the mid and distal thirds of the right wall of the trachea and is directed to the upper lobe. It is more common in male patients and in children with other congenital abnormalities and should always be suspected when persisting respiratory morbidity in childhood is present. Three types of tracheal bronchi are described by Doolittle and Mair,¹ including a tracheal diverticulum, a fully developed supranumerary tracheal bronchus, and a high apical lobe, as was present in our case.

The finding of a tracheal bronchus was new for us, and only 4 cases have been published in cases of lung transplant.²⁻⁵ In 1 of these 4, the tracheal bronchus was present in the recipient and not in the donor lung.² The other 3 recipients underwent sequential bilateral lung transplant,³⁻⁵ but only in 2 cases was the right upper lobe preserved and reimplanted.^{4,5} Brichon and colleagues³ excised the tracheal bronchus because it only supplied the right apical segment of the right upper lobe, in contrast to the 2 other cases in which the tracheal bronchus supplied the whole right upper lobe, as was also the case for us. Reconstruction techniques to preserve this right upper lobe were different. Schmidt and colleagues⁵ excised the tracheal bronchus and made it part of the anastomosis of the right donor lung (Figure 2, B), whereas Sekine and associates⁴ performed a carinoplasty in the recipient and a donor patch with the orifice of the tracheal bronchus and the intermediate bronchus, constructing an end-to-end anastomosis between the carina of the recipient and the right donor patch (Figure 2, C). A theoretic tech-

nical option includes an anastomosis of the donor trachea to the recipient right main bronchus. This leaves the left main bronchial stump, however, which may give rise to a stump fistula, and an anastomosis is created at the tracheal level, with a higher risk of ischemic complications (Figure 2, D). Because of the limited number of case reports published, it was difficult to select a technique. Although in our opinion the technique of Schmidt and colleagues⁵ carries a higher theoretic risk of stenosis, the technique of Sekine and associates⁴ carries a higher risk of airway ischemia because it is a true tracheal anastomosis.

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Transcatheter aortic valve intervention through the axillary artery for the treatment of severe aortic stenosis

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Transcatheter aortic valve implantation (TAVI) has been proposed as an alternative to conventional surgery for high-risk patients and has been successfully effected through

both the transfemoral¹ and transapical² approaches. The femoral route can be difficult in patients with small or diseased iliofemoral arterial systems that either prevent access, result in procedural failure, or cause major vascular injury. The transapical approach avoids these problems; however, the apex of the left ventricle can be a friable and unforgiving structure in the older patient. In addition, a small anterolateral thoracotomy is required for the transapical approach, and this can be a problem in cases of severe respiratory dysfunction. We describe a trans-axillary artery technique for TAVI in a patient with severe lung disease and peripheral vascular disease to illustrate this approach, along with its potential advantages and limitations.

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CLINICAL SUMMARY

The patient was a 71-year-old woman with a long history of bronchiectasis and *Pseudomonas* colonization. She was seen for increasing breathlessness during the previous 9 months resulting in numerous hospitalizations. She was found to have no significant deterioration in her preexisting respiratory function. Cardiac investigations determined the presence of severe aortic stenosis, with a peak transvalvular gradient of 97 mm Hg and a valve area of 0.63 cm². Angiography revealed nonsignificant coronary artery disease but bilateral small and diffusely diseased femoral arteries.

The patient was subsequently discussed at our Structural Heart Multi-Disciplinary Meeting and was considered to face a prohibitively high risk with conventional aortic valve replacement. She was referred to our TAVI program, and protocol-driven transthoracic echocardiography and aortography confirmed adequate anatomic parameters for transcatheter valve replacement. The small diseased femoral arteries made the transfemoral approach unsuitable. In light of her significant respiratory dysfunction, we believed that a small thoracotomy would also pose a significant risk. Angiography demonstrated a healthy aortic arch with nondiseased and good-sized left subclavian and axillary arteries, and the decision was made to proceed through the axillary approach.

The proximal axillary artery was exposed through a small infraclavicular incision, and the 18F sheath was inserted through a transverse arteriotomy. The tip of the sheath was advanced into the mid ascending aorta (Figure 1), and the CoreValve self-expanding nitinol prosthesis (CoreValve Inc, Irvine, Calif) was implanted in the standard manner

FIGURE 1. Positioning of delivery sheath into aorta through axillary artery.

