Weaning from cardiopulmonary bypass after minimally invasive partial tricuspid valvectomy with single-lung ventilation

Sir,

The surgical approach to the management of medically refractory infective tricuspid valve endocarditis in intravenous drug users (IVDU) remains controversial in the cardiothoracic surgery literature.\[1\] While the majority of these patients receive a valve replacement, a significant portion (14%) receive a valvectomy.\[1\] In a large meta-analysis study by Luc et al., a trend toward higher postoperative right heart failure and 30-day mortality was seen in the valvectomy group. Nevertheless, valvectomy remains an attractive option for active IVDU patients as it avoids the need for foreign material and anticoagulation, decreases the risk of heart block and has similar survival outcomes at 6 months.\[1\] For the anaesthesiologist, considerations for severe iatrogenic tricuspid regurgitation (TR) leading to right ventricular distention and ultimately failure with valvectomy is critical to consider at cardiopulmonary bypass (CPB) separation as right heart failure itself carries high perioperative mortality ranging from 37 to 90%.\[2\]

A 35-year-old male IVDU presented to our hospital with fevers and was ultimately found to have methicillin-susceptible Staphylococcus aureus tricuspid endocarditis refractory to intravenous antibiotics. Surgical valvectomy was performed via the right mini-thoracotomy approach utilising single-lung ventilation (SLV) with beating heart CPB. A large organised vegetation on the atrial side of the posterior tricuspid valve leaflet was noted and resected, resulting in expected severe TR [Figure 1]. Suture annuloplasty was not able to be performed due to a lack of suturable surrounding healthy tissue. In anticipation of right ventricular (RV) dysfunction upon weaning from CPB in the setting of the incompetent tricuspid valve, inhaled epoprostenol 0.05 µg/kg/min was initiated. Vasopressor support of norepinephrine 0.05 µg/kg/min, vasopressin 0.04 units/min and phenylephrine 0.3 µg/kg/min were required to successfully wean from CPB (duration 38 min). Given triple vasopressor requirements and concern for depressed RV function, a 10 mg milrinone bolus was given via the endotracheal route with a demonstration of normal RV function with these interventions. The patient was extubated on postoperative day 1 and ultimately recovered uneventfully in the remainder of his 25-day hospitalisation.

Proactive support of RV function in the setting of iatrogenic severe TR is prudent, as RV failure occurs in 20–30% of all cardiac surgeries.\[3\] RV support is especially critical in this surgical circumstance as elevated pulmonary arterial pressures (PAP) are expected with the use of CPB due to inflammatory mediators, endothelial damage, inadequate perfusion through the bronchial arteries and expected protamine administration.\[4\] Further, mild hypercapnia, a known exacerbator of pulmonary hypertension (PH), is anticipated with SLV required for surgical exposure. We therefore utilised both inhaled epoprostenol and intratracheal milrinone (tMil) to assist with haemodynamic management.

Combined inhaled milrinone and prostacyclin has been studied and shown to be more effective in reducing PH (by approximately 8%) and increasing stroke volume (by approximately 5%) compared to using either drug alone.\[2,5\] While inhaled or nebulised milrinone has more commonly been studied, it can also be administered as a bolus via the intratracheal route (tMil). tMil has a faster uptake and is much more readily available and practical to administer in the cardiac operating room compared to other inhalation routes.\[2,3\] tMil, similar to the inhaled route, reduces PAP without causing systemic hypotension and increases cardiac output, stroke volume and atrial contraction. It has also been associated with earlier postoperative weaning of vaspressors and shorter ICU and hospital lengths of stay.\[3\]

Anaesthesiologists may be faced with this complex clinical scenario of managing severe iatrogenic TR post-CPB and SLV more commonly in the future as our opioid crisis continues to explode while our
surgical interventions become less invasive. Further study of combining readily available tMil and inhaled prostacyclin in minimally invasive cardiac valvectomy surgery with SLV is needed.

Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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Submitted: 03-Apr-2020
Revised: 24-Apr-2020
Accepted: 30-Apr-2020
Published: 01-Oct-2020

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How to cite this article: Vander Wielen BA, Hollander K. Weaning from cardiopulmonary bypass after minimally invasive partial tricuspid valvectomy with single-lung ventilation. Indian J Anaesth 2020;64:901-2.

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