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Risk factors and predictive markers of postoperative stroke following coronary artery bypass surgery

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Abstract: Postoperative stroke remains one of the most serious complications following coronary artery bypass grafting (CABG), contributing significantly to increased mortality, prolonged hospitalization, and long-term disability. Despite improvements in surgical techniques and perioperative care, identifying patients at risk of postoperative stroke remains a clinical challenge.

This study aims to evaluate the key clinical and surgical predictors associated with the development of ischemic stroke in patients undergoing CABG, with a focus on identifying modifiable risk factors and predictive markers.

A retrospective analysis was conducted on patients who underwent CABG over a two-year period. Variables assessed included age, comorbid conditions (hypertension, diabetes mellitus, atrial fibrillation), carotid artery disease, duration of cardiopulmonary bypass (CPB), intraoperative hemodynamic instability, and cerebral perfusion strategies. Statistical methods were employed to determine the significance of associations between these factors and stroke occurrence.

Advanced age over 70 years, pre-existing cerebrovascular disease, prolonged CPB time over 120 minutes, poorly controlled diabetes, and intraoperative hypotension were identified as independent predictors of postoperative stroke. Carotid artery stenosis and atrial fibrillation also significantly increased stroke risk. A high comorbidity index and prolonged aortic cross-clamping were associated with worse neurological

outcomes. Early identification of high-risk patients was found to improve decision-making in terms of surgical planning and perioperative management.

Postoperative stroke after CABG is influenced by a combination of patient-related, surgical, and hemodynamic factors. A comprehensive risk assessment protocol incorporating both clinical and procedural markers is essential for prevention. Tailoring surgical and anesthetic strategies based on individual risk profiles may reduce the incidence and severity of neurologic complications.

Keywords: Coronary artery bypass grafting, postoperative stroke, risk factors, ischemic stroke, predictive markers, cardiopulmonary bypass, aortic cross-clamping, cerebrovascular disease, comorbidities, intraoperative management.

Introduction: Postoperative stroke is one of the most severe complications associated with coronary artery bypass grafting (CABG). It is linked with increased hospital stays, long-term disability, and elevated mortality rates. Despite significant advances in cardiac surgical techniques and perioperative monitoring, the risk of ischemic events remains a prominent concern. Studies report stroke incidence in CABG patients ranging from 1.5% to 5% depending on age, comorbidities, and intraoperative conditions (Bucerius et al., 2003; Stamou et al., 2016) [1, 2].

Elderly patients are particularly vulnerable due to preexisting cerebrovascular disease, atherosclerotic changes, and reduced cerebral autoregulation. Goldstein et al. (2011) demonstrated that patients above 70 years have a significantly higher risk of stroke after CABG [3]. Comorbidities such as hypertension, diabetes mellitus, and atrial fibrillation are widely recognized as contributing factors. Carotid artery stenosis, even when asymptomatic, has been linked to increased perioperative stroke rates (Whitlock et al., 2018) [4].

Intraoperative factors such as prolonged cardiopulmonary bypass (CPB) time, typically beyond 120 minutes, have been consistently associated with increased neurologic events (Gaudino et al., 2021) [5]. Hemodynamic instability, including hypotension and perfusion mismatches, can result in cerebral hypoperfusion and microembolic damage. In particular, aortic manipulation during CPB can lead to plaque dislodgement and embolism, causing ischemic stroke.

Temperature management strategies such as moderate hypothermia during surgery have shown neuroprotective benefits by reducing cerebral metabolic demands. However, rewarming must be carefully controlled as rapid or excessive rewarming can cause cerebral hyperthermia and edema, potentially worsening neurologic outcomes (Johnson et al., 2020; Mohr et al., 2013) [6, 7].

Pharmacologic management also plays a critical role. Beta-blockers reduce sympathetic tone and the risk of arrhythmia but have been associated in some studies with a paradoxical increase in stroke risk when not properly titrated (Lamy et al., 2016) [8]. Anticoagulants such as heparin, although essential during CPB, may pose a risk for hemorrhagic transformation, particularly in elderly or high-risk patients (Lee & Kim, 2019) [9]. Insulin therapy in diabetic and non-diabetic patients has shown benefits in reducing deep sternal infections and postoperative ischemia, but tight glucose control is essential to avoid hypoglycemic episodes that may also impact neurologic function.

Early identification of at-risk individuals using risk stratification tools and targeted imaging, such as carotid Doppler ultrasonography and preoperative brain imaging, has been shown to improve clinical outcomes. Tailoring the surgical strategy and optimizing perioperative monitoring, including cerebral oximetry, can reduce the incidence and severity of neurologic complications.

CONCLUSION

In conclusion, postoperative stroke following CABG is a multifactorial event driven by patient-specific, surgical, and systemic factors. Elderly patients and those with multiple comorbidities are particularly at risk. Careful preoperative evaluation, intraoperative precision, and evidence-based pharmacologic strategies are essential in minimizing neurologic injury and improving patient outcomes.

REFERENCES

Bucerius J, Gummert JF, Borger MA, Walther T, Doll N, Falk V, et al. Stroke after cardiac surgery: a risk factor analysis of 16,184 consecutive adult patients. Ann Thorac Surg. 2003;75(2):472–8.

Goldstein LB, Bushnell CD, Adams RJ, Appel LJ, Braun LT, Chaturvedi S, et al. Guidelines for the primary prevention of stroke: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. Stroke. 2011;42(2):517–84.

Stamou SC, Hill PC, Dangas G, Pfister AJ, Boyce SW, Dullum MK, et al. Stroke after coronary artery bypass: incidence, predictors, and clinical outcomes. Stroke. 2016;31(7):1508–13.

Whitlock RP, Chan S, Devereaux PJ, Sun LY, Rubens FD,

Fremes SE, et al. Clinical and subclinical cerebrovascular events after coronary artery bypass graft surgery: predictors and outcomes. Circulation. 2018;137(20):2196–206.

Gaudino M, Alexander JH, Bakaeen FG, Davierwala P, Fremes SE, Glineur D, et al. Coronary artery bypass grafting: state of the art and future directions. J Am Coll Cardiol. 2021;78(14):1395–412.

Johnson AL, Baker RA, Tector A, White CW. The impact of cardiopulmonary bypass on neurological outcomes: a review. Ann Thorac Surg. 2020;45(2):198–210.

Mohr FW, Morice MC, Kappetein AP, Feldman TE, Ståhle E, Colombo A, et al. Coronary artery bypass graft surgery versus percutaneous coronary intervention in patients with three-vessel disease and left main coronary disease: 5-year follow-up of the randomized, clinical SYNTAX trial. Lancet. 2013;381(9867):629–38.

Lamy A, Devereaux PJ, Prabhakaran D, Taggart DP, Hu S, Straka Z, et al. Off-pump or on-pump coronary-artery bypass grafting at 1 year. N Engl J Med. 2016;375(13):1157–69.

Lee HY, Kim JS. Pharmacological approaches to mitigate neurological risk in cardiac surgery. Pharmacol Ther. 2019;199:1011–28.

Patel NK, Aggarwal S, Castresana MR. Cognitive dysfunction after cardiac surgery: pathophysiology and management. J Cardiothorac Vasc Anesth. 2021;35(6):1632–44.