



Editor:

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## Chairman's Message

Jaimie Henderson, M.D.



Jaimie Henderson, M.D.

As we move into 2003, neurosurgical pain management continues to face significant challenges. The Joint Section on Pain is involved in efforts on several fronts to address these challenges and maintain neurosurgical leadership in the management of pain. One important effort involves educating our colleagues about the advances in pain medicine which offer hope for patients with intractable pain. As announced in the last newsletter, the Pain Section will be presenting a special symposium at the annual meeting of the Joint Section on Spine & Peripheral Nerves in Tampa, Florida on March 8, 2003. Dr. Ed Benzel and I will be co-chairing the symposium, which will focus on various options for the treatment of spinal pain, both from a reconstructive and a symptomatic standpoint. Six didactic lectures and two hours of case discussions will address the difficult problem of axial back pain. Interest in this symposium is quite high, and I would encourage

section members to attend. Please also join us for the annual meeting of the American Association of Neurological Surgeons in San Diego from April 26 – May 1 (see page 7). Dr. Kenneth Follett will be chairing a breakfast seminar on Monday, April 28 on the neurosurgical management of intractable pain. The Pain Section Scientific Session will begin at 2:45 PM on Tuesday, April 29 with a special symposium comparing spinal fusion vs. interventional techniques in low back pain. The William Sweet Young Investigator's Award will be presented at 4 PM, followed by open papers. I hope to see you all in San Diego.

Progress has been made in creating a position statement on the qualifications of neurosurgeons to care for pain patients and to perform interventional treatments for pain. This statement has been approved by the Executive Committee of the CNS, and is awaiting approval by the Board of Directors of the AANS. Any neurosurgeon who is experiencing difficulty in obtaining privileges to practice in the area of pain can contact the Chairman of the Pain Section and obtain a package of materials including this position statement as well as supporting documentation of neurosurgical training in pain. Armed with this information, neurosurgeons have a fighting chance against those who would seek to use misinformation to restrict our practice. The statement as approved by the CNS is as follows:

1 Neurosurgeons are well-trained in the diagnosis, management and interventional treatment of patients with pain. Successful completion of the primary written board examination of neurosurgery requires detailed knowledge of the neuroanatomical substrates of pain perception from subcutaneous receptors, peripheral nerves, the spinal cord, and brainstem to the thalamus and cerebral cortex. Neurosurgery residents are exposed during their 5 years of formal training to a wide variety of painful conditions including spinal pain, trigeminal neuralgia, cancer pain, post-stroke and post-spinal injury pain, headache, complex regional pain syndrome, painful neuropathies and others. They are educated on the pathophysiology of pain syndromes and their management. The neurosurgery resident curriculum (available at [www.neurosurgery.org/resident/curriculum/pain.html](http://www.neurosurgery.org/resident/curriculum/pain.html)) details specific areas of knowledge that residents are expected to have mastered upon completion of their

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## Consultants' Corner

The following materials and text, were provided by Jaimie Henderson, M.D. (hypothetical case notes) and Yücel Kanpolat, M.D., (discussion). These hypothetical cases and discussions were originally presented at the 52nd CNS Meeting, Philadelphia 2002, as part of the Consultants' Corner Session on Management of Intractable Pain. This represents two consult discussions from one of the five contributors who took part in this session. The other contributors, whose consult discussions are not included here were; Nicholas Barbaro, M.D., Giancarlo Barolat, M.D., Kenneth Follett, M.D., Ph.D., and Andrew Shetter, M.D.

### Consult 1 – hypothetical case notes

- ◆ 61 year old woman
- ◆ known carcinoma of the lung
- ◆ metastases to liver
- ◆ 3 year history of right shoulder pain with radiation into the upper arm
- ◆ described as aching, burning
- ◆ worse with activity and use of right upper extremity
- ◆ pain is constant with some waxing & waning
- ◆ pain rated by verbal scale as 8/10 most of the time, 6/10 at its best, and 10/10 at its worst
- ◆ known Pancoast tumor
- ◆ considered non-resectable
- ◆ has had RT and chemotherapy
- ◆ presently no pain at any other site
- ◆ taking MS Contin 120 mg / day, “takes the edge off”
- ◆ visible right forearm atrophy
- ◆ mild distal weakness including finger flexion and finger extension
- ◆ decreased sensation in C7 – T4 dermatomes

### Dr Kanpolat discusses the options:

The surgical procedure of choice must be tailored in accordance with an evaluation of the patient's general condition and pain type.