FIGURE 2. Deployment of CoreValve prosthesis (CoreValve Inc, Irvine, Calif) into aortic position.

(Figure 2). The prosthesis was well positioned, with no significant residual transvalvular gradient and only trivial aortic regurgitation. The patient made an uneventful recovery, apart from high-grade atrioventricular block necessitating a permanent pacemaker. At 5 months after the procedure, she was doing well, her symptomatic status has improved markedly, and she was delighted with the outcome.

DISCUSSION

TAVI is an emerging field with the potential to provide relief of aortic stenosis for a high-risk patient population.^{3,4} There still are many as yet unresolved difficulties with these technologies. Two of the major concerns are the access route to the diseased valve and the ability to accurately position the prosthesis.⁵ Although smaller sheaths and other improvements in technology will facilitate a transfemoral approach, this access route will still be challenging in a significant proportion of cases for the foreseeable future. The transapical route is an option for these patients and may have some advantages with respect to ease of device positioning and implantation. It may not, however, be suitable for patients with severe respiratory dysfunction.

The axillary approach is simple and familiar to cardiac surgeons. The subclavian and proximal axillary arteries are usually good-sized vessels and are often free of atherosclerotic disease. We have used this approach successfully for 2 additional patients; in all 3 cases, exposure of the vessel, insertion and removal of the 18F sheath, and vessel repair were easy and uncomplicated. This approach provided good stability of the sheath and valve delivery system,

with what appeared to be simpler device positioning and implantation relative to the transfemoral approach. A patent left internal thoracic artery graft is probably a contraindication to a left axillary approach. The potential to compromise innominate artery flow is a relative contraindication to the right axillary approach.

The trans-axillary artery approach offers an additional tool in the new armamentarium for the treatment of aortic stenosis in patients who are candidates for TAVI but who have significant respiratory dysfunction and problematic iliofemoral access precluding the other available techniques. We also believe that it offers some advantages relative to the transfemoral and transapical approaches and is worthy of evaluation in a broader patient population as an alternative access route.

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Palliative bidirectional Glenn anastomosis for unresectable metastasis in the right ventricle from renal cell carcinoma 16 years after nephrectomy

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We report a patient with late renal cell carcinoma metastasis to the right ventricle 17 years after radical nephrectomy. The unresectable huge metastasis caused hemodynamic impairment due to right ventricular inflow and outflow tract obstruction, which was managed by means of partial excision of right ventricular intracavity tumor, tricuspid valve replacement, and bidirectional cavopulmonary anastomosis.

CLINICAL SUMMARY

A 53-year-old woman was admitted in a local hospital because of right-heart failure, including 2-month-old palpitation and dyspnea on exertion. Seventeen years earlier, she had undergone right nephrectomy for a high-grade (G3) clear cell-type renal cell carcinoma (RCC) (pT1 bN0 M0). Echocardiography showed that the massive right ventricular intracavity mass obliterated the right ventricular cavity. Pericardial effusion was massive and drawn off by pericardiocentesis.

The diagnosis of metastatic RCC was made from biopsy. The patient was referred to us for further investigations and treatment.

Echocardiography and magnetic resonance imaging revealed a large mass that nearly obliterated the right ventricular cavity and that invaded into the ventricular septum. The septum was remarkably hypertrophied up to 29 mm, compressing the left ventricular cavity. The intracavity mass also involved right ventricular free wall and subvalvular apparatus of tricuspid valve, extending into left ventricular wall across around the apex (Figure 1). A systolic right ventricular pressure was elevated to 55 mm Hg.

After admission, the patient deteriorated despite inotropic support. Six days after admission, she developed low urine output and orthopnea. Blood chemistry analysis showed acute liver dysfunction and coagulopathy disorder. Uncontrollable heart failure necessitated percutaneous cardiopulmonary support and emergency surgery.

Midsternotomy imaging revealed that the intramural tumor mass occupied not only the entire anterior and diaphragmatic free wall of the right ventricle but also the apical wall of the left ventricle. After cardioplegic arrest, the infundibular portion of the right ventricle was incised longitudinally. The entire right ventricular cavity was filled with fragile yellow-gray tumor, which had a stalk growing from the

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