# Management of antiplatelet agents in patients undergoing endoscopic procedures

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Literature review current through: **Sep 2023.**
This topic last updated: **May 12, 2022.**

## INTRODUCTION

Management of antiplatelet agents in patients undergoing endoscopic procedures is challenging because interrupting antithrombotic therapy transiently increases the risk of thromboembolism. At the same time, some endoscopic interventions may have bleeding risks that are increased by the antiplatelet agent given for thromboembolism prevention. Limited data are available to guide the management of patients on antiplatelet agents in these settings.

This topic will review the periprocedural management of patients taking antiplatelet agents for the prevention of thromboembolism. The management of patients taking anticoagulants, as well as patients with disorders of hemostasis (eg, von Willebrand disease, hemophilia) are discussed elsewhere. (See "Management of anticoagulants in patients undergoing endoscopic procedures" and "Gastrointestinal endoscopy in patients with disorders of hemostasis".)

The therapeutic effect of antiplatelet agents is impaired platelet function, including preventing platelet activation and inhibiting platelet aggregation. The mechanism of action of aspirin in low doses is inhibition of cyclooxygenase and platelet generation of thromboxane A2, resulting in an antithrombotic effect. Clopidogrel, ticlopidine, ticagrelor, and prasugrel inhibit platelet function by binding to the $P2Y_{12}$ component of the adenosine diphosphate receptors which prevents activation of the GPIIb/IIIa receptor complex, thus reducing platelet aggregation. Aspirin, clopidogrel, ticlopidine, or prasugrel irreversibly inhibit platelet function for 7 to 10 days, corresponding to the average lifespan of platelets. The mechanism of action of

antiplatelet agents is discussed in more detail separately. (See "Platelet biology and mechanism of anti-platelet drugs", section on 'Platelet receptors and their agonists'.)

The American Society for Gastrointestinal Endoscopy (ASGE) has issued guidelines regarding the management of patients taking antiplatelet agents based upon the available evidence and consensus opinion [1]. The recommendations in this topic are consistent with the ASGE guidelines. This topic is also addressed in guidelines from the American College of Gastroenterology, the American College of Chest Physicians, the British Society of Gastroenterology/European Society of Gastrointestinal Endoscopy, the American College of Cardiology/American Heart Association, and the American College of Surgeons, which make similar (although not identical) recommendations [2-6].

## GENERAL PRINCIPLES

**Factors that guide decision-making** — The management of antiplatelet agents for patients undergoing endoscopy takes into account the patient's risk of thromboembolic complications in the absence of antiplatelet therapy, the procedure-related bleeding risk, and the specific features of the antiplatelet agent [7,8].

Much of our approach is based on expert opinion; thrombotic and bleeding risks may vary depending on individual circumstances, and data from randomized trials or well-designed observational studies are unlikely to be available to guide clinical practice in all settings. Thus, the approach is not based on high-quality evidence and is intended only as clinical guidance in decisions about periprocedural management of antiplatelet agents.

### Assessing individual patient risk

**Estimating thromboembolic risk** — The probability of a thromboembolic complication following discontinuation of antiplatelet agents depends on the condition for which the medication was prescribed. A higher thromboembolic risk increases the importance of either minimizing or avoiding a time interval without therapy. We consult with the clinician who is managing the patient's antiplatelet therapy to estimate the thromboembolic risk. (See 'Specialty consultation' below and "Gastrointestinal endoscopy in patients with disorders of hemostasis", section on 'Specialty consultation'.)

Antiplatelet agents are used in patients who have a history of or who are at risk for cerebrovascular events, acute coronary syndromes, percutaneous coronary or vascular interventions with stenting, or peripheral arterial disease. Patients are at high risk for complications such as stent thrombosis if antiplatelet therapy is discontinued prematurely

( table 1) [9]. (See "Noncardiac surgery after percutaneous coronary intervention", section on 'Statement of the problem' and "Noncardiac surgery after percutaneous coronary intervention", section on 'Nonemergency noncardiac surgery'.)

