Perioperative Management of Anticoagulation

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KEYWORDS

• Subdural hematoma • Anticoagulation • Antiplatelet • Bleeding • Thrombosis

KEY POINTS

- Antithrombotic drugs should be reversed emergently in all patients with chronic subdural hematomas (SDHs) who require urgent surgery; if surgery can be delayed, it is less certain whether to do this or to wait for spontaneous recovery from anticoagulation.
- There are no data to guide practitioners on whether or not to reverse antiplatelet drugs.
- Appropriate laboratory monitoring should guide the adequacy of reversal for all agents.
- Postoperative resumption of anticoagulant and antiplatelet drugs should be guided by a thorough and individualized assessment of hemorrhagic and thromboembolic risk.

INTRODUCTION

The use of antithrombotic agents, either antiplatelet or anticoagulant drugs, is expanding with a progressive rise in prevalence of patients with atherosclerotic risk factors as well as thrombogenic cardiac arrhythmias typically seen in the elderly.[1,2] There is strong evidence for short-term dual-antiplatelet therapy as the standard of care for patients with acute coronary syndromes[3,4] and oral anticoagulation in patients with atrial fibrillation at high risk of thromboembolism.[5]

Antiplatelet and anticoagulant drugs are known to predispose to the development of both acute and chronic SDHs.[6,7] These may occur in a dose-dependent manner; 1 series of patients on warfarin found an increase in subdural hemorrhage risk by more than 7-fold, with an increase in prothrombin ratio from 2.0 to 2.5, whereas another demonstrated a 2.4-fold increase in risk of SDH formation with increasing doses of dabigatran.[8,9] The impact of preoperative antithrombosis on hematoma recurrence postoperatively remains controversial.[10–15]

Patients on antithrombosis presenting with acute or chronic SDHs are thought to be at higher likelihood of presenting with larger hematomas or more severe neurologic deficits. Although the literature specific to SDH is limited on the impact of antithrombosis on hematoma size or propensity for expansion,[16] there is strong evidence for increased expansion of intracerebral hematomas (ICHs) with warfarin anticoagulation.[17,18] Standard neurosurgical and neurocritical care of subdural hematomas, therefore, involves reversal of antithrombosis preoperatively, where possible, and a

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thorough individualized risk-benefit assessment of antithrombosis resumption.

This article highlights the spectrum of antithrombotic agents in common use, their mechanisms of action, and strategies for reversal. The current evidence for antithrombosis resumption, with available metrics for stratifying hemorrhagic and thromboembolic risk, is also reviewed.

PLATELET ACTIVATION

The initial response to endothelial injury begins with platelet adhesion to exposed extracellular matrix (Fig. 1). This interaction is mediated by the glycoprotein (GP) Ib/V/IX receptor complex on the platelet surface and von Willebrand factor bound to exposed collagen at the site of vessel injury. Adhesion leads to platelet activation by several pathways, initiated by collagen, ADP, thromboxane A_2, serotonin, and thrombin (factor II).[19] Collectively, these pathways alter the morphology as well as secretory and receptor phenotypes of platelets into an active form. The primary effector of activated platelets is the GPIIb/IIIa surface receptor, activation of which is responsible for mediating platelet aggregation and thrombus propagation, stabilized by fibrin deposition from concurrent activation of coagulation cascades.[19]

COAGULATION CASCADE

Classically, the coagulation cascade comprises an extrinsic pathway, initiated by tissue injury, and a contact-initiated intrinsic pathway, both leading to a common final pathway (Fig. 2). This system is useful for understanding tests of coagulation activity but is likely simplified from current understanding of coagulation as a cell-based and surface-based process.[20] Prolonged activated partial thromboplastin time (aPTT) may be secondary to heparin; lupus anticoagulant; deficiencies of factors 8, 9, and 11; and von Willebrand disease.

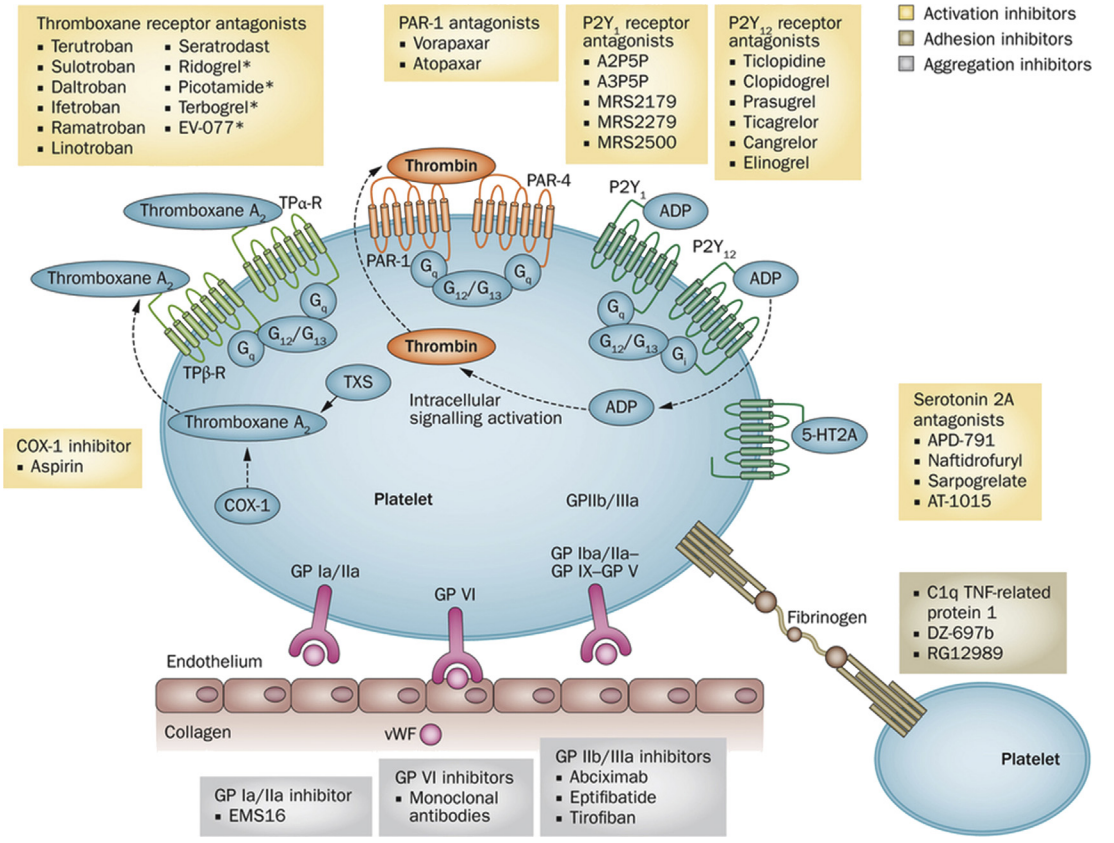

Fig. 1. A summary of the extracellular receptors and intracellular signaling pathways involved in platelet adherence to injured vascular endothelium, activation, and aggregation. Current and emerging drugs inhibiting platelet activation, adhesion, and aggregation are shown in boxes. 5-HT2A, serotonin receptor 2A; PAR, protease-activated receptor; TP, thromboxane prostanoid receptor; TXS, thromboxane A_2 synthase; vWF, von Willebrand factor; * combined thromboxane-receptor antagonists and TXS inhibitors. (*From* Franchi F, Angiolillo DJ. Novel antiplatelet agents in acute coronary syndrome. Nat Rev Cardiol 2015;12(1):30–47; with permission.)