POSTERIOR PERICARDIAL DRAINAGE: COULD IMPROVING CHEST TUBE PATENCY PROVIDE THE SAME BENEFITS?

To the Editor:

There is growing evidence that retained shed mediastinal blood significantly affects outcomes and resource use after cardiac surgery.^{1,2} The recently published meta-analysis by Gozdek and colleagues³ addresses this problematic with compelling results by assessing whether efforts to reduce pooling of blood around the heart with posterior pericardial drainage after cardiac procedures might be valuable to patients' recovery. Their systematic review of 19 randomized, controlled trials that enrolled 3425 patients demonstrated significantly reduced odds of cardiac tamponade, pericardial effusion, and postoperative atrial fibrillation, as well as shortened hospital stay and lessened risk of death.

In the review of Gozdek and colleagues,³ posterior pericardial drainage was achieved either by a posterior pericardiotomy (n = 1447), a surgeon-created pericardial incision to shunt shed blood to the pleural space, or by insertion of a chest tube posterior to the heart (n = 103). The methods were associated with similar benefits, although significant drawbacks were associated with posterior pericardiotomy, including the risk of cardiac herniation, bypass graft herniation, and long-term adhesions, as well as a 64% increase in the odds of pleural effusions, which correlates with the fact that blood is simply shunted from one space to another and not drained from the cavity.

This meta-analysis is important, because it clearly establishes the evidence that keeping the blood away from the pericardial space where it can promote effusions and supraventricular tachyarrhythmias is important to outcomes but also shows that conventional chest drainage does not get the job done. Given the drawbacks, in an accompanying editorial, Dr Vincent Conti⁴ asks an obvious question. Why can't this be accomplished by adding a posterior mediastinal chest tube?

Whether the addition of a chest tube in the posterior mediastinum is the best way to reduce retained pericardial blood is debatable. In fact, we studied this in a randomized, prospective study and did not find it routinely helpful in preventing pericardial effusions, tamponade, or postoperative atrial fibrillation.⁵ The high incidence of chest tube occlusion in the early hours after heart surgery, around 36% despite efforts to strip and milk them, might explain why such drainage could be insufficient.⁶

Our current efforts to assess this question revolve around studying the hypothesis that active efforts to clear chest tubes of clot at the bedside may be able to achieve similar results to posterior pericardiotomy. In a propensity-matched study by Sirch and coworkers,⁷ patients with active clearance of chest tubes had a 43% reduction in retained blood (from 20% to 11%) and a 33% reduced incidence of postoperative atrial fibrillation (from 30% to 20%), essentially reproducing the findings of this meta-analysis. We are currently enrolling patients in a 2-site clinical trial to determine whether this can be further verified in a randomized, controlled setting. If so, this may be a simple way to enact protocols for postoperative atrial fibrillation prevention by better externally draining shed mediastinal blood, rather than shunting it to the pleural space through a posterior pericardiotomy.

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References

1. Balzer F, von Heymann C, Boyle EM, Wernecke KD, Grubitzsch H, Sander M. Impact of retained blood requiring reintervention on outcomes after cardiac surgery. *J Thorac Cardiovasc Surg.* 2016;152:595-601.e4.
2. Boyle EM Jr, Gillinov AM, Cohn WE, Ley SJ, Fischlein T, Perrault LP. Retained blood syndrome after cardiac surgery: a new look at an old problem. *Innovations (Phila).* 2015;10:296-303.
3. Gozdek M, Pawliszak W, Hagner W, Zalewski P, Kowalewski J, Paparella D, et al. Systematic review and meta-analysis of randomized controlled trials assessing safety and efficacy of posterior pericardial drainage in patients undergoing heart surgery. *J Thorac Cardiovasc Surg.* 2017;153:865-75.e12.
4. Conti VR. Draining the posterior pericardial space: pericardiotomy versus just another tube. *J Thorac Cardiovasc Surg.* 2017;153:876-7.
5. Moss E, Miller CS, Jensen H, Basmadjian A, Bouchard D, Carrier M, et al. A randomized trial of early versus delayed mediastinal drain removal after cardiac surgery using silastic and conventional tubes. *Interact Cardiovasc Thorac Surg.* 2013;17:110-5.
6. Karimov JH, Gillinov AM, Schenck L, Cook M, Kosty Sweeney D, Boyle EM, et al. Incidence of chest tube clogging after cardiac surgery: a single-centre prospective observational study. *Eur J Cardiothorac Surg.* 2013;44:1029-36.

