Perioperative Considerations for Antithrombotic Therapy in Oculofacial Surgery: A Review of Current Evidence and Practice Guidelines

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Purpose: Recent survey studies have demonstrated wide variability in practice patterns regarding the management of antithrombotic medications in oculofacial plastic surgery. Current evidence and consensus guidelines are reviewed to guide perioperative management of antithrombotic medications.

Methods: Comprehensive literature review of PubMed database on perioperative use of antithrombotic medication.

Results/Conclusions: Perioperative antithrombotic management is largely guided by retrospective studies, consensus recommendations, and trials in other surgical fields due to the limited number of studies in oculoplastic surgery. This review summarizes evidence-based recommendations from related medical specialties and provides context for surgeons to tailor antithrombotic medication management based on patient’s individual risk. The decision to continue or cease antithrombotic medications prior to surgery requires a careful understanding of risk: risk of intraoperative or postoperative bleeding versus risk of a perioperative thromboembolic event. Cessation and resumption of antithrombotic medications after surgery should always be individualized based on the patient’s thrombotic risk, surgical and postoperative risk of bleeding, and the particular drugs involved, in conjunction with the prescribing doctors. In general, we recommend that high thromboembolic risk patients undergoing high bleeding risk procedures (orbital or lacrimal surgery) may stop antiplatelet agents, direct oral anticoagulants, and warfarin including bridging warfarin with low-molecular-weight heparin. Low-risk patients, regardless of type of procedure performed, may stop all agents. Decision on perioperative management of antithrombotic medications should be made in conjunction with patient’s internist, cardiologist, hematologist, or other involved physicians which may limit the scope of guidelines depending on patient risk and should be used on a case-by-case basis. Further studies are needed to provide oculofacial-specific evidence-based guidelines.

(Ophthalmic Plast Reconstr Surg 2022;38:226–233)

Givcn the aging of the United States population and the high prevalence of cardiovascular disease, it is not surprising that an increasing proportion of patients presenting to oculofacial surgeons are using antithrombotic medications. One study at a large oculofacial plastic surgery practice found that 40% of patients used at least 1 antithrombotic agent. Antithrombotic medications consist of antiplatelet or anticoagulants; anticoagulants are generally divided into warfarin and heparin or a newer class of direct oral anticoagulants (DOACs). Any of these medications can result in increased bleeding during surgery, leading to increased operative time, intraoperative and postoperative complications, postoperative bruising, and poor postoperative cosmesis. Rarely, orbital compartment syndrome and vision loss may occur. This review aims to provide the evidence of when and which antithrombotic medications should be held before surgery and when they can be safely resumed, highlighting areas of consensus and controversy. Decision-making must be done in conjunction with the patient’s primary care doctor, cardiologist, or other involved physicians depending on the patient’s risk profile and surgical procedure to be performed.

METHODS

PubMed searches were conducted using the following search criteria: “blood thinners AND oculoplastic,” “blood thinners AND eyelid,” “blood thinners AND lacrimal,” “blood thinners AND orbit,” “antiplatelet AND oculoplastic,” “direct oral anticoagulant AND oculoplastic,” and “anticoagulant AND oculoplastic.” Targeted searches for relevant articles in related fields such as dermatology, ENT, facial plastic surgery, and plastic surgery literature were carried out. Abstracts were reviewed for relevance. Updated consensus statements from cardiology, anesthesiology, and hematology regarding perioperative risks with antithrombotic agents were also reviewed.

Classes of Antithrombotic Agents. There are 3 main classes of antithrombotic agents currently approved by the Food and Drug Ad-
ministration for use in the United States: (1) antiplatelet agents, (2) anti-
ticoagulants, and (3) DOACs. Antiplatelet agents permanently or tem-
porarily inhibit platelet aggregation, while anticoagulants impede the
formation of fibrin by inhibiting clotting factors through various mecha-
nisms; both result in impaired hemostasis. Many over-the-counter medi-
cations and supplements may also impact bleeding, such as nonsteroidal
anti-inflammatory drugs (NSAIDs), fish oil, and vitamin E.

**Antiplatelet Agents.** Antiplatelet agents inhibit platelet aggregation and thrombus formation. Antiplatelet agents include aspirin, clopidogrel, ticagrelor, cilostazol, dipyridamole, and prasugrel. The 2 most commonly used antiplatelet agents are aspirin and clopidogrel (Plavix).

