Play it again...Dr Gibbon

Frank A. Baciewicz, Jr, MD

From the Division of Cardiothoracic Surgery, Michael and Marian Ilitch Department of Surgery, Wayne State University School of Medicine, Detroit, Mich.

Disclosures: Author has nothing to disclose with regard to commercial support.

Received for publication Nov 10, 2017; accepted for publication Nov 13, 2017; available ahead of print Jan 11, 2018.

Address for reprints: Frank A. Baciewicz, Jr, MD, Harper Hospital, 3990 John R, Detroit, MI 48201 (E-mail: fbaciewi@dmc.org).

J Thorac Cardiovasc Surg 2018;155:1082-3

0022-5223/\$36.00

Copyright © 2017 by The American Association for Thoracic Surgery

<https://doi.org/10.1016/j.jtcvs.2017.11.040>

Frank A. Baciewicz, Jr, MD

Central Message

The ability of cardiopulmonary bypass to provide hemodynamic support and allow surgical pulmonary embolectomy as envisioned by Dr Gibbon in 1931 is ready for an encore.

See Article page 1095.

If Dr John Gibbon had reviewed “Outcomes After Surgical Pulmonary Embolectomy for Acute Submassive and Massive Pulmonary Embolism: A Single Center Experience” by Pasrija and colleagues,¹ he would have experienced a déjà vu moment. While caring for a woman who would eventually die from a pulmonary embolism in 1931, Dr Gibbon forged the idea for developing a machine to oxygenate the blood and save his patient’s life. His later development of cardiopulmonary bypass ushered in the era of open-heart surgery and the possibility of surgical pulmonary embolectomy with circulatory support.

This manuscript from the University of Maryland reports an outstanding overall 30-day mortality of 7% for surgical pulmonary embolectomy. Pasrija and colleagues achieved 100% survival (28/28) in the submassive group, 88% survival (16/18) in the massive without arrest subset, and 78% survival (7/9) in the massive with arrest group. These outcomes are similar to those in recent publications from Edelman and colleagues,² Keeling and colleagues,³ and Neely and colleagues,⁴ which have detailed 30-day mortalities of 2.7%, 11.7%, and 6.6%, respectively, after surgical pulmonary embolectomy. These recent results are in stark contrast to earlier reviews by Kalra and colleagues,⁵ Kilic and colleagues,⁶ and Meyer and colleagues,⁷ with 26.3%, 27.2%, and 37.5% 30-day mortality, respectively.

These markedly improved results are likely related to several factors. First, surgical techniques that isolate the pulmonary circulation, avoid aortic crossclamping, use intermittent short periods of circulatory arrest, and employ retrograde pulmonary perfusion⁸ have contributed. Second, anesthetic management with drugs to manipulate the pulmonary vasculature, avoidance of positive airway pressure, and the use of transesophageal echo have assisted induction of these unstable patients and improved their postoperative care.

Third, selection of patients, ie, avoiding those who have had extended periods of cardiopulmonary arrest or refusing operation on patients in cardiopulmonary arrest, may have affected reported results. Keeling and colleagues³ reported a 30-day mortality of 32% in surgical embolectomy

patients with preoperative cardiopulmonary arrest, Carvalho and colleagues⁹ mentioned an 85% 30-day mortality in salvage cases, and Aymard and colleagues¹⁰ noted 27% short-term mortality in patients having surgical pulmonary embolectomy after failure of thrombolytic therapy.

Fourth, the ability to stabilize and rescue a patient at bedside with percutaneous circulatory support (veno-arterial extracorporeal membrane oxygenator) allows an operation on a patient who is well-oxygenated, nonacidotic, not requiring inotropic support, and with a clearer decision window. Takahashi and colleagues¹¹ reported a series of 24 patients, with 19 in cardiogenic shock and 16 on preoperative percutaneous veno-arterial extracorporeal membrane oxygenator support with a surprising 30-day mortality of only 12.5%. In the study from Pasrija and colleagues,¹ 4 of 18 in the massive without arrest and 2 of 9 in the massive with cardiopulmonary arrest were on mechanical support at the time of operation, but the outcomes of these mechanically supported patients are not detailed.