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7. Sirch J, Ledwon M, Puski T, Boyle EM, Pfeiffer S, Fischlein T. Active clearance of chest drainage catheters reduces retained blood. *J Thorac Cardiovasc Surg.* 2016; 151:832-8. e1-2.

<http://dx.doi.org/10.1016/j.jtcvs.2017.03.090>

2. Moss E, Miller CS, Jensen H, Basmadjian A, Bouchard D, Carrier M, et al. A randomized trial of early versus delayed mediastinal drain removal after cardiac surgery using silastic and conventional tubes. *Interact Cardiovasc Thorac Surg.* 2013;17:110-5.
3. Sirch J, Ledwon M, Puski T, Boyle EM, Pfeiffer S, Fischlein T. Active clearance of chest drainage catheters reduces retained blood. *J Thorac Cardiovasc Surg.* 2016; 151:832-8. e1-2.

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CHOICE OF SECOND PERICARDIAL DRAINAGE TUBE FOR POSTERIOR PLACEMENT

Reply to the Editor:

The letter from Demers and colleagues highlights a major question that still remains, namely whether effective pericardial space drainage with properly placed tubes that are kept patent will improve outcomes similar to the result achieved by Gozdek and colleagues.¹ It is reassuring that they have initiated a well-designed randomized trial to address this question such as I suggested my editorial. In their previous study referred to in the letter, they used a posterior Blake tube left in place for 5 days but had a high incidence of tube occlusion and did not see a benefit.² The other study that they quoted, by Sirch, and coworkers,³ used an active-clearance technique for the chest tube and found similar benefit to that seen in the study by Gozdek and colleagues,¹ but almost all those patients had only anterior mediastinal tubes placed. It is to be hoped that in the randomized trial proposed by Demers and colleagues they not only optimize chest tube patency but also choose a posterior pericardial tube, such as a soft rubber flat or oval tube with antithrombotic coating, that most surgeons would consider both harmless and effective when placed behind the heart.

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References

1. Gozdek M, Pawliszak W, Hagner W, Zalewski P, Kowalewski J, Paparella D, et al. Systematic review and meta-analysis of randomized controlled trials assessing safety and efficacy of posterior pericardial drainage in patients undergoing heart surgery. *J Thorac Cardiovasc Surg.* 2017;153:865-75.e12.

POSTERIOR PERICARDIAL DRAINAGE BY ANY MEANS MAY IMPROVE OUTCOMES AFTER CARDIAC SURGERY

Reply to the Editor:

We read with great interest the letter to the Editor by St-Onge and colleagues¹ on our recently published research article.² At the same time, we are glad that our findings have drawn the attention of international readership to the unmet need of adequate draining of the pericardial space after heart surgery procedures.

In brief, with a meta-analysis of 19 randomized controlled trials (RCTs) that enrolled 3425 patients, we assessed the efficacy and safety of posterior pericardial drainage, defined as posterior pericardiotomy incision, chest tube to posterior pericardium, or both compared with the control group that received no posterior pericardial drainage. Adequate drainage in the experimental group was associated with a significant 90% reduction of the odds of cardiac tamponade ($P < .001$) and 58% reduction of postoperative atrial fibrillation ($P < .001$). The odds of early and late pericardial effusion were significantly reduced: relative risks of 0.20 (95% confidence interval, 0.11-0.36; $P < .001$) and 0.05 (95% confidence interval, 0.02-0.10; $P < .001$), respectively. Reductions in postoperative complications translated into a significantly reduced odds of composite end point of death or cardiac arrest ($P = .03$), numerically lower odds of acute kidney injury ($P = .08$), and shorter length of hospital stay ($P < .001$).

The question raised by both Conti³ in an accompanying editorial and St-Onge and colleagues¹ is whether placement of a posterior intrapericardial drainage tube is as effective as the procedure of posterior pericardiotomy given the theoretic risk of procedural complications with the latter approach being vein graft compression, bleeding from the