is also claimed by the proponents of repair outside of infancy. From 1974 to 1993, 103 infant repairs were performed with a mean age at repair of 6.1 (SEM 0.3) months, 9% of cases were under 1 month of age. All procedures were complete corrections and only 3 patients had undergone previous shunt operations. Early mortality was 3.8% overall with zero mortality over the past 5 years (46 cases). Transannular patching was required in 61% of cases. Surgical technique has changed during the period of this study from the transventricular approach (60 cases) to the transatrial approach (43 cases) with a decreased incidence of transannular patching from 82% to 32% ($P < 0.01$). Follow up was 92% complete and a mean follow up period of 6.8 years. Actuarial (Kaplan-Meier) survival at 1 year was 96% and at 17 years was 94%. There were no cardiac related late deaths. Congenital native PA stenoses were found in 9 cases, all of which were corrected at the time of surgery. Subsequent PA stenoses occurred in 6 cases. Two were successfully balloon angioplastied but the remainder required reoperation. Three were related to previously repaired congenital stenosis. One was related to the site of the BT shunt and only 2 (2%) developed new stenoses, these were both at the origin of the left PA and both had transannular patching originally. Infant repair of TOF can be achieved with low perioperative mortality and rewarding long-term results. The incidence of transannular patching is comparable with that reported in older children and has fallen significantly with use of the transatrial approach. Congenital PA abnormalities can be successfully treated at the time of operation and subsequent new PA abnormalities are rare but may require surgical repair.

909-27 Monocusp Valves in the Transannular Patch Repair of Tetralogy of Fallot: Do They Make a Difference?

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To evaluate the efficacy of monocusp valve to prevent early significant pulmonary insufficiency (PI), and its impact on the immediate postoperative clinical evolution, early postoperative echocardiographic and clinical parameters were compared between 20 patients (group 1) repaired with an autologous pericardial monocusp valve sutured to the ventriculotomy, and 9 patients (group 2) without, from July 1994 to July 1995. In group 1, ratio of PI (rPI) jet width measured by colour Doppler to the infundibulum diameter at the insertion of the monocusp valve level was used to quantify the severity of PI. In group 2, rPI width to the pulmonary artery diameter at native valve level was used. Moderate to severe PI was arbitrarily defined as a rPI above 50%. Clinical parameters (pH, base excess, FiO_2, PaO_2, $PaCO_2$, mean BP, CVP, urine output, use of inotropic agents) were analyzed at 6, 12, 24, and 48 hours postoperatively. Preoperative assessment did not reveal any differences between the 2 groups. Within the first 2 weeks postoperatively the mean (± SD) rPI for group 1 (0.29 ± 0.12) was significantly lower than for group 2 (0.68 ± 0.30), $p < 0.002$. Clinical data during the first 48 h postoperatively were similar in both groups except for central venous pressure, which was lower in group 1 ($p < 0.009$).

The autologous pericardial monocusp valve appears to prevent the incidence of moderate to severe PI within the first 2 postoperative weeks. The prevention of significant PI by the insertion of the monocusp valve in the transannular repair of TOF appears to reduce the volume overloading of the RV in the early postoperative period as demonstrated by the reduction in CVP.

909-28 Fate of the Aorta After Arterial Switch Operation

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Concerns have been voiced that the pulmonary valve serving as neo-aortic valve after arterial switch operation (ASO) is susceptible to dilatation and incompetence. Failure of the anastomosis to grow, might result in stenosis. This study determines the incidence of aortic complications after ASO, in a group of patients operated since 1977. 97 pts. still alive and in the Netherlands formed the studied group. Median follow-up is 7.9, range 0.4 to 17.4 y. 34 pts. had associated VSD, 8 pts. had aortic coarctation and one had interrupted aortic arch.

A normal aortic root diameter was found in 77 pts. 75/77 had no or only trivial aortic incompetence, 2/77 had mild (grade II/IV) incompetence.

An aortic root diameter above normal for body surface area was found in 20 patients. No or only trivial incompetence was seen in 17/20 pts, 2 patients have mild incompetence and 1 patient developed moderate (grade III/IV) incompetence with clinical significance 1.5 y after ASO.

