

ECP-1. Multimodal, Intraoperative Monitoring during Paddle Lead Placement for Cervicothoracic Spinal Cord Stimulation

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Objective: We investigated the efficacy of combined somatosensory evoked potential (SSEP) and electromyography (EMG) monitoring during paddle lead placement through cervicothoracic laminectomy under general anesthesia in a retrospective review of data from 25 patients.

Methods: Muscle MEP recordings and SSEP monitoring were used for surveillance of the spinal cord. Collision testing of SSEPs and threshold amplitudes of compound muscle action potentials (CMAP) in the bilateral upper and lower extremities evoked by electrode contacts of the paddle lead were checked to determine the laterality of lead in mediolateral direction.

Results: A significant decrease in amplitudes of muscle MEPs in spite of stable SSEPs occurred in two patients: one patient with retrograde C1-C2 insertion and an other patient with anterograde C4/5 insertion. Repositioning of leads based on significantly asymmetrical collision testing of SSEPs and thresholds of CMAPs in bilateral extremities was needed in 6 and 8 patients, respectively. In 22 patients, paresthesia coverage of the painful area was consistently located in the painful side, either unilaterally or bilaterally. There was no episode of revision for suboptimal lead placement.

Conclusions: Intraoperative neurophysiological guidance using SSEP and muscle MEP was useful for safe and accurate placement of paddle leads for cervicothoracic SCS.

MEMO



ECP-2. Phantom Remodeling Effect of Dorsal Root Entry Zone Lesioning in Phantom Limb Pain Caused by Brachial Plexus Avulsion

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Objective: Dorsal root entry zone (DREZ) lesioning has been reported to be effective for phantom limb pain caused by brachial plexus avulsion pain. Most reports on DREZ lesioning for brachial plexus avulsion pain have focused on the results of pain relief without detailed description on phantom sensation following DREZ lesioning.

Methods: Two patients (one with amputation and the other non-amputated) with chronic intractable phantom limb pain caused by brachial plexus avulsion underwent DREZ lesioning on the avulsed segments of the cervical spinal cords. Changes of the phantom limb were observed.

Results: Immediately following DREZ lesioning, the phantom limb pain disappeared in the amputee, the phantom arm was shortened, and the phantom hand disappeared. The other patient with the non-amputated arm reported an immediate 50% reduction in the size of the phantom hand, pain relief was up to 70% of the preoperative phantom limb pain. There was no further change in the phantom arm and hand during the follow-up of 1.5 to 2 years.

Conclusion: Phantom arms and hands showed a prompt shortening and reduction in size rather than disappearance, following successful DREZ lesioning in patients with chronic phantom limb pain caused by brachial plexus avulsion.

MEMO



ECP-3. Botulinum Toxin Therapy for the Treatment of Hemifacial Spasm

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Objective: To report treatment results of hemifacial spasm patients who treated with botulinum toxin and consider the effect of botulinum toxin for neuro-functional disorders.

Methods: four patients underwent botulinum toxin therapy. Botulinum toxin was mainly injected affected side of periorbital area. 4 sites each on affected side were injected with 2.5 IU botulinum toxin. Injections for cheek, chin or neck area were added if needed.

Results: all treated patients had improvements of symptoms. Two patients got second treatment. The duration of effect was 16 weeks in average.

Conclusion: Botulinum toxin therapy is effective for the treatment of hemifacial spasm. This less invasiveness, less painful and less time-consuming treatment modality occupies some area for the treatment of neuro-functional disorders.

MEMO



ECP-4. Clinical Analysis of Forty-nine Patients with Hemifacial Spasm Treated by Vertebral Artery Transposition Using a Bioglue-coated Teflon Sling

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Objective: Hemifacial spasm (HFS) caused by vertebral artery (VA) compression is difficult to treat with a traditional decompression technique to cushion the offending vessel from the REZ of facial nerve using Teflon felt. The authors analysed the clinical data of fifty-four patients with HFS who were treated by VA transposition using a bio-glue coated Teflon sling.

