

FACTORS AFFECTING LONG-TERM SUCCESS IN THE TREATMENT OF CHRONIC BENIGN PAIN BY SPINAL CORD STIMULATION

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We have an active database of 450 patients with a mean follow-up period of 97.6 months, with a study period spanning over 25 years. Analysis of this database has enabled us to identify predictors which influence the outcome.

Patient selection is an important tool to achieve long-term success. Psychological factors, like fear avoidance, depression or refusal to be weaned off narcotics should be avoided as they have a negative influence on long term success. Pre-implant McGill Pain Questionnaire scores and the percentage of VAS improvement during the trial period and subsequently in the first three months, is an important predictor of long-term success.

Trial stimulation is an important tool for reducing the rate of failed permanent implants, and improves cost-effectiveness. In our series 20% of patients failed the trial stimulation in spite of otherwise strict screening measures. The stimulation induced paraesthesia during a trial period should cover, if not the whole territory, a minimum of 85% of the area of pain, otherwise the results are less than optimal. In our series, a coverage of less than 70% invariably resulted in failure within the first three months.

The etiology of the pain syndrome has a strong influence on the success rate. Failed back syndrome, CRPS I and II, peripheral vascular disease, angina, multiple sclerosis and peripheral neuropathy giving a have shown to be high responders while phantom limb pain, stump pain, bone and joint pain, paraplegic pain, perirectal pain, central deafferentiation pain and post herpetic neuralgia were found to be poor responders.

The age of the patient does not seem to affect the success rate, however females have a better pain relief in the first year but in the long term males ended up with a higher success rate than females. Unilateral versus bilateral limb pain did not influence long-term success rates.

In patients who had undergone previous surgical procedures, the shorter the duration of pain to implantation the greater the success rate. Success rate decreases from approximately 85% with a delay of less than 2 years to approx 9% if the delay is 15 years or greater ($p < 0.001$). Those patients whose pain did not follow a surgical procedure had a better response to SCS than patients with multiple surgical procedures prior to the first implant ($p < 0.05$).

The multi-polar and multi-channel systems improve the long-term reliability and success rate (hazard ratio = 0.46 $p < 0.001$) and have proven to reduce the incidence of open surgery from 23% to 16 % to restore paraesthesia coverage and pain relief. Paddle electrodes yield higher success rates than percutaneously implanted systems. Complex programming using shielded cathodes, stimulation across the physiological mid-line and sub-second cycling can convert about 9.7 % of otherwise failures into the success group.

For patients who experience a predominance of axial pain in conjunction with neuropathic pain, the success rate is enhanced (VAS score for back pain was reduced by 58% and for radicular pain by 60%) by the use of staggered

quadripolar or octapolar electrodes and complex programming using a tripolar configuration.

Third Party coverage like the Workers' Compensation negatively affects the long term success by 12% and return to employment by 15%.

Reducing the complication rate directly affects long term success rates. Electrode fracture can be reduced by using a paramedian approach by approximately 20%. Further reduction of fracturing is possible through the use of a three wing plastic anchor placed immediately at the point of exit of the lead from the spine, with the anchor nose pushed through the deep fascia. This works by reducing the kink or the bend in the lead at the point of exit. The incidence of vertical displacement is less if a glue is used along with suture to fix the anchor to the deep fascia and if the pulse generator is implanted in the anterior abdominal wall (excursion 1.5cm during various body movement) as compared to the gluteal area (9cm excursion). The use of twist lock anchor should be avoided as it leads to a high rate of crushed cables and malfunctioning electrodes (17% of cases). Use of prophylactic antibiotics resulted in an infection rate of 3.4% at our centre as compared to the literature where infection rate ranges from 5-9%.

Regular follow-up with a dedicated neuromodulation nurse, to optimize the stimulation parameters and to trouble shoot the malfunctions is also important.