Diagnosis of pulmonary vein stenosis by transoesophageal echocardiography in comparison to magnetic resonance angiography.

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Recently, it has been shown that atrial fibrillation may be due to discharging focal activity, primarily located in the pulmonary veins (PV). Radio frequency catheter ablation of such arrhythmia triggers is feasible and can eliminate atrial fibrillation. PV stenosis has been reported as a complication of this procedure. Doppler measurements by TEE has been used to detect PV stenosis, but there are no clear-cut criteria for the diagnosis of a significant stenosis. We developed a new definition of significant PV stenosis and compared our results with magnetic resonance imaging (MRI).

Methods: We examined 39 patients (55 ± 10 years old, 30 male) 19 ± 11 months after ablation of one or more pulmonary veins because of refractory atrial fibrillation with TEE and signal enhanced MRI on the same day, independently. A significant PV stenosis was defined as Doppler peak velocity of ≥ 110 cm/s combined with spectral broadening and deformity of the flow signal (minimum velocity between systolic and diastolic peak ≥ 60% of the mean of both peaks). With angi MRI pulmonary veins were assessed on raw images and after 3D reconstruction, a decrease in PV diameter by ≥ 50% was considered significant.

Results: In 155 of 156 PV it was possible to measure Doppler flow. In 71 untreated PV peak velocity was 56 ± 17 cm/s. All together 144 PV demonstrated no obstruction by both TEE and MRI. Accordingly, both procedures showed 3 occlusions and 4 stenosis. TEE indicated two more stenosis in minor side branches, which were not seen by MRI. Another two PV revealed stenotic Doppler flow, one demonstrating a minor stenosis with MRI (≤ 50%), the other no stenosis. MRI revealed additional 4 mild stenosis (≤ 50%) with mean Doppler peak velocity of 94 cm/s (range 56-120 cm/s) but normal flow pattern. TEE measured peak velocity ≥ 110 cm/s but normal flow pattern in additional 5 PV, none showed an obstruction with MRI.

Conclusion: We introduce new Doppler criteria for the diagnosis of significant PV stenosis, which showed good correlation to MRI findings. Measuring simply peak velocity leads to overestimation of number and severity of PV stenosis.

ORAL PRESENTATIONS

Transoesophageal echo and source of embolism

4 December 2003, 14:00 to 15:30

Location: Room 4

Assessment of aortic elastic properties by transesophageal strain echocardiography after repair of coarctation of the aorta.

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Background: Increased arterial stiffness may participate in the genesis of hypertension and persistent increases in left ventricular mass after surgical correction of coarctation of the aorta (CoA). The purpose of the present study was to assess the aortic elastic properties using tissue Doppler imaging (TDI) and strain echocardiography in patients (pts) after coarctectomy.

Methods: Transesophageal echocardiography with TDI and strain capabilities (Toshiba corp, Tokyo, Japan) was performed in 10 pts aged 12-39 years who had repair of CoA and residual aortic narrowing ≤ 30% and who were not hypertensive at rest. 11 age- and sex-matched subjects with no signs of heart disease were selected as normal controls (CTR). Aortic transverse sections were measured at the level of the proximal, distal and coarctation segments. Transverse aortic stiffness was measured by the elastic modulus (Ep) and stiffness index beta (b) using previously reported formulas. TDI wall velocities during systole (Sw), early relaxation (Ew) and atrial systole (Aw) were measured in transverse views in both groups. Using dedicated software peak systolic strain (ps e) was measured from the resultant deformation curves in the same views.

Results: In the coarctectomy pts there was a significant increase of Ep (47.6 ± 6.5 vs 21.6 ± 2.9 kPa, p < 0.001) and b (4.11 ± 2.51 vs 2.28 ± 0.65, p<0.005) at the level of the proximal and coarctation segments. Transverse aortic stiffness was measured by the elastic modulus (Ep) and stiffness index beta (b) using previously reported formulas. TDI wall velocities during systole (Sw), early relaxation (Ew) and atrial systole (Aw) were measured in transverse views in both groups. Using dedicated software peak systolic strain (ps e) was measured from the resultant deformation curves in the same views.

Conclusion: Thus, pts with CoA have increased proximal aortic stiffness and reduced wall velocities and wall strain even after successful repair.
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Assessment of an experimental left ventricle-to-coronary artery stent by ultrasound.

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Objective: A left ventricle-to-coronary artery (LV-CA) stent is proposed as an alternative way of revascularization when PTCA or CABG are no option. Standard echocardiography was used to facilitate proper placement and to study patency during follow-up (FU).

