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TRIOLOGICAL SOCIETY BEST PRACTICE

Should Antithrombotic Therapy Be Withheld Perioperatively for Cutaneous Facial Reconstructions?

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1 | Background

Anticoagulant and antiplatelet therapy is increasingly common in populations undergoing cutaneous facial reconstruction after Mohs micrographic surgery or excision of cutaneous malignancies. Perioperative continuation of these agents may increase the risk of postoperative hemorrhagic complications, particularly in the well-vascularized head and neck region. Conversely, cessation may expose patients to catastrophic thromboembolic events such as a stroke, myocardial infarction, or pulmonary embolism. Current practice patterns vary widely amongst surgeons. Available data derive predominantly from the dermatologic literature and largely focus on minor cutaneous excisions and reconstructions, which may limit its applicability to more complex surgery including interpolated or large advancement flaps. This best practice review addresses perioperative management of antithrombotic therapy for facial reconstruction after skin cancer resection.

2 | Literature Review

Traditionally, antithrombotic therapy (ATT) has been thought to increase perioperative hemorrhagic complication rates, and recommendations for cessation prior to surgery are common. Several studies have examined ATT-associated hemorrhagic and thromboembolic complications (Table 1).

Clinical practice guidelines for reconstruction after resection of cutaneous malignancies published in 2021 provided two recommendations regarding ATT management perioperatively

[1]. The work group recommended continuing ATT for adults undergoing reconstruction *in the office-based setting*, nevertheless advising consultation with the prescribing physician when there is felt to be a significant bleeding risk (*moderate evidence*). Consulting with physicians managing these medications prior to reconstruction *in a facility setting* was recommended, as the risk of bleeding and/or negative sequelae from bleeding events may be higher in this context and warrant consideration of perioperative bridging or cessation (*good practice recommendation*). The working group additionally found acceptable for clinicians to perform reconstructive surgery in a delayed fashion (*option*), allowing time to plan if ATT cessation is advised upon discussion with the prescribing provider. These guidelines provide a basic framework for managing antithrombotic therapy for facial reconstruction but fail to explore the association of hemorrhagic and thromboembolic complications with various types of reconstruction.

The largest systematic review and meta-analysis to date having examined ATT in cutaneous surgery found an increased risk of hemorrhage of any type in 3.5% of 9214 patients on ATT when compared to 1.2% in 21,696 control patients not on ATT [2]. However, the absolute risk difference was low and may not be clinically significant. No difference was found in rates of thromboembolic events between patients on ATT and controls in five studies reporting on this outcome. However, one study noted two cases of serious thromboembolic events (myocardial infarction and stroke) in 59 patients who stopped ATT versus none in 84 who continued. A key limitation of this systematic review and meta-analysis is the inclusion of diverse reconstructive techniques, from simple primary closure to locoregional

TABLE 1 | Summary of clinical studies.

Author	Study design	Total no of patients receiving ATT	Class of ATT studied	Procedure and site	Summary of findings	Recommendations	Level of evidence
Chen, 2021	Clinical practice guidelines	N/A	Anticoagulant, antithrombotic, and antiplatelet medications (aspirin, warfarin, clopidogrel, and direct oral anticoagulants)	Reconstruction after skin cancer resection, all sites	- Combined evidence from 6 mostly low-quality studies showed no difference in the rate of occurrence of perioperative bleeding or hematoma in patients having been administered ATT prior to surgery versus not. - Pragmatic case series and cohort studies that have conversely detected a higher rate of bleeding with ATT use have noted the cases of increased bleeding did not result in serious consequences to patients. - Case reports have documented serious thromboembolic side effects with ATT cessation.	The work group recommends: - Continuation of anticoagulant, antithrombotic, and antiplatelet medications for adult patients undergoing reconstruction after skin cancer resection in the office-based setting. - Coordination with the physician managing the anticoagulation medication before modifying the medication prior to reconstruction procedures in a facility (nonoffice-based) setting.	5
Bonadurer, 2022	Systematic review and meta-analysis (29 studies)	30,910 patients, 9214 on ATT	Warfarin and VKAs, aspirin and/or clopidogrel, heparin derivatives, direct oral anticoagulants	Cutaneous surgery, all sites	- Increased bleeding rate in patients taking ATT when compared to patients not on ATT (OR 2.63, 95% C.I. 1.90–3.63, $p < 0.001$). - No difference in hemorrhage rates in patients whose ATT was stopped versus continued (OR 1.16, 95% C.I. 0.73–1.83, $p = 0.54$)—No difference in thromboembolic events in 5 studies comparing patients on ATT versus controls (OR 1.39, 95% C.I. 0.23–8.58, $p = 0.90$)	Continuation of prescribed ATT is advisable for patients undergoing cutaneous surgery	2a

