This case report concerns a 10-year-old boy who previously underwent a Senning operation for transposition of the great arteries with an intramural course of the coronary arteries. The patient had recurrent episodes of atrial tachycardia with 1:1 atrioventricular conduction that caused, in combination with dysfunction of the systemic right ventricle, hemodynamic instability. Unresponsive to antiarrhythmic drug treatment, the patient was referred to our institution for an electrophysiological study and radiofrequency catheter ablation.

Electrophysiological Examination and Ablation
The procedure was performed under general anesthesia. Because the atrial tachycardia caused hemodynamic instability, the mapping procedure was aimed at identification of the arrhythmogenic substrate and critical isthmus of a presumed macro-reentrant circuit with only brief episodes of induced tachycardia. First, a registered 3D shell of the cardiac anatomy was created on an electroanatomic mapping system (Cartosound, Biosense Webster, Diamond Bar, Calif), using...
intracardiac echocardiography (ICE). By positioning the ICE catheter inside the systemic venous atrium, the entire cardiac anatomy could be visualized, including structures that form a potential area of conduction block such as the caval veins, the tricuspid valve annulus, and surgical suture lines (eg, atrial baffle suture line) (Figure 1). Second, bipolar voltage mapping of the systemic venous atrium was performed during sinus rhythm to further evaluate the arrhythmogenic substrate and to confirm areas of conduction block caused by surgical incisions (Figure 2). An area of low voltages (\(\geq 0.5 \text{ mV}\)) and persistent double potentials was found near the interatrial septum, confirming the location of the atrial baffle suture line. Based on these findings and the current literature on tachycardia ablation in Senning patients, a selection of potential reentry circuit isthmus sites was made (Figure 2). Subsequently, the atrial tachycardia was induced and reentry was confirmed as the underlying mechanism by entrainment mapping at the selected sites. The responses to entrainment pacing are given in Figure 2. Pacing near the cavotricuspid isthmus (CTI) from inside the pulmonary venous atrium resulted in identical flutter-wave (F-wave) morphology in all 12 ECG leads and a postpacing interval similar to the intraatrial reentrant tachycardia (IART) cycle length (\(\Delta\)) is given. Additionally, a tracing of the response to entrainment pacing at the cavotricuspid isthmus is given (white box). The tracing includes surface ECG leads III, aVF, V_1, and V_6 and intracardiac recordings from the reference catheter inside the SVA and the mapping catheter. Pacing was performed from the distal electrodes of the mapping catheter (first 2 beats on each tracing). IOV indicates inferior caval vein; MAP, mapping catheter; PA, posterior-anterior view; PVs, pulmonary veins; SCV, superior caval vein; p, proximal; m, mid; d, distal.

Figure 2. Bipolar voltage map of the systemic venous atrium (SVA) integrated with the 3D shell of the cardiac anatomy created with ICE in a posterior view. Bipolar voltages are color coded: Low voltages (arbitrarily defined as \(< 0.5 \text{ mV}\)) are displayed in red, high voltages (\(\geq 0.5 \text{ mV}\)) are displayed in pink. Green dots represent sites with double potentials. Black dots represent sites selected for entrainment pacing during IART. For each selected site, the difference between postpacing interval and tachycardia cycle length (\(\Delta\)) is given. Additionally, a tracing of the response to entrainment pacing at the cavotricuspid isthmus is given (white box). The tracing includes surface ECG leads III, aVF, V_1, and V_6 and intracardiac recordings from the reference catheter inside the SVA and the mapping catheter. Pacing was performed from the distal electrodes of the mapping catheter (first 2 beats on each tracing). IOV indicates inferior caval vein; MAP, mapping catheter; PA, posterior-anterior view; PVs, pulmonary veins; SCV, superior caval vein; p, proximal; m, mid; d, distal.

Discussion
Intra-atrial reentry is the most common mechanism for supraventricular tachycardia in patients with a Mustard or Senning baffle. Image integration (eg, multi-slice computed tomography and electroanatomical mapping) can facilitate the ablation of these tachycardias by visualizing the complex cardiac anatomy and its relation to the position of the ablation catheter. However, the accuracy of image integration is limited by the quality of the registration process. Differences in heart rate, heart rhythm, and fluid status can negatively influence this process. In the present report, a new anatomic mapping technique is used to create a 3D anatomic map of the cardiac anatomy with ICE. This technique does not require a

\[\Delta = \text{Postpacing Interval - IART Cycle Length}\]

\[\checkmark = \text{Inside reentrant circuit}\]

\[\times = \text{Outside reentrant circuit}\]

\[\Delta = 2 \text{ ms}\]

\[\text{Paced F-wave = Spontaneous F-wave}\]

\[\text{Stimulus - F-wave = Electrogram - F-wave}\]
registration process and allows visualization of landmark structures with minimal radiation exposure. The anatomic information acquired with ICE in combination with rough voltage mapping enabled us to identify and confirm the critical isthmus by limited entrainment mapping at selected sites during only brief episodes of tachycardia.

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**References**


Real-Time Integration of Intracardiac Echocardiography to Facilitate Atrial Tachycardia Ablation in a Patient With a Senning Baffle
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