Spinal cord stimulation case series

Twenty-five consecutive patients received surgical implantation of a spinal cord stimulation electrode under conscious sedation using dexmedetomidine and local anesthesia. Vanhauwaert et al. evaluated the effects of the administered drug, patient comfort, and the adequacy of the stimulation pattern.

Twenty-four patients completed the procedure with only dexmedetomidine and local anesthesia. An infusion was started on average 55 minutes (sd 29) prior to incision. The mean dose of lidocaine was 430 mg (sd 95). There were no significant hemodynamic changes. The median time to reach Modified Aldrete's score postoperative was 67 minutes (sd 38). In 46% of the patients, the position of the electrode was changed guided by the feedback of the patient. More than half of the patients remember most details of the procedure. Only four patients mentioned substantial discomfort and only three would definitely not want to undergo this procedure again.

Implantation of spinal cord stimulation electrodes through a surgical laminectomy using dexmedetomidine is a safe and feasible procedure with adequate comfort for patients and surgeons. This way of working increases the optimal position of the electrode resulting in the most convenient stimulation pattern and avoiding revisions [1)].

A study of Kamieniak et al., from the Medical University of Lublin, was done to give new insights into the Spinal Cord Stimulation (SCS) mechanism of action and the role of MMP-2 and MMP-9 in the development of neuropathic pain (NP).

Clinical assessments were performed and biochemical markers were determined in two groups of patients: the control group (24 individuals) and the failed back surgery syndrome (FBSS) group (24 patients). Seventeen patients with the FBSS had SCS implanted and were examined before surgical procedure, one month after (17 patients), and three months after operation (12 patients). Clinical status was assessed with the use numeric rating scale, pain rating index of McGill pain questionnaire, Oswestry disability index and Beck depression inventory. MMP-2 and MMP-9 serum levels were determined using gelatin zymography. Immunoenzymatic method was employed to determine plasma concentrations of tissue inhibitors of metalloproteinases (TIMPs).

Levels of MMP-2 and TIMP-2 were higher in the FBSS group compared to the control group. The difference was statistically significant ($p < 0.001$ and $p = 0.004$, respectively). The concentration of MMP-2 was significantly increased ($p = 0.0135$) one-month post-SCS and remained elevated but stable up to three months after implantation. TIMP-2, MMP-2/TIMP-2, MMP-9, TIMP-1, and MMP-9/TIMP-1 serum levels did not change significantly.

Matrix metalloproteinases may play a role in the development of Failed Back Surgery Syndrome (FBSS) Spinal Cord Stimulation (SCS) increases the already elevated MMP-2 serum levels which are associated with Neuroinflammation in FBSS patients [2)].

2018

In a prospective multicenter open label trial, subjects were assigned to undergo asleep (n = 19) or awake (n = 11) SCS implantations in a nonrandomized fashion. Subjects received paddle leads following laminotomy. The process for intraoperative programming differed between the groups:

awake subjects participated by verbally reporting on pain-paresthesia overlap, while for asleep subjects, paresthesia location was inferred based on electromyographic monitoring.

Operative time was shorter for the asleep group compared to the awake group (88.9 ± 51.2 min vs 125.2 ± 37.9, respectively; P = .018), as well as 27% less total time spent in the operating room (95.4 ± 48.6 min vs 130.6 ± 39.9; P = .014). At 6 wk postimplant, subjects in the asleep group had better pain-paresthesia overlap than the awake group (83.5% ± 19.8 coverage vs 46.6% ± 44.5, respectively; P = .05) and fewer extraneous paresthesia (16.7% ± 23.1 vs 71.2% ± 30.3; P < .001). Both groups had equivalent levels of pain relief (more than 50%) after 6 and 24 wk of treatment. There were 2 adverse events in the asleep group compared to 6 in the awake group.

Electrophysiological monitoring during asleep SCS implantation is a robust tool becoming more frequently used. This comparative prospective series demonstrates that asleep placement allows for shorter procedure and operating room times with superior paresthesia coverage profiles, while maintaining lower adverse events and equal clinical outcomes for pain relief [3)].

2017

Implanting centers in three European countries conducted a retrospective chart review of SCS systems implanted from 2010 to 2013. Ethics approval or waiver was obtained, and informed consent was not required. The chart review recorded implants, follow-up visits, and date and reasons for any explants through mid-2016. Results are presented using Cox regression to determine factors associated with explant for inadequate pain relief. RESULTS: Four implanting centers in three countries evaluated 955 implants, with 8720 visits over 2259 years of follow-up. Median age was 53 years; 558 (58%) were female. Explant rate was 7.9% per year. Over half (94 of 180) of explants were for inadequate pain relief, including 32/462 (6.9%) of implants with conventional nonrechargeable SCS, 37/329 (11.2%) with conventional rechargeable and 22/155 (14.2%) with high-frequency (10 kHz) rechargeable SCS. A higher explant rate was found in univariate regression for conventional rechargeable (HR 1.98, p = 0.005) and high-frequency stimulation (HR 1.79, p = 0.035) than nonrechargeable SCS. After covariate adjustment, the elevated explant rate persisted for conventional rechargeable SCS (HR 1.95, p = 0.011), but was not significant for high-frequency stimulation (HR 1.71, p = 0.069).

This international, real-world study found higher explant rates for conventional rechargeable and high-frequency SCS than nonrechargeable systems. The increased rate for conventional rechargeable stimulation persisted after covariate adjustment [4)].

2012

A prospective trial enrolled 81 patients. The mean age was 57 years (range 27-82 years) with an almost equal sex distribution (male 47%, female 53%). Most patients (90%) had failed back surgery syndrome combined with lower extremity pain and lower back pain. A percutaneous paddle lead was implanted using a novel introduction system for percutaneous implantation. All implantations were performed under local anesthesia. Prior to the final implantation of the impulse generator, all patients underwent seven days of trial stimulation with pain assessment using a visual analog scale (VAS). The median follow-up was 12 months.

The data showed favorable clinical outcomes for paresthesia coverage and pain reduction (median

VAS 8.4 vs. 2.3), with a risk profile comparable with known percutaneous techniques. Compared with the published data (2-22%), the lead migration rate in this study was low (2.5%). No perioperative complications occurred.

This, minimally invasive percutaneous paddle lead is effective and safe, with a low migration rate. Placement can be done under local anesthesia, allowing an intraoperative assessment of the paresthesia coverage in terms of pain relief. This approach is less invasive and offers a faster and more comfortable procedure compared with laminotomy or laminectomy [5].

1)
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