When possible, interventional endoscopic procedures should be delayed for a minimum of one month but ideally for at least six months from the time of the index cardiovascular event. For patients who are within six months of starting dual antiplatelet therapy (DAPT) but who require an endoscopic procedure, management depends on the procedure-related bleeding risk ( table 2) (see 'P2Y12 receptor blockers' below and 'Dual antiplatelet therapy' below):

- If bleeding risk from an endoscopic procedure is low, DAPT is continued periprocedure.
- If bleeding risk from an endoscopic procedure is high, $P2Y_{12}$ inhibitor therapy is discontinued for the minimum duration that is possible, while aspirin is continued.
- If bleeding risk from an endoscopic procedure is very high (eg, endoscopic mucosal resection [EMR] of a polyp ≥2 cm), aspirin and $P2Y_{12}$ inhibitor therapy are interrupted. However, most elective procedures can be delayed until the minimum duration of DAPT has been completed.

Indirect data on whether discontinuing antiplatelet therapy before surgery impacts mortality, bleeding requiring transfusions, or ischemic events have been uncertain [10]. Analysis of administrative databases suggests that the risk of major adverse cardiac and cerebrovascular events related to interruption of antiplatelet agents was linked to the time interval between coronary stent placement and interruption of antithrombotic therapy. The risk of adverse events was high during the first month but continued to be increased for three to six months after coronary stent placement [11]. In contrast, in the Aspirin and Tranexamic Acid for Coronary Artery Surgery (ATACAS) trial addressing antiplatelet interruption for coronary artery bypass graft surgery, there were no significant differences in the risk of a primary outcome (ie, nonfatal myocardial infarction, stroke, or pulmonary embolism) or in rates of bleeding for patients on aspirin compared with placebo [12]. In addition, outcomes at one year were not significantly different between the groups [13]. Thus, even with high-risk interventions, the likelihood of added thromboembolic protection from perioperative ASA was not evident, and discontinuation of antiplatelet agents for noncardiac interventions with high bleeding risk may be safe. However, in a meta-analysis of 46 studies including >30,000 patients who had noncardiac surgery (endoscopic procedures were excluded), antiplatelet agents were associated with minimal increased bleeding risk but no increase in thromboembolic complications [14].

Risk factors for cardiac stent thrombosis are discussed separately. (See "Coronary artery stent thrombosis: Incidence and risk factors".)

Indications for antiplatelet agents and management of the underlying diseases are discussed separately:

- Secondary prevention of cardioembolic events in patients with a history of stroke (see "Long-term antithrombotic therapy for the secondary prevention of ischemic stroke")
- Secondary prevention of cardioembolic events in patients with a history of myocardial infarction (see "Prevention of cardiovascular disease events in those with established disease (secondary prevention) or at very high risk", section on 'Antiplatelet therapy')
- Prevention of stent thrombosis in patients who have undergone coronary stenting (see "Acute ST-elevation myocardial infarction: Antiplatelet therapy" and "Acute non-ST-elevation acute coronary syndromes: Early antiplatelet therapy" and "Long-term antiplatelet therapy after coronary artery stenting in stable patients")
- Long-term management for patients with peripheral arterial disease (see "Overview of lower extremity peripheral artery disease")

**Estimating procedure-related bleeding risk** — The risk of bleeding depends on the endoscopic procedure and the need for (and type of) therapeutic intervention. (See "Gastrointestinal endoscopy in patients with disorders of hemostasis", section on 'Estimating procedure-related bleeding risk'.).

Common low risk procedures (bleeding risk <1 percent) include ( table 2):

- Upper gastrointestinal endoscopy (esophagogastroduodenoscopy [EGD]) including mucosal biopsy
- Colonoscopy including mucosal biopsy
- Endoscopic retrograde cholangiopancreatography (ERCP) without sphincterotomy
- ERCP with biliary stent placement but without sphincterotomy

Common high-risk procedures (bleeding risk ≥1 percent) include:

- EGD with esophageal variceal ligation
- EGD with esophageal dilation
- Percutaneous endoscopic gastrostomy tube placement
- Colonoscopy with resection of polyp ≥1 cm
- ERCP with biliary or pancreatic sphincterotomy

The approach to managing antiplatelet agents depends on whether the procedure is low or high risk for bleeding. For some procedures (ie, screening colonoscopy), the preprocedure

estimate of bleeding risk is uncertain because it is unknown whether a high-risk intervention (ie, removal of polyp ≥1 cm) will be necessary. For patients undergoing a procedure with uncertain risk, management options depend on the patient's risk of thrombosis and the specific antiplatelet agent. (See 'Elective procedures' below.)

Measures to prevent bleeding after colonoscopy (eg, polypectomy techniques, use of hemoclips) are discussed separately. (See "Management and prevention of bleeding after colonoscopy with polypectomy".)