For decades, aspirin has been indicated for both primary and secondary prevention of cardiovascular disease, and many patients also use it for analgesia unrelated to cardiovascular disease. Many patients forget to include aspirin when reporting a medication list, particularly if it is a low dose (e.g., 81 mg or “baby” aspirin).

Recently, data have questioned whether aspirin should be used for primary prevention; however, many patients are still taking it for this reason.

Clopidogrel is used as secondary prevention in patients with prior thromboembolic event, prior myocardial infarction, or an implanted device such as a cardiac stent. Aspirin and clopidogrel may be used synergistically (termed dual antiplatelet therapy) in patients at high risk for thromboembolic event. Patients on dual antiplatelet therapy tend to bleed more than patients on a single agent.

Dual antiplatelet therapy has been compared with aspirin monotherapy in reducing recurrent stroke in patients with history of stroke and transient ischemic attack. A recent systematic review and meta-analysis comparing the efficacy and safety of clopidogrel versus aspirin monotherapy for secondary prevention in patients with prior stroke showed ischemic or hemorrhagic stroke were all significantly lower for clopidogrel monotherapy compared with aspirin.

Nonsteroidal anti-inflammatory drugs (NSAIDs) also inhibit platelet activity, though the effect is usually of shorter duration. NSAIDs act by inhibiting cyclooxygenase (COX), an enzyme with 2 isoforms: COX-1 and COX-2. Both isoforms produce prostaglandins that promote inflammation, fever, and pain. However, only COX-1 is responsible for production of thromboxane A2, which is needed for platelet aggregation. NSAIDs may be selective in inhibiting only COX-2 (e.g., celecoxib), or nonselective, inhibiting both COX-1 and COX-2 (e.g., ibuprofen, indomethacin, or naproxen). Thus, nonselective NSAIDs interfere with platelet aggregation, while selective NSAIDs have negligible effects on platelet function.

**Anticoagulants.** Anticoagulants directly inhibit clotting factors in the coagulation cascade and are indicated in patients with prior pulmonary or venous thromboembolism or prophylactically in the setting of atrial fibrillation, prosthetic heart valves, and rheumatic heart disease. Warfarin (Coumadin) is the most commonly used oral anticoagulant. Warfarin is a vitamin K antagonist that impairs gamma-
carboxylation of factors 2, 7, 9, and 10 resulting in reduced thrombin generation. Warfarin has many food and drug interactions, a narrow therapeutic index, and requires frequent monitoring for dose titration. In the event of emergency surgery or uncontrolled hemorrhage, the anticoagulant effect of warfarin is reversible with vitamin K and fresh frozen plasma.

Unfractionated heparin is an anticoagulant that is delivered intravenously, but its derivative, fractionated or low-molecular weight heparin (LMWH), is available by subcutaneous injection. Enoxaparin is an example of LMWH.

**Direct Oral Anticoagulants.** The DOACs are alternatives to warfarin in patients with a history of atrial fibrillation or pulmonary or venous thromboembolism. Examples include apixaban, betrixaban, dabigatran, edoxaban, and rivaroxaban (Table 1). Compared with warfarin, DOACs have a more predictable pharmacologic profile, fewer food and drug interactions, and require no regular monitoring.

| Generic name | Trade name | Metabolism | Monitor effects | Antidote |
|--------------|------------|------------|----------------|----------|
| Enoxaparin   | Lovenox Coumadin | Liver | PT/INR | Protamine sulfate, Vitamin K |
| Warfarin     | Liver | Liver | | FFP, PCC, aPCC |
| Dabigatran   | Pradaxa Renal | N/A | | Dialysis, Idarucizumab, aPCC (FEIBA, PER97701) |
| Rivaroxaban  | Xarelto Liver, Renal | N/A | | PCC, aPCC, Andexanet alfa, PER97701, rFVIIa |
| Apixaban     | Eliquis Liver | N/A | | Andexanet alfa, PER97701, Andexanet alfa |
| Betrixaban   | Beyvysa Liver, Renal | N/A | | PER97701 |
| Edoxaban     | Savaysa Liver, Renal | N/A | | |

**AVAILABLE DATA ON SPECIFIC ANTITHROMBOTICS AND OCULOPLASTIC SURGERY**

**Aspirin**

There is 1 randomized controlled trial on perioperative management of aspirin in patients undergoing upper blepharoplasty or ptosis repair. This is the only randomized trial on antithrombotic medications in oculoplastic surgery; antithrombotic agents have not been studied prospectively in lacrimal or orbital surgery. Patients were randomized to take aspirin 81 mg or placebo for 7 days preoperatively. Results of 48 patients showed no significant difference in bruising or mild postoperative bleeding.

