidities. Common indications for antithrombotic therapy include atrial fibrillation, coronary stents, venous thromboembolism (VTE), and mechanical heart valves.

Risk of thrombotic events (e.g., stroke) in patients with atrial fibrillation is calculated using the CHADSVASC index. Scores of 0–1 have less than 1% per year risk of ischemic stroke, while scores of 2 have a greater than 2% risk of ischemic stroke per year [11].

Patients with acute coronary syndrome or coronary artery disease treated with coronary stents are placed on antiplatelet therapy to prevent stent thrombosis. Risk stratification for these patients depends on the time since stent placement. Patients are considered high risk in the first month after bare metal stent and 12 months after drug eluting stent, with the highest risk in the first 6 weeks [12, 13].

The risk of thrombosis in patients with VTE depends on the timing of the thrombotic event, with patients who have experienced VTE in the last 3 months considered high risk [12]. For patients with mechanical heart valves on warfarin (as direct oral anticoagulants (DOACs) are not approved for this indication), high-risk patients include those with metal valves in the mitral position as well as those with mechanical valves and atrial fibrillation [12]. Bioprosthetic valves and mechanical valves in the aortic position are considered low risk [2].

**Aspirin**

Aspirin is an essential therapy for patients with known coronary artery disease or after vascular events such as myocardial infarction or stroke. Through the inhibition of cyclooxygenase, aspirin inhibits platelet function for the life of the platelet, increasing bleeding risk for up to 9 days [14].

Despite aspirin’s antiplatelet effects, multiple studies have demonstrated that both diagnostic colonoscopy and colonoscopy with polypectomy can safely be performed without discontinuation of aspirin [15–17]. In a recent meta-analysis of 11 studies with over 9000 patients undergoing polypectomy while on aspirin, there was no increase in risk of immediate postpolypectomy bleeding, though there was a small increase in risk of delayed postpolypectomy bleeding (OR 1.7, CI 1.2–2.2) [18•]. For higher risk interventions, such as EMR of polyps > 2 cm, aspirin is associated with an increased risk of hemorrhage [19, 20].

The overall small risk of hemorrhage while on aspirin must be weighed against the possibly devastating effects of holding the antiplatelet agent prior to colonoscopy. In a meta-analysis of over 600 studies and 50,000 patients where aspirin was not taken, there was a more than threefold increase in cardiovascular events with a mean time to event of only 11 days [21].

Given this risk-benefit calculation of significant thrombotic events such as stroke or myocardial infarction versus gastrointestinal hemorrhage—and the fact that most hemorrhages related to interventions during colonoscopy can be endoscopically controlled—all three international guidelines recommend
against withholding aspirin even for high-risk procedures (Table 1). The one exception to consider is a patient with low thrombotic risk—for example, aspirin for primary prophylaxis—undergoing a high-risk procedure such as resection of a large colon polyp > 2 cm, in which case the decision should be individualized after consultation with the patient’s cardiologist or neurologist. If the decision is made to withhold aspirin prior to a high-risk procedure, it should be held for 5–7 days to reduce risk of hemorrhage and can be restarted 7–10 days after the procedure.

### Thienopyridines

Thienopyridines inhibit P2Y<sub>12</sub> receptors on platelet cells in order to inhibit adenosine diphosphate (ADP) induced platelet aggregation [22]. Clopidogrel and prasugrel are irreversible inhibitors of platelet function with normal platelet aggregation returning 7–10 days after discontinuation of the drug. Ticagrelor reversibly inhibits platelet aggregation with normal plate function returning 3–5 days after discontinuation of the drug.

Both prospective and retrospective studies have suggested a significant increase in bleeding after polypectomy in patients on thienopyridines, though the overall bleeding rate was low (2.4% and 2.1%, respectively) [23, 24]. However, a more recent study of 2016 patients randomized to clopidogrel or