**Specialty consultation** — We consult with the clinician who is managing the patient's long-term anticoagulation (eg, cardiologist, neurologist, vascular specialist) to estimate the patient's thrombotic risk and to determine if antiplatelet therapy can be safely interrupted.

## URGENT PROCEDURES FOR GI BLEEDING

For patients with gastrointestinal (GI) bleeding, the risk of discontinuing antiplatelet therapy should be weighed against the risk of continued bleeding without interrupting therapy. The approach is individualized based on the severity and source of GI bleeding, the risk of rebleeding after achieving hemostasis, the specific antiplatelet agent(s), and the patient's thrombotic risk as determined by the clinician managing the antiplatelet therapy [1]. (See 'Specialty consultation' above and "Gastrointestinal endoscopy in patients with disorders of hemostasis", section on 'Specialty consultation'.)

**Patients with life-threatening bleeding** — For patients with life-threatening GI bleeding, we discontinue all antiplatelet agents. Management may also include platelet transfusion, if rapid correction of platelet dysfunction is necessary [15,16]. Indications for and risks of platelet transfusion in the setting of active bleeding are discussed separately. (See "Platelet transfusion: Indications, ordering, and associated risks".)

The duration of platelet dysfunction varies depending on the specific antiplatelet agent. For example, platelet aggregation gradually returns to baseline in approximately three to nine days after discontinuing a $P2Y_{12}$ receptor blocker. In contrast, GPIIb/IIIa inhibitors have shorter durations of activity (eg, tirofiban or eptifibatide: four to eight hours). (See "Acute non-ST-elevation acute coronary syndromes: Early antiplatelet therapy", section on 'Glycoprotein IIb/IIIa inhibitors'.)

**Patients with non-severe bleeding** — The approach to patients with nonsevere GI bleeding prior to endoscopic evaluation primarily depends on the patient's thrombotic risk determined in

consultation with the clinician who is managing the patient's antithrombotic therapy ( table 1):

- **Low thrombotic risk** – For patients with low thrombotic risk, antiplatelet therapy is generally interrupted, and the timing for restarting antiplatelet agents is determined after endoscopic evaluation and achieving hemostasis. (See 'Restarting antiplatelet therapy' below.)

- **High thrombotic risk** – For patients with high thrombotic risk, antiplatelet therapy is generally continued prior to endoscopic evaluation. Gastrointestinal bleeding in a high-risk patient poses unique therapeutic challenges because interrupting antiplatelet therapy increases the risk of complications (eg, myocardial ischemic events, stent thrombosis) but it is sometimes necessary to achieve endoscopic hemostasis [17,18]. The management of antiplatelet therapy in this setting is individualized with input from a multidisciplinary team, and this is discussed in detail elsewhere. (See "Gastrointestinal bleeding in patients undergoing percutaneous coronary intervention" and "Long-term antiplatelet therapy after coronary artery stenting in stable patients".)

**Restarting antiplatelet therapy** — The timing for restarting antiplatelet therapy depends on whether the risk of rebleeding is low or high based on the bleeding source, and this risk assessment is done by the endoscopist. An example of a lesion with a low rebleeding risk is a clean-based duodenal ulcer, while a duodenal ulcer with a visible vessel initially has a higher risk of rebleeding following endoscopic treatment ( table 3). (See "Overview of the treatment of bleeding peptic ulcers", section on 'Stigmata of recent hemorrhage'.)

**Patients with low rebleeding risk** — Patients are regarded as having low rebleeding risk if either of the following conditions is noted at endoscopy:

- A lesion at low risk for rebleeding (ie, duodenal ulcer with a clean base), provided that hemostasis has been achieved

- No bleeding source identified and no active bleeding seen

The approach to and timing for restarting antiplatelet therapy after achieving hemostasis in patients with low rebleeding risk depends on the specific agent:

- Patients on $P2Y_{12}$ receptor blockers – We wait one to three days (depending on the agent) following hemostasis to restart $P2Y_{12}$ receptor blockers (see 'P2Y12 receptor blockers' below):

  - Clopidogrel: one day after procedure

- Prasugrel: two to three days after procedure
- Ticagrelor: two to three days after procedure

The reinitiation of clopidogrel is not delayed beyond one day because of its slower onset of action (24 hours) compared with prasugrel or ticagrelor that reach their peak antiplatelet effect more quickly (two to four hours).

- Aspirin – We wait one day following endoscopic hemostasis to restart aspirin.

