Catheter Closure of Atrial Septal Defects

Sunday, March 07, 2004, 9:00 a.m.-11:00 a.m.
Morial Convention Center, Hall G
Presentation Hour: 9:00 a.m.-10:00 a.m.

1019 Anatomic Interaction Between the Aortic Root and the Atrial Septum: An Echocardiographic Prospective Study
Géraldine Bertaux, Jean-Christophe Eicher, Annie Petit, Petar Dobrak, Pierre Louis, Jean-Eric Wolf, St Ann University Hospital, Dijon, France, St Ann University Hospital, Brno, Czech Republic

Background: Patent foramen ovale (PFO) is a rare pattern of dysplasia that may be observed with atrial right-to-left shifting (RLS). A few cases have been reported in association with an atrial aneurysm, but no documented pathophysiologic explanation has been proposed.

Methods: We studied 72 consecutive patients (mean age 66.2 ± 10, 68% males) referred for pre-operative assessment of either an atrial valve disease or an aneurysm of the ascending aorta. During catheterisation, a careful search for a patent foramen ovale (PFO) was performed. During multipane transesophageal echocardiography we measured: maximal diameter of the ascending aorta (AoD), minimal atrial septal dimension (ASd) at the level of the atrial root, and maximal oscillation amplitude of the atrial septum (ASo). Patients with an atrial septal aneurysm were excluded. A PFO was sought by contrast infusion through a brachial vein and through the femoral vein, and the RLS was categorized as grade 1, 2 or 3. The relationships between AoD, ASd, and ASo were studied. In patients with a PFO, we looked at the relationship between RLS grade and ASo.

Results: Mean AoD was 43.4 ± 9 mm (range 30-64). A PFO was found in 26% of the patients.

<table>
<thead>
<tr>
<th>Correlation study</th>
<th>r</th>
<th>p</th>
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<tbody>
<tr>
<td>AoD / Asd</td>
<td>-0.49</td>
<td>&lt;0.002</td>
</tr>
<tr>
<td>AoD / Aso</td>
<td>0.24</td>
<td>0.041</td>
</tr>
<tr>
<td>Asd / Aso</td>
<td>-0.37</td>
<td>&lt;0.002</td>
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In 19 patients with a PFO, ASo / RLS grade p = 0.52, ASo / RI grade p = 0.038.

Interpretation: These results demonstrate that a distortion of the aortic root significantly affects the atrial septal morphology by reducing its apparent size, decreasing its tautness, and increasing its mobility. The increased septal mobility appears to be an important risk factor for RLS in the presence of a PFO.

1019-201 Migraine Relief Following Transcatheter Closure of Patent Foramen Ovale
Mark Reisman, Jill T. Jesurum, Merrill P. Spencer, Kimberly A. Krabli, Lance Diethl, John V. Olsen, Christine Smith, William A. Gray, Swedish Medical Center, Seattle, WA

Background: Current theory suggests that right-to-left shunt (RLS) through a patent foramen ovale (PFO) permits paradoxical microemboli and neuromediators to bypass lung filtration thereby potentially triggering migraineur. The purpose of this study was to determine if transcatheter PFO closure in migraineurs is associated with a reduction in migraine frequency.

Methods: Between July 2001 and 2003, 120 patients underwent transcatheter PFO closure to prevent recurrent cryptogenic stroke or transient ischemic attack. According to criteria defined by the International Headache Society, 42% (50/120) of patients experienced active migraine symptoms and 28% (34/120) of those reported migrainous aura. Following PFO closure, patients were serially evaluated to assess residual RLS and migraine frequency. Contrast transcranial Doppler was used to measure microembolic signals during normal respiration and during calibrated (40 mmHg) respiratory strain. The mean time of follow-up was 4 months after PFO closure.

