across a systemic to pulmonary communication and exiting through an artery. In case of an arterio-arterial loop, the guide wire is advanced through an artery and exits through another. The technique was performed in 11 patients, aged 7 days to 60 years and weighing 2.6 to 65 kg (median 10 kg). The diagnoses were patent ductus arteriosus (PDA) in 4 cases, tetralogy of Fallot (2), critical pulmonary stenosis (2), critical aortic stenosis (1), recoarctation (1) and pulmonary atresia (1). The systemic to pulmonary communications through which the loop was performed were: PDA in 6 cases, Blalock Taussig shunts (3) and patent foramen ovale (1). In 1 case an arterio-arterial loop was used, through the radial and femoral arteries.

The extremity of a 0.014 to 0.035" guide wire was snatched with snare catheters (4 to 5 Fr) specially designed to retrieve foreign bodies, which were advanced arterially in 8 cases and venously in 3. The extremity of the wire was snared in the pulmonary artery in 4 cases,atra (4) or right ventricle (3). It was then pulled out through an introducer in all patients except one, in whom it was stabilized in the pulmonary artery. The loop thus achieved allowed an excellent support for interventional procedures. These included percutaneous closure of the arterial duct (4), dilatation of the right ventricular outflow tract (2), pulmonary valve (2), aortic valve (1), recoarctation (1) and stent insertion in a pulmonary artery (1). In all cases the interventional procedure was completed successfully.

When the conventional techniques do not result, the use of guide wire loops in selected patients provide an excellent support for progression and positioning of catheters and balloons.

P75
Bioequivalence of different devices for interventional closure of the persistent ductus arteriosus (PDA) in an animal model
Sigler M, Grabitz RG, Hauke S, Henze U, Seغلhve MC, von Bemuth G
Department of Pediatric Cardiology, Interdisciplinary Center of Clinical Research on Biomaterials, Department of Pathology, Aachen University of Technology, Aachen, Germany

Objective. To evaluate and compare the tissue reaction of ductus arteriosus (DA) after implantation of three types of devices.

Background. The PDA can be closed by means of transcatheter implantation of devices. Prior to clinical use characterization of the tissue reaction to the implant is mandatory. Methods. A medical grade stainless steel coil (n=8), a nickel/titanium coil (n=10) or a polyvinylalcohol foam plug knitted on a Titanium wire frame (n=12) were used for interventional closure of a PDA in a neonatal lamb model. The PDA had been maintained by repetitive balloon dilatation. Between 1 and 278 days after implantation the animals were sacrificed and the ductal block removed. Besides standard histology and electronmicroscopy (SEM) we introduced immunohistochemical staining for bioequivalence screening. Before performing immunohistochemical stainings in sections from DA tissue we tested a variety of antibodies against human tissue antigens for eligibility in ovine tissue.

Results. Six antibodies originally raised against human antigens were found to show crossreactivity with sheep tissue (Vimentin, Cytokeratin, smooth muscle actin, Ki 67, von Willebrand factor, Desmin). SEM revealed the growth of a cellular layer with a cobblestone pattern on the sortal and pulmonary surface of the occluded DA as early as two weeks after implantation of all devices. Immunohistochemical stainings of these superficial cells showed antigen characteristics of endothelial cells. After initial thrombus formation which caused occlusion of the DA after implantation there was ingrowth of fibromuscular cells resembling smooth muscle cells in the foam plug which was completed within 6 weeks. Cellular organisation of the thrombotic material was completed within 4 weeks following nickel/titanium coil-implantation and within 6 months after implantation of the medical grade steel coil. No specimen showed signs of a foreign body reaction (FBR).

Conclusions.
1. Antibodies against epitopes in human tissue can reveal crossreactivity with sheep tissue and may be of help to evaluate the biocompatibility of implants in sheep.
2. The three devices tested revealed no foreign body reaction within 9 months.
3. Organisation of thrombotic material with ingrowth of fibromuscular cells and covering of the implants with a cellular layer was demonstrated in a material-dependent time pattern.