Data are limited regarding the timing for and benefit of restarting antiplatelet agents; however, several society guidelines favor restarting antiplatelet therapy after hemostasis is achieved [1,19,20]. In addition, resuming aspirin for secondary prevention reduces the mortality risk [19]. In a trial of 156 patients with a history of either cardiovascular or cerebrovascular disease and with bleeding from peptic ulcer disease, restarting low-dose aspirin (80 mg daily) after achieving endoscopic hemostasis reduced the mortality risk compared with placebo (hazard ratio [HR] 0.2, 95% CI 0.05-0.70). However, there was a trend toward an increase in rebleeding risk in the aspirin group compared with placebo (HR 1.9, 95% CI 0.6-6.0).

**Patients with high rebleeding risk** — For most patients with lesions at high risk of rebleeding (ie, duodenal ulcer with active bleeding) ( table 3), we delay restarting antiplatelet therapy (if possible, depending on the patient's thrombotic risk) until the rebleeding risk is lower. (See 'Patients with low rebleeding risk' above and "Gastrointestinal bleeding in patients undergoing percutaneous coronary intervention".)

The duration of the delay is based on several factors, including the source and location of bleeding, the endoscopic method used to achieve hemostasis, the hemodynamic status of the patient, the patient's underlying thrombotic risk, and the potential consequences of rebleeding (eg, need for surgical intervention).

Risk factors associated with rebleeding and the natural history of specific gastrointestinal lesions are discussed in various UpToDate topics on gastrointestinal bleeding:

- (See "Overview of the treatment of bleeding peptic ulcers", section on 'Risk factors for persistent or recurrent bleeding'.)
- (See "Approach to acute upper gastrointestinal bleeding in adults", section on 'Risk stratification'.)
- (See "Methods to achieve hemostasis in patients with acute variceal hemorrhage", section on 'Natural history and prognosis with treatment'.)
- (See "Colonic diverticular bleeding", section on 'Risk of rebleeding and complications'.)

## NON-ELECTIVE PROCEDURES FOR NONBLEEDING INDICATIONS

When non-elective endoscopic procedures are required for patients on antiplatelet agents who are not actively bleeding (ie, patients with acute cholangitis from biliary obstruction), management options include a temporary, low-risk endoscopic intervention (ie, biliary stent without sphincterotomy) in order to delay the need for a procedure that carries a higher risk of bleeding ( table 2). (See "Post-endoscopic retrograde cholangiopancreatography (ERCP) bleeding", section on 'Preventive strategies'.)

However, some patients (ie, those with obstructive jaundice from pancreatic cancer) may require a high-risk endoscopic intervention (ie, biliary sphincterotomy) prior to biliary stent placement or may require endoscopic ultrasound with biopsy for diagnostic purposes. (See "Endoscopic stenting for malignant biliary obstruction" and "Clinical manifestations, diagnosis, and staging of exocrine pancreatic cancer", section on 'Endoscopic ultrasound-guided biopsy'.)

The management of patients on antiplatelet therapy who require a non-elective, high-risk endoscopic intervention for conditions other than gastrointestinal bleeding is similar to the management of patients who need urgent endoscopic therapy for gastrointestinal bleeding. (See 'Urgent procedures for GI bleeding' above.)

If a high-risk endoscopic intervention cannot be delayed and rapid reversal of the antiplatelet effect is required, platelet transfusion may be given if the risk of procedure-related bleeding outweighs the risk of thrombotic events. (See 'Assessing individual patient risk' above.)

## ELECTIVE PROCEDURES

**Low risk procedures** — No change in antiplatelet therapy is required prior to elective procedures with a low bleeding risk ( table 2) (eg, upper gastrointestinal endoscopy [esophagogastroduodenoscopy] or colonoscopy, including mucosal biopsy) [1]. However, for most patients scheduled for screening colonoscopy, the bleeding risk is uncertain because it is unknown whether or not removal of a polyp ≥1 cm will be required. Our approach to management in this setting is similar to that for high-risk procedures because an elective colonoscopy can be delayed until the patient's thrombotic risk is lower(See 'High or uncertain risk procedures' below.)

**High or uncertain risk procedures**

**Timing of elective procedure** — Whether an elective, high (or uncertain) risk procedure (eg, screening colonoscopy where polypectomy may be required) is performed or is delayed is guided by the patient's thrombotic risk (see 'Estimating thromboembolic risk' above):

- For patients at low thrombotic risk, an elective procedure can be performed after most antiplatelet agents (excluding aspirin) are temporarily discontinued. The approach to interruption and resumption of antiplatelet agents depends on the agent used. (See 'Adjusting antiplatelet agents' below.)