Although there were no instances of postoperative retrobulbar hemorrhage, the study was not powered sufficiently to detect statistical significance in this and other bleeding complications.

**NSAIDs**

The effect of nonselective NSAIDs on intra- or postoperative bleeding complications is unclear; some studies suggest increased risk while others suggest there is no increased risk of bleeding complications.

There is evidence that the selective COX-2 inhibitor celecoxib does not significantly affect platelet function or intraoperative bleeding. Other NSAIDs that affect COX-2 more than COX-1, such as meloxicam and etodolac, have also been shown to have little impact on bleeding risk (Table 2).

For post-surgical pain, the intravenous NSAID ketorolac is often offered by the anesthesiologists as an alternative to narcotics, but there have been conflicting studies over whether this may cause increased risk of postoperative bleeding. A recent retrospective study and randomized control trial in patients who received intravenous ketorolac in levator advancement surgery found better analgesia and showed

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TABLE 2. Characteristics of nonsteroidal anti-inflammatory drugs

| Generic name | Trade name | Cyclooxygenase (COX) enzyme affected | Half life (hours) | Affects platelet function |
|--------------|------------|--------------------------------------|------------------|--------------------------|
| Aspirin      | Aspirin    | COX-1, COX-2                          | 0.25             | Yes                      |
| Celecoxib    | Celebrin   | COX-2                                | 11               | No                       |
| Diclofenac   | Catafyl/Voltaren Arthrotec (combined with misoprostol) | COX-1, COX-2 | 1.1 | No                       |
| Diflunisal   | Dolobid    | COX-1, COX-2                          | 13               | Yes                      |
| Etodolac     | Lodine/Lodine XL | COX-2 | 6.5 | No                       |
| Fenoprofen   | Nalfon     | COX-2                                | 2.5              | No                       |
| Flurbiprofen | Ansaid     | COX-1                                | 3.5              | Yes                      |
| Ibuprofen    | Advil      | COX-1, COX-2                         | 2                | Yes                      |
| Indomethacin | Indocin    | COX-1, COX-2                         | 4-5              | Yes                      |
| Ketoprofen   | Orudis/KT Oruvail | COX-1, COX-2 | 1.5 | Yes                      |
| Ketorolac    | Toradol    | COX-1, COX-2                          | 5-6              | Yes                      |
| Meloxicam    | Mobic      | COX-2                                | 20               | No                       |
| Nabumetone   | Relafen    | COX-2                                | 26               | No                       |
| Naproxen     | Aleve/Naprosyn/Anaprox | COX-1, COX-2 | 14 | Yes                      |
| Oxaprozin    | Daypro     | COX-1, COX-2                          | 58               | Yes                      |
| Piroxicam    | Feldene    | COX-1, COX-2                         | 57               | Yes                      |
| Sulindac     | Clinoril   | COX-1, COX-2                         | 8                | No                       |
| Tolmetin     | Tolectin   | COX-1, COX-2                         | 1                | Yes                      |

Assessment of Surgical Bleeding Risk

Currently, there is no standardized risk assessment that determines the bleeding risk of common oculoplastic procedures. Intraoperative bleeding risk is based on the location (proximity to nerves, main blood vessels, or important organs) and extent of tissue damage. Postoperative bleeding risk is based on wound condition after surgery, tissue damage, and tissue perfusion.

Understanding Surgical Bleeding Risk

The reported risk of vision-threatening hemorrhage intraoperatively or postoperatively for all types of oculoplastic procedures is less than 1%. The risk of vision loss from postoperative hemorrhage varies with procedure, ranging from 0.0045% for blepharoplasty (based on survey data) to 0.24% for orbital surgery.

A prospective study by Custer et al. of 1500 oculoplastic procedures reported an overall rate of severe hemorrhage of 0.4% and “troublesome” intraoperative bleeding of 9%. Patients who continued antiplatelets and anticoagulants had no increased risk of intraoperative bleeding, postoperative bruising, or severe bleeding complications.