P76
Single-center experience with three different atrial septal defect closure devices. Comparative study
Formigoni R, Rinelli G, Santoro G, Rossetti L, Gucione P, Ballerini L
Pediatric Cardiology, Ospedale "Bambino Gesù", Rome, Italy

Atrial septal defects (ASD) are now amenable to closure with the use of several devices, none of which has been proven to be superior in respect to others. We tested three different devices in a series of 27 pediatric patients (pts.): the Sideris Buttoned Occluder (group 1, n=7, age 6.3 ± 3.9 yrs, weight 23 ± 12 kg, Qp/Qs 1.9 ± 0.5), Microvena Angel Wings (group II, n=11, age 8.6 ± 3.0 yrs, weight 29 ± 15 kg, Qp/Qs 1.4 ± 0.4), and Amplatzer (group III, n=9, age 7.2 ± 3.1 yrs, weight 25 ± 7 kg, Qp/Qs 1.4 ± 0.5). ASD stretch diameter in mm was similar between gr. II (14 ± 3) and III (12 ± 4), but larger for gr. I (19 ± 2). Complete occlusion at 24h was achieved in all pts., except for 2 of gr. I (one occlusion after 6 mos., and one significant shunt after 12 mos.). Complications were transient coronary air embolism in 2 pts. of group I and one hemopericardium after 6h, requiring surgery, for group II. Device-related procedure time (from sizing of the defect until the release of the device) was significantly shorter for group III (24 ± 13 min) if compared to both gr. I (65 ± 15 min, p=0.001) and gr. II (43 ± 12 min, p=0.04). The “Angel Wings” device deployment times were shorter than those recorded in the “Buttoned Device” group. There were no cases of significant vascular injury, despite the larger dimensions of the Microvena device sheaths (12 or 13F sheaths) in respect to the smaller ones of the other groups (9-10F and 7-8F respectively). In conclusion, the three devices have proven to be effective and relatively safe. However, even if only initial and perhaps biased due to the larger dimensions of the “Buttoned Device” group ASDs, our experience shows the Amplatzer to be the simplest and less time-consuming device.

Surgery
P77
Homografts in the right ventricular outflow tract after neonatal repair of common arterial trunk
Eykens B, Lawrenson J, Dammaun M, Daenen W, Gewillig M
University Hospital K.U.L., Louven, Belgium

From 1989 to 1997 a cryopreserved homograft (sorta: 6;
Among the criteria of suitability for TCPC, MPAP is the most subdued routinely.

Pulmonary vascular resistances (PVR), obviously too high for total cavopulmonary connection (TCPC), were evaluated in the medical records of 116 consecutive patients having undergone TCPC by the same surgical team from 11/1988 to 10/1997. Nineteen patients have required a homograft replacement in the pulmonary or aortopulmonary trunk. The valve annulus of the homograft varied between 18 and 24 mm (mean 20.2 ± 1.9 mm). Nine other patients operated after 1991 are clinically well with a mean follow-up of 21.9 months (1.9-72.5); current homograft gradient is 28±10.8 mmHg. Survival of the homograft in the right ventricular outflowtract after surgical repair of a common arterial trunk in early infancy is very satisfactory. Homograft replacement in the RVOT can be postponed beyond the age of 5 years when an adult size homograft can be implanted.

P78 How to improve selection for total cavo-pulmonary connection: an analysis of operative morbidity and mortality in 116 consecutive patients

Houyou L, Planché C, Laour-Cayet F, Bmniiaux J, Serraf A
Marie-Lannelongue Hospital, Le Plessis Robinson, France

The quality of operative results in total cavopulmonary connection (TCPC) is closely related to the accuracy of the indication. The medical records of 116 consecutive patients having undergone TCPC by the same surgical team from 1988 to 1997 were reviewed. Operative morbidity and mortality were carefully analyzed, in the aim of refining the criteria of suitability for TCPC. An intraatrial baffle was used in all patients but 2 with an extracardiac conduit. Thirteen patients (11.2%) died within 30 days after surgery or during the postoperative hospital stay, a few hours to 4 months after surgery. One died 6 years later from ventricular dysfunction. Previous PA banding and systemic arteriovenous valve atresia were detrimental factors with longer hospital stay and postoperative effusions (p<0.05). Age, elective intraatrial baffle fenestration, type of cardiopathy and mean pulmonary artery pressure (MPAP) had no significant influence on operative mortality. However, all deaths but 3 were related to excessively high right atrial pressures with immediate hemodynamic failure. In 7 of these 10 patients, MPAP was < 15 mmHg. This suggests that MPAP only is not accurate enough to select the candidates to TCPC. Pulmonary vascular resistances (PVR), obviously too high in these cases, should be a better selection tool but was not measured routinely.

