Appendix 1

Sinus node modification is usually performed with conscious sedation, but general anesthesia can also be used without paralytics so that phrenic nerve stimulation and function can be monitored[1]. In addition to fluoroscopy, 3-dimensional mapping using electroanatomic mapping is recommended, from both procedural flow and safety perspectives. Unipolar mapping likely does not provide any significant difference in ability to localize sinus node activation compared to bipolar mapping[2, 3]. Other imaging guidance such an intracardiac echocardiography may facilitate catheter location and tissue contact, while also providing awareness of complications such as perforation and stenosis of the SVC[1, 4-7]. For ablation catheters, while 4-mm tip electrode catheter may provide more accurate mapping, larger non-irrigated or irrigated catheters are recommended to deliver deeper lesions from the endocardial surface and may be more effective particularly along the terminal crest[8-10]. With these temperature control systems, the power should be set to achieve 50-60° C temperatures at the catheter tip during ablation. If an irrigated catheter is used, the radiofrequency (RF) power is typically set at 30-40 W, but lower wattage such as 20 W can be used initially and titrated up to goal every few seconds in cases where the phrenic nerve is in close proximity to the ablation site. Applications of RF energy usually are delivered for 60 seconds[1, 11].

To move the exit of the sinus node impulses more superiorly, isoproterenol infusion is more predictable than bolus delivery, with the required infusion rate usually being 2 mcg/min, but up to 10 mcg/min has been used[1, 3, 6, 12-14]. The course of the phrenic nerve can be mapped with the ablation catheter using high output pacing, at least 10 mA output with 2 ms pulse width.[15] Tagging of the phrenic nerve sites using 3-dimensional mapping can be accomplished altogether prior to mapping of the sinus node, but confirmed absence of phrenic nerve capture should be done before each potential ablation site for IST[1]. An electrophysiology catheter can be positioned to pace the phrenic nerve while ablating, thereby providing another method to monitor phrenic nerve function.

The electrograms at potential ablation sites should precede the sinus tachycardia P wave by 25 msec. If unipolar mapping is used, the unipolar electrogram should show a 'QS' configuration timing in onset with the bipolar electrogram[1]. With delivery of RF energy, the sinus rate may increase or an accelerated junctional rhythm can occur[1, 6]. Typically with ablation, the focus will migrate inferiorly down the right

atrium, an average of 23 +/- 11 mm requiring repeat mapping and ablation eventually covering a length of 19-23 mm[4, 12, 16]. Ablation in adjacent tissue, such as the arcuate ridge may be required[8, 17].

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