

Subthreshold Spinal Cord Stimulation in a Fontan Patient with Superimposed Refractory Angina and Post-Thoracotomy: A Case Report

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Context

- Anginal pain signals that are transmitted between the coronary adventitia and autonomic ganglia can be modulated by spinal cord stimulation (SCS) of the cord segments of the upper four thoracic vertebra thereby stabilizing the myocardium during ischemia and suppressing angina.¹
- The use of SCS for post-thoracotomy pain syndrome (PTPS) and refractory angina pectoris has been known utilizing dated componentry and paresthesia-based “subthreshold” stimulation.²
- SCS has not been utilized for superimposed angina and PTPS nor has angina been treated with non-salvage subthreshold stimulation.³

Case Description

- 18-year-old female with prothrombin mutation requiring perpetual anticoagulation, hypoplastic left ventricle status-post staged Norwood to Glenn procedures with respective sterno-thoracotomies and ultimately extracardiac non-fenestrated Fontan complicated by PTPS.
- Angina and thoracotomy pain persisted despite pharmacologic optimization, angioplasty and re-do sternotomy.
- The patient presented for palliative measures given refractory pain to prior therapies, activity intolerance, and progressive debility.

Figure 1. Fluoroscopic capture of trial leads (PA).

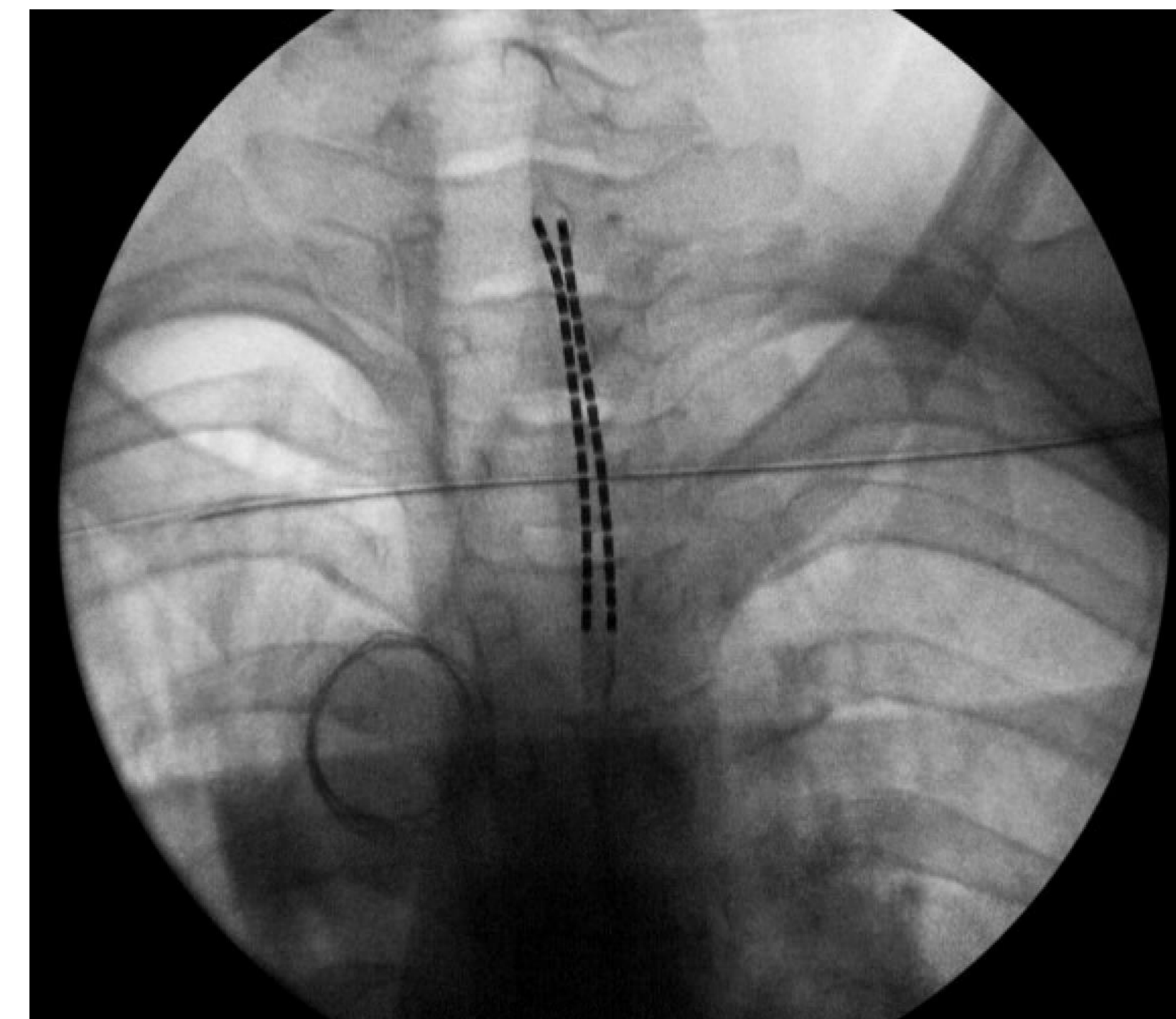


Figure 2. Cardiac neuromodulation pathway⁴

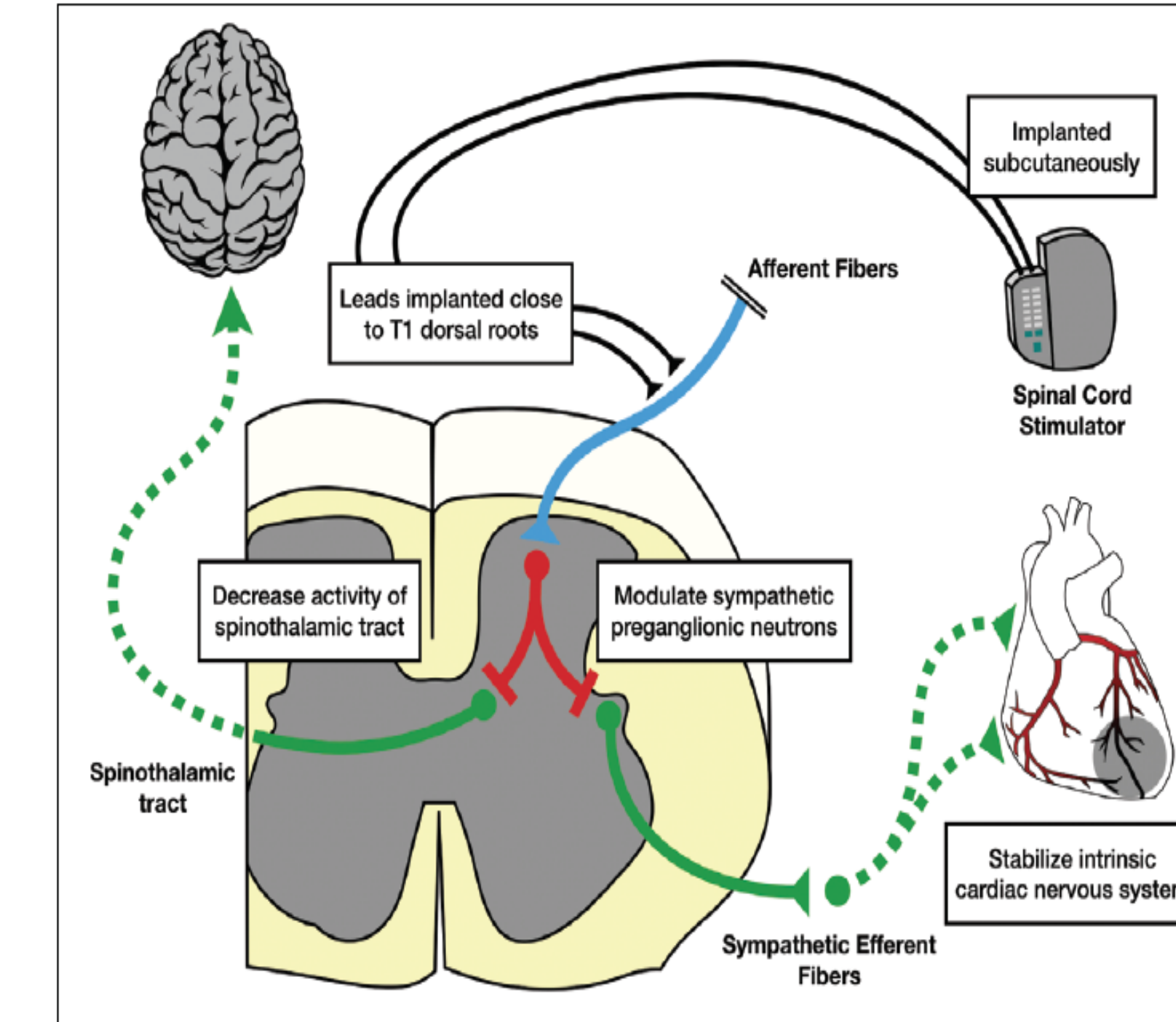


Table 1. Stimulation Parameters

Combination Waveform Therapy	Central Stimulation Point	Amplitude	Pulse Width	Frequency
Program 1	Contact 6, Left	0.9 mA	550 μ s	250 Hz