Recent studies in lung, orthopedic and abdominal surgery suggest low or negligible bleeding risk with perioperative continuation of aspirin. Recommendations in the facial plastics and dermatologic literature also suggest that continuation of antithrombotic medications is associated with low rates of severe hemorrhagic complications. However, it is important to note that results from other specialties may not be transferable due to the unique risk of vision loss with oculoplastic surgeries. The surgeon must assess both the risk and impact of hemorrhage in different oculoplastic procedures based on the nature of incision, depth of dissection, duration of case, ability to easily cauterize or tamponade (e.g., easy with enucleation, difficult with decompression), and the ramifications of bleeding.

Eyelid procedures anterior to the orbital septum such as chalazion excision, eyelid lesion removal, and skin-only blepharoplasty are associated with low risk of vision-threatening hemorrhagic complications, whereas eyelid procedures posterior to

Understanding Patient Risk of Thromboembolism

Patients are on different antithrombotic medications for different reasons, and some patients are at higher risk than others for thromboembolic events. In patients who stop warfarin for any reason, including perioperatively, there is an approximately 1% risk of a thromboembolic event within 30 days. This risk increases 4-fold in patients with mechanical heart valves. One meta-analysis estimated the additional risk of any vascular event from withholding aspirin for 7 days perioperatively at roughly 0.14%. A recent retrospective study estimated the risk of thromboembolism and major bleeding from withholding DOACs perioperatively to be 1.05% and 0.53%, respectively. Another prospective study in patients withholding DOACs perioperatively estimated rate of arterial thromboembolism to be 0.16% in the apixaban cohort, 0.60% in the dabigatran cohort, and 0.37% in the rivaroxaban cohort.
the septum (external ptosis repair and blepharoplasty with fat manipulation) and orbital surgery have higher risk of vision-threatening retrobulbar hemorrhage.

Although orbital surgery in general is higher bleeding risk, orbital surgery in a blind eye or for eye removal is unique in that the risk of vision loss is nonexistent. Therefore, surgeons often choose to continue antithrombotic medications in these cases, cautery aggressively, and tamponade with a pressure patch postoperatively.

Balancing Thromboembolic and Bleeding Risks

Although there are no specific guidelines for oculoplastic surgery, we can extrapolate evidence-based recommendations from other specialties. The American College of Chest Physicians has released guidelines for patients on antithrombotic medication undergoing elective procedures. The oculoplastic surgeon must consult with the patient’s internist, cardiologist, hematologist, or other involved physicians to stratify the patient’s risk (Table 3). If a patient is high-risk, there is a high chance that the patient cannot discontinue antithrombotic medications for any reason, including any oculoplastic surgery. In this case, surgery should be deferred unless (1) bleeding risk for that particular surgery is low, or (2) avoiding surgery creates a high morbidity or mortality risk to the patient. If the patient is low risk, the consulting physician will likely approve perioperative discontinuation of antithrombotic medications.

Once the patient risk is determined, Table 4 helps identify how best to proceed with antithrombotic medications based on the type of surgery to be performed. These guidelines are primarily driven by patient risk: in high-risk patients undergoing high-risk procedures, guidelines recommend stopping DOACs and warfarin and bridging warfarin with LMWH. Low-risk patients should also stop these medications and do not require bridging. High-risk patients should continue antiplatelet agents when possible, and low-risk patients may stop antiplatelet agents.

Patients with history of cardiac stent being treated with dual antiplatelet therapy should continue aspirin perioperatively if possible, whereas clopidogrel and similar agents (P2Y12 inhibitors) are to be discontinued if warranted by the type of noncardiac elective surgery.

The use of heparin or LMWH as a perioperative substitute for patients on continuous warfarin therapy is a common practice, but high-quality data regarding the safety of heparin bridging therapy is limited, and this practice remains controversial. Some studies have shown an increased risk of bleeding and thromboembolic events in patients undergoing bridging therapy.

This decision must be discussed with the physician prescribing the warfarin.

When to Stop Antithrombotic Medications Preoperatively

Generally, the half-life of the medication is the basis for deciding when to stop that medication prior to surgery (Table 5). Patient kidney and liver function as well as the half-life and COX-2 selectivity of their specific NSAID medication should be considered in determining when and whether to hold the medication prior to surgery. Additionally, it is common practice to request that patients stop over the counter NSAIDs, vitamins, and supplements preoperatively. There is little evidence to guide when patients should stop supplements especially as doses and formulations are not FDA-regulated.