Results: Migraineurs with aura (n = 23) experienced a mean reduction in migraine frequency from 7.8 ± 10.9 (pre-closure) to 1.7 ± 4.7 (post-closure) events/month (p <.01). Migraineurs without aura (n = 9) reported a clinically important reduction in migraine frequency from 11.8 ± 12.7 (pre-closure) to 3.4 ± 8.1 (post-closure) events/month (p = .07). Overall, 42% (21/50) of migraineurs experienced complete resolution of migrainous symptoms. Additionally, 5 (10%) patients reported a substantial (>50%) reduction and 2 (4%) patients reported a partial (<50%) reduction in migraine frequency. Only 5 (10%) patients reported no reduction in migraine frequency following PFO closure. A significant reduction in RLS was observed following PFO closure in migraineurs with and without aura (N = 44), during normal respiration (146 ± 128 vs. 22 ± 63, p <.01) and with calibrated strain (270 ± 65 vs. 92 ± 125, p <.01). Complete closure without residual RLS was achieved in 61% (27/44) of patients.

Conclusion: Transcatheter PFO closure results in significant reduction in migrainous events. The mechanism of this causal effect warrants further investigation.

1019-202 Effect of Rim Deficiency and Occluder Size on Acute and Mid-Term Results of Transcatheter Atrial Septal Defect Closure in Adults
Maria Heiser, Raphael Rosenhek, Harald Gabriel, Thomas Binder, Gerald Maurer, Peter Probst, Helmut Baumgartner, University of Vienna, Vienna, Vienna, Austria

Background: Although a rim of ≥5 mm around the defect was originally considered mandatory for transcatheter atrial septal defect (ASD) closure, defects with <5 mm rim to the aorta are now accepted. Whether this may be associated with damage of the aortic wall, a higher likelihood of residual shunt, aortic regurgitation (AR) or other unfavorable effects especially when using larger sized occluders has not been studied.

Methods: All pts in whom ASD closure was attempted between 1998 and 2002 were included (n=111, 80 female, 52±17yrs, Amplatzer occluder, mean follow-up [FU] 2.2±1.2 yrs). Sufficient rim was present in 36 pts. (group A), 48 pts. (group B) had only a small rim <5 mm to the aorta and 27 pts. had no rim to the aorta (group C). FU studies were performed at 3, 6 and 12 months every year thereafter.

Results: The procedure was successful in all pts. (occluder size 25±5mm, range 9 to 30mm). No major complications occurred. Minor complications were: transient ST-elevation (2), transient AV block (1) and transient SVT (4). At last FU, no relevant residual shunt was present in any pt., while 5 pts. (group A: 3; group B:2) had mild shunts (Qp:Qs ≥1:3). Mild AR was present in 20 pts. prior to intervention. In only 1 pt. an increase to mild to moderate AR was found (group A: 3; group B:2; group C: 1). A new murmur was presented with a new finding of trace or mild AR at FU. Mild mitral regurgitation (MR) was common prior to intervention (71 pts.). In 4 pts. an increase to mild-to-moderate MR was observed (group A:1; group B: 3). Trace MR was an inconsistent finding disappearing in 6 pts. and remaining in 17 pts. (group A: 6; group B: 7; group C: 4). No aortic complications were observed. The only adverse events observed during FU were transient palpitations and the occurrence of atrial fibrillation (group A: 2; group B: 4; group C: 3). The occluder size was not related to any of these observations.

Conclusion: ASDs with small and even missing rim to the aorta can safely be closed with Amplatzer occluders. Neither a deficient rim to the aorta nor the use of larger occluders appears to result in an increased likelihood of residual shunt, of the occurrence or worsening of AR and MR or of other adverse events.

1019-203 Stability of the Amplatz Septal Occluder Device: Importance of the Atrial Tissue Rim
Arkush K. Chhabra, Babak Azarbal, Hitoshi Anzai, Michael Fishbein, Catherine Diao, Vicki Chan, Richard Gaster, John Moore, Jonathan Tobis, University of California- Los Angeles, Los Angeles, CA

Background: Pericardial closure of secundum atrial septal defects (ASD) with the Amplatz Septal Occluder device requires an adequate rim of septal tissue to stabilize the device. The amount of septal tissue and atrial rim necessary for stabilization has not been quantified.

Methods: An artificial ASD was created in fresh autopsyed hearts through a right atrial incision. ASDs (12 to 40 mm in diameter) were created and 9 sizes of Amplatz (12 through 40mm) were inserted. The force required to pull these devices through the ASD was measured in 260 attempts with a handheld ergometer. In 9 hearts, sequential 30-degree segments of atrial rim 7 mm wide were removed, and the force required to pull the device through the atrial septum was re-measured.