Among the criteria of suitability for TCPC, MPAP is the most difficult to obtain, and is inadequate. The measure of total PVR is therefore mandatory, with exclusive use of Fick's method. If corrected measurement cannot be obtained (especially if an aortopulmonary shunt is present), a PVR bracket is used, TCPC being indicated only if the 2 measurements are strictly < 2 Wood Units.m2. Recurrent catheterizations are often necessary. Intraatrial baffle fenestration does not seem to reduce mortality and morbidity among high-risk patients. Such patients should therefore not to be proposed for TCPC and an adequate palliative operation should be preferred.

P79 Anomalous atroventricular valvar apparatus causing outflow tract obstruction: surgical implications of a heterogeneous and complex problem

McElligoncy DB, Reddy VM, Parry AJ, Silverman NH, Hanley FL
University of California, San Francisco, CA, USA

Anomalous atroventricular valvar (AVV) apparatus causing outflow tract obstruction (OTO) is well-recognized but rare. In addition to obstruction anomalous AVV attachments may interfere with procedures to relieve OTO or perform OT reconstruction. Since 7/92, 19 pts (median age 10 yrs) have had systemic or pulmonary OTO due to accessory AVV tissue and/or anomalous attachments of the subvalvar apparatus. Primary diagnoses were isolated systemic OTO (5), L-transposition (TGA) (4), repaired AV septal defect (AVSD) (3), TGA after Senning (2), arch obstruction (2), and functional univentricular heart (3). OTO was to the systemic circulation in 13 pts and to the pulmonary circulation in 6. In 5 pts there was also interference with systemic OT repair. OTO gradients ranged from 20-110 mmHg (median 55 mmHg). Obstructing tissue was related to the left AVV in 13 pts, to the right in 2, to both in 3, and to the common AVV in 1. Complete correction of the AVV anomaly was possible in 13 pts by removal of accessory tissue or division of anomalous attachments. Partial relief was possible in 3 pts. 2 had resection of accessory tissue and modification of the operative procedure because a double switch for L-TGA could not be performed; the other pt had asplenia with bilateral OT obstruction due to anomalous AVV apparatus and had partial relief by resection of AVV tissue along with a Damus procedure. Another pt with L-TGA could not undergo double switch due to anomalous chordal attachments and a conduit was used instead. One pt was converted to a Ross-Konno procedure because chordal attachments to the canal septum precluded adequate resection. One pt with unbalanced AVSD and systemic OTO due to both accessory and functional AVV tissue did not have surgery because the parents refused a Norwood operation and the valvar anomalies precluded a Ross-Konno. Resection of a discrete membrane contributing to systemic OTO was performed in 10 pts, as was OT myectomy. There were 2 deaths; the median residual OT gradient was 8 mmHg. There was no recurrence of OTO at follow-up ranging from 3-60 mos. In the majority of cases, tailoring of surgical techniques will permit complete relief of OTO due to AVV anomalies. However, such anomalies may limit surgical options and necessitate a modified approach in some pts.

P80 Surgery for cyanotic patients: normothermic controlled reoxygenation

Como AJ, Lai AB, Valon A
HCI International Medical Centre, Clydebank, Scotland, UK

