
Approximately 1 in 6 warfarin-treated patients with atrial fibrillation undergo an elective surgery annually, yet the need for bridging anticoagulation during perioperative warfarin interruption remains uncertain. To address this clinical ambiguity, Douketis et al conducted a randomized, double-blind, placebo-controlled trial enrolling 1884 patients with chronic (permanent or paroxysmal) atrial fibrillation or flutter, undergoing an elective operation or invasive procedure that required interruption of warfarin therapy. Participants were randomized to receive bridging anticoagulation therapy with low-molecular-weight heparin (100 IU of dalteparin per kilogram of body weight, n=934) or matching placebo (n=950), from 3 days until 24 hours before the procedure and then for 5 to 10 days after the procedure. Warfarin was stopped 5 days before the procedure and resumed within 24 hours post procedure. Primary outcomes were arterial thromboembolism (stroke, systemic embolism, or transient ischemic attack) and major bleeding.

The incidence of arterial thromboembolism was 0.4% in the no-bridging group and 0.3% in the bridging group (risk difference, 0.1 percentage points; 95% confidence interval, –0.6 to 0.8; P=0.01 for noninferiority). Incidence of major bleeding was lower in the nonbridging than the bridging group (1.3% versus 3.2%; relative risk 0.41; P=0.005 for superiority). Risk of minor bleeding was also lower in the nonbridging group (2.0% versus 20.9%; P<0.001). Median time to a thromboembolic event after the procedure was 19.0 days (interquartile range, 6.0–23.0); median time to major bleeding after the procedure was 7.0 days (interquartile range, 4.0–18.0).

This study provided high-quality evidence suggesting that bridging anticoagulation does not lower perioperative risk of arterial thromboembolism in patients with atrial fibrillation and increases risk of major bleeding in selected elective surgeries. The results should be interpreted with caution because patients undergoing major surgical procedures associated with high rates of arterial thromboembolism and bleeding (such as carotid endarterectomy, major cancer surgery, cardiac surgery, or neurosurgery) were excluded from the trial. Patients with mechanical heart valves were also excluded and few patients had a CHADS2 (congestive heart failure, hypertension, age ≥75 years, diabetes mellitus, stroke) score of 5 or 6. The role of bridging anticoagulation in patients at high risk for arterial thromboembolism remains unknown. Future study should also explore potential roles of nonvitamin K antagonist oral anticoagulants for perioperative bridging anticoagulation therapy.


Optimal blood pressure (BP) levels after intracranial hemorrhage (ICH) remain poorly defined. In this single-center observational study of 1145 consecutive patients with ICH from 1994 to 2013, the authors investigated the association between BP and risk of recurrent ICH. BP was determined by interview and medical record review at 3, 6, 9, and 12 months, and every 6 months thereafter. Adequate BP control was defined based on 2007 American Heart Association/American Stroke Association guidelines for secondary prevention after ICH (systolic BP <140 mm Hg [<130 mm Hg for diabetics] and diastolic BP <90 mm Hg [<80 mm Hg for diabetics]). BP was reported as a continuous and categorical variable across stages of hypertension (per Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure 7). Primary outcome was recurrent lobar or nonlobar ICH.

During a mean follow-up of 36.8 months (interquartile range, 16.2–55.4), adequate BP control was achieved on ≥1 measurement by 54.6% (range, 49.2%–58.7%) and consistently (ie, at all available time points) by 43.2% (range, 34.5%–51.0%). Annual recurrent ICH rates were higher among those with lobar compared with nonlobar ICH (7.8% versus 3.2%; P<0.001). Inadequate BP control was associated with higher risk of recurrent ICH in survivors of both lobar (adjusted hazard ratio, 3.53; 95% confidence interval, 1.65–7.54) and nonlobar ICH (adjusted hazard ratio, 4.23, 95% confidence interval, 1.02–17.52). Systolic BP during follow-up was associated with increased risk of lobar ICH recurrence (hazard ratio, 1.33 per 10 mm Hg increase [95% confidence interval, 1.02–1.76]) and nonlobar ICH recurrence (hazard ratio, 1.54 per 10 mm Hg increase [95% confidence interval 1.03–2.30]).

Although this study was limited by selection bias (single center), nonstandardized BP measurements, its observational nature, and the absence of other outcome data, several key
findings will inform future studies. First, it showed a strong, independent association between BP, even at prehypertensive levels, and recurrent ICH, suggesting a potential role for aggressive BP control after ICH. Second, BP was associated with recurrent ICH in survivors of lobar ICH, suggesting that BP control may be important in individuals with cerebral amyloid angiopathy-related ICH. Third, less than half the patients achieved guideline recommended BP levels, highlighting an evidence-practice gap. Prospective randomized controlled trials are needed to evaluate the effect of BP control on recurrent ICH risk, and to identify the threshold at which protective effects of lowering BP turn to harm.
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