| Table 1. Management of antithrombotic agents |
|---------------------------------------------|
| **Patient thrombosis risk**                  | **High** |
| **Procedure hemorrhage risk**                | Low |
| Low                                         | • ASA: continue |
| • ASA: continue                             | • ASA: continue |
| • Thienopyridines: continue                 | • Thienopyridines: continue |
| • DATP: continue                            | • DATP: continue |
| • Warfarin: continue, ensure INR in therapeutic range | • Warfarin: continue, ensure INR in therapeutic range; restart evening of procedure if hemostasis |
| • DOAC: continue (consider holding AM dose) | • DOAC: continue |
| • ASA: continue (can consider holding if very low-risk patient and high-risk procedure) | If indication for antiplatelet therapy is finite, consider delaying procedure if possible |
| • Thienopyridines: hold for 5 days prior to procedure (consider holding ticagrelor for 3 days) | • ASA: continue |
| • DAPT: hold thienopyridine for 5 days, continue ASA | • Thienopyridines or DAPT: hold thienopyridine for 5 days after consultation with prescribing physician |
| • Warfarin: hold for 5 days, ensure INR < 1.5 | • Warfarin: discontinue 5 days prior, bridge with heparin; restart evening of procedure if hemostasis, discontinue bridge once therapeutic |
| • DOAC: hold for 2 days (3 days if renal insufficiency, 72 h if CrCl < 50 with dabigatran) | • DOAC: discontinue 2 days prior (longer for renal insufficiency), bridge with heparin; restart 24–48 h after procedure if hemostasis |
| High                                        |     |
| • ASA: continue                             | • ASA: continue |
| • Thienopyridines: continue                 | • Thienopyridines: continue |
| • DAPT: continue                            | • DAPT: continue |
| • Warfarin: continue, ensure INR in therapeutic range | • Warfarin: continue, ensure INR in therapeutic range; restart evening of procedure if hemostasis |
| • DOAC: continue                            | • DOAC: continue |
| • If indication for antiplatelet therapy is finite, consider delaying procedure if possible |     |
| • ASA: continue                             | • ASA: continue |
| • Thienopyridines or DAPT: hold thienopyridine for 5 days after consultation with prescribing physician |     |
| • Warfarin: discontinue 5 days prior, bridge with heparin; restart evening of procedure if hemostasis, discontinue bridge once therapeutic |     |
| • DOAC: discontinue 2 days prior (longer for renal insufficiency), bridge with heparin; restart 24–48 h after procedure if hemostasis |     |
placebo 7 days prior to polypectomy found no difference in immediate or delayed postpolypectomy bleeding with no change in serious thrombotic events [25].

Similar to patients receiving aspirin therapy, major guidelines suggest continuing thienopyridines prior to low-risk procedures (Table 1). For high-risk procedures, the indication for antiplatelet therapy should be evaluated and the procedure should be delayed, if possible, until after antiplatelet therapy can be safely discontinued—for example until 12 months after stent placement for acute coronary syndrome. If antiplatelet therapy cannot be discontinued at a future time or the procedure cannot be delayed, thienopyridines should be withheld for at least 5 days prior to the procedure [1–3]. While not universal practice, theoretically ticagrelor can be held for as short as 3 days given its shorter duration of action [3]. For high-risk patients on thienopyridines undergoing high-risk procedures, the risks and benefits of holding antiplatelet therapy should be discussed with the patient and the physician managing the patient’s antiplatelet therapy.

There are no guidelines on resumption of antiplatelet agents. While some practitioners restart clopidogrel the day following the procedure and prasugrel and ticagrelor on the second day (given faster onset of action), others favor immediate re-initiation of antiplatelet therapy, particularly in high-risk patients.

Many patients on thienopyridines are on dual antiplatelet therapy (DAPT) as dual therapy is more effective than aspirin alone at preventing cardiovascular events in patients with known cardiovascular disease [26]. Withholding both antiplatelet agents puts these patients at significantly higher thrombotic risk. For example, in patients with coronary stents on DAPT, the median time to thrombosis is 7 days when both agents are held versus 122 days if aspirin is continued [27]. In accordance with the guidelines, we therefore continue aspirin and hold thienopyridines in low-risk patients on DAPT undergoing high-risk procedures. For high-risk patients, for example, those with recent coronary stents, the risks and benefits should be made in consultation with the patient’s other providers.

### Warfarin

Warfarin is a vitamin K antagonist resulting in anticoagulation through the inhibition of vitamin K–dependent synthesis of clotting factors II, VI, XI, and X. Determination of the risk of thrombosis in patients on warfarin depends on the indication for its use. Common indications for warfarin include atrial fibrillation, VTE, and mechanical heart valves. High-risk patients include those with recent (<3 months) VTE, metal mitral valve, prosthetic mitral valve with atrial fibrillation, or atrial fibrillation with mitral stenosis. Low-risk conditions include indications such as VTE >3 months from onset, bioprosthetic valves, and non-valvular atrial fibrillation [2, 12].