Surgery for patients (pts) with cyanotic heart defects (CHD) may be complicated by damages induced by hypothermic cardiopulmonary bypass (CPB) and CPB-related coagulation defects.
monary bypass (CPBP) and acute reoxygenation at the onset of CPBP. Twenty-eight consecutive pts, median age 1 yr 6/12 (4 mos - 12 yrs), median body weight 9.4 kg (3.8 - 27.0 kg), underwent surgery for CHD with "normothermic controlled reoxygenation". The diagnosis was pulmonary atresia with ventricular septal defect (7), tetralogy of Fallot (5), pulmonary atresia with intact ventricular septum (4), tricuspid atresia (4), transposition of the great arteries (3), double discordance (2), hypoplastic right ventricle (1), infradiaphragmatic total anomalous pulmonary venous connection (1) and complex anterioventricular septal defect with pulmonary stenosis (1). In all pts CPBP was started with a non pre-oxygenated prime (FiO2 = 0.21) and was conducted at normothermia (37°C), high flow (3.0-3.5 L/M2/min), and with the same arterial pO2 of the patient before CPBP. Mean aortic cross clamp was 24' (range 0-108') and mean CPBP was 133' (range 32-274').

Results: There were no early or late deaths, in a mean follow-up of 7 mos (range 2-20 mos). Inotropic support: 24/28 pts. (=86%) required <5mcg/kg/min of dobutamine, 4/28 pts. (=14%) 5-10mcg/kg/min. Ventilatory support: 20/28 pts. (=71%) were extubated within 3 hrs after surgery, 26/28 (93%) within 24 hrs, two infants (2/28=7%) required >24 hrs of mechanical ventilation. Only two pts (2/28=7%) required administration of NaHCO3 in the immediate postoperative period. Median stay in ICU was 1 day (range 1-13 days), median stay in hospital was 8 days (range 4-28 days).

Conclusion: 1) surgery for CHD can be performed with "normothermic controlled reoxygenation"; 2) the postoperative course seems to be more expeditious requiring less inotropic and ventilatory support, compared with the conventional hyperoxic hypothermic CPBP; 3) based on preliminary results, prospective studies seem justified in order to evaluate the "normothermic controlled reoxygenation" in its effectiveness in reducing postoperative morbidity and hospital costs, and its applicability in neonates.

P81

Arginine, nitric oxide and cyclic guanosine monophosphate metabolic pathway in infants undergoing open heart surgery

Chaloupecky V, Janovec J, Vojtovic P, Kostelka M, Hucin B, Thaskal T, Sprong L.
Kardiocentrum, Prague, Czech Republic

Objective: Increased pulmonary vascular reactivity is frequently observed after surgery for heart malformations with pulmonary hypertension. We examined the role of endogenous nitric oxide (NO) and cyclic guanosine monophosphate (CGMP) production in infants in early postoperative period.

Patients: 14 infants (median age 3 months) undergoing cardiac surgery for ventricular septum defect (8 pts), arterial switch for transposition of the great arteries and ventricular septum (3 pts), truncus arteriosus (2 pts) and total anomalous pulmonary venous drainage (1 pt) were studied. All patients survived and none had pulmonary hypertensive crisis. Methods and measurements: plasma arginine (NO precursor) and citrulline (arginine metabolic product), nitrates and nitrates (NO2- /NO3-; NO oxidative products) and CGMP (the second messenger) were determined by high pressure liquid chromatography before and 4 hours after the cardiopulmonary bypass, and on postoperative Day 1, 2 and 7.

Results: Compared to pre-bypass levels on Day 1 plasma arginine declined from 69 ± 19 μmol/l to 50 ± 13 μmol/l (p < 0.001) and citrulline peaked from 6.8 ± 4.0 μmol/l to 11.4 ± 4.2 μmol/l (p < 0.001). NO2- / NO3- increased from 35.9 ± 6.4 μmol/l to 41.4 ± 4.9 μmol/l (p < 0.001) and plasma CGMP peaked from 4.8 ± 0.7 μmol/l to 6.3 ± 1.0 nmol/l (p < 0.001). Plasma arginine, citrulline and NO2- / NO3- returned to pre-bypass levels on Day 7 whereas CGMP was still significantly increased (5.4 nmol/l).

Conclusion: metabolic pathway arginine - nitric oxide - CGMP is activated in infants undergoing open heart surgery.