Methods: Forty-nine patients with HFS caused by VA compression were treated with a transposition technique using a bioglue-coated Teflon sling. A usual suboccipital retrosigmoid craniotomy and infra-floccular approach was performed. The offending vertebral artery compressing from the REZ of facial nerve was mobilized and a hand-made bio-glue coated Teflon sling was inserted and passed around the VA and an end of the sling was suture fixed to the petrosal dura. during the procedure a rubber dam was applied to protect cerebellum. The length of sling was adjusted to transpose VA adequately without any kinking of the perforating vessels arising from the VA. If any offending vessel is detected after VA transposition, further decompressing procedure to put Teflon piece was applied.

Results: There were 28 male and 21 female patients. HFS developed on the left side in 39 cases and on the right side in 10. The mean age of onset was 52.9 years (range 22-71) and the mean duration of symptoms was 40.3 months (4 months-10 years). Mean follow-up duration was 66.9 months (range 13-121 months). All 49 patients had experienced complete resolution of their HFS. In all patients, lateral spread response was disappeared 2 weeks postoperatively when compared with the preoperative baseline. Postoperatively, MR imaging was obtained to demonstrate a transposed VA from the facial nerve in some patients (3 cases) whose spasm sustained several months postoperatively. Postoperative stroke was developed in one patient whose symptoms such as numbness of the hemibody improved gradually. No immediate postoperative facial weakness was developed. One patient suffered from hearing loss, another developed a postoperative transient unilateral vocal cord paralysis, and a patient developed delayed CSF leak which need operation for dural repair.

Conclusion: A transposition of VA using a bio-glue coated Teflon sling may be a safe and effective surgical technique to treat patients with HFS caused by VA compression.



ECP-5. A Preliminary Comparison of the Depressive Mood and Anxiety of Hemifacial Spasm Patients before and after Microvascular Decompression: Psychiatric Questionnaire Survey

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Objective: Depressive mood and anxiety which are quite common as a distinct entity, may also develop secondary to hemifacial spasm relative to their significant disfigurement. Few studies have examined mood disturbance due to facial twitching in patients with hemifacial spasm. This study aimed to compare the preoperative, postoperative evolution of mood disturbance in hemifacial spasm patients to examine the effect of surgical intervention on mood outcome.

Methods: This study used a longitudinal design and was qualitative in nature. Twenty hemifacial spasm patients were assessed before microvascular decompression by using the Liebowitz social anxiety scale (LSAS), Korean-social avoidance and distress scale (K-SAD), Hospital anxiety depression scale, Beck depression inventory (BDI), Beck anxiety inventory (BAI), and severity of facial spasm were assessed and ten patients among the patients were underwent above tests at pre-, and postoperative 1 month. Patients were tested pre-and postoperatively to measure any changes in their mood. Patients will be asked to complete a questionnaire about their health-related quality of life and satisfaction with the surgery at 6 months after surgery. Postoperative changes were examined using paired t-tests.

Results: Before surgery, hemifacial spasm patients had significant psychiatric histories with similarly high rates of depressive mood and social anxiety. There were improvement in facial twitching at 1 month postoperatively and the patients reported mood disturbance was significantly improved in proportion to the surgical outcome.

Conclusions: In this cohort of patients with hemifacial spasm who suffered depressive mood and anxiety, microvascular decompression significantly improved either their facial symptom or psychosocial problems. limitation of the work and suggestion for future research are discussed.



ECP-6. Long-term Efficacy and Tolerability of Vagus Nerve Stimulation in Patients with Intractable Epilepsy

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Objective: The aim of this study was to evaluate the long-term seizure outcome in patients with refractory epilepsy who were treated with vagus nerve stimulation (VNS).

Methods: This investigation was designed as an uncontrolled, open-label, retrospective and long-term study. From June 1999 to March 2015, 96 pts were implanted with VNS. Inclusion criteria were as the following: more than 2-year follow-up and documented seizure frequency before and after implantation. Seizure reduction was evaluated at 1, 2, 3 and 4 years after implantation. Primary outcome measures were the reduction in mean seizure frequency and responder rate (seizure reduction of at least 50%).