Program 2	Contacts 12-16, Bilateral	2.1 mA	200 μ s	200 Hz

Discussion:

The patient’s history and examination were indicative of two distinct pain syndromes including PTPS with neuropathic features along the distribution of the intercostal nerves of T2-4. The patient’s history illustrated an overlapping anginal pain that was triggered only with increase in activity. Given the overlap of thoracic cord targets for modulation of both thoracotomy pain, as well as autonomic ganglia correlating to T1 to T4 segments that would allow the influence of anginal pain, we postulated that SCS to these segments would cover this patient’s multifaceted pain. Anticipating hemodynamically fragile Fontan physiology⁵ the trial procedure was planned in collaboration with pediatric anesthesiology. Pain coverage was achieved perioperatively with 16 contact epidural electrodes positioned cephalad at T1 spanning to T4.

Results:

1. Clinically significant reduction of thoracic pain severity along the distribution of the T2-4 intercostal nerves was reported during the 7-day SCS trial.
2. Clinically significant reduction of anginal pain severity and frequency was reported during the 7-day SCS trial.
3. Patient was recommended for permanent implantation which was successfully completed in a similar collaborative fashion with pediatric anesthesiology peri-operatively.

Conclusions

- ***Overlapping segment targets in the upper thoracic cord allow for dual therapeutic targeting of post- thoracotomy pain and chronic angina with subthreshold based SCS.***
- ***This case describes the first use of SCS in a Fontan patient.***

References

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