### TABLE 3. Simplified risk stratification of patients for thromboembolism

| Highest risk                          | Lowest risk                            |
|--------------------------------------|----------------------------------------|
| Mitral valve prosthesis              | Bileaflet aortic valve prosthesis      |
| Any caged-ball or tilting disc aortic valve prosthesis | without atrial fibrillation and no other risk factors for stroke |
| Recent stroke or TIA (within 6 months) | Atrial fibrillation with low CHADS2 score (0–2) |
| Atrial fibrillation with high CHADS2 score (5 or 6) | Coronary artery disease without stent |
| Rheumatic valvular heart disease     | VTE > 12 months previous and no other risk factors |
| VTE within 3 months                  |                                        |
| Severe thrombophilia (e.g., deficiency in protein C, protein S, or antithrombin; antiphospholipid antibodies) |                                |
| Recently drug-eluting stent (within 12 months) |                        |
| Bare metal stent within 30 days      |                                |
| LVAD*                                |                                |

### TABLE 4. How to manage blood thinners perioperatively

| Surgery bleeding risk | Patient risk of thromboembolism | Minimal (chalazion, eyelid lesion) | Mild (eyelid and brow surgery) | High (lacrimal, orbital, facelift surgery) |
|-----------------------|---------------------------------|----------------------------------|-------------------------------|------------------------------------------|
| Low                   | Continue all medications        | Stop all medications             | Stop warfarin and bridge with LMWH Continue Aspirin if possible | Stop all medications Stop DOAC Stop warfarin and bridge with LMWH Stop Aspirin |
| High                  | Continue all medications        | Stop DOAC                         | LMWH                           |                                          |

*Extrapolated and adapted to oculofacial surgery, based on Spyropoulos et al. (2016). DOAC, direct oral anticoagulant; LMWH, low-molecular weight heparin.

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Supplements and Vitamins

Many supplements have been shown to have antithrombotic effect, including but not limited to garlic, Ginkgo biloba, ginger, ginseng, fish oil, vitamin E, and selenium (Table 6). These all affect the coagulation cascade at different points and are reviewed in a recent article.59 There are anecdotal reports of bleeding episodes on many of these agents, yet more detailed studies have shown equivocal bleeding risk at normal doses but potentially increased risk when used in combination with antithrombotic medications. Perhaps the most well-studied is vitamin E, which inhibits platelet aggregation in a dose-dependent manner at doses higher than 400 IU/day and was found clinically to be linked to hemorrhagic events in atrial fibrillation patients on warfarin.60

Conversely, some supplements and medications are taken perioperatively to reduce bleeding and bruising. Arnica montana is an herb available in topical and oral formulations marketed for its ability to reduce postoperative ecchymosis. Although there is little evidence for its efficacy in reducing ecchymosis, it is often recommended by surgeons. It has also been studied for its effect on postoperative pain and edema.

Table 5. When to stop blood thinners before surgery

| Class          | Agent          | Time to peak effect | When to stop before surgery | Elimination half life |
|----------------|----------------|---------------------|----------------------------|-----------------------|
| Antiplatelet   | Aspirin        | 5–30 min            | 7–10 days56,57             | 0.25 hours            |
|                | Clopidogrel    | 0.75 hours          | 5 days56,57                | 6 hours               |
| Anticoagulant  | Warfarin       | 72–96 hours         | 3–5 days                   | 20–60 hours           |
|                | LMWH           | 3–5 hours (enoxaparin) | 24 hours58            | 4.5–7 hours           |
| DOAC           | Dabigatran     | 1–3 hours           | 1–5 days*59             | 8–15 hours            |
|                | Apixaban       | 2–4 hours           | 24–48 hours*59           | 7–11 hours            |
|                | Rivaroxaban    | 1–2 hours           | 24–48 hours*59           | 12 hours              |
|                | Edoxaban       | 1–2 hours           | 24–48 hours*59           | 10–14 hours           |
|                | Betrixaban     | 3–4 hours           | 96 hours                 | 19–27 hours           |

*Depending on renal function.

DOAC, direct oral anticoagulant; LMWH, low-molecular weight heparin.

