things that need to be studied that will likely minimize CSA-AKI? Of course. The dialog represented by the *Journal* commentaries related to the article by Ranucci and colleagues reflects the article's importance. Hopefully, this dialog of commentaries will stimulate further rigorous studies to address incompletely resolved issues surrounding CSA-AKI. I look forward to these future studies.

Victor A. Ferraris, MD, PhD
Department of Surgery, College of Medicine
University of Kentucky
Lexington, Ky

References

1. Ranucci M, Johnson I, Willcox T, Baker RA, Boer C, Baumann A, et al. Goal-directed perfusion to reduce acute kidney injury: a randomized trial. *J Thorac Cardiovasc Surg.* 2018;156:1918-27.e2.
2. Montisci A, Travaglini S, Miceli A. Commentary: The lack of a magic bullet. *J Thorac Cardiovasc Surg.* 2019;157:2352-3.
3. Ortega-Loubon C, Fernández-Molina M, Carrascal-Hinojal Y, Fulquet-Carreras E. Cardiac surgery-associated acute kidney injury. *Ann Card Anaesth.* 2016;19:687-98.
4. Ferraris VA. Perfusion-induced acute kidney injury: a litany of uncertainty and frustration. *J Thorac Cardiovasc Surg.* 2018;156:1928-30.
5. Ortega-Loubon C, Fernández-Molina M, Fierro I, Jorge-Monjas P, Carrascal Y, Gómez-Herreras JI, et al. Postoperative kidney oxygen saturation as a novel marker for acute kidney injury after adult cardiac surgery. *J Thorac Cardiovasc Surg.* 2019;157:2340-51.e3.
6. Montisci A, Miceli A. Reply: Cardiac surgery-associated acute kidney injury: Finding the gunpowder. *J Thorac Cardiovasc Surg.* 2020;159:e71-2.
7. Ortega-Loubon C, Fernández-Molina M, Fierro I, Jorge-Monjas P, Carrascal Y, Gómez-Herreras JI, et al. Postoperative kidney oxygen saturation as a novel marker for acute kidney injury after adult cardiac surgery. *J Thorac Cardiovasc Surg.* 2019;157:2340-51.e3.

<https://doi.org/10.1016/j.jtcvs.2019.12.014>

REPLY FROM THE AUTHORS: ACUTE KIDNEY INJURY: INFINITY TIMES INFINITY Reply to the Editor:

Acute kidney injury (AKI), a complex disease associated with poor outcomes, remains an open issue in cardiac surgery despite much effort. Although our perspectives differ, we are all engaged in improving our results. Whether it is the lack of a magic bullet (our view) or the need of protective armor (your view), the meaning does not change.^{1,2} As specified previously, AKI is a 1 million-piece puzzle that involves many preoperative, intraoperative, and postoperative variables.³ Any potential measure to prevent it is welcome. We can discuss this an infinite number of times. Perhaps we made a mistake. AKI is not a 1 million-piece puzzle—it's much more.

Authors have nothing to disclose with regard to commercial support.

Antonio Miceli, MD, PhD^a
Andrea Montisci, MD^{b,c}

^aDepartment of Minimally Invasive Cardiac Surgery

^bDepartment of Anesthesia and Intensive Care

Cardiothoracic Center

Istituto Clinico Sant'Ambrogio

Milan, Italy

^cDepartment of Cardiac Surgery

University of Milan

Milan, Italy

References

1. Montisci A, Travaglini S, Miceli A. The lack of a magic bullet. *J Thorac Cardiovasc Surg.* 2019;157:2352-3.
2. Ortega-Loubon C, Tamayo E, Jorge-Monjas P. Reply: Cardiac surgery-associated acute kidney injury: a protective armor rather than a lethal ammunition. *J Thorac Cardiovasc Surg.* 2020;159:e261.
3. DiBacco L, Montisci A, Miceli A. Commentary: Acute kidney injury: The one-million-pieces puzzle. *J Thorac Cardiovasc Surg.* 2019;157:2367-8.

<https://doi.org/10.1016/j.jtcvs.2019.12.015>

CEREBROVASCULAR COMPLICATIONS AFTER CARDIAC SURGERY: IT IS TIME TO TRACK AND TREAT LARGE VESSEL OCCLUSION

To the Editor:

We read with a great interest the recent article by Sheriff and colleagues¹ concerning large vessel occlusion (LVO) stroke after cardiothoracic surgery (CTS). Sheriff and colleagues¹ conducted a monocenter study of their own database, with 5947 patients being reviewed between July 2013 and April 2018. Among 148 patients with cerebrovascular complications within 30 days of surgery, 10.1% had LVO. Almost half of these patients were considered candidates for emergency thrombectomy, with encouraging functional outcome at 3 months. This was also suggested by a case-control study on perioperative stroke, which included 68% CTS patients.²