Results: The force required to pull an Amplatz device through a given ASD size with an...
intact rim was directly proportional to the increasing size of the Amplatzer (range 0.05 to 1.5 lbs). In the samples with segments of atrial rim excised, the force required was significantly less (range 0.2 to 0.85 lbs, p<0.02). Loss of 30% of the atrial rim segment produced a 40% mean reduction (p<0.05) in the amount of force required to dislodge the device.

Conclusion: There is a linear relationship between the size of the Amplatzer device and force needed to pull it through an ASD. The circumference of atrial rim is important in determining the force needed to pull the device through an ASD. The circumference of atrial rim is important in determining the force needed to pull the device through an ASD.

Successful ASD closure was achieved in all pts (occluder size 24 ± 5 mm, range 18-30 mm). No major complications occurred. Minor complications were self-limited SVT (requiring evaluation by either brain imaging or trans-esophageal echo), or DRC. Of these, 261 (71%) (age = 50±15 yrs, males = 42%, follow-up (F/U) = 17±7 months) received CS and 109 (29%) (age = 49±15 yrs, males = 33%, F/U = 6±2 months) received AMP. Patients receiving CS or AMP were compared by cox hazard analysis adjusted for baseline variables and length of follow-up.

Results: Incidence of death (3, 0.8%) and CVA (2, 0.5%) was low and did not differ between groups. Incidence of DRC was 8 (2.2%), only occurred in the CS device and generally occurred late (median = 11 months) during follow-up. Incidence of ONS was significantly greater (78 (30%) versus 7 (6%), p=0.001), and incidence of DRC was significantly greater for CS versus AMP (univariate hazard ratio (HR) = 0.26 (CI=0.11-0.63, p=0.002), adjusted HR = 0.25 (CI=0.11-0.59, p=0.001)) as well as for any adverse event [univariate HR = 0.30 (CI=0.14-0.67, p=0.003), adjusted HR = 0.25 (CI=0.14-0.67, p=0.003)].

Conclusion: In this large single-center consecutive study of patients undergoing PFO-C, adverse event rates were significantly reduced by the use of the Amplatzer-PFO® compared with the CardioSeal® device. The underlying reasons for these results require further study.

Poster Session 1039

Surgery for Congenital Heart Disease
Sunday, March 07, 2004, Noon-2:00 p.m.
Morial Convention Center, Hall G
Presentation Hour: 1:00 p.m.-2:00 p.m.

1039-199
Reduction of QRS Duration After Pulmonary Valve Replacement in Adult Fallot Patients Is Related to Degree of Reduction of Right Ventricular Volume
Bart Hooft van Huyskoren, Coen A. Swenne, Aric C. Maan, Alexander van Straten, Henk J. Riitsema van Eck, Martin J. Schalk, Ernst E. van der Wall, Albert de Roos, Mark G. Hazeckamp, Hubert W. Vliegen, Leiden University Medical Centre, Leiden, The Netherlands

Background: Fallot (TOF) is associated with ventricular tachycardia (VT) and sudden death. Stabilization of QRS duration on the long run has been shown after pulmonary valve replacement (PVR), however, the short-term effects of PVR, and the relation to degree of reduction of RV volume is unknown. Optimal timing of PVR remains subject to debate.

Methods: 26 adult TOF pts who underwent PVR were included. Standard 12 lead ECGs were recorded before and one year after PVR and analysed by a blinded observer. QRS duration was determined with a computer program using averaging techniques.

Results: QRS duration decreased in 17 pts from 148 ± 32 to 139 ± 32 ms, remained constant: 156 ± 10 ms in 3 pts, and increased slightly in 6 pts from 149 ± 33 to 151 ± 33 ms. For the whole group, the QRS duration shortened from 149 ± 33 to 144 ± 31 ms, p<0.001. Cardiac MRI showed a RV end-diastolic volume decrease from 306 ± 67 to 210 ± 62 mL (p<0.001). QRS duration correlated well with RV end-diastolic volume (r = 0.5, p = 0.01, see figure).

Conclusion: In adult patients with TOF, late after total repair, PVR leads to a reduction of QRS duration in the majority of patients. The degree of reduction of QRS duration is associated with the degree of RV reduction. Improvement of this marker for VT and sudden death supports a less restrictive management concerning PVR in these pts.