P82

Incidence, etiology and management of chylothorax after cardiac surgery

Beghetti M, Le Coutre C, La Scala G, Belfi D, Kalangoz A, Oberhauser I, Friedli B.
Hôpital des Enfants, Geneva, Switzerland

The aim of this study was to review our experience with chylothorax, a rare but potentially serious complication of pediatric cardiac surgery. Methods: We reviewed all patients diagnosed with chylothorax (C) between 1985 and 1996. Management included chest drainage and medium chain triglycerides (MCT) diet for 7d, if improvement followed by MCT diet for 3w, if not changed to total parenteral nutrition for 3w, if cured 2w of MCT if not cured: surgery(S). Interval from operation to diagnosis (IT), duration of C(D), total volume loss/kg(TVL) and % of patients requiring S were recorded. Results: 39 patients (21 female, median age: 5y; range: 1d to 17y; median weight: 12.1 kg; range: 2.9 to 39 Kg) were diagnosed with C, giving an incidence of 2.3% (39/1688 cardiac operations). There were 2 etiology groups: group A: direct injury (25/39: 64%), Group B: thrombosis (T) and/or high venous pressure (HVP) (14/39: 36%).

| IT days | D days | TVL ml/kg | S% |
|---------|--------|-----------|----|
| Group A | 7 ±2.1 | 20 ±3.5   | 45 |
| Group B | 14 ±2*  | 40 ±9*    | 6/14(42)* |

([Results are expressed as mean ± SEM; *p<0.05 (Mann-Whitney and Fisher exact test).]

There was no difference for age and weight between group A and B. Mean TVL was higher in patients requiring surgery (1148 ± 401 versus 307 ± 75 ml/kg, p<0.01). Sensing procedure (4/14 in B; 2/25 in A) and bicavopulmonary shunt (6/14 in B; 0/25 in A) revealed at higher risk of longer drainage and require more often surgery because of increased risk of T and/or HVP.

Conclusions: Conservative management can be successful in the majority of patients (80%). However, C due to T and/or HVP has a significantly increased morbidity and requires surgery more often. Prevention, early recognition and treatment of potential complications, such as T and/or HVP, in patients at risk may lead to increase success of conservative management.

P83

Influence of temperature on leukocyte kinetics during cardiopulmonary bypass and postoperative organ damage

Qing MA, Seghaye MC, Vazques J*, Grabitz RG, Klosteraffen B**, Sigler M**, Messmer BJ*, von Bernuth G Dept of Paediatric Cardiology, *Thoracic- and Cardiovascular Surgery and **Institute of Pathology, Aachen University of Technology, Aachen, Germany

Objectives: To study the influence of core temperature during cardiopulmonary bypass (CPB) on leukocyte kinetics and perioperative organ damage.

Methods: Eighteen young pigs (weight 40 kg) were randomly...
and IL8 and of the natural anti-inflammatory cytokine IL10 were
was stimulated in vitro with bacterial endotoxin (LPS) (1 ng/ml)
investigated before as well as 5- and 14 days after arterial switch
Background: Cardiac operations induce a systemic inflammatory
during and after CPB. At the end of the experimentation (6 hours
Leukocyte count was determined before, during and after CPB. At the end of the experimentation (6 hours
Conclusions: Our results demonstrate that neonates having undergone
the production of pro-inflammatory cytokines. - In contrast, the production

cells in the days or weeks following the operative procedure and
two-procedure and valve repair at leaflet level, was evaluated retrospectively.
From 1986 till 1997 all 76 patients with primary repair for CAVSD were included. 58 pts (76%) had Down's syndrome. Before
surgery echocardiographic AV-valve regurgitation was absent or
limited in 68 (89%), moderate in 4 (5%) and severe in 4 (5%). 43
pts (57%) had Down's syndrome. Before