We also collected data on LVO in our center. We reviewed all consecutive adult patients hospitalized in the intensive care unit within 2 days after CTS with cardiopulmonary bypass between August 2016 and March 2018 in our tertiary center. Of 1946 patients, 57 (2.9%)

Authors have nothing to disclose with regard to commercial support.

had clinical suspicion of cerebrovascular complications and underwent cerebral imaging (post-anoxic coma, salvage surgery, and cerebrovascular complications occurring after the 2 first days of intensive care unit stay were excluded). Computed tomographic (CT) angiography was mainly performed over magnetic resonance (MR) angiography (89.6% vs 10.4%). Most frequent clinical presentations were limb motor deficit and seizure (63% and 31%, respectively). Three patients of 57 (5.3%, 95% confidence interval: 1.1%-14.6%) had a LVO and one was considered as candidate for emergent thrombectomy. Delay between intensive care unit arrival and symptom detection and delay between symptom detection and cerebral imaging were 3.1 hours (interquartile range, 2.3-7.9) and 1.8 hours (interquartile range, 0.6-3.3), respectively. No risk factor of LVO has been identified in our series. These results were presented at the annual meeting of the French Society of Anesthesiology and Intensive Care (September 19-21 2019, Paris, France).

Although these 2 series have different inclusion criteria, they constitute the largest consecutive series reporting LVO stroke after CTS. The prevalence is slightly underestimated, however, because 12.8% of patients with stroke in the study of Sheriff and colleagues¹ and 15.8% in ours did not benefit from vessel imaging, despite the implementation of an institutional protocol. CT angiography was the preferred cerebrovascular imaging modality in both series, because it had better availability and less contraindication relative to magnetic resonance imaging angiography in this specific population. As opposed to the study of Sheriff and colleagues, no statistical association between cardiopulmonary bypass duration and LVO was found in our series. This was probably due to shorter mean cardiopulmonary bypass duration (106 min vs 158 min) and a smaller sample size in our series.

Although LVO stroke is a rare event in the setting of CTS, all cardiac care providers should pay great attention, because an evidence-based therapeutic opportunity now exists out to 24 hours after the last known well time.³ Efforts should be made to allow for the following: (1) early detection of clinical abnormalities by using minimal postoperative sedation and active clinical neurologic monitoring; (2) urgent cerebrovascular imaging performance; and (3) urgent referral to neurointerventional care providers to discuss thrombectomy. A preestablished multidisciplinary procedure adapted to each particular institution would largely facilitate appropriate management.⁴

Rémi Schweizer, MD^a
Matthias Jacquet-Lagrèze, MD^a

Jean-Luc Fellahi, MD, PhD^{a,b}

^aService d'Anesthésie-Réanimation
Hôpital Louis Pradel
Hospices Civils de Lyon
Lyon, France
^bInserm U1060
Université Claude Bernard Lyon 1
Lyon, France

References

1. Sheriff F, Hirsch J, Shelton K, D'Alessandro D, Stapleton C, Koch M, et al. Large-vessel occlusion stroke after cardiothoracic surgery: expanding time windows offer new salvage opportunities. *J Thorac Cardiovasc Surg.* 2019;158:186-96.e2.
2. Premat K, Clovet O, Frasca Polara G, Shotor E, Bartolini B, Yger M, et al. Mechanical thrombectomy in perioperative strokes: a case-control study. *Stroke.* 2017;48:3149-51.
3. Furie KL, Jayaraman MV. 2018 Guidelines for the early management of patients with acute ischemic stroke. *Stroke.* 2018;49:509-10.
4. Boyer T, Sigaut S, Puybasset L, Deltour S, Clarençon F, Degos V. From preoperative evaluation to stroke center: management of postoperative acute ischemic stroke. *Anaesth Crit Care Pain Med.* 2016;35:299-305.

<https://doi.org/10.1016/j.jtcvs.2019.10.147>

REPLY: TIME TO SHOW GREATER APPRECIATION OF LARGE VESSEL OCCLUSION STROKE AFTER CARDIOVASCULAR

SURGERY

Reply to the Editor:

We read with great interest the letter by Schweizer and colleagues.¹ It seems timely that efforts to increase awareness of the issues relating to the importance of treating large vessel occlusion (LVO) in the setting of cardiovascular surgery (CVS) is being brought to the forefront. LVO stroke is relatively rare; Sheriff and colleagues² reported an overall stroke rate of 2.48% in their series, of which ischemic stroke accounted for 92.5% and LVO stroke comprised only 10.1%. Similarly, Schweizer and colleagues reported an overall stroke rate of 2.9%, of which LVO stroke accounted for only 5.3%, or 3 of 57 patients.

As reported in both series, LVO stroke is relatively rare, but its significance lies in causing a preponderance of stroke-related deaths and severe disabilities.³ An LVO stroke is usually caused by the occlusion of a large terminal intracranial vessel, such as the internal carotid artery or the proximal segments (eg, M1, M2) of the middle cerebral artery.⁴ The territories covered by these vessels are poorly