Results: In 96 patients, 56 patients (M:F=29:27) were included in the study. One excluded patient was removed VNS due to infection, thirty-seven were short follow-up duration, and two didn't record sz diary. Mean age at the time of implantation was 27.7 years (range 7-65) and mean disease duration was 16.5 years (range 1-45). Overall mean seizure reduction was 40.3%. The responder rates of yearly follow-up were 32.1% (n=56) at 1 yr, 39.3% (n=56) at 2 yrs, 35.3% (n=51) at 3 yrs, and 45.6% (n=46) at 4 yrs. During follow-up periods, 7 (12.5%) patients were removed or stopped VNS due to side-effects or no efficacy. Thirty-two (57.1%) patients suffered from minor side-effects (hoarseness, cough, throat discomfort). There were no differences of stimulation intensity or number of side-effects between responder and non-responder group.

Conclusion: Long-term outcome suggests that VNS is an effective treatment option that can be alternative to surgery in patients with refractory epilepsy.

MEMO



ECP-7. Cross-spectro-spatial Network Analysis of Cortical Stimulation Electrocorticography in Epilepsy

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Objective: Network analysis involving multiple frequencies and multiple electrocorticography channels was performed using cortical stimulation data.

Methods: 20 patients with medically intractable epilepsy operated after electrocorticographic monitoring between Sep. 2013 and Dec. 2014 were included for the study. Single pulse cortical stimulation evoked potential segments were selected for the analyses. Wavelet transform was performed in 22 frequencies from 0.5 to 625 Hz by complex Morlet wavelets. Network analysis encompassing multiple frequencies and channels were performed. Number of nodes were number of channels×number of frequencies. Connectivity was calculated between all combinations of nodes using mutual information. Nodes with high connectivity were clustered to identify cross-spectro-spatial cluster. Whether high-connectivity cluster more significantly located within seizure onset zone was tested using permutation analysis.

Results: In high connectivity cluster, broadband channels and narrowband channels coexisted. Theta or beta frequency distributed most widely within high-connectivity cluster. High connectivity cluster distributed significantly more significantly within seizure onset zones than non-high-connectivity cluster by 12%. This probability is $p < 4/10^6$ when calculated using permutation based on randomization test. Gradual high frequency decrements from broadband to narrowband channels within a high connectivity cluster occurred.

Conclusion: Epileptic network involves both broadband and low-frequency narrowband portions. Whole extent of epileptic network is identified by low-frequency area. Broadband portion including high-frequency is more localized. Transition between broadband and low-frequency portion is gradual and may be related to different propagation range according to frequency.



ECP-8. Patient's Selection and Practices of Intrathecal Baclofen Pump Implantation

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Intrathecal baclofen therapy (ITB) has been successfully used for the treatment of spasticity. ITB therapy is one of the most important developments in the management of spastic hypertonia and other related features of the upper motor neuron syndrome (UMNS). It is effective in reducing spastic hypertonia caused by cerebral palsy, cord injury, brain injuries, multiple sclerosis, and stroke, among other conditions. This technique allows for reduced medication doses that can decrease the side effects typically associated with oral or parenteral drug delivery.

However, complications occur among patients with ITB therapy. These problems may involve the medication (eg, known adverse effects of baclofen such as drowsiness and weakness) but more frequently result from malfunction of the ITB system, thereby leading to underdosing or interruption of drug delivery. The latter scenario may lead to a potentially life-threatening withdrawal syndrome. Hence, it is important to reliably identify the cause of the malfunction so that corrective measures occur without delay. Complications often are identified with readily available tests, as in the case of plain radiographs demonstrating a catheter fracture. Sometimes more involved procedures may be needed to detect the source of the malfunction. A fluoroscopic dye study may confirm the presence of small tears in the catheter, whereas a “rotor study” may reveal a pump stall. There are instances in which these tests may not reveal the problem, and the clinician is challenged to establish the presence and cause of the problem and devise an appropriate treatment plan. Physicians should be aware of mechanical, pharmacological, surgical, and patient-specific complications, including possible granuloma formation. Newer intrathecal drug delivery systems may allow for better safety and quality of life outcomes. In this presentation, we will present the result from 13 patients with baclofen pump implantation for severe spasticity caused by various neurological conditions, and discuss about the issues regarding patient's selection and practices.