cells/ml). Leukocyte count continued to
there was no difference in leukocyte count between groups.
Results: In all groups, there was a significant fall of total leukocyte
and heart, lung, liver and intestine were taken for histological examination.
Results: As compared with the control culture, there was a significant production of TNFα, IL8 and IL10 before as well as 5-
and 14 days after the operation. In comparison with the prooperative results, TNFα and IL8-production decreased significantly 5
days after the operation (p<0.02 and <0.05, respectively) whereas
IL10-synthesis remained unchanged. There was no significant difference between cytokine production before and 14 days after the operation.
Conclusions: Our results demonstrate that neonates having undergone
cardiac operation display transient postoperative inhibition of
the reactivity of immune competent cells with decreased production
of pro-inflammatory cytokines. - In contrast, the production of the natural anti-inflammatory cytokine IL10 remains postoperatively unaltered and could be in turn, at least in part, involved in the postoperative inhibition of TNFα and IL8 synthesis.
P85
Population: 340 cases
Method: We sought to determine outcomes of isolated total anomalous pulmonary venous drainage (TAPVD). Records were reviewed for 340 children with isolated TAPVD born between 01/1943 to
02/1997, and evaluated at a single institution at a median age of 18 days at presentation (range, birth to 12.2 yr). TAPVD was supracardiac in 44%, cardiac 20%, infracardiac 25%, mixed 9% and unknown in 2%. Prior to 1960, patients presented at a significantly older age and were less likely to have infracardiac TAPVD, suggesting significant prehospital mortality. Repair was performed in 288 pts (85%) at a median age of 2 mo (range, 1 day to 14.1 yr); the remaining pts died without or before surgery. Proportion of
pts without repair according to birth cohort were 56% before 1950, 1950-59 39%, 1960-69 20%, 1970-79 10%, 1980-89 10% and 1990-97 2%. Median age at repair decreased significantly for birth cohorts: 9.7 yr before 1950, 1950-59 1.2 yr, 1960-69 0.31 yr, 1970-79 0.25 yr, 1980-89 0.06 yr and 1990-97 0.07 yr. Pulmonary vein obstruction (PVO) was present before surgery in 43% with supracardiac TAPVD, 23% in cardiac, 91% in infracardiac and 62% with mixed drainage. Kaplan Meier survival estimates after repair were 74% at 1 wk, 67% at 6 mo, 63% at 5 yr and 59% at 20 yr. Since 1970 there has been no significant improvement in survival after repair, with survival since 1990 (n = 52) of 94% at 1 wk, 85% at 6 mo and 75% at 5 yr. After controlling for date of repair, significant risk factors for mortality included infracardiac TAPVD, younger age at repair and PVO; after controlling for PVO, cardiac TAPVD was an independent risk factor; age was not. Reoperation for PVO was required for 18 pts (11 died), with freedom from reoperation of 91% at 1 yr, 90% at 5 yr and 87% at 15 yr after repair. Early mortality after repair of TAPVD remains significant; PVO carries a poor prognosis.

**P87 Coronary perfusion after arterial switch operation for transposition of the great arteries**

Kaku S, Nuno MA, Ferreira R, Ramos S, Sousa M, Ferreira M, Pinto F, Magallanes M
Servicio de Cardiologia Pediatria, Hospital de Santa Maria, Lisboa, Portugal

Reports of stenosis and occlusion of the coronary arteries (CA) in asymptomatic survivors of the arterial switch operation (SWITCH) for transposition of the great arteries (TGA) led us to prospectively study the patency of the CA and left ventricular (LV) function in 26 children (CH) with TGA after a median of 3.4 years after SWITCH. At operation 17 CH had type "A" CA (Yacoub's classification), 7 type D, one type E and one single CA. Internal mammary to anterior descending CA anastomosis in one huge. Four CH had mild aortic insufficiency, four had resid-ual atrial shunt and 4 atrial baffle fenestrations were occlud- ed by buttoned Sideris device with an excellent result. All pts but one underwent initially one or more palliative surgery and 3 pts had previous Fontan procedure. The technique of the TCPC included intraatrial tunnel (Puga or Kreutzer) (54), pediculated pericardium extracardiac tube (7) and Kawashima (7). 2 pts underwent early reoperations. Pts were followed by echocardiography (68), catheterization, scannography and radionuclide angiography (RNA). There is no late death. During the follow-up, all pts are well, in NYHA I or II class. Arterial oxygen saturations are ≥ 90% in 19 pts (pulmonary arte- rio-venous fistulas, residual arterial or right-to-left shunt or residual systemic right-to-left shunt) and > 90% in the remainder. Late complications include ventricular dysfunction (6), supraventricular (5) and ventricular (1) arrhythmias, thrombosis (4) (intraatrial tunnel, left pulmonary artery, superior lobar left pulmonary artery, innominate vein), A-V block (1), kidney infarction after catheterization (1), transient ischemic brain attack (1), missed sudden death (ventricular fibrillation) (1). RNA ejection fraction (EF) of the single ventricle range between 45 and 50% in 7 pts, between 51 and 60% in 6 and > 60% in 9. After infusion of dobutamine, EF increase over 60% in 16/19 pts. One patient was reoperated for a right-to-left residual shunt and 4 atrial baffle fenestrations were occlud- ed by buttoned Sideris device with an excellent result. All pts but 13 are under treatment at the end of the FU. From this series of 68 pts, we conclude that mid-term results of TCPC are very encouraging in preoperative well selected pts but longer FU period is needed in order to reach more conclusions about thromboembolic risk and ventricular function.

