

Spinal cord stimulation for refractory angina pectoris: a retrospective analysis of efficacy and cost-benefit

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Background

Patients with refractory angina pectoris have severe symptoms despite of optimal medications, but are not suitable for revascularizations. Spinal cord stimulation (SCS) has been used for treating refractory angina pectoris since 1985. The efficacy of SCS has been proven by randomized controlled trials and follow-up studies have shown that SCS is a safe treatment. The objective of the current study was to retrospectively analyse the clinical outcomes and cost-benefit of SCS in patients with refractory angina pectoris.

Methods

Under local anaesthesia, an electrode was introduced through a Touhy needle into the epidural space and was guided to the level of the Th1-Th2 vertebrae under X-ray monitoring. The tip of the electrode (Medtronic Inc.) was adjusted so that the paraesthesia in the chest covered the area of angina pectoris. The end of the electrode was then fixed to the ligaments and connected to an extension wire which was tunneled subcutaneously to the waist below the left costal arch, where it was connected to a subcutaneous pulse generator (Itrel 3, Medtronic Inc.). The procedure for the temporary electrode was similar to that for the permanent electrode; however, the electrode was connected to an external pulse generator. The device was programmed the day after the implantation, and the patient obtained a patient programmer to adjust the intensity of the stimulation. The patient was instructed to use low stimulation intensity intermittently or constantly and high stimulation intensity during an acute angina attack for 5-10 minutes. Usually, the patient had 1-2 device controls per year by specially trained nurses.

Eighteen months after SCS implantation, the effects on Canadian Cardiovascular Society (CCS) functional level and acute symptom relief of 24 patients with permanent SCS were analysed by review of medical records. Nineteen of these 24 patients were able to report their anginal frequency, nitroglycerin consumption and subjective perception on physical activity and quality of life.

Results

Following SCS treatment, 87% patients experienced acute symptom alleviation, 83% improved by at least 1 CCS class and 94% experienced improvement of global quality of life ($p < 0.01$). Angina frequency decreased from a median of 14.0 to 2.3 attacks/week ($p < 0.01$). Nitroglycerin intake decreased from a median of 27.5 to 1.5 doses/week ($p < 0.01$). CCS angina class improved from a median of 3 to 2 ($p < 0.001$).

During a 3-year period before SCS implantation, the hospitalization rate and duration related to coronary artery disease increased progressively. The duration of hospitalization increased from a median of 3 to 10 days/patient/year. In the year after SCS implantation the duration of hospitalization decreased to a median of 0 day/patient/year ($p < 0.001$). The cost of hospital care due to coronary artery disease decreased significantly thereafter. The total cost of SCS procedure was recovered within 16 months after implantation, which is less than 40% of the device life span.

Conclusions

This retrospective study indicates that SCS treatment alleviates angina symptom and improves quality of life. The treatment is also effective in preventing hospitalizations and saving costs of hospital care. A prospective study is warranted to confirm the current observations.