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Stellate Ganglion Localization Using Near-Infrared Intraoperative Imaging During Cardiac Sympathetic Denervation

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Introduction

This image shows a novel, real-time method of locating the stellate ganglion using near-infrared (NIR) intraoperative imaging with indocyanine green (ICG) during bilateral cardiac sympathetic denervation (CSD). The research reported here adhered to Helsinki Declaration guidelines.

The patient is a 40-year-old female with recurrent ventricular tachyarrhythmias due to a familial cardiomyopathy caused by a variant in NKX2.5, a transcription factor which functions in heart development. She had failed multiple prior attempts at catheter ablation. She was referred for CSD and was systemically infused with 5 mg/kg ICG 24 hours preoperatively. Intraoperatively, a thoracoscope (VisionSense, New York, NY) capable of white light and NIR imaging was used. The sympathetic chain was not well visualized under white light guidance. NIR imaging clearly located the stellate ganglion, which was divided bilaterally (Figure 1). The patient had no complications from the procedure and has not had any further episodes of VT over a follow-up period of two years.

CSD has shown efficacy in treating refractory tachyarrhythmias in several recent case series.^{1–3} Despite these encouraging findings, CSD is not effective in a significant proportion of patients. This failure may be explained in part by pathologic neural remodeling in these patients, which can make sympathetic chain identification challenging.² There are no prior reports of real-time, intraoperative methods of cardiac sympathetic nerve imaging as an adjunct to CSD.

Previous work by our group has shown the efficacy of NIR intraoperative imaging with ICG as a tumor mapping agent during oncologic surgery.⁴ ICG has been used previously to image nerves but this is the first use of ICG-based imaging as an adjunct for CSD.⁵ This case underscores the feasibility of this technique, which may improve success rates for CSD.

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Disclosures: None.

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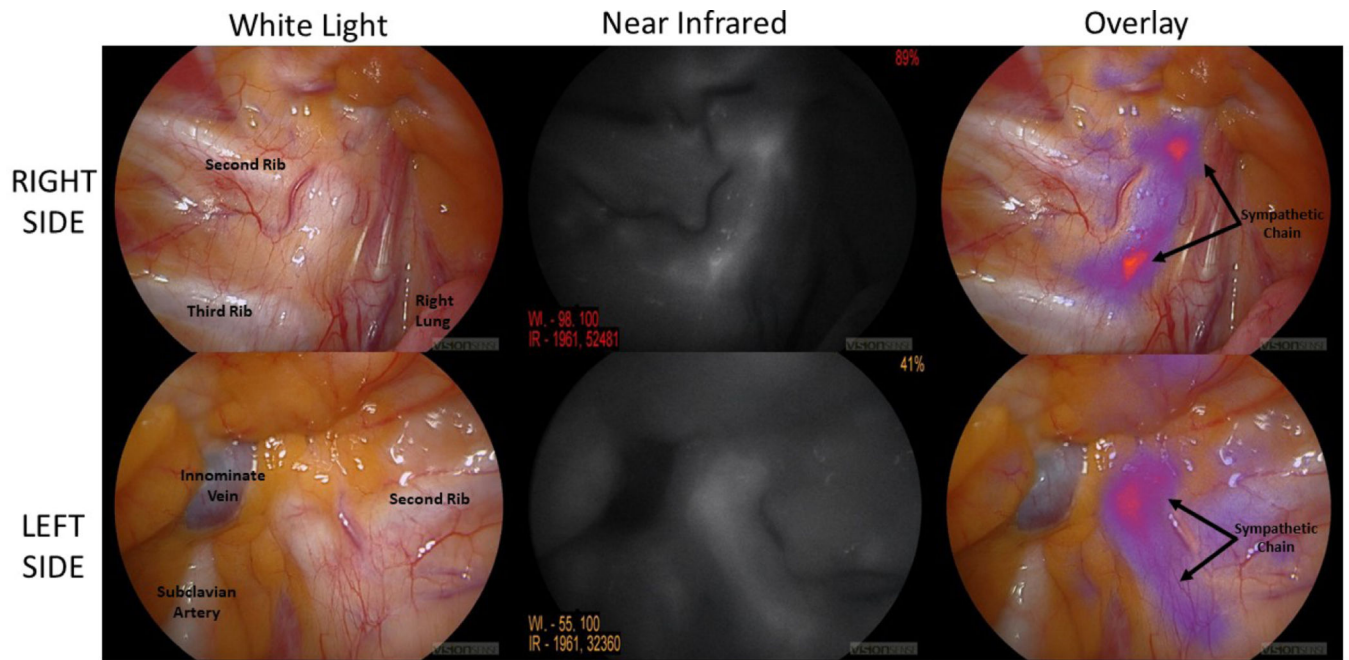


Figure 1.

Near-infrared intraoperative imaging localizes the stellate ganglion bilaterally. The top row of images depicts the patient's right side with the sympathetic chain not clearly identifiable by white-light thoracoscopy in the far left column. NIR and fused images in the center and right columns, respectively, show clear visualization of the stellate ganglion under IMI guidance. The bottom row depicts similar images on the patient's left side.