

The mechanical impact of the device on the atrial deformation was more obvious in the Amplatzer group compared to the Helex and Cardioseal groups. The latter two devices are more softer compared to the Amplatzer, the soft device may not distort the atrial septum and may reduce stress between the device and the heart.

Associated atrial aneurysm can also contribute to the reduced atrial septal deformation after device closure using Amplatzer, since four patients in the Amplatzer group had an associated aneurysm and only one patient in the Cardioseal and Helex groups had respectively an aneurysm.

6 Conclusions: (1) Transcatheter closure of PFO does not affect the left ventricular function or right ventricular function. (2) Transcatheter closure of PFO may affect septal early diastolic motion and deformation. (3) Whether there is a difference between the results with the Amplatzer, Helex and Cardioseal occluder could not be proved by this study (because of different group sizes).

7 Summary

Background: The patent foramen ovale (PFO) is the most common congenital heart disease in adults. It permits interatrial right-to-left shunt which has been demonstrated to be related to paradoxical embolism. Paradoxical embolism through a patent foramen ovale has been recognized as a potential cause of transient ischemic attack (TIA) and cryptogenic stroke. Percutaneous transcatheter closure of PFO is now used as an alternative to surgery or long-term anticoagulation for the treatment of patients with paradoxical embolism and PFO. It has a high success rate, low incidence of hospital complications, low frequency of recurrent systemic embolic events and avoids some of the disadvantages of open-heart surgery. Although many studies

demonstrate that transcatheter closure of PFO is a safe and effective therapy for patients with paradoxical embolism with PFO, the influence of the transcatheter closure on heart function has not been completely clarified. In order to assess whether occluder devices affect heart function and whether there is any difference between three different occluders (Amplatzer, Cardioseal and Helex), we used pulsed wave TDI (tissue Doppler imaging) and strain rate techniques to determine the cardiac function in patients with PFO before and after interventional treatment.

Methods: The study group consisted of 50 PFO patients with paradoxical embolism. There were 28 men and 22 women, with an age range of 16 to 78 years. Median age was 41.4 years. The PFO was closed with the Amplatzer occluder in 20 patients (group A), with the Cardioseal occluder in 14 patients (group B) and with the Helex occluder in 16 patients (group C). Each patient underwent echocardiographic evaluation (two-dimensional echocardiography and Doppler echocardiography) in our laboratory for assessment of cardiac structure and function. All patients were in sinus rhythm. Echocardiography was performed using the Vingmed System Five Ultrasound system (GE, Horten, Norway) equipped with TDI capabilities. The patients were examined in the left lateral decubitus position with a 2.5MHz sector probe one day before and after intervention. For each patient, an ECG was simultaneously recorded. Diastolic velocity and systolic velocity from the mitral annulus, tricuspid annulus, septal site and strain rate from the septal annulus, roof of atrial septum, left atrium and right atrium were obtained in the apical four-chamber view. All Doppler echocardiograms and tissue Doppler images were obtained during normal respiration.

Results: All patients had devices implanted successfully. There were no acute complications. The E wave, A wave and E/A ratio of the transmitral flow and transtricuspid flow showed no significant difference between pre- and post-intervention values in all three groups. In TDI measurements, the E wave, A wave, S wave and E/A ratio of the mitral annulus motion velocity, tricuspid annulus motion velocity showed no differences between pre- and post-intervention in all three groups. The Em of septal motion velocities and strain rate were lower after closure than

before transcatheter closure procedure in all groups and including Amplatzer group. Am and Sm of septal motion velocities and strain rate showed no significant changes between pre-intervention and post-intervention. In the Cardioseal and Helex groups, these parameters showed no significant changes between pre- and post-intervention.

Conclusion: (1) Transcatheter closure of PFO procedure does not affect the left ventricular function or right ventricular function. (2) Transcatheter closure of PFO may affect septal early diastolic motion and deformation. (3) Whether there is a difference between the results with the Amplatzer, Helex and Cardioseal occluders could not be proved by this study (because of different group sizes).