There is discrepancy between guidelines regarding the risk associated with thrombophilia syndromes and VTE. ASGE guidelines suggest that thrombophilia syndromes are associated with medium-high risk of thrombosis, while ESGE guidelines classify all thrombophilia syndromes as low risk without definitive data supporting either position. Given the heterogeneity of risk in
these patients, we generally discuss the risks and benefits with the patient’s hematologist.

For low-risk procedures, such as diagnostic colonoscopy with or without biopsy, warfarin can be safely continued as long as INR remains in the therapeutic range (Table 2). Warfarin does, however, increase the risk of hemorrhage with high-risk procedures. For example, in a study of over 5000 consecutive cases of colonoscopy with polypectomy, warfarin was demonstrated to be an independent risk factor for hemorrhage with an odds ratio of 13.37 [5]. Therefore, for high-risk procedures such as polypectomy, EMR, or ESD, warfarin should be held for 5 days prior to the procedure with preprocedure goal INR < 1.5. Given its slow onset, warfarin should be restarted on the evening of the procedure if hemostasis is achieved.

Patients at a high risk of thrombosis should undergo bridging with heparin products such as low molecular weight heparin or heparin infusion if hospitalized. Low molecular weight heparin should be held the evening before the procedure and continued until INR has returned to therapeutic range. For patients with non-valvular atrial fibrillation, evidence from the BRIDGE trial supports discontinuation of warfarin as needed without the need for bridging therapy with heparin even in higher risk patients with high CHADSVASC scores [28].

The ability to avoid heparin bridging is significant. While safer than continuing anticoagulation, patients who undergo bridge therapy remain at a higher risk of hemorrhage than patients who have anticoagulation held without bridging. In a retrospective study of 117 patients that underwent colonoscopy with polypectomy either with or without bridge therapy after holding anticoagulation, the incidence of hemorrhage was significantly higher in the bridge therapy group (20.0% vs 1.4%), with a particularly high risk for delayed bleeding [29].

Reversal of anticoagulation for bleeding patients depends on the acuteness of illness. Guidelines suggest reversal of INR for patients with life-threatening bleeding. Guidelines suggest reversal with 4-factor prothrombin complex concentrate (PCC) over fresh frozen plasma (FFP) given faster onset, lack of need for ABO matching, and less risk of volume overload [3]. ESGE guidelines also suggest concomitant vitamin K (5–10 mg) given the short half-life of factor VII in PCC [30]. APAGE also suggests concomitant vitamin K but a lower dose of <5 mg to reduce the risk of hypercoagulability [3]. The timing for the resumption of warfarin in bleeding patients with hemostasis is controversial. Evidence suggests that resuming warfarin between days 7 and 30 decreases the risk of thrombosis and death, but it increases the risk of re-bleeding if started prior to 7 days. ESGE suggests resumption between 7 and 15 days, while the APAGE suggests restarting after 3 days as the risk of bleeding reduces significantly by that time [2, 3].

Direct oral anticoagulants

DOACs include apixaban, rivaroxaban, and edoxaban, all of which inhibit factor Xa, as well as dabigatran, which inhibits thrombin (factor IIa). They are currently approved for prevention of thromboembolism in non-valvular atrial fibrillation as well as for treatment and prevention of DVT and pulmonary
| Class                  | Drug (brand name) | Mechanism of action                                                                 | Half-life | Hold duration (time before procedure) |
|-----------------------|-------------------|--------------------------------------------------------------------------------------|-----------|---------------------------------------|
| **Antiplatelet agents** |                   |                                                                                      |           |                                       |
| Antiplatelet agents   | Aspirin           | Irreversible inhibition of cyclooxygenase 1 and 2, inhibiting formation of thromboxane A2 and platelet aggregation | 15–20 min | 5–7 days                              |
| Thienopyridines       | Clopidogrel (Plavix, Bristol-Myers Squibb/Sanofi Pharmaceuticals Partnership, Bridgewater, NJ, USA) | Irreversible inhibition of P2Y₁₂ component of ADP receptor, preventing Glib/IIIa activation and platelet aggregation | 6 h       | 5 days                                |
|                       | Prasugrel (Effient, Eli Lilly and Company, Indianapolis, Ind, USA) | Irreversible inhibition of P2Y₁₂ component of ADP receptor, preventing Glib/IIIa activation and platelet aggregation | 7 h       | 5 days                                |
|                       | Ticagrelor (Brilinta, AstraZeneca, Wilmington, Del, USA) | Reversible inhibition of P2Y₁₂ component of ADP receptor, preventing Glib/IIIa activation and platelet aggregation | 7 h       | 5 days (can consider 3–5 days)        |
| **Anticoagulants**    |                   |                                                                                      |           |                                       |
| Anticoagulants        | Vitamin K antagonist | Vitamin K antagonist resulting in anticoagulation through the inhibition of vitamin K–dependent synthesis of clotting factors II, VI, XI, X | 20–60 h   | 5 days                                |
|                       | Warfarin (Coumadin, Bristol-Myers Squibb Company, Princeton, NJ, USA) |                                                                                      |           |                                       |
|                       | DOACs             | Reversible inhibition of thrombin (factor IIa) inhibitor                              | 12–14 h   | 2 days (3 days if CrCl < 50)          |
|                       | Dabigatran (Pradaxa, Boehringer Ingelheim Pharmaceuticals Inc., Ridgefield, Conn, USA) |                                                                                      |           |                                       |
|                       | Rivaroxaban (Xarelto, Janssen Pharmaceuticals, Inc., Raritan, NJ, USA) | Reversible inhibition of factor Xa                                                  | 7–11 h    | 2 days                                |
|                       | Apixaban (Eliquis, Bristol-Myers Squibb Company, Princeton, NJ, USA) | Reversible inhibition of factor Xa                                                  | 8–15 h    | 2 days                                |
|                       | Edoxaban (Savaysa, Daiichi Sankyo Co, LTD, Tokyo, Japan) | Reversible inhibition of factor Xa                                                  | 10–14 h   | 2 days                                |
embolism. DOACs offer the advantage of rapid therapeutic anticoagulation within 1–4 h and offset within 24 h without the need for therapeutic monitoring. Importantly, they are all to varying extent renally cleared, meaning prolonged anticoagulation effects in patients with renal insufficiency.