(Continues)

TABLE 1 | (Continued)

Author	Study design	Total no of patients receiving ATT and no of patients on ATT	Class of ATT studied	Procedure and site	Summary of findings	Recommendations	Level of evidence
Kraft, 2015	Retrospective case-control study	640 patients, 320 on ATT	Aspirin, clopidogrel, and warfarin	Facial plastic and reconstructive procedures: – Cutaneous reconstructions including grafts, local and/or interpolated flaps (577/640), nasal surgeries (24/640), and other cosmetic surgeries (39/640)	– No difference in bleeding rates in patients taking ATT compared to patients not on ATT (4.1% vs. 3.8%, $P=0.82$). – When subclassifying by agent, increased bleeding rate in patients taking warfarin (OR 3.80, 95% C.I. 1.15–12.60, $P<0.05$), but no significant difference in serious complications (complete graft loss, dehiscence or return to the operating room)	– ATT can likely be continued in this patient population. Specifically, continued use of aspirin is likely cardioprotective and associated bleeding risk is not higher than in patients not taking aspirin. While warfarin increased bleeding rate, the lack of serious adverse outcomes with its use seem to favor continued use. – Patients taking multiple agents should be weaned to a single agent if possible.	3a
Ireland, 2024	Systematic review of 13 studies	10,750 patients, 1312 on ATT	DOAC	Cutaneous surgery most commonly involving the head, face and/or scalp, including Mohs surgery, direct excision, and closure with primary intention, healing by secondary intention, flaps and grafts	– Pooled hemorrhagic complication rate in two studies where DOAC was continued was 1.71% (122 patients). – Pooled thromboembolic complication rate in two studies where DOAC was interrupted was 0.15% (1291 patients) – Comparable bleeding rates in one study comparing interruption vs. continuation (3/17 vs. 11/112 events, respectively). – Remaining eight studies comparing DOAC continuation to patients not on ATT showed mixed results.	– DOAC should be continued for minor dermatologic procedures (biopsy or excision with primary closure, expected duration < 30 min) – For advanced procedures (grafts of flaps, or expected duration > 30 min), DOACs should be stopped 24H prior and resumed 24H postoperatively for patients with a low thromboembolic burden.—For advanced procedures in patients with a moderate to high thromboembolic burden (CHADS2 score ≥ 3, stroke or TIA within 3 months, recurrent VTE or VTE ≤ 12 months, active cancer or thrombophilia), discussion with the prescribing physician is advised.	2a

(Continues)

TABLE 1 | (Continued)

Author	Study design	Total no of patients receiving and no of ATT	Class of ATT studied	Procedure and site	Summary of findings	Recommendations	Level of evidence
Romain, 2025	Systematic review and meta-analysis (20 studies)	26,860 procedures, 6984 on ATT	Aspirin	Cutaneous surgery: – Head and neck in 8,585/11,120 with reported site—Secondary intention (19%), closed primarily (46%), local flap (26%), grafted (9%), others (1%) in 16, 803 procedures with reported method of closure	– Increased risk of hemorrhage or hematoma of any severity in patients taking aspirin compared to patients not on ATT (OR 1.39, 95% C.I. 1.02–1.90, $p=0.04$)	– No recommendation	2a

Abbreviations: ATT, Antithrombotic therapy; CHADS₂, congestive heart failure, hypertension, age $\geq$ 75 years, diabetes mellitus history, stroke or TIA symptoms previously; DOAC, Direct oral anticoagulant; FTSG, full-thickness skin graft; INR, International normalized ratio; STSG, split-thickness skin graft; TIA, transient ischemic attack; VKA, Vitamin K antagonists; VTE, venous thromboembolism.

flaps, with no subgroup analyses. While this supports the use of continuing ATT therapy for less involved reconstructive surgeries, the data may not apply to more complex techniques with a higher risk of bleeding (e.g., multistage interpolated flaps or cervicofacial flaps).