- For most patients at transiently high thrombotic risk, we delay elective procedures until the patient's thrombotic risk is lower, as determined by the indication for antiplatelet therapy and in consultation with the clinician who is managing the patient's anticoagulation (eg, cardiologist, neurologist). (See "Noncardiac surgery after percutaneous coronary intervention" and "Early antithrombotic treatment of acute ischemic stroke and transient ischemic attack".)

  For example, our practice of delaying elective high-risk procedures for patients with cardiac stenting within the previous six months is based upon indirect data showing higher rates of stent thrombosis and other cardiovascular complications with premature cessation of dual antiplatelet therapy (DAPT) in the setting of noncardiac surgery, and these issues are discussed separately [21-28]. (See "Long-term antiplatelet therapy after coronary artery stenting in stable patients".)

**Adjusting antiplatelet agents**

**P2Y12 receptor blockers** — For high- or uncertain-risk endoscopic procedures in low-risk patients on $P2Y_{12}$ receptor blockers (ie, clopidogrel), our approach is the following [7,8,29] (see "Noncardiac surgery after percutaneous coronary intervention", section on 'Nonemergency noncardiac surgery'):

- Discontinue the drug prior to the procedure (time interval depends on the specific agent):

  - Clopidogrel: five to seven days
  - Prasugrel: five to seven days
  - Ticagrelor: two to three days (reversible $P2Y_{12}$ inhibitor)
  - Ticlopidine: 10 to 14 days

  These time frames represent the minimum duration of interrupting the antiplatelet agent that results in normal platelet aggregation.

- Perform endoscopic procedure

- Restart $P2Y_{12}$ receptor blocker for most patients, provided that hemostasis has been achieved, as follows:

  - Clopidogrel: one day after procedure
  - Prasugrel: two to three days after procedure
  - Ticagrelor: two to three days after procedure
  - Ticlopidine: one day after procedure

  The decision to restart antiplatelet therapy is contingent upon achieving hemostasis as determined by the endoscopist. If the procedure-related bleeding risk is determined to be very high (ie, endoscopic mucosal resection [EMR] of a polyp ≥2 cm), the $P2Y_{12}$ receptor blocker may be restarted after four to seven days.

We restart clopidogrel one day after the procedure with a one-time dose that is equal to twice the patient's usual maintenance dose (maximum 150 mg) and on day 2 resume the patient's usual maintenance dose. For example, if the patient's maintenance dose of clopidogrel is 75 mg daily, a one-time loading dose of 150 mg is given one day after the procedure, and beginning on day 2, the patient resumes 75 mg once daily.

Reinitiation of clopidogrel is not delayed beyond one day because of its slower onset of action (ie, 24 hours) compared with other agents (prasugrel or ticagrelor) that reach their peak antiplatelet effect more quickly (two to four hours).

$P2Y_{12}$ receptor blockers are held prior to high-risk endoscopic procedures to lower the risk of procedure-related bleeding. For example, some studies suggest that the use of $P2Y_{12}$ platelet receptor blockers may increase the risk of postpolypectomy bleeding [30-32]. The effect of clopidogrel on postpolypectomy bleeding was examined in a meta-analysis of five observational studies with 6743 patients [33]. At the time of colonoscopy, 574 patients (9 percent) were taking clopidogrel, with or without aspirin. The rate of postpolypectomy bleeding was higher in patients receiving clopidogrel compared with those who were not (6 versus 2 percent; risk ratio 2.5, 95% CI 1.7-3.8). (See "Management and prevention of bleeding after colonoscopy with polypectomy".)

**Aspirin** — We do not routinely stop aspirin prior to high-risk endoscopic procedures; however, we typically do not give aspirin immediately following the procedure. Aspirin is resumed one day after the procedure, provided that hemostasis is achieved. Our approach is consistent with society guidelines [1]; however, for patients on aspirin for primary prevention, we delay restarting aspirin for 7 to 10 days for patients who undergo EMR of a colon polyp ≥2 cm or other high risk, advanced procedures (ie, endoscopic submucosal dissection [ESD]).

