A Novel Sinus Node Sparing Hybrid Ablation Approach for Inappropriate Sinus Tachycardia

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Funding: None.

Word count: 936

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ABBREVIATIONS

CT crista terminalis
IST inappropriate sinus node tachycardia
IVC inferior vena cava
JR junctional rhythm
RA right atrium
SN sinus node
SVC superior vena cava
PV pulmonary vein

CENTRAL PICTURE

Complete ablation lesion set.

CENTRAL MESSAGE

We describe Sinus Node Sparing Hybrid Ablation for inappropriate sinus tachycardia.

INTRODUCTION

Inappropriate sinus node tachycardia (IST) is a debilitating disease in which treatment options present a clinical challenge\textsuperscript{1,2,3}. Sinus node (SN) modulation and ablation techniques yield disappointing results with increased risk of postoperative SN dysfunction, pacemaker implantation, and diaphragmatic paralysis\textsuperscript{3}. We describe a standardized approach for our novel Sinus Node Sparing Hybrid Ablation technique (Video1).
The University Hospital of Brussels’ Ethics Committee approved the study and publication (No. 143201524999, approved July 15, 2015). The patient provided informed written consent for publication.

**TECHNIQUE**

*Preparation*

The patient is supine with selective left lung ventilation.

*Mapping*

A multipolar mapping catheter is introduced in the right femoral vein and moved into the right atrium (RA) by an EP cardiologist. A decapolar catheter is positioned in the coronary sinus. Bipolar activation mapping identifies the earliest site of activation (head of the SN), referenced to both an endocardial fiducial point (e.g., coronary sinus electrogram) and the surface P-wave. The endocardial catheter is left on the earliest activation site for subsequent visualization by the cardiac surgeon.

*Port placement right hemithorax*

A 0° camera port is introduced in the 5th intercostal space (mid-axillary line). CO₂ insufflation (8mmHg; 8L/min) is started. Two instrument ports are placed in the 3rd and 7th intercostal space (anterior axillary line).

*Opening of the pericardium*

The pericardium is opened 2 cm anterior to the phrenic nerve, from aorta to diaphragm. Traction sutures are placed.
Mapping and SN demarcation

The site of earliest SN activation is visualized by gently pushing the endocardial catheter outwards, followed by epicardial marking with a pen.

Dissection of pericardial reflections

For oblique sinus access, blunt dissection of the pericardial reflection is performed using a grasper (Johann™, MicroFrance, France) and suction tool, creating a triangle between the pericardium and the right inferior pulmonary vein (PV)–IVC junction. To ease light dissector passage around the PVs, blunt dissection is performed between the right pulmonary artery and right superior PV.

Ablation

Superior vena cava ablation

A bipolar radiofrequency clamp is placed over the ostium of the superior vena cava (SVC), cranial to the blue spot. Before ablating, the effect on the rate is observed for 30 s to avoid a junctional rhythm (JR). If this occurs, the clamp is positioned more cranially. Maximum three applications are performed.

Crista terminalis and right PVs ablation

A light dissector with gliding path is moved around the right PVs. The clamp is positioned parallel over the crista terminalis (CT). The CT is then clamped without incorporating the muscular part of the free RA wall. Importantly, the clamp cannot cross the border zone of the fat of Waterstone’s groove-RA. Additionally, the clamp tip may not be more anterior than half-way the SVC diameter. A 30 s (minimum) waiting period is observed, minimizing the risk of low JR and pacemaker need.
In case of slow JR, the clamp is moved more posteriorly. This line interconnects with the SVC line.

At least six to ten applications are performed. Following, the PVs are ablated minimally four times.

**Inferior vena cava ablation**

The inferior RA adjacent to the ostium of the inferior vena cava (IVC) is ablated at least three times. This line interconnects with the CT line.

If the SVC-CT and IVC-CT lines are not interconnecting, a lateral bite with the clamp is performed at this level, or the gap is closed by a linear radiofrequency pen or 4mm irrigated catheter. The endpoint is a 25% heart rate reduction or a fast JR. If the heart rate is insufficiently lowered, the clamp is reapplied where it initially lowered the most, however, closer to the SN.

**Re-Mapping**

Endocardial re-mapping is performed.

**Touch-up ablation**

If lines are not blocked, epicardial or endocardial touch-up lesions are made. We recommend a CT endocardial touch-up in all cases.

**CONCLUSION**

We propose a standardized technique for sinus node sparing hybrid IST ablation.

**REFERENCES**


**LEGEND**

**Video 1** describes Sinus Node Sparing Hybrid Ablation.
A: Superior vena cava ablation
B: Crista terminalis ablation
C: Right pulmonary veins ablation
D: Inferior vena cava ablation