

Anesthetic Management of Late Arterial Switch Operations for Patients with Transposition of the Great Arteries and a Systemic Right Ventricle

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Introduction: Patients with transposition of the great arteries (TGA) have a morphologic right ventricle (RV) that ejects blood into the systemic circulation. Unless corrected in the neonatal period, these patients are at risk for RV failure from systemic pressure and/or volume overload, and thus many require corrective surgery or transplantation later in life. In recent years, patients with D- or L-TGA have presented after the neonatal period for complete corrective surgery to re-route blood flow to normal physiologic patterns, allowing the morphologic left ventricle (LV) to eject into the systemic circulation, and the RV into the pulmonary circulation.(1,2) The purpose of this study was to describe the anesthetic management and perioperative outcome of this small but challenging group of patients.

Methods: Medical records and anesthesia database were reviewed retrospectively for patients with L-TGA or D-TGA who underwent complete corrective operations outside of the neonatal period, consisting of either the double switch operation (arterial switch plus Senning or Mustard operation), switch conversion (arterial switch plus takedown of previous Senning or Mustard), or Senning/Mustard plus Rastelli procedure. Demographic, intraoperative anesthetic and surgical, and perioperative outcome data were collected as noted in Results. Descriptive statistics are reported as mean \pm SD.

Results: 12 patients were identified from 1998-2003. Primary diagnosis was D-TGA in 3, and L-TGA in 9. Associated diagnoses were ventricular septal defect in 9, Ebstein's anomaly in 4, pulmonic stenosis/atresia in 3, and aortic obstructive lesions in 3. Six patients had undergone previous pulmonary artery bandings and 2 had undergone previous Senning/Mustard operation. Six patients underwent a double switch operation, 2 a switch conversion, and 4 a Senning/Mustard plus Rastelli. Demographic, intraoperative, and outcome data are reported in Tables 1 and 2. All patients received high-dose fentanyl, midazolam, isoflurane, and vecuronium or pancuronium. No patient required mechanical circulatory support. Ten of 12 patients required postoperative mechanical ventilation for >24 hours. There were no perioperative deaths, no new gross neurologic deficits, and all patients were discharged home.

Discussion: Patients presenting for late corrective operations for TGA are a small but growing group, as their systemic RV fail or are at risk to fail. The operations are long and complex, and require multiple anesthetic interventions. Perioperative outcomes are good.

References: 1. Eur J Cardiothor Surg 2003;24:11-20. 2. J Thorac Cardiovasc Surg 2003;125:500-7.

Table 1. Intraoperative and Outcome Data (n=12)

Age (years)	8.4 \pm 6.2
Weight (kg)	27.6 \pm 21.3
Number of previous operations	1.7 \pm 1.6
Anesthesia time (minutes)	742 \pm 105
Surgical time (minutes)	641 \pm 103
CPB time (minutes)	383 \pm 78
Aoxcl time (minutes)	231 \pm 60
Lowest temperature on CPB ($^{\circ}$ C)	22.9 \pm 1.2
RBC ml/kg post-CPB	13.0 \pm 8.1
FFP ml/kg post-CPB	10 \pm 9
Cryo ml/kg post-CPB	3 \pm 6
Platelets ml/kg post CPB	13 \pm 12
ICU LOS (days)	7.6 \pm 3.3
Hospital LOS (days)	15.1 \pm 6.0
Neurologic morbidity (no.)	0
Death within 30 days (no.)	0

CPB = cardiopulmonary bypass; Aoxcl = aortic crossclamp; RBC = red blood cells (including packed and cell salvage); FFP = fresh frozen plasma; cryo = cryoprecipitate; ICU = intensive care unit; LOS =length of stay

Table 2. Anesthetic Management Data (n=12)

Dobutamine	1
Dopamine	11
Epinephrine	6
Milrinone	2
Nitroglycerine	3
Sodium nitroprusside	1
1 inotropic agent	6
2 inotropic agents	6
3 inotropic agents	0
Mechanical support	0
Epsilon-aminocaproic acid	8
Aprotinin	3
Ventricular arrhythmias	3
Atrial arrhythmias	0
Junctional rhythm	3
Permanent pacemaker	4
Emergency femoral bypass	1
Cardiopulmonary resuscitation	0

Numbers are number of patients receiving each drug or intervention