In addition, some advanced endoscopists and UpToDate contributors hold aspirin for five to seven days prior to selected high-risk procedures (eg, EMR, ESD) if aspirin is being given for primary prevention. However, we do not interrupt aspirin therapy if it is being given for secondary prevention. (See "Management and prevention of bleeding after colonoscopy with polypectomy", section on 'Measures to prevent bleeding' and "Overview of endoscopic resection of gastrointestinal tumors".)

Aspirin use in patients undergoing endoscopic sphincterotomy and colon polypectomy (polyps <2 cm) does not increase bleeding risk [34-39]. (See "Post-endoscopic retrograde cholangiopancreatography (ERCP) bleeding", section on 'Antiplatelet agents (excluding aspirin)'.)

Aspirin use in patients undergoing selected advanced procedures (eg, EMR, ESD) results in a higher risk of bleeding [40-44]; however, indirect evidence shows that the risk of thrombosis increases in patients on aspirin for secondary prevention when it is held [45-47]. In a trial of 220 patients on aspirin for secondary prevention who were undergoing noncardiac surgery, patients on continuous aspirin therapy had lower rates of postoperative cardiac events compared with patients in whom aspirin was held (2 versus 9 percent) [45]. There were no differences in bleeding complications between the two groups. (See "Overview of endoscopic resection of gastrointestinal tumors", section on 'Endoscopic submucosal dissection'.)

**Dual antiplatelet therapy** — $P2Y_{12}$ receptor blockers (eg, clopidogrel, prasugrel, or ticagrelor) are used in combination with aspirin for the treatment of acute coronary syndromes and cardiovascular and cerebrovascular disease, and this regimen is referred to as DAPT. For high- or uncertain-risk endoscopic procedures in patients on long-term dual antiplatelet therapy (ie, clopidogrel plus aspirin) who have completed the minimum duration of uninterrupted dual therapy, we discontinue the $P2Y_{12}$ receptor blocker between two and seven days (depending on the specific agent) prior to the procedure while aspirin is continued without interruption [1,2]. We perform the procedure and then restart the $P2Y_{12}$ receptor blocker in one to three days (depending on the specific agent), provided that hemostasis has been achieved. (See 'P2Y12 receptor blockers' above and 'Estimating thromboembolic risk' above.)

The practice of temporarily discontinuing the $P2Y_{12}$ receptor blocker while continuing aspirin for patients who have completed initial therapy with DAPT for cardiac stents is probably safe, and several studies have evaluated thrombotic risk in this setting [48-50]. In general, the risk of a thromboembolic complication is higher when DAPT is interrupted earlier (ie, within the first month) compared with later (between one and 12 months), and these issues are discussed in more detail separately. (See "Long-term antiplatelet therapy after coronary artery stenting in stable patients", section on 'Patients needing temporary discontinuation' and "Coronary artery stent thrombosis: Incidence and risk factors", section on 'Risk factors'.)

**Dipyridamole** — Periprocedural management of dipyridamole depends on whether it is being given alone or in combination with aspirin [7] (see "Long-term antithrombotic therapy for the secondary prevention of ischemic stroke", section on 'Aspirin plus dipyridamole'):

- For patients on dipyridamole alone, we perform high-risk endoscopic interventions without interrupting therapy.
- For patients on aspirin-extended-release dipyridamole, we discontinue aspirin-extended-release dipyridamole two to three days before the procedure and continue aspirin alone. We restart aspirin-extended-release dipyridamole one day after the procedure if hemostasis was achieved.

Limited data suggest that aspirin-extended-release dipyridamole may increase the risk of bleeding after high-risk endoscopic interventions [51]. Dipyridamole alone probably does not increase the bleeding risk; however, no studies in this setting are available.

Some advanced endoscopists hold all dipyridamole-based therapies prior to selected high-risk procedures (ie, endoscopic mucosal resection). If it is determined that the procedure-related bleeding risk is greater than the potential benefit of continuing dipyridamole during the periprocedural period (through consultation with the endoscopist and the clinician managing therapy), medication adjustments are as follows (see "Perioperative medication management", section on 'Other antiplatelet agents' and "Endoscopic removal of large colon polyps", section on 'Endoscopic mucosal resection techniques'):

- Dipyridamole alone: Discontinue two to three days prior to procedure.
- Aspirin-extended-release dipyridamole: Discontinue two to three days prior to procedure, but aspirin monotherapy is given while dipyridamole is being held.

Dipyridamole reversibly inhibits platelet aggregation, has an elimination half-life of 12 hours, and is typically given to patients with history of stroke or transient ischemia attack. (See "Long-term antithrombotic therapy for the secondary prevention of ischemic stroke", section on 'Aspirin plus dipyridamole'.)

## SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Endoscopy preparation, sedation, and special considerations".)

## SUMMARY AND RECOMMENDATIONS

- The probability of a thromboembolic complication following discontinuation of antiplatelet agents depends upon the condition for which the medication was prescribed ( table 1). (See 'Estimating thromboembolic risk' above.)

- The risk of bleeding from endoscopic procedures can be classified as high or low. In general, diagnostic procedures (with or without biopsy) are low risk, whereas therapeutic procedures are high risk ( table 2). (See 'Estimating procedure-related bleeding risk' above and "Gastrointestinal endoscopy in patients with disorders of hemostasis", section on 'Estimating procedure-related bleeding risk'.)

- We consult with the clinician managing the patient's antiplatelet therapy (eg, cardiologist, neurologist, vascular specialist) prior to interrupting antiplatelet agents. (See 'Specialty consultation' above and "Gastrointestinal endoscopy in patients with disorders of hemostasis", section on 'Specialty consultation'.)

- For patients on antiplatelet therapy with gastrointestinal (GI) bleeding, the risk of stopping or reversing the effects of antiplatelet therapy should be weighed against the risk of continued bleeding in the setting of platelet dysfunction. The approach is individualized based on the severity of GI bleeding, the risk of rebleeding after achieving hemostasis, the specific antiplatelet agent(s), and the patient's thrombotic risk as determined by the clinician managing the antiplatelet therapy. (See 'Urgent procedures for GI bleeding' above.)

- For patients undergoing elective procedures with low bleeding risk ( table 2), no interruption of antiplatelet therapy is required. (See 'Low risk procedures' above.)

- For patients undergoing elective procedures with a high or uncertain bleeding risk ( table 2), we take the following approach:

  - For patients at low thrombotic risk on $P2Y_{12}$ receptor blockers, we suggest discontinuing the $P2Y_{12}$ receptor blockers prior to elective high-or uncertain-risk procedures (**Grade 2C**). The duration for holding a $P2Y_{12}$ receptor blocker prior to the procedure is as follows (see 'P2Y12 receptor blockers' above):

    - Clopidogrel: five to seven days
    - Prasugrel: five to seven days
    - Ticagrelor: two to three days

We restart $P2Y_{12}$ receptor blockers for most patients in one to three days (depending on the specific agent) after the endoscopic intervention, provided that hemostasis has been achieved as determined by the endoscopist.

- For patients at low thrombotic risk taking aspirin, we suggest continuing aspirin prior to elective high- or uncertain-risk endoscopic procedures (**Grade 2C**). For most patients, we resume aspirin on the day following the procedure, provided that hemostasis was achieved following endoscopic intervention. However, for patients who undergo selected high-risk procedures (eg, endoscopic mucosal resection or endoscopic submucosal dissection) and who are on aspirin for primary prevention, we delay restarting aspirin for 7 to 10 days. (See 'Aspirin' above.)

- For patients on long-term dual antiplatelet therapy (ie, clopidogrel plus aspirin) who have completed the minimum duration of uninterrupted dual therapy, we discontinue the $P2Y_{12}$ receptor blocker for two to seven days (depending on the agent) prior to a high- or uncertain-risk endoscopic procedure, while aspirin is continued without interruption. The $P2Y_{12}$ platelet receptor blocker is restarted in one to three days (depending on the agent) after the procedure, provided that hemostasis has been achieved following endoscopic intervention. (See 'Dual antiplatelet therapy' above.)

- For patients with transiently high thrombotic risk, we delay elective endoscopic procedures with a high or uncertain bleeding risk until the patient's thrombotic risk is lower. (See 'Timing of elective procedure' above.)

- The management of patients on anticoagulants or patients with disorders of hemostasis (eg, thrombocytopenia, renal failure) are discussed elsewhere. (See "Management of anticoagulants in patients undergoing endoscopic procedures" and "Gastrointestinal endoscopy in patients with disorders of hemostasis".)



