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Ablation of Inappropriate Sinus Tachycardia

A Systematic Review of the Literature

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ABSTRACT

OBJECTIVES The goal of this study was to describe short- and long-term outcomes in all patients referred for inappropriate sinus tachycardia ablation, along with the potential complications of the intervention.

BACKGROUND Sinus node (SN) ablation/modification has been proposed for patients refractory to pharmacological therapy. However, available data derive from limited series.

METHODS The electronic databases MEDLINE, Embase, CINAHL, Cochrane, and Scopus were systematically searched (January 1, 1995–December 31, 2015). Studies were screened according to predefined inclusion and exclusion criteria.

RESULTS A total of 153 patients were included. Their mean age was 35.18 ± 10.02 years, and 139 (90.8%) were female. All patients had failed to respond to maximum tolerated doses of pharmacological therapy (3.5 ± 2.4 drugs). Mean baseline heart rates averaged 101.3 ± 16.4 beats/min according to electrocardiography and 104.5 ± 13.5 beats/min according to 24-h Holter monitoring. Two electrophysiological strategies were used, SN ablation and SN modification, with the latter being used more. Procedural acute success (using variably defined pre-determined endpoints) was 88.9%. Consistently, all groups reported high-output pacing from the ablation catheter to confirm absence of phrenic nerve stimulation before radiofrequency delivery. Need of pericardial access varied between 0% and 76.9%. Thirteen patients (8.5%) experienced severe procedural complications, and 15 patients (9.8%) required implantation of a pacemaker. At a mean follow-up interval of 28.1 ± 12.6 months, 86.4% of patients demonstrated successful outcomes. The symptomatic recurrence rate was 19.6%, and 29.8% of patients continued to receive antiarrhythmic drug therapy after procedural intervention.

CONCLUSIONS Inappropriate sinus tachycardia ablation/modification achieves acute success in the vast majority of patients. Complications are fairly common and diverse. However, symptomatic relief decreases substantially over longer follow-up periods, with a corresponding high recurrence rate. (J Am Coll Cardiol EP 2016;■:■–■)

Inappropriate sinus tachycardia (IST) is a syndrome characterized by unexpectedly fast sinus rates at rest, with minimal physical activity, or both. It is manifest by a spectrum of debilitating symptoms, including palpitations, weakness, fatigue, dizziness, and near-syncope (1,2). Available pharmacological therapy often falls short in providing reliable symptomatic relief, although multiple recent studies have elucidated a potential value of the If blocker ivabradine in the treatment of IST (2). Sinus node (SN) modification via radiofrequency (RF) ablation is considered for drug-refractory cases (3). However, there is no consensus on the optimal procedural approach. Physicians must choose between SN modification and ablation, use open-chested or conventional intravascular access, and conform to one of many

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ABBREVIATIONS AND ACRONYMS

ICE = intracardiac echocardiography

IST = inappropriate sinus tachycardia

PN = phrenic nerve

POTS = postural orthostatic tachycardia syndrome

RA = right atrial

RF = radiofrequency

SN = sinus node

SVC = superior vena cava

available mapping methods. Acute and chronic success rates have varied widely between series reported thus far. Moreover, techniques remain subject to potential complications. These include permanent pacing requirement (3), phrenic nerve (PN) paralysis (4), and transient superior vena cava (SVC) syndrome (5,6), among others. Accordingly, IST ablation is not recommended as a routine intervention by the HRS Expert Consensus Document on IST (Class III) (7). However, the latter document does sanction the use of IST ablation in highly selected circumstances or as part of research protocols.

The goal of the present study was to conduct a systematic review of the different approaches described to date, their short- and long-term results, and the potential complications that can occur during IST ablation/modification.

MATERIALS AND METHODS

A systematic review and best-evidence synthesis was conducted in compliance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (8).

LITERATURE SEARCH. Electronic databases MEDLINE, Embase, CINAHL, Cochrane, and Scopus were systematically searched from January 1, 1995, to December 31, 2015. The following search terms were used: *inappropriate sinus tachycardia ablation*, *inappropriate sinus tachycardia modification*, and *sinus node ablation*. Each article's references were screened for additional relevant papers that may have been missed by the initial search.

ELIGIBILITY CRITERIA. Titles and abstracts were screened for eligibility via the following criteria.
Inclusion:

- Languages: English, French, Swedish, Arabic, Norwegian, Danish, and Spanish.
- Publication type: original manuscripts in peer-reviewed journals.
- Study design: systematic reviews, meta-analyses, randomized controlled trials, case-control, and cohort studies. Studies reporting a minimum of 2 IST ablation cases were included.
- Study population: human participants of all ages who have undergone SN ablation/modification.
- Case definition: IST must be defined in compliance with the definition provided in the Expert Consensus Statement on the Diagnosis and Treatment of Inappropriate Sinus Tachycardia (7). It states: "The syndrome of IST is defined as a sinus heart rate >100 beats/min at rest (with a mean 24-h heart rate >90 beats/min not due to primary causes) and is associated with distressing symptoms of palpitations." Accordingly, studies including patients with postural orthostatic tachycardia syndrome (POTS) were excluded (9).
- Study outcomes: acute success, complication rates, maneuvers to avoid PN injury, and long-term follow-up.

Exclusion:

- Study design: nonsystematic reviews, cadaveric, biomechanical, and laboratory studies.
- Study population: animals.

SCREENING. Initially, 1 reviewer read all titles retrieved from the database search and removed citations clearly unrelated to IST. An abstract review was subsequently conducted. Full-text articles were obtained for all abstracts except those that clearly did not meet the eligibility criteria. If after analyzing the full text, the eligibility of an article remained uncertain, a second reviewer conducted a full-text analysis of the article to determine eligibility. A third reviewer was consulted in the event of disagreement. Level of agreement on study eligibility was tested by using the kappa statistic and 95% confidence intervals.

CRITICAL APPRAISAL. Two reviewers appraised eligible papers by using the modified Scottish Intercollegiate Guidelines Network criteria (10). Reviewers were international scientists and/or had experience in systematic review methodology.

DATA EXTRACTION. Extracted data included the following: 1) study name, authors, and publication date; 2) publication language; 3) publication type; 4) geographic origin; 5) pre-procedural evaluation; 6) IST definition; 7) population size; 8) study design; 9) participant characteristics; 10) electrophysiological details of the SN ablation/modification procedure; 11) prognostic factors/outcomes; 12) complications; 13) follow-up periods; and 14) key findings. These endpoints were summarized in 4 tables (**Tables 1 to 5**).

QUALITY ASSESSMENT. A thorough evaluation of bias took place, as described previously (11,12). Appraisal included reporting bias, external validity bias, internal validity bias, internal validity confounding, and power. Each study was assigned a numerical indicator for the degree of each bias type, after which it was designated a title of low, medium, or high