Active clearance chest tubes: Awaiting randomized data

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The PleuraFlow Active Tube Clearance (ATC) Technology System (Clearflow, Inc, Anaheim, Calif) is a commercially available chest tube that contains a guidewire-based clearance mechanism to maintain chest tube patency. To date, retrospective studies have shown that ATC chest tubes may reduce bleeding complications after heart surgery in certain patient populations.¹⁻³ A secondary benefit uncovered in previous study was a reduced rate of postoperative atrial fibrillation (POAF) with use of ATC chest tubes, thought to be related to reduced atrial irritation from improved mediastinal drainage.¹ In the current issue of the *Journal*, St-Onge and colleagues⁴ from The Montreal Heart Institute performed a retrospective analysis of ATC chest tube use at their institution during a 3-month period, with a primary aim of assessing for reduced POAF. In an unadjusted analysis, there was an encouraging 34% reduction in POAF in patients managed with ATC chest tubes relative to conventional chest tubes. Attempts at risk-adjustment yielded mixed results, however; reduced POAF associated with ATC chest tubes was reproduced in a multivariable model but not in a propensity-matched subgroup analysis.

The study by St-Onge and colleagues⁴ contains many limitations that are appropriately acknowledged in the article, including small sample size, lack of standardized POAF prophylaxis, and unbalanced patient characteristics and procedural complexity between groups due to a lack of randomization. In addition, the study protocol did not allow for stripping of the conventional chest tubes, which is a ubiquitous nursing practice at most institutions (whether one chooses to publicly admit it or not). As a result, the study may not have achieved a “real-world” comparison between ATC and conventional chest tubes.

Perhaps more notable is that ATC chest tubes were not associated with improved mediastinal drainage over conventional chest tubes, as evidenced by equivalent chest tube output, transfusions, and interventions for intrathoracic fluid removal between groups. In response to this somewhat perplexing finding, St-Onge and colleagues⁴ hypothesized that a *faster rate* of drainage from an unobstructed tube may

A novel chest tube with a self-clearing mechanism may reduce atrial fibrillation.

Central Message

Self-clearing chest tubes may reduce postoperative atrial fibrillation after heart surgery, but randomized data are needed to prove benefit.

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lead to a change in the composition of pericardial fluid around the heart, thereby reducing local inflammation despite equivalent total drainage amounts. This explanation is highly speculative, because the rate of chest tube drainage and the composition of pericardial fluid from ATC and conventional chest tubes has not been studied. In fact, no evidence to date has been generated in the clinical setting to show that ATC chest tubes improve mediastinal drainage or reduce the quantity of retained mediastinal blood in relation to conventional chest tubes.^{1,3,4} It thus remains unclear whether ATC chest tubes provide any true mechanical advantage relative to conventional chest tubes and stripping practices.

Despite these unanswered questions, the proof of clinical benefit with this innovative technology will ultimately require a well-designed prospective, randomized, controlled trial. Fortunately, St-Onge and colleagues⁴ are to be applauded for launching such a trial at their institution (NCT02808897) to validate the findings of their report. The trial will randomize 508 patients to receive conventional or ATC chest tubes and is expected to be completed in October of 2017. In addition to comparing rates of POAF and bleeding complications, the investigators are further encouraged to document whether ATC chest tubes reduce the quantity of retained mediastinal blood and achieve cost savings relative to conventional chest tubes.

References

1. Sirch J, Ledwon M, Püski 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.
2. Vistarini N, Gabrysz-Forget F, Beaulieu Y, Perrault LP. Tamponade relief by active clearance of chest tubes. *Ann Thorac Surg*. 2016;101:1159-63.

3. Maltais S, Davis ME, Haglund NA, Perrault L, Kushwaha SS, Stulak JM, et al. Active clearance of chest tubes reduces re-exploration for bleeding after ventricular assist device implantation. *ASAIO J*. 2016;62:704-9.
4. St-Onge S, Ben Ali W, Bouhout I, Bouchard D, Lamarche Y, Perrault LP, et al. Examining the impact of active clearance of chest drainage catheters on postoperative atrial fibrillation. *J Thorac Cardiovasc Surg*. 2017;154: 501-8.