It was encouraging to see the preoperative right ventricular-to-left ventricular (RV/LV) ratio >1 improve dramatically after embolectomy, although not all patients had postoperative echoes. The postoperative ratio of RV/LV < 1 is related to meticulous technique that removed the majority of clot from the pulmonary tree. As compared with thrombolytic therapy, the improved clearance of clot should also lead to decreased postoperative pulmonary artery pressure and may account for the excellent 1-year survival of 91%. According to Lehnert and colleagues,¹²

surgical embolectomy demonstrated less residual emboli (31%) compared with thrombolytic drug clearance (76%).

The issue of patient selection remains paramount, and as the authors mentioned, this series is a retrospective analysis. The total number of patients screened, if any patients in whom thrombolytic therapy failed were included, and how a cancer diagnosis or age contributed to their assessment of candidates for surgical embolectomy are unanswered questions. Although an RV/LV ratio >1, inability to administer thrombolytic agents, recent postoperative patients, hemodynamically unstable patients, and patients with a predicted mortality of >5% offer guidelines, the criteria for offering surgical pulmonary embolectomy is still not well defined. Additional studies are necessary to better define the role and timing of surgical pulmonary embolectomy.

The report supports the possibility that cardiopulmonary bypass, first envisioned as a rescue option by Dr Gibbon, can be an integral part of the treatment protocol for selected patients with submassive and massive pulmonary emboli. As Humphrey Bogart (playing Rick Blaine) intoned “Play It Again Sam” in the movie *Casablanca*, Dr Gibbon may be prepping for an encore of surgical pulmonary embolectomy.

ADDENDUM

In fact, Humphrey Bogart famously uttered only “Play It Sam” in the movie *Casablanca*, but it has been paraphrased “Play It Again Sam.”

References

1. Pasrija C, Kronfli A, Rouse M, Raithe M, Bittle GJ, Pousatis S, et al. Outcomes after surgical pulmonary embolectomy for acute submassive and massive pulmonary embolism: a single center experience. *J Thorac Cardiovasc Surg.* 2018;155:1095-106.e2.
2. Edelman JJ, Okiwelu N, Anvardeen K, Joshi P, Murphy B, Sanders LH, et al. Surgical pulmonary embolectomy: experience in a series of 37 consecutive cases. *Heart Lung Circ.* 2016;25:1240-4.
3. Keeling WB, Sundt T, Leacche M, Okita Y, Binongo J, Lasajanak Y, et al. Outcomes after surgical pulmonary embolectomy for acute pulmonary embolus: a multi-institutional study. *Ann Thorac Surg.* 2016;102:1498-502.
4. Neely RC, Byrne JG, Gosev I. Surgical embolectomy for acute massive and submassive pulmonary embolism in a series of 115 patients. *Ann Thorac Surg.* 2015;100:1245-51.
5. Kalra R, Bajaj NS, Arora P, Arora G, Crosland WA, McGiffin DC, et al. Surgical embolectomy for acute pulmonary embolism: systematic review and comprehensive meta-analyses. *Ann Thorac Surg.* 2017;103:982-90.
6. Kilic A, Shah AS, Conte JV, Yuh DD. Nationwide outcomes of surgical embolectomy for acute pulmonary embolism. *J Thorac Cardiovasc Surg.* 2013;145:373-7.
7. Meyer G, Tamisier D, Sors H, Stern M, Vouhé P, Makowski S, et al. Pulmonary embolectomy: a 20-year experience at one center. *Ann Thorac Surg.* 1991;51:232-6.
8. Spagnolo S, Grasso MA, Tesler UF. Retrograde pulmonary perfusion improves results in pulmonary embolectomy for massive embolism. *Tex Heart Inst J.* 2006;33:473-6.
9. Carvalho EM, Macedo FL, Panos AL, Ricci M, Salerno TA. Pulmonary embolectomy: recommendation for early surgical intervention. *J Card Surg.* 2010;25:261-6.
10. Aymard T, Kadner A, Widmer A, Basciani R, Tevaearai H, Weber A, et al. Massive pulmonary embolism: surgical embolectomy versus thrombolytic therapy—should surgical indications be revisited? *Eur J Cardiothorac Surg.* 2013;43:90-4.
11. Takahashi H, Okada K, Matsumori M, Kano H, Kitagawa A, Okita Y. Aggressive surgical treatment of acute pulmonary embolism with circulatory collapse. *Ann Thorac Surg.* 2012;94:785-91.
12. Lehnert P, Möller CH, Mortensen J, Kjaergaard J, Olsen PS, Carlsen J. Surgical embolectomy compared to thrombolysis in acute pulmonary embolism: morbidity and mortality. *Eur J Cardiothorac Surg.* 2017;51:354-61.