In terms of gastrointestinal hemorrhage, dabigatran and rivaroxaban showed a modest increased risk versus warfarin (hazard ratios 1.49 and 1.61, respectively), whereas apixaban had a similar overall risk to warfarin [31].

Similar to patients on warfarin, if the indication for the anticoagulation is time limited and the procedure is not time sensitive, we suggest delaying the procedure (Table 2). For patients who need a low-risk procedure while still taking a DOAC, the DOAC can be continued. Given the variability of anticoagulation effect based on timing of the last dose and lack of widely available testing for measuring the anticoagulation effect of DOACs, we recommend that patients withhold the morning dose on the day of the procedure.

Patients on DOACs undergoing high-risk procedures should hold the medication for 2 days prior to the procedure based on their known pharmacodynamics with rapid offset [32]. As dabigatran has increased renal clearance compared to other DOACs (about 80% vs <50%), patients with significant renal insufficiency with creatinine clearance 30–50 ml/min should hold dabigatran for an additional day (i.e., 3 days prior to the procedure). As apixaban, rivaroxaban, and edoxaban all have <50% renal clearance without excess accumulation in patients with renal insufficiency, there is no need to hold these drugs for longer than 2 days even in the setting of renal insufficiency [2, 3]. Hematology input should be considered in patients with rapidly worsening renal function requiring a high-risk procedure due to the difficulty in assessing anticoagulation effect in these patients.

Due to the rapid offset and onset of the anticoagulation effects of DOACs, bridging is not necessary in patients with atrial fibrillation and has been shown to increase the risk of major hemorrhage without reducing cardiovascular events [33].

There are no definitive data in regard to restarting DOACs after high-risk procedures. Based on expert opinion, we recommend that restarting a DOAC 1–2 days following a procedure assuming hemostasis has been achieved as anticoagulation effect will be restored within hours. For patients with particularly high thrombosis risk, bridging therapy may need to be considered.

Reversal of anticoagulation in patients with acute bleeding on DOACs remains controversial. Patients with non-life-threatening bleeding can generally have their DOAC held given the rapid offset of action. As indicated in practice guidelines, some patients with serious life-threatening bleeding may benefit from reversal. However, data is lacking on the optimal modality for reversal in the majority of patients. Vitamin K has no impact on the mechanism of anticoagulation in DOAC, and FFP has not been shown to have any clinical benefit. Further, with the exception of dabigatran, DOACs are not dialyzable [34].

A monoclonal antibody reversal agent for dabigatran, idarucizumab, was approved in 2015 and readily reverses the anticoagulation effect of dabigatran but not other DOACs. More recently, andexanet alpha has been approved for reversal of apixaban and rivaroxaban but is not widely available. One commonly available theoretical reversal agent for patients with life-threatening bleeding on DOACs is 4 factor PCC, which has been shown to improve PTT
in healthy patients on apixaban [35]. The use of PCC for reversal of anticoagulation in DOACs should be reserved only for life-threatening conditions, however, given the current lack of data, increased risk of thrombosis, and the likely rapid offset of DOACs with simply holding the medication.