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Topic 2632 Version 32.0

## GRAPHICS

### Periprocedural thrombotic risk for patients on antiplatelet therapy

| Risk stratum | Indication for antiplatelet therapy | | |
|---|---|---|---|
| | **Coronary artery disease*** | **Cerebrovascular disease** | **Peripheral arterial disease** |
| High thrombotic risk | Acute coronary syndrome ≤6 months<br>Cardiac stent ≤6 months | Stroke or TIA ≤3 months | |
| Low thrombotic risk | Ischemic heart disease without stent<br>Cardiac stent >6 months<br>Acute coronary syndrome >6 months | Stroke or TIA >3 months | PAD without revascularization<br>PAD with revascularization¶ |

Risk stratification is based upon the available data and consensus opinion. Consultation with the clinician who is managing the patient's long-term antiplatelet therapy is required for risk assessment and prior to interrupting antiplatelet therapy. This approach is intended as clinical guidance and does not substitute for clinical judgment in decisions about periprocedural management of antiplatelet agents.

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TIA: transient ischemic attack; PAD: peripheral arterial disease.

* Some patients remain on dual antiplatelet therapy (eg, clopidogrel and aspirin) beyond the minimum duration (ie, 6 to 12 months) because of an underlying condition that confers additional risk (eg, reduced left ventricular ejection fraction, history of diabetes, prior history of stent thrombosis, less than optimal stenting result). Refer to UpToDate topics on the management of coronary artery disease.

¶ For most patients with PAD following revascularization, the risk of thrombosis with cessation of antiplatelet agents including aspirin can be variable and depends on the type and location of revascularization. Refer to UpToDate topics for content on the management of peripheral arterial disease.

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Graphic 121390 Version 1.0

## Procedure-related bleeding risk from gastrointestinal procedures

| |
|---|
| **Higher-risk procedures** |
| Polypectomy* |
| Biliary or pancreatic sphincterotomy |
| Treatment of varices |
| PEG placement[¶] |
| Therapeutic balloon-assisted enteroscopy |
| EUS with FNA[Δ] |
| Endoscopic hemostasis |
| Tumor ablation |
| Cystgastrostomy |
| Ampullary resection |
| EMR |
| Endoscopic submucosal dissection |
| Pneumatic or bougie dilation |
| PEJ |
| **Low-risk procedures** |
| Diagnostic (EGD, colonoscopy, flexible sigmoidoscopy) including mucosal biopsy |
| ERCP with stent (biliary or pancreatic) placement or papillary balloon dilation without sphincterotomy |
| Push enteroscopy and diagnostic balloon-assisted enteroscopy |
| Capsule endoscopy |
| Enteral stent deployment (controversial) |
| EUS without FNA |
| Argon plasma coagulation |
| Barrett's ablation |

EGD: esophagogastroduodenoscopy; ERCP: endoscopic retrograde cholangiopancreatography; PEG: percutaneous endoscopic gastrostomy; EUS: endoscopic ultrasound; FNA: fine-needle aspiration; EMR: endoscopic mucosal resection; PEJ: percutaneous endoscopic jejunostomy.

* Among patients undergoing colonic polypectomy, the size of the polyp influences the risk of bleeding, and it may be more appropriate to categorize polyps less than 1 cm in size as low risk for bleeding.

¶ PEG on aspirin or clopidogrel therapy is low risk. Does not apply to dual antiplatelet therapy.

Δ EUS-FNA of solid masses on aspirin/nonsteroidal anti-inflammatory drugs is low risk.

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Graphic 50700 Version 8.0

## Endoscopic predictors of recurrent peptic ulcer hemorrhage[1,2]

| Endoscopic stigmata of recent hemorrhage | Prevalence, percent | Risk of rebleeding on medical management, percent |
|---|---|---|
| Active arterial bleeding (Forrest Ia) | 12% (arterial bleeding + oozing) | 55 (arterial bleeding + oozing) |
| Oozing without visible vessel (Forrest Ib) | | |
| Non-bleeding visible vessel (Forrest IIa) | 8 | 43 |
| Adherent clot (Forrest IIb) | 8 | 22 |
| Flat spot (Forrest IIc) | 16 | 10 |
| Clean ulcer base (Forrest III) | 55 | 5 |

*References:*

*1. Katschinski B, Logan R, Davies J, et al. Prognostic factors in upper gastrointestinal bleeding. Dig Dis Sci 1994; 39:706.*
*2. Laine L, Jensen DM. Management of patients with ulcer bleeding. Am J Gastroenterol 2012; 107:345.*

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Graphic 78607 Version 8.0

## Contributor Disclosures

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Contributor disclosures are reviewed for conflicts of interest by the editorial group. When found, these are addressed by vetting through a multi-level review process, and through requirements for references to be provided to support the content. Appropriately referenced content is required of all authors and must conform to UpToDate standards of evidence.

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