mycotic aneurysms. This procedure is less invasive and can be performed in patients who are unable to tolerate a craniotomy, or when clot evacuation is not required.^{1,5} Using endovascular embolization of both a ruptured and an unruptured cerebral aneurysm, Asai and colleagues⁶ successfully performed a heart repair 1 day later.

Early cardiac surgery is critical in preventing further systemic embolism, but there are other contributing factors that must be taken into account to improve patient outcome. An individualized and multidisciplinary approach must be adopted in clinical decision making. The case report by Maruyama and colleagues² is a welcome addition to the literature regarding the optimal timing of surgical interventions by demonstrating that a valve repair can be safely performed only 3 days after resection of a ruptured intracranial mycotic aneurysm. Is sooner better? A prospective randomized study is required to provide a more definitive answer.

However, given the rarity of intracranial mycotic aneurysms and the variety of clinical presentations of infectious endocarditis, a controlled study may be difficult.

References

1. Ducruet AF, Hickman ZL, Zacharia BE, Narula R, Grobelny BT, Gorski J, et al. Intracranial infectious aneurysms: a comprehensive review. *Neurosurg Rev*. 2010;33:37-46.
2. Maruyama R, Yamada A, Sugiyama T, Ujihira K, Nishioka N, Iba Y, et al. Mitral valve repair for endocarditis can be performed 3 days after repair of a bleeding mycotic brain aneurysm. *J Thorac Cardiovasc Surg*. 2016;151:e59-61.
3. Kang DH, Kim YJ, Kim SH, Sun BJ, Kim DH, Yun SC, et al. Early surgery versus conventional treatment for infective endocarditis. *N Engl J Med*. 2012;366:2466-73.
4. Rossi M, Gallo A, De Silva RJ, Sayeed R. What is the optimal timing for surgery in infective endocarditis with cerebrovascular complications? *Interact Cardiovasc Thorac Surg*. 2012;14:72-80.
5. Kanno S, Thomas SV. Intracranial microbial aneurysm (infectious aneurysm): current options for diagnosis and management. *Neurocrit Care*. 2009;11:120-9.
6. Asai T, Usui A, Miyachi S, Ueda Y. Endovascular treatment for intracranial mycotic aneurysms prior to cardiac surgery. *Eur J Cardiothorac Surg*. 2002;21:948-50.

EDITORIAL COMMENTARY

Multidisciplinary risk assessment and treatment: The evolution of triage

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Napoleon's chief surgeon, Baron Dominique Jean Larrey, is widely credited with the origin of triage.¹ In the early 1800s, Baron Larrey convinced military leadership of the need to evacuate wounded from the battlefield while conflict was still underway. This novel approach marked a major turning point in the evolution of surgical care. After all, no commander would have risked additional personnel evacuating the wounded were the care provided not actually beneficial! These benefits that we take for granted today were clearly less apparent in the early 19th century. Another novel approach was to treat the most critically injured first, without regard for nationality or rank. This undoubtedly helped establish medical prioritization as a vital triage function.

Writing in 1846, in what must have been a colder, more rational time, British naval surgeon John Wilson further

refined the concepts of triage and prioritization.² He limited evacuations to those who might benefit from surgical care. This model distributed surgical decision making to the corpsmen, who were closer to the front line. Importantly, it implies a broader knowledge and understanding of surgical capabilities among the nonsurgeon members of the team.

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Central Message

For complicated patients, a collaborative multidisciplinary approach is best.

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These 2 elements of triage—timeliness of intervention and medical prioritization—that were established in the early 19th century continue to underpin medical decision making today. Consider the modern emergency department: physicians continually triage patients according to medical acuity. For patients with trauma who have multiple problems, a trauma team triages each problem within an individual according to its medical urgency. The trauma team then sees each problem addressed by an appropriate specialist on the basis of the magnitude and imminence of the threat to the patient's health. Urgency and priority are the essence of triage, and for patients with trauma, the algorithms are well rehearsed.

The challenge, as illustrated by the patient in this case report, is the accurate assessment of risks and benefits across specialties with seemingly opposing interests. How should a patient with a bleeding mycotic aneurysm in the brain and a mitral vegetation at significant risk of embolization be treated? Given the devastating consequences of intracranial hemorrhage (ICH), neurosurgeons are normally very cautious about postcraniotomy anticoagulation. Conversely, it is well documented that cardiopulmonary bypass and recent intracranial ICH commonly result in death. On the surface, for the patient in this case, it is an impasse.

Digging a little deeper, large neurosurgical centers have published experience with venous thromboembolism, including therapeutic anticoagulation for life-threatening

pulmonary embolism. One series describes 42 patients treated with full anticoagulation, with some treated as early as 2 days after craniotomy.³ None of these patients had ICH, although ICH did develop in 2 of 66 patients in another series.⁴ The risk of full anticoagulation after recent craniotomy is not zero, but it is less than we might have expected. Certainly, the risk to the patient is less than the rate of stroke in patients with highly mobile left-sided vegetations that are greater than 10 mm in diameter.⁵

With an n of 1 and an unknown denominator, this report may or may not represent a model of how to care for a patient with a mycotic cerebral aneurysm and mitral endocarditis. What it does give us is far more valuable. It gives us a model of how surgical specialists can set aside individual biases, balance risks across disciplines, and hammer out a solution that is best for the patient. Baron Larrey would be impressed.

References

1. Blagg CR. Triage: Napoleon to the present day. *J Nephrol*. 2004;17:629-32.
2. Watt J. Doctors in the wars. *J R Soc Med*. 1984;77:265-7.
3. Scheller C, Rachinger J, Strauss C, Alfieri A, Prell J, Koman G. Therapeutic anticoagulation after craniotomies: is the risk for secondary hemorrhage overestimated? *J Neurol Surg A Cent Eur Neurosurg*. 2014;75:2-6.
4. Smith TR, Nanney AD III, Lall RR, Graham RB, McClendon J Jr, Lall RR, et al. Development of venous thromboembolism (VTE) in patients undergoing surgery for brain tumors: results from a single center over a 10 year period. *J Clin Neurosci*. 2015;22:519-25.
5. Thuny F, Di Salvo G, Belliard O, Avierinos JF, Pergola V, Rosenberg V, et al. Risk of embolism and death in infective endocarditis: prognostic value of echocardiography: a prospective multicenter study. *Circulation*. 2005;112:69-75.