Methods: In 9 open chest healthy pigs (mean 67 kg) a balloon expandable LV-CA stent was surgically implanted in the left anterior descending coronary artery (LAD). A novel epicardial 13 MHz ultrasound was used to measure ventricular wall thickness and to facilitate placement in the proper angle. During FU at 2-4 weeks and at termination 6-12 weeks, TEE with Doppler was used to assess the patency of the channel. Proximal to the LV-CA stent, the native LAD was left open (n=4) or ligated (n=5).

Results: In all animals, epicardial 13 MHz ultrasound guided correct positioning and confirmed patency by showing bi-directional flow through the LV-CA stent. When using TEE at FU, partial antegrade and retrograde flow could be observed when LAD left open (see fig.). In all cases where the LV-CA stents were of appropriate length to traverse the myocardium, and where the surgical method did not create a stenosis the stents remained open as shown by TEE. The 13 MHz probe became a useful tool in training surgeons to avoid stenosis of the artery. The probe also measures the antegrade and retrograde characteristic signature flow of the LV-CA stent, and thus is a positive proof of patency.

Conclusion: In a novel experimental revascularization approach with a LV-CA stent, epicardial 13 MHz ultrasound and TEE proved the proper tools to facilitate implantation and patency assessment during follow-up, respectively.

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Transesophageal echocardiography (TEE)-guided cardioversion (C) of atrial fibrillation (AF) implies a 4 weeks post-C oral anticoagulation therapy (OAT), because of the risk of thromboembolism due to left atrial and/or appendage stunning (S). In most patients (pts) post-C S lasts about one week. We evaluated the feasibility and safety of a new TEE-guided strategy with a 2nd, 7 days post-C TEE, in order to shorten to one week the period of anticoagulation in pts without S. For a rapid and brief anticoagulation we used enoxaparin (E) instead of OAT.

Methods: We enrolled into a multicenter, randomized, prospective, clinical trial 206 pts with AF ≥ 2 days eligible for C. They were randomly assigned to two groups. Group A pts received E at a dosage of 100U.l./kg twice a day and underwent TEE-guided C. After seven days a 2nd TEE was carried out and, in the absence of S, E was stopped. In the presence of S, E was embriated with OAT for three weeks. Group B pts carried out a conventional TEE-guided C with heparin and four weeks of OAT post-C.

Results: Of the 105 Group A pts, 98 underwent the 1st TEE. Of these 2 (2.1%) did not undergo C due to thrombosis and 7 (7.1%) due to dense spontaneous echocardiograf (SEC). C was efficacious in 76 pts. After 1 week 61 pts were still in SR and 53 with a Valsalva test.

Conclusions: These results suggest that the shortened Post-C anticoagulation strategy for AF may constitute a feasible and safe therapeutic alternative to the conventional TEE-guided approach. If a larger trial, currently under way, should confirm these data, the management of pts undergoing C for AF could be greatly simplified.

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Patent foramen ovale size is still a risk factor for recurrent cerebrovascular events in patients with cryptogenic stroke.

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Background and Purpose: There is a growing evidence that patent foramen ovale (PFO) is associated with the occurrence of an embolic stroke of unknown cause. Furthermore, anatomic features like a large PFO size or an aneurysmal building of the septum primum (ASA) may predispose this patients to a higher risk for recurrent cerebrovascular events. The current study sought to determine the risk of recurrent stroke in patients with different treatment strategies, furthermore we analysed the implication of PFO-characteristics on the recurrent stroke rate.

Methods: We undertook an observational study of 280 pts (mean age 44±11 years) with a cryptogenic cerebrovascular event and a PFO. PFO size (separation between overlapping septum primum and septum secundum) and atrial septum deviation was evaluated by multplane transesophageal echocardiography in all patients. Treatment options were antplatelet therapy, oral anticoagulation or interventional closure of the PFO. The primary endpoint was a neurologist confirmed recurrent cerebrovascular event.

Results: During a mean follow up of 2.5±1.6 years (778.6 patient-years), 33 recurrent cerebrovascular events occurred. In a cox regressions model (including age, previous stroke, hypertension, hypercholesterolemia, diabetes and PFO-characteristics), the most important predictor of a recurrent stroke was the interaction of a history of stroke (hazard ratio 4.3, 95%CI 2.0-9.2; p<0.001) and a PFO-44mm (hazard ratio 3.7, 95%CI 1.2-11.2; p<0.001). Compared with oral anticoagulation, interventional closure of the PFO decreased the risk (hazard ratio 0.05, 95% CI 0.12-0.28). Conclusion: In cryptogenic stroke patients with large PFOs, interventional PFO closure seems to be the preferable secondary-prevention-strategy.

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Abstracts