A baffle puncture is a challenging procedure but can be safely done using direct visualization of the region of interest. To our knowledge, however, it has never been performed in a patient with dextrocardia. All equipment used for transseptal puncture is designed for left-sided hearts. Transoesophageal echocardiography (TEE) is a valuable tool to safely guide transseptal puncture in structurally normal atria. The aim of this case presentation is to demonstrate the usefulness of TEE in structurally and functionally modified hearts.

Case report

A 62-year-old male was presented because of multiple recurrences of atrial tachycardia (AT). At an early age, he was diagnosed with dextrocardia, right isomerism, congenitally corrected transposition of the great arteries, persistent left-sided superior and inferior caval veins, an atrial septum defect (ASD), and pulmonary valve stenosis (Figure 1). At the age of 31, the ASD was closed with a Teflon® patch and a variant Mustard operation was performed to re-route both left-sided venae cavae to the systemic venous atrium. Fifteen years later, tricuspid valve insufficiency necessitated implantation of a prosthetic atrioventricular valve (St Jude Medical, Minneapolis, MN, USA) in the systemic ventricle (Figure 1). In the last 10 years, the patient has experienced multiple recurrences of AT leading to acute heart failure on many occasions. Pharmacological treatment did not alleviate the symptoms and therefore an electrophysiological study was undertaken in order to determine the origin and possible treatment of the arrhythmia. The study was conducted using femoral venous access because a retrograde arterial approach was impossible, given the presence of a prosthetic tricuspid valve at the base of the pulmonary venous atrium. Under general anaesthesia, the right femoral vein was punctured and a transseptal 8F sheath (SL1, St Jude Medical) was inserted. Using fluoroscopy and TEE for guidance, the tip of the sheath was positioned in the systemic venous atrium adjacent to the baffle (Figure 2). A Brockenbrough needle (St Jude Medical) with a manually modified curve was loaded into
the sheath and advanced to within 1 cm of the dilator tip. Using TEE guidance, the tip of the dilator was aimed directly at the baffle in a position where the cavity of the systemic venous atrium could be clearly identified on the contralateral side. The baffle was directly approached with the needle under continuous monitoring with fluoroscopy and TEE. A baffle puncture was performed through the Teflon® patch while injecting radio-opaque contrast through the Brockenbrough needle. As soon as echocardiographic contrast material appeared in the pulmonary venous atrium on TEE, successful trans-baffle puncture was confirmed (Figure 2). The transseptal sheath was then advanced and the dilator and needle were withdrawn. Subsequently, a bi-atrial bipolar activation map (Figure 3) and voltage map could be created using the CARTOTM navigation system (Biosense Webster, Diamond Bar, CA, USA) in combination with the magnetic navigation system (Niobe, Stereotaxis, St. Louis, MO, USA). The voltage map showed multiple channels capable of conducting re-entry tachycardia. The clinical tachycardia was identified and proven to be triggered by a microre-entry circuit in the lower lateral part of the systemic venous atrium. Successful ablation was carried out and sustained tachycardia was no longer inducible. The patient remained haemodynamically stable during the procedure. Transthoracic echocardiography at discharge showed no pericardial effusion.

**Discussion**

In the early days of percutaneous puncture of the interatrial septum, physicians relied solely on fluoroscopic landmarks to define anatomical boundaries.4 Subsequently, two-dimensional echocardiography in general and TEE in particular proved to be a useful adjunct to fluoroscopy during transseptal puncture improving its safety and preventing complications,1,3 especially for specific indications.5 More recently, intracardiac echocardiography (ICE) has emerged as an additional tool to visualize the fossa ovalis and to minimize the risk of life-threatening complications.6 In the current case, we were confronted with several challenges in order to gain access to the pulmonary venous atrium to create activation and voltage CARTOTM maps. Retrograde mapping of the pulmonary venous...
atrium through the femoral artery and the aorta was impossible, given the obvious risks associated with passing the prosthetic tricuspid valve. Using the approach via the femoral and the inferior caval vein to reach the pulmonary venous atrium on the other hand implied puncture of both a Teflon\textsuperscript{TM} patch closing the ASD and the baffle constructed during Mustard surgery. Moreover, the patient also had dextrocardia which complicated the use of standard anatomical landmarks on fluoroscopy. Direct imaging of the cardiac cavities using TEE is proved to be extremely helpful in successfully performing the baffle puncture and avoiding complications. TEE can be used as an alternative to ICE in patients with extremely modified hearts to exclude the presence of thrombotic material in the atria: with the TEE probe already present in the patient at the beginning of the procedure, no additional venous puncture for the ICE is required.

In conclusion, we present the very first report demonstrating a successful baffle puncture in a patient with dextrocardia and status long after Mustard correction. Direct imaging using TEE seems to be a very useful tool for guiding the puncture. We do believe, therefore, that these kind of procedures can be safely done, but only in centres with considerable experience in congenital heart disease, baffle punctures, echocardiography, and electrophysiology.

Figure 3 CARTO\textsuperscript{TM} activation maps of systemic venous atrium (A and B) and pulmonary venous atrium (C and D). A micro-re-entry circuit is identified in the lower lateral part of the systemic venous atrium (red zone, early electrical activation) and successful ablation is carried out in this region (red dots, ablation points).
References