Kraft et al. [3] described findings of a retrospective study of outcomes in facial plastic and reconstructive surgery (mostly cutaneous), comparing complication rates in 320 patients having received ATT (aspirin, clopidogrel and/or warfarin) to matched controls not on ATT. The authors report no difference in bleeding rates (hematoma or ecchymoses) between cohorts (4.1% vs. 3.8% respectively, $p=0.82$). When subclassifying by antithrombotic agent, no difference was found between cohorts for antiplatelets (aspirin and/or clopidogrel). Patients taking warfarin had increased bleeding rates (OR 3.80, 95% C.I. 1.15–12.60, $p<0.05$) compared to patients not on ATT, however rates of serious complications (flap or graft loss, dehiscence or return to the operating room) were not significantly increased. The authors thus suggest thromboembolic risks of cessation likely outweigh the modest risk of serious bleeding-related complications. They additionally recommend that patients using multiple antithrombotic therapies be ideally weaned to a single agent if possible.

Ireland et al. [4] performed a systematic review of 13 studies detailing the perioperative management of direct oral anticoagulants (DOACs) in patients undergoing cutaneous surgery. They reported a pooled hemorrhagic complication rate with DOAC continuation of 1.71% (122 patients). Two studies evaluated thromboembolic complication rates with DOAC cessation, finding a pooled rate of 0.15% (1291 patients). One study involving 129 cutaneous procedures (amongst other surgeries) on patients taking a DOAC compared complication rates with DOAC cessation vs. continuation and found no significant difference in bleeding rates on subgroup analysis of the cutaneous procedures (17.6% vs. 9.8%, $p=0.93$). Pooled thromboembolic events of the parent study (including nondermatologic procedures) were comparable between the cessation and continuation arms (0.5% vs. 0.5%, $p=1$). Ireland et al. reported mixed results when comparing complication rates in patients on DOACs compared to controls and noted limitations in the limited sample sizes of the available studies. The authors recommend continuation of the DOAC for minor dermatologic procedures (biopsy or excision with primary closure expected to be shorter than 30 min in duration) and consideration of DOAC cessation (24 h prior to and following the procedure) for advanced procedures (grafts or flaps or expected duration greater than 30 min) as managed by the prescribing physician.

Few studies have stratified bleeding risk according to type of excision and reconstruction. Romain et al. [5] reviewed 20 studies evaluating bleeding complications in patients taking aspirin who underwent excision of cutaneous lesions mostly in the head and neck. They report an increased risk of hemorrhage or hematoma of any severity in aspirin users compared to patients not on ATT (OR 1.39, 95% C.I. 1.02–1.90, $p=0.04$). Furthermore, one of the referenced papers found that local flap reconstruction was an independent risk factor for total postoperative bleeding (defined as any hemorrhage lasting longer than 4 h despite external pressure, requiring evaluation by a medical provider, or leading to a prolonged hospital stay or hospital readmission).

They report that aspirin use conferred a 124-fold increased risk of total postoperative bleeding. These findings have important implications for preoperative counseling, reconstructive planning and implementing strategies to minimize this risk including meticulous hemostasis and pressure dressings.

3 | Best Practice Summary

Though limited by heterogeneity in inclusion criteria and outcomes, current data suggest that ATT should be continued for minor facial reconstructions (e.g., primary closure, skin grafts, and local flaps). However, perioperative cessation of antithrombotic therapy should be considered when a more complex facial reconstruction is anticipated or planned (e.g., interpolated flaps and cervicofacial flaps). The duration of interruption and the potential need for bridging therapy vary depending on the specific agent, its pharmacokinetics, the indication for therapy/thromboembolic risk, and the anticipated procedural bleeding risk. As such, perioperative ATT management should be guided by interdisciplinary discussion between the surgeon and prescribing physician. Further studies are required to examine the differences in hemorrhagic risk between various facial reconstructive procedures and the safety of perioperative antithrombotic cessation.

4 | Level of Evidence

These recommendations are based on three systematic reviews and/or meta-analyses including mostly cohort studies (level 2a), one clinical practice guideline (level 5), and one retrospective review (level 3a).

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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