**P88 Mid-term results of total cavopulmonary connection**

Marçan F, Godart P*, Kante A*, Rey C*, Bosser G, Bativere GM*, Voksman G*, Worms AM
Dept Of Pediatric Cardiology, Hospital D'Enfants, Nancy, France; *Dept of Pediatric Cardiology, Hopital Cardiologique, Lille, France

Between 1989 and 1997, 71 consecutive patients (pts) from Lille (39) and Nancy (32) aged 1.5-20.2 yrs received total cavopulmonary connection (TCPC) at a mean age of 6.3 yrs (yrs). There were 3 operative deaths (4.2 %). The purpose of this study is to evaluate the mid-term results of the 68 surviving, pts at a mean follow-up (FU) of 3.4 yrs. The basic diagnosis in these 68 pts was single ventricle (37), tricuspid atresia (17), right ventricle hypoplasia (6) and complex mal-formation (8). All pts but one underwent initially one or more palliative surgery and 3 pts had previous Fontan procedure. The technique of the TCPC included intraatrial tunnel (Puga or Kreutzer) (54), pediculated pericardium extracardiac tube (7) and Kawashima (7). 2 pts underwent early reoperations. Pts were followed by echocardiography (68), catheterization, scannography and radionuclide angiography (RNA). There is no late death. During the follow-up, all pts are well, in NYHA I or II class. Arterial oxygen saturations are ≥ 90% in 19 pts (pulmonary arte-rio-venous fistulas, residual arterial or right-to-left shunt or residual systemic right-to-left shunt) and > 90% in the remainder. Late complications include ventricular dysfunction (6), supraventricular (5) and ventricular (1) arrhythmias, thrombosis (4) (intraatrial tunnel, left pulmonary artery, superior lobar left pulmonary artery, innominate vein), A-V block (1), kidney infarction after catheterization (1), transient ischemic brain attack (1), missed sudden death (ventricular fibrillation) (1). RNA ejection fraction (EF) of the single ventricle range between 45 and 50% in 6 pts, between 51 and 60% in 6 and > 60% in 9. After infusion of dobutamine, EF increase over 60% in 16/19 pts. One patient was reoperated for a right-to-left residual shunt and 4 atrial baffle fenestrations were occlud- ed by buttoned Sideris device with an excellent result. All pts but 13 are under treatment at the end of the FU. From this series of 68 pts, we conclude that mid-term results of TCPC are very encouraging in preoperative well selected pts but longer FU period is needed in order to reach more conclusions about thromboembolic risk and ventricular function.

**P89 Long-term results of the Mustard operation**

Pozzi M, Kitchiner D, Franke R, Arnold R, Ashley P
Department of Pediatric Cardiac Surgery and Pediatric Cardiology
Royal Liverpool Children's Hospital, Alder Hey, Liverpool, UK

We have reviewed 192 patients who underwent Mustard's operation for transposition of the great arteries (TGA) at the Royal Liverpool Children's Hospital between 1965 and 1991. 163 had simple TGA and 29 complex TGA. Median duration of follow up was 11.2 years (3-26) and overall survival 76% (146/192). 101 patients (52%) are event free and asymptomatic. 47% have demon-strated systemic pathway obstruction of which 36 have required intervention by balloon, stent or surgery. Pulmonary pathway obstruction was an early complication (8 patients) requiring re-operation. 88% of patients available for documentation remain in sinus rhythm. Right ventricular function remains good in 67%, and only mildly impaired in 13%. Functional class corre-