infundibulum contributes only 13% of the total RV stroke volume. Bodhey and colleagues² found the stroke volume of the infundibulum to account for 25% of the total RV stroke volume in healthy individuals. The fact that the RV infundibulum has limited contribution to global RV function, however, does not mean that the RV infundibulum is not important in maintaining RV function. In fact, there is good evidence leading us to speculate that RV infundibular contractility may play a key role in protection of the RV against deleterious consequences of the chronic volume overload related to pulmonary regurgitation after TOF repair.^{3,4}

One should remember that many factors other than the length of the RV incision could also influence late outcomes of patients with repaired TOF. These factors include the width of the transannular patch, the number of coronary arterial branches sacrificed, the extent of infundibular muscle resection, and the methods of myocardial protection. Poor myocardial protection and ensuing septal dysfunction can definitely affect the long-term outcomes of patients with repaired TOF, and we cannot rule out the possibility of poor myocardial protection in the historical cohort of patients who underwent TOF repair long ago and whose late outcomes are being studied today. In the current era of improved myocardial protection, however, serious septal dysfunction is too rarely observed after operation for TOF for us to reconsider our current method of myocardial protection.

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AWAKE THORACOSCOPIC SURGERY: SAFETY ISSUES IN DIFFICULT AIRWAY AND USE OF THORACIC EPIDURAL ANESTHESIA

To the Editor:

We read with great interest the article by Galvez and colleagues¹ that reported successful application of awake uniportal video-assisted thoracoscopic surgery (VATS) in a patient with metastases after nasopharyngeal cancer.¹ We congratulate Galvez and colleagues¹ and agree with them that a combination of uniportal and nonintubated VATS techniques would expand the armamentarium of thoracic surgical practice in an ambulatory setting.^{1,2} There are safety issues associated with nonintubated VATS, however, and these should be highlighted in their patient management.

First, a nonintubated technique for VATS is believed to benefit those patients who would be at high risk when undergoing an intubated single-lung ventilation.³ In this respect, patients with an anticipated difficult airway are appealing candidates; however, they should be selected more stringently, especially in the case of previous head and neck surgery or radiotherapy. In our own non-intubated VATS cohort, there still

were 4% of cases requiring conversion to tracheal intubation.³ Despite a conversion protocol, emergency management of difficult airway in such patients may be more challenging, and the increased risks of airway morbidity or mortality may outweigh the benefits of nonintubated VATS, especially when a lateral decubitus position is used.

Second, the use of thoracic epidural anesthesia for minimally invasive thoracic surgery is on the decline.⁴ Not only is thoracic epidural catheterization, time-consuming and technically demanding, we are also concerned that the single injection of 0.5% bupivacaine hydrochloride (INN bupivacaine) in a large dose (15 mL) may be excessive and can be associated with significant hemodynamic disturbances because of potentially complete sympathetic block. In addition, an unpredictable high-level blockade of phrenic nerves may occur and jeopardize the diaphragmatic function, which is essential in nonintubated VATS. In our experience, 8 to 10 mL of 2% lidocaine is sufficient to achieve a sensory block between the T2 and T9 dermatomes and provides a safer therapeutic window.³ With single-incision VATS, we believe that the requirement of local anesthetic can be reduced even further, because a sensory block between the T4 to T6 may be enough for a single fifth intercostal incision.

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Reply to the Editor:

We thank Hung and colleagues for their letter concerning our paper of awake uniportal VATS. We are gratified to discover that they agree with us, especially coming from a group with such a large experience in awake procedures.¹

The first issue that Hung and colleagues point out is a safety issue related to a recognized difficult airway. The airway management is a big challenge for the anesthesiologist. Our patient had a history of previously treated nasopharyngeal cancer, which certainly made the nonintubated procedure appealing, but all the difficult airway predictors were negative (Mallampati score of 1, correct neck extension, thyromental space more than 4 finger breadths). As we systematically do, we had the emergency protocol ready with different sizes of double-lumen tubes. In this case, we administered a dose of an anticholinergic drug before the surgery to prevent secretions, administered nebulized 4% lidocaine, and also had prepared an adult bronchoscope to do an awake intubation. The surgery was undertaken on the left side, making it much easier to isolate because a

normal tube could be introduced in the right main bronchus and then afterward put it correctly with the endobronchial blocker from Cook (Cook Medical Inc, Bloomington, Ind) prepared with the bronchoscope. In our protocol we also are prepared, if emergency lateral decubitus intubation is very challenging, to introduce a chest tube through the incision and seal it with a transparent, sterile film connecting the tube to a water seal, so that we can quickly reexpand the lung to put the patient in the horizontal position to develop the emergency orotracheal intubation in less adverse conditions.

Referring to the second issue raised by Hung and colleagues, it is true that the thoracic epidural catheterization is technically demanding; however, in our hospital we have three full-time thoracic anesthesiologists with great experience. The use of different techniques, such as the paravertebral blockade, is not an option in this type of awake procedure because in our experience we have had incomplete sensory block. We have also read with great interest articles about nonintubated patients with local anesthesia²; in our short experience, however, it is difficult to achieve such a high level of sensory block with intercostal injections of local anesthesia, especially depending on patient morphotype, such as obesity. We agree with Hung and colleagues that the volume administered was too high, and it is important to highlight their comment that achieving a T4 to T6 block is usually enough for a single incision. We have therefore nowadays reduced the volume; because this was our first patient, however, we were very concerned about the pain and

may have needed additional thoracoscopic ports. The patient did not have any hemodynamic disturbances, because the volume was administered throughout the entire surgery rather in a single bolus. The pioneering way we are venturing is combining the awake nonintubated anesthetic approach with the minimally invasive approach we have nowadays, uniportal video-assisted thoracoscopic surgery. We have already performed several procedures (metastasectomies, pulmonary biopsies, lung cancer relapse surgery), and we have noticed that this approach is safe, minimizing airway and lung injuries. The uniportal incision has 2 advantages that stand out in our uniportal video-assisted thoracoscopic surgical lobectomy series of 40 cases and many other articles attest³: the bigger size relative to usual thoracoscopic ports allows a better and quicker lung collapse in the nonintubated patient, and the surgeon's view is improved and the instrumentation completely feasible.

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