

have reported minimally invasive VATS using ECMO.^{4,5} The use of ECMO, however, has a potential problem with bleeding, especially when pleural adhesion exists. In the present case, we selected VATS under local and epidural anesthesia with preparation of ECMO, expecting less bleeding during the operation and early recovery after the operation. The procedure was well tolerated and the air leakage was completely controlled. The patient was discharged on day 4 after the operation.

VATS procedures under local and epidural anesthesia have been reported in patients with spontaneous pneumothorax⁶ and secondary pneumothorax after lung transplantation.⁷ In a small randomized study, Pompeo and colleagues⁸ reported that awake VATS bullectomy with pleural abrasion for spontaneous pneumothorax was feasible and provided equivalent outcome to procedures with the patient under general anesthesia. Thoracoscopic operations with the patient awake, however, have limitations. First, effective epidural anesthesia is indispensable and general anesthesia has to be induced when effective analgesia cannot be obtained. Second, total lung collapse cannot be obtained, especially in patients with limited contralateral pulmonary function, and thus lesions close to the hilum would not be adequately treated. Bearing these limitations in mind, we

conclude that VATS under local and epidural anesthesia can be applicable to selected patients with pneumothorax after pneumonectomy and is especially useful in those whose general condition has deteriorated.

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Arterial switch operation in children with interrupted aortic arch: Long-term outcomes

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Transposition of the great arteries associated with interrupted aortic arch (TGA-IAA) is a very uncommon anomaly. Only approximately 6% to 10% of children with IAA have TGA^{1,2} and surgical repair in these patients is com-

plex. Herein we report the long-term outcomes of 5 patients operated on for TGA-IAA at The Royal Children's Hospital at a mean 14.3 years after repair.

CLINICAL SUMMARY

The study was approved by a Research Ethics Board of Royal Children's Hospital. Between May 1983 and January 2009, 720 patients underwent an arterial switch operation (ASO) for TGA at the Royal Children's Hospital in Melbourne. Biventricular repair was done in 710 (99%) patients. Of these 710 patients, 5 (0.7%) had TGA-IAA (Table 1). Four of the 5 had IAA type A and 1 had IAA type B.³ The 5 patients were operated on at a median of 8 days of age (range, 1-118 days) and at a median weight of 3.44 kg (range, 3.1-4.76 kg). Four patients had single-stage repair of TGA-IAA, and 1 had a staged approach. End-to-side arch repair was performed in 4 patients from

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TABLE 1. Patients' characteristics

No.	Year of repair	Age (d)	Sex	Weight (kg)	IAA type	TGA or TBA	Repair	Follow-up (y)	Reintervention
1	1987	118	M	4.76	A	TBA	Staged	17.2	Yes
2	1988	2	F	3.1	B	TGA	Simultaneous	21.3	Yes
3	1992	1	M	3.44	A	TBA	Simultaneous	11.6	No
4	1995	8	M	3.40	A	TBA	Simultaneous	13.2	No
5	2000	9	F	3.60	A	TGA	Simultaneous	10.0	No

IAA, Interrupted aortic arch; TGA, transposition of great arteries; TBA, Taussig-Bing anomaly.

a midline sternotomy as previously described,² and 1 patient had IAA repair via a left thoracotomy with an 8-mm polytetrafluoroethylene interposition graft (Gore-Tex graft: W. L. Gore & Associates, Inc, Flagstaff, Ariz) and pulmonary artery banding 116 days before ASO. The ASO was performed in standard fashion. Mean cardiopulmonary bypass time was 208 minutes (range, 135–298 minutes). Mean aortic crossclamp time was 123 minutes (range, 90–169 minutes). Mean circulatory arrest time was 32 minutes (range, 15–67 minutes) in those patients who had end-to-side arch repair. The patients were followed up for a mean of 14.3 years (range, 9.7–19.6 years). There were no hospital deaths and no late deaths. Four reoperations were performed in 2 patients. One patient required 3 reoperations: resection of subvalvular aortic stenosis, subvalvular and valvular pulmonary stenosis (3 months after ASO), aortic valve replacement (9 years after ASO), and replacement of the left pulmonary artery using a 14-mm polytetrafluoroethylene ringed conduit and replacement of the main pulmonary artery using a 22-mm Hemashield Dacron prosthesis (Boston Scientific, Natick, Mass) (15.5 years after ASO). The other reoperation occurred in the patient who had arch repair before ASO. This patient required replacement of the 8-mm polytetrafluoroethylene interposition graft with an 18-mm polytetrafluoroethylene interposition graft owing to recoarctation.

Of the 4 patients without a mechanical aortic valve prosthesis, 2 had no evidence of aortic valve regurgitation and 2 had moderate aortic regurgitation at last follow-up. None of the 4 patients had any evidence of aortic root dilatation. All patients were in New York Heart Association class I.

DISCUSSION

Only a few case reports exist that document surgical experience with TGA-IAA.^{4,5} Single-stage repair was performed in 4 of the 5 patients in this study and is our current policy for correction of IAA cases with associated anomalies, as previously indicated.² Although single-stage repair of TGA-IAA has been associated with a high mortality rate,^{3,4} we are able to show no hospital deaths and good long-term outcomes in 4 patients with single-stage repair.

Aortic valvular function is an issue in the long term for ASO survivors. This may even be more of an issue for patients with TGA-IAA in whom there is a considerable discrepancy between the size of the aorta and pulmonary artery. In our study, 2 patients had moderate aortic valve regurgitation and another required aortic valve replacement 9 years after ASO. We believe that pericardial patch augmentation of the arch should be avoided because this may result in dilatation of the neo-aorta and subsequent neo-aortic valve insufficiency. Careful adjustment of the neo-aortic root to the size of the ascending aorta is a must to avoid distortion of newly created aortic root.

Only 1 of our 4 patients having single-stage repair required reoperation. However, this patient required 3 different reoperations spaced over a period of 15 years. Although the exact reasons for the high reoperation rate in 1 patient are unknown, it appears that development of severe subvalvular stenosis may have accelerated damage to the neo-aortic valve. The neo-aortic valve had to be replaced 9 years after resection of subvalvular obstruction. We no longer use interposition grafts² to repair the IAA. Long-term follow-up of these patients is clearly warranted.

CONCLUSIONS

Although the patients' functional status remains excellent at long-term follow-up, the high reoperation rate requires thorough follow-up in this rare subgroup of patients.

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