

The Pain Journal

A Medical Newsletter Providing Current and Cutting-Edge Information Regarding the Treatment of Pain and Spine Disorders

Spinal Cord Stimulation for the Treatment of Angina?

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The use of spinal cord stimulation (SCS) has been used for chronic neuropathic pain for the past four decades. In the United States, the most common use of SCS is the treatment of neuropathic pain caused by failed back surgery syndrome. Within the most recent decade or so, pain physicians in the United States have begun to broaden the scope of use of SCS to include other pain states such as diabetic peripheral neuropathy, chronic radiculopathy, and complex regional pain syndrome. There are some forward thinking physicians who have advocated the use of SCS for cases involving chronic abdominal pain, and some have even proposed its use for the treatment of obesity. Aside from these aggressively progressive proposals, there is one proven use of SCS that has seemingly fallen by the wayside in this country — the use of SCS in cases involving ischemic induced pain.

Ischemic pain is pain caused by peripheral vascular and coronary artery disease, i.e. leg pain and chest pain from poor blood circulation. Its use for this purpose has quite a long history, and this has been a leading reason for SCS implantation in Europe. As a matter of fact, the use of SCS in lower limb vascular disease was first described in a study published in 1976; not in Europe but in the New York State Journal of Medicine. Many studies since then have shown that the use of SCS has improved blood flow, and promotes healing of lower limb ulcers caused by poor circulation.

Extending from this idea, the use of SCS on the coronary circulation was first proposed in the early 1980's. The technique is nearly the same as SCS implantation for low back and/or leg pain, with the only difference being that the electrode leads are advanced to a higher level in the spine. In the years that followed, many studies were published which showed that SCS caused an increase in blood flow

to the heart, and thus decreased coronary artery related chest pain. In 1998, the landmark ESBY study from Sweden was published in *Circulation*, the *Journal of the American Heart Association*. This study directly compared SCS to coronary artery bypass graft (CABG) surgery in patients with stable angina. In this study, 104 patients were randomly assigned to either receive SCS or CABG. Amazingly, both treatment groups had similar results, affording 79.5% of patients in the CABG group and 83.7% of patients in the SCS group a significant reduction in the number of chest pain episodes and significant reduction in use of short-acting nitroglycerin. The most stunning finding was the comparison of the mortality rates between the groups, which was 13.7% in the CABG group and 1.9% in the SCS group. In a five-year follow-up to this study, the authors found that SCS and CABG both offered equivalent long-lasting improvement in quality of life. At three years, the survival rate was 84.9% in the SCS group and 76.5% in the CABG group. At five years, the survival rate was 75.5% in the SCS group and 68.6% in the CABG group. These differences in survival rates were not statistically significant. An evaluation of cost-effectiveness in this series of patients showed that SCS is a less expensive treatment option for angina as compared to CABG. The SCS group had fewer hospitalization days related to the primary intervention (either SCS implantation or cardiac surgery), and fewer hospitalization days due to cardiac events in the years following the intervention. In a review of the literature in 2004, Yu reported that with SCS treatment the frequency of angina attacks decreased from a median of 14.0 attacks per week to 2.3 attacks per week. Nitroglycerin intake decreased from a median of 27.5 doses per week to 1.5 doses per week. In the year after SCS implantation the duration of hospitalization decreased to a median of 0 days per patient per year, as compared to a median of 10 days per

patient per year prior to implantation. He found that the total cost of the SCS procedure was recovered within 16 months after implantation, which is less than 40% of the device life span.

An additional point that should not be overlooked is the fact that many patients with severe coronary artery disease are poor candidates for major cardiac surgery, where the stress of the surgery alone carries too much risk. In this country, these patients are managed with medications alone, and often despite optimal medical management are left with poorly controlled chest pain and a poor quality of life. The use of SCS should strongly be considered for these patients who are not candidates for major cardiac surgery, but would be candidates for the minor surgery that is involved in SCS implantation. In these patients, SCS may be the only option to provide significant improvement in cardiac blood flow, and therefore the only option to provide significant improvement in their quality of life.

After reading this you must be wondering why we are not using SCS for coronary artery induced chest pain in this country. At the minimum, why are American physicians essentially ignoring SCS as even an option in the treatment of these patients? I am not sure that there is a clear answer to that question. At the risk of sounding like a conspiracy theorist, I believe that political pressure may be playing a role. By invoking politics, I am not referring to Democrat versus Republican. The politics here involve the surgical and non-surgical

Cardiologists who stand to lose a significant amount of their revenue if SCS use becomes widespread. Additionally, I believe that an even more powerful force at play is from the hospitals, which rely on the significant revenue in which cardiac procedures generate for them. Unfortunately, as with many things in our society, the financial incentives which benefit the few often trump the well being of the populace as a whole. Again, these statements are merely my opinion, and have not been substantiated in any way.

The conclusion that SCS is categorically a superior treatment for angina appears to be premature, but the studies discussed in this article certainly raise a strong and important argument. Ultimately, larger studies need to be explored to firmly establish the safety and efficacy of SCS for the use of coronary artery disease induced chest pain. However, the studies which have been published so far have shown that SCS provides similar results to the current standard of care, which are angioplasty with cardiac stenting, and CABG. Additionally, SCS is a treatment option which is significantly less invasive, therefore it gives patients that otherwise may not be heart surgery candidates a treatment option other than medication alone. I believe that the use of SCS for the treatment of angina in this country is inevitable. The reason I believe this is that in the end, the question cannot be ignored: if given the choice between major open heart surgery and minor SCS implantation surgery to treat angina, which would you choose? §

March/April 2007 § Volume 3, Issue 2

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