1. Introduction

The first report of a dorsal column stimulator for pain appeared in 1967. Shealy outlined the electrical and physical configurations amenable to treat pain syndromes originating in the spinal cord (1). Twenty years later the first report of spinal cord stimulation for angina suggested its usefulness in a selected group of patients (2). Following this initial report, some four dozen papers have added to the largely European experience with this modality. Several papers have included a prospective, randomized evaluation of SCS as an adjunct to standard therapy (3). The clinical message has consistently been that SCS can aid pain control in refractory angina, and possibly improve cardio dynamics. Angina results when myocardial oxygen demand exceeds delivery. The time elapsed of the imbalance until the onset of symptoms has not been precisely demonstrated. Rest pain is a term to describe pain, usually in vascular disease, that occurs when metabolic demands are at low ebb. We found this term to be applicable to cardiac patients who experienced pain regardless of activity levels or emotional states. Patients are diagnosed with refractory angina when anti-angina medications such as nitrates have failed to control symptoms and revascularization is not anatomically or physiologically possible. This may be due to small vessel disease, Syndrome X, or after failure of novel revascularization techniques, such as transmyocardial laser surgery. Patients with rest pain experience fear, altered quality of live (QOL) and reduced exercise tolerance.

Exercise programs and medications have formed the foundations for treatment in this patient group. Our evaluation showed a subgroup severely affected by their disease state, without effective means of treatment. Several authors have shown SCS to affect peripheral blood flow and sympathetic state (4-5). We proposed to look at a group of patients treated with SCS to evaluate their QOL, exercise tolerance and pain history.

All patients were referred from the cardiology clinic. Cardiac catheterization was accomplished in the preceding two years. No major infarct event was recorded from catheterization to entry. Anti-angina medications were maximized and continued through inception into the study. The resulting group of 18 patients was asked to record a monthly pain diary, complete a SF-36 health self-assessment for and a McGill pain questionnaire. A physicians assistant versed in pain assessment supervised completion of a visceral analog score (VAS) and performed a preoperative interview and physical exam. Exclusion criteria were age less than 18, pacemaker, previous SCS, bleeding diathesis.

The surgical technique was done on a same-day basis. Under somatosensory and electrocardiographic monitoring, a short-acting general anesthetic was given. Patients were placed in the left lateral decubitus position. A laminectomy was performed at the thoracic 5-6 levels. A paddle four or eight contact electrode was placed and fixed to the dura (Laminitrode or Octrode, Neuromed, Ft. Lauderdale, FL, USA). The lead terminals were tunneled suprafascially to the anterior right upper quadrant. The receiver/generator was placed in a subcutaneous pocket and closed. A single perioperative dose of antibiotics was given. The patients were allowed to stimulate 1 week following surgery. Evaluation was done at 1, 6 and 12 months by the physician’s assistant. Exercise testing was completed at 6 and 12 months.

2. Results

Repeat Tran esophageal echo was completed in half the patients. No significant change was seen from pervious cardiac output/index data. Pain reports showed an improvement of 50 percent at 1 month, 70 percent at 6 months and 80 percent at 1 year. A telephone survey revealed 80 percent of the group alive at 2 years and all are still using the stimulator. No stimulator-induced arrhythmias were seen at implant and none in the six patients undergoing Holter ambulatory assessment. SF-36 forms revealed a significant rise from preoperative levels through 1 year. Exercise tolerance improved 15 percent
Overall, but was improved to 30 percent in the first 6 months and leveled off at 1 year.

3. Discussion

In the United States, there are an estimated 50,000 cases of refractory angina. Less invasive procedures have addressed a small group of these patients, but following angioplasty, pain reduction is distinct from radiology results. Their recurrent chest pain results in repeated emergency room visits, excessive workup and costly medications. Wall and Melzak postulated the theory of SCS, and use in the lumbar spine has been clinically efficacious for 20 years (6). In that interval, continued changes in lead technology, receiver durability and programmable systems have allowed patients better ease of use. It has allowed clinicians the chance to extend lead time through additional stimulation paradigms. Treatment for patients with peripheral vascular disease and regional pain syndromes has found sustained success with these devices. There are a number of theoretical issues as to placement of the electrodes and their programming but these are questions whose answers will continue to improve the results for long-term implants.

In the peripheral disease patients, it has been advanced that SCS activates sympatholytic pathways to improve small vessel flow (7). For regional pain syndromes, integration of the signal in the dorsal horn impacts pain transmission pathways. A secondary effect on the alpha-adrenergic receptors (inhibition) and C-fos levels has been seen. In the cardiac arena, changes in the cardiovascular centers in the brain stem and a vagolytic response are reported. Increased coronary artery blood flow and improved exercise tolerance are seen in several groups (8-9).

Overall, our patients have found their 2-year experience with SCS to be satisfactory, resulting in improvement in QOL, reduction in pain and reduced dependence on the medical system.

References