Table 6. Dietary supplements that potentially influence risk of hemorrhage

| Supplements that may increase bleeding risk | Supplements intended to decrease bleeding/bruising risk |
|--------------------------------------------|--------------------------------------------------------|
| Some evidence                              | Little evidence of efficacy                            |
| Vitamin E                                  | Arnica montana                                        |
| Fish oil/Omega 3                           | Rhododendron tomentosum                                |
| Ginger                                     | —                                                      |
| Ginseng                                    | —                                                      |
| Ginkgo biloba                              | —                                                      |
| Garlic                                     | —                                                      |
| Selenium                                   | —                                                      |
| Taurine                                    | —                                                      |
| Passion Flower                             | —                                                      |
| Chamomile                                  | —                                                      |
| Cinnamon                                   | —                                                      |
| Cayenne Pepper                             | —                                                      |
| Curcumin                                   | —                                                      |
| Feverfew                                   | —                                                      |
| Tree-ear mushrooms                         | —                                                      |
| Grape seed extract                         | —                                                      |
| Echinacea                                  | —                                                      |
| Green tea extract                          | —                                                      |
| Glucosamine                                | —                                                      |
| Chondroitin sulfate                        | —                                                      |
| Coenzyme Q10                               | —                                                      |
| Policosanol                                | —                                                      |
| Turmeric                                   | —                                                      |
| Magnesium                                  | —                                                      |
| Biotin                                     | —                                                      |

One prospective, placebo-controlled study in men undergoing sequential upper blepharoplasty found no difference in ecchymosis or patient comfort in patients on oral Arnica.60 Another study found that Arnica reduced edema but not ecchymosis after rhinoplasty and reduced ecchymosis compared with placebo after facelifting.61 The most recent literature review by American Academy of Ophthalmology does not support the use of Arnica for reducing ecchymosis after oculoplastic surgery.62 Tranexamic acid is an antifibrinolytic agent beginning to be studied in oculoplastic surgery63 but has been used in trauma, orthopedic, cardiac, and recently (off-label) in plastic surgery to reduce blood loss and possibly to improve postoperative edema.64

Timing to Resume Antithrombotic Medications Postoperatively

There is a dearth of studies on when to resume postoperative antithrombotic therapy. We suggest that, if the surgery was not complicated by bleeding, one can resume warfarin on the evening of surgery.65 Given warfarin’s delayed onset of action of 2 to 5 days, it can take up to 7 to 14 days to attain a patients’ therapeutic international normalized ratio (INR) with their usual maintenance dosing.60
Based on a recent prospective study, we recommend resuming DOACs (dabigatran, rivaroxaban, apixaban, edoxaban, and betrixaban) on postoperative day 1 after low bleeding risk procedures (eyelid procedures) and postoperative days 2 to 4 (depending on agent and renal function) after high bleeding risk procedures (lacrimal, orbit, and facelift procedures). In this study, hypertension was the only modifiable risk factor in predicting bleeding events.

Antplatelet therapy should be resumed on the evening of surgery if the surgery did not have any bleeding complications.

Fibrinolysis and fibrin formation is a tightly regulated physiological process. Disturbance in the balance between fibrin formation and fibrinolysis by antithrombotic medications can lead to enhancement of clot lysis capability. Studies suggest that dabigatran, rivaroxaban, and apixaban increase clot lysis permeability and decrease time clot lysis time when compared with control clots in absence of anticoagulants. Studies also suggest warfarin increases plasma clot porosity as early as 3 days after initiating treatment, reaching the plateau value after 7 days. A study analyzing clots in vitro demonstrated aspirin to loosen fibrin networks, enhance clot lysis and lower clot rigidity. There is currently no data that demonstrates clodipogrel to have an effect on plasma clot properties.

**CONCLUSION**

Currently, no guidelines exist regarding perioperative antithrombotic use in oculofacial plastic surgery. As a result, a wide spectrum of practice patterns exist. Guidelines from related medical specialties provide evidence-based or expert consensus recommendations that may guide surgeons. The oculofacial surgeon, in close conjunction with the patient's other physicians, should consider the surgical risks of bleeding complications and patient-specific risk factors when managing antithrombosis. Oculofacial surgery is unique in the risk of vision loss from orbital hemorrhage, and this must be considered. One should refer to the most updated consensus guidelines for antithrombolic medications management in surgery and also seek input from the patient's internist, cardiologist, and hematologist to tailor antithrombotic management to each patient's individual risk.

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