Normal aortic flow velocities were found in 93/97 patients. Increased flow has been observed in 4/97. One pt. was operated for subaortic stenosis which was underestimated pre-operatively and one pt. with transposition, VSD and interrupted aortic arch required reoperation 1 week after ASO for stenosis at the cannulation site. Two pts. have aortic stenosis at site of the anastomosis, one of these had patch enlargement of the anastomosis during reoperation for pulmonary stenosis, the other patient did not require reoperation to date.

Re-coarcatation was excluded in 5/8 patients. Balloon angioplasty for recoarctation was necessary in 2 patients, including the one patient with interrupted aortic arch. One patients awaits reintervention.

We conclude that after ASO the neo-aortic valve is larger than normal in 20% of patients and mild or moderate aortic regurgitation is seen in 5%. A clear relationship between dilatation and insufficiency could not be demonstrated. Stenosis of the aortic anastomosis was seen in 2% of the patients.

910 Heart Rate Variability in Diseased and Normal Hearts

Monday, March 25, 1996, Noon–2:00 p.m.
Orange County Convention Center, Hall E
Presentation Hour: 1:00 p.m.–2:00 p.m.

910-109 Heart Rate Variability in Isolated Rabbit Heart

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Clinical evidence for the presence of heart rate variability (HRV) in patients with cardiac denervation after heart transplantation raised our interest in HRV in an isolated heart preparation. Therefore hearts of seven adult white ELCO rabbits were transferred to a perfusion apparatus. After a stabilization of 30 min. in the Langendorff mode, the hearts were perfused in the working heart mode and in the Langendorff mode for 20 min. each. HRV was analyzed in the frequency domain. A computer simulated ECG at a constant heart rate of 2 Hz was used for error estimation of the system. In the isolated heart, HRV was of random, broad-band fluctuations, different from the well characterized oscillations at specific frequencies in intact animals. Mean RR was 423 ± 51 ms in the Langendorff, 406 ± 33 ms in the working heart mode and 500 ms in the computer simulated ECG, total power was 663 ± 207 ms2, 817 ± 318 ms2 and 3.7 ms2, respectively. There was no significant difference in any measure of HRV between Langendorff and working heart mode. These data show the presence of HRV in isolated, denervated hearts. Left atrial filling, i.e. the working heart mode, did not alter HRV, indicating that left atrial stretch did not influence sinus nodal discharge rate.

910-110 Heart Rate Variability During Obstructive Sleep Apnea

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We have demonstrated that heart rate variability (HRV) is unique during specific sleep stages and is significantly altered by myocardial infarction. Obstructive sleep apnea syndrome (OSA) is associated with increased peripheral sympathetic nerve activity both while awake and during sleep, but data is limited concerning the effects of OSA on HRV during specific sleep stages. We examined HRV during non-REM sleep in 10 patients with OSA and compared the patterns with 9 healthy control subjects. Five minute segments of ECG were digitized during non-REM sleep in each control subject and during non-REM sleep with and without apnea episodes in the patient group. Spectral analysis of HRV was computed with Fourier transformation quantifying total power (0.04–0.5 Hz), low frequency power (LF,.04–0.15 Hz), and high frequency power (HF,.15–0.5 Hz). The low to high frequency ratio (LF/HF) was then computed. The LF/HF tended to be higher in the patient group without apnea vs. controls (3.3 ± 1 vs. 1.5 ± 0.4, respectively, $p = 0.10$) and increased significantly when the patients had apnea episodes (3.3 ± 1 to 11 ± 2, $p < 0.005$). The change in LF/HF during apnea was due to a marked increase in the LF band (from 36.6 ± 5% to 67 ± 4%, $p < 0.005$) and reduction in the HF band (from 31.1 ± 2% to 10.0 ± 1%, $p < 0.05$). These findings suggest that sympathetic activity is significantly elevated during non-REM apnea episodes in patients with OSA. Such autonomic imbalances favoring the sympathetic limb, especially at a time normally associated with increased vagal activity, may help explain the incidence of lethal events in patients with OSA.

MONDAY POSTER