Pain remission at one year follow up with Spinal Cord Stimulation

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Background

- Spinal cord stimulation (SCS) is an effective modality for management of refractory neuropathic pain unresponsive to conservative therapies.
- Successful in providing pain relief, improving function and enhancing the quality of life for patients suffering from chronic pain conditions such as failed back surgery syndrome (FBSS), neuropathic pain, and complex regional pain syndrome (CRPS).

- Potential candidates for SCS undergo a trial of an external device. Those who experience 50% or greater pain relief are offered permanent implantation.
- Still, after permanent implantation, only 48% of patients who receive SCS for failed back surgery syndrome (FBSS) achieved 50% or greater pain relief at long term follow-up visit.

- Researchers have speculated that SCS success depends on a multitude of factors, one being the assessment and control of emotional and cognitive variables to allow more reasonable expectations.
- This study focuses on analyzing the ability of certain variables to contribute to remission rates.
- Identification of characteristics for remitters may aid in patient selection.

Methods

- Retrospective analysis of a prospectively collected database occurring over the period of 12 months. Single-center study. Patients with chronic pain who were deemed candidates for permanent SCS were offered involvement in our IRB-approved prospective outcomes database.

- Variables included BDI, PCS, MPQ, ODI, and ISI, of which the difference scores between pre-operative and 1 year post-operative were the primary data analyzed.

- Demographic Analysis
  - Examined body mass index (BMI), age, gender, tobacco use, reported alcohol use, opioid use, pain location, pain, employment, relationship status, comorbid health conditions, disability, and anxiety/depression present at time of surgery.

- Data Analysis completed using IBM SPSS. Significance was determined at p < 0.05.
  - Descriptive statistics were conducted on each variable to attain frequencies, mean values and standard error values.
  - ANOVA and chi-square analysis were performed to determine relationships between variables.
  - A stepwise multiple regression model was constructed to evaluate those factors that best contributed to the variance in NRS scores among the patients.


Results

Table 1: Demographics for cohort of 86 thoracic SCS subjects

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>55 3.0</td>
<td>11.2</td>
</tr>
<tr>
<td>Pain Location</td>
<td>Lower back alone</td>
<td>9</td>
</tr>
<tr>
<td>Lower extremity alone</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Leg-brach</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Back-leg</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Other (abdominal, thoracic)</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Pearson Chi-square analysis outcomes between variables and outcomes (non-responders, average responder and remitter).

<table>
<thead>
<tr>
<th>Variable</th>
<th>df</th>
<th>Chi-square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression/mood</td>
<td>2</td>
<td>12.02</td>
</tr>
<tr>
<td>Disability status</td>
<td>2</td>
<td>4.62</td>
</tr>
<tr>
<td>Employment</td>
<td>2</td>
<td>3.17</td>
</tr>
<tr>
<td>Duration</td>
<td>2</td>
<td>2.45</td>
</tr>
<tr>
<td>Medical Complications</td>
<td>2</td>
<td>0.40</td>
</tr>
<tr>
<td>Pre-operative usage</td>
<td>2</td>
<td>3.93</td>
</tr>
</tbody>
</table>

Figure 1.1. The effect of disability and pre-operative opioid usage on remitter status.

- Frequency of patients on disability and those not on disability achieving non-responder, average responder, and remitter status (2: 0.6-0.4) were determined. Frequency of pre-operative opioid users and non-users achieving non-responder, average responder, and remitter status (2: 17.68, p < 0.001) were determined. Statistical significance determined by Pearson correlation coefficient.

Figure 2. Significant changes between baseline to one-year follow-up scores of the ODI (Y2)-8.01 (p < 0.01), N=68, and PCS(F2)=7.67 (p < 0.01, N=66) surveys among remitters, average responders, and non-responders. Error bars represent standard error of the mean (SEM).

Discussion

- Our study demonstrates a remission rate of 22% with SCS at one year follow up with a total of 19.8% of our total patient cohort having an NRS of 0.

- Greater decreases in PCS and ODI correlate with remission.

- Patients with less optimistic outlooks and less belief in control of their pain may have increased operative disability and opioid use correlate with lower likelihood of remission.

- Multiple regression modeling showed ODI was the single largest contributor to NRS variability.

- This study and future studies on the topic would be important in improving criteria for patient selection and managing expectations.

Future Directions

- Further studies with a larger patient pool and multicenter studies would greatly benefit the neuromodulation community in gaining a better understanding of the impact of certain variables on patient remission rates following SCS implantation.
- This study and future studies on the topic would be important in improving criteria for patient selection and bettering treatment outcomes of SCS implantations.
- Understanding pain remission and the variables that promote remission could lead to fewer SCS revision surgeries, improved patient satisfaction, and even a reduction in opioid usage in the chronic pain patient population.

References