**Special considerations: polypectomy**

Postpolypectomy bleeding is one of the most common complications associated with colonoscopy, and its risk is increased in patients on antithrombotic therapy [6, 27, 36]. Bleeding can be categorized into immediate bleeding during or shortly after the procedure or late bleeding, hours to weeks after the procedure.

Compared to diagnostic colonoscopy, colonoscopy with polypectomy carries a significant increase in bleeding risk. In a large systematic review, the risk of hemorrhage after colonoscopy with polypectomy versus no-polypectomy was 9.8 versus 0.6 per 1000 colonoscopies [37]. Based on the overall increase risk of hemorrhage with polypectomy, society guidelines are in agreement that colonoscopy with polypectomy should be characterized as a high-risk procedure, and antithrombotic agents should be managed accordingly. However, multiple studies investigating various subgroups of polypectomy based on polyp size and polypectomy technique have found conflicting results on the true risk of hemorrhage.

While polypectomy overall increases the risk of hemorrhage in patients on anticoagulation, the size of the polyp is also significant. In a study of 123 patients (225 polypectomies) on warfarin, there was a total of one postpolypectomy bleed requiring transfusion, with two other bleeds not requiring intervention [38]. Based on these results, polypectomy on warfarin was found to in fact be low risk (<1%) in polypectomy of small polyps < 1 cm.

Technique of polypectomy is similarly important. The safety of cold snare polypectomy versus hot snare polypectomy was previously demonstrated in a prospective randomly controlled trial of patients undergoing hot versus cold snare polypectomy of small (up to 1 cm) polyps while on anticoagulation. While there was more immediate bleeding in the cold snare group (23% vs 5.7%), bleeding was able to be controlled endoscopically, and there was no delayed bleeding. Conversely, 14% of the hot snare group required endoscopic hemostasis for delayed hemorrhage [39••]. Building on this finding of the safety of cold snare polypectomy for small polyps, a recent randomly controlled trial compared cold snare polypectomy in anticoagulated patients to traditional hot snare polypectomy with heparin bridge for subcentimeter polyps and found no increase in major bleeding [40••]. Current ESGE guidelines recommend cold snare polypectomy for all subcentimeter polyps [41].

It is also important to consider that the vast majority of postpolypectomy bleeding can be treated endoscopically, with emerging data supporting prophylactic techniques in certain situations. For example, in a randomized trial in patients who underwent polypectomy of polyps 1–4 cm, patients who had postpolypectomy sites closed with hemoclips had significantly less delayed postpolypectomy bleeding (1.1% versus 6.9%) [42]. A more recent randomized trial in patients who underwent polypectomy of lesions > 2 cm found a similar
reduction in bleeding in patients who underwent hemoclip closure; however, the effect was only significant in polyps in the proximal colon [43].

Conclusions

Management of antithrombotic agents in patients undergoing colonoscopy requires a careful analysis of the risk of hemorrhage associated with the procedure and the risk of thrombosis associated with interruption of such agents in patients with underlying cardiovascular disease.

In general, diagnostic colonoscopy with or without biopsy is associated with an acceptably low risk of hemorrhage and does not require interruption of antithrombotic agents. For procedures associated with a high risk of hemorrhage, such as EMR and ESD, antithrombotic agents should be held based on accepted guidelines if patients are at a low risk of thrombosis—such as those with VTE > 3 months or atrial fibrillation without valvular disease. In patients undergoing high-risk procedure who also have a high risk of thrombosis, the decision regarding colonoscopy with interventions must be individualized. If the requirement for antithrombotic agents is finite—such as after coronary stent placement—the procedure should be delayed if possible. If antithrombotic agents cannot be held and the procedure cannot be delayed, the decision on how to proceed should be made in a multidisciplinary manner with the physician managing the antithrombotic agents and the patient.

While polypectomy has previously been considered a high-risk procedure given increased risk of hemorrhage, new studies have helped differentiate the risk of hemorrhage based on characteristics such as polyp size and polypectomy technique to allow for more individualized decision-making.

Compliance with ethical standards

Conflict of interest
Michael O’Donnell declares that he has no conflict of interest. Seth A. Gross declares that he has no conflict of interest.

Human and animal rights
This article does not contain any studies with human or animal subjects performed by any of the authors.
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- Of importance
- Of major importance

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