This patient had plexopathy due to lung carcinoma. The pain type was not singular (both nociceptive and neuropathic pain were present), and thus could not be treated by a simple procedure.

Theoretically, the best procedure for this patient is the DREZ procedure, since this provides a possible mechanism to control both the nociceptive and neuropathic pain. However, the general condition of the patient indicated that this very sophisticated procedure was not optimal.

Cordotomy is a very effective procedure to control nociceptive pain (Fig. 1).

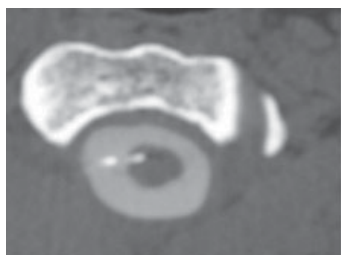


Fig. 1 Antero-medial localization of electrode in lateral spinothalamic tract at C1-C2 level in CT-guided percutaneous cordotomy.

With the help of CT-guidance, the anterior medial portion of the lateral spinothalamic tract, which contains the pain fibers of the arm and chest regions, can be approached and destroyed easily and safely (1-2). In practice, I performed 175 CT-guided cordotomy procedures between 1988-2002. One hundred and

sixty-five were cancer pain patients, 13 of which presented as Pancoast tumors. Cordotomy effectively controlled nociceptive pain in all patients. No mortality was observed in the series and no complications were observed in the Pancoast tumor group. In conclusion, I select CT-guided cordotomy as a safe and effective procedure for nociceptive pain. If neuropathic pain is the dominant pain type, I do not perform cordotomy, but rather recommend three-cyclic antidepressant and gabapentin treatment.

### References:

1. Kanpolat Y. in Burchiel KJ (ed): *Percutaneous Stereotactic Pain Procedures: Surgical Management of Pain*. New York, Thieme 2002;745-762.
2. Kanpolat Y, Akyar S, Caglar S, Unlu A, Bilgic S. CT-Guided percutaneous selective cordotomy. *Acta Neurochir (Wien)* 123:92-97, 1993

### Consult 2 – hypothetical case notes

- ◆ 38 year old woman
- ◆ three year history of pain in lower right face
- ◆ found to have inflammatory condition of the the submandibular gland and had this removed, with initial good pain relief
- ◆ pain recurred about 6 months later
- ◆ now agonizing and constant
- ◆ described as constant burning sensation
- ◆ intermittent sharp, “ice pick” pain
- ◆ worse with stress, talking, eating, swallowing
- ◆ no trigger zones
- ◆ numerous attempted interventions:
  - local injections
  - sympathetic blockade
  - sphenopalatine block
  - percutaneous trigeminal gangliolysis
  - none offered significant relief
- ◆ opioids make her sleepy and do not help the pain
- ◆ decreased pinprick third trigeminal division
- ◆ no allodynia or hyperpathia
- ◆ facial movement and muscles of mastication symmetric

### Dr Kanpolat discusses the options:

Atypical facial pain is one of the most complicated and problematic cases in our practice. Atypical facial pain is a central pain problem. In the surgical treatment of this type of pain, one must remember that peripheral destructive procedures are counterproductive, actually worsening the pain. Mesencephalic tractotomy and nucleus caudalis DREZ operation are indicated for this type of pain problem, however both procedures present risks.

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## Selected Open Papers

### Annual CNS Meeting, Philadelphia 2002

The following materials and text provided by the authors were originally presented at the 52nd CNS Meeting, Philadelphia 2002 as part of the open papers section. Open paper abstracts were also included on the abstract program CD.

### Somatotopic Arrangement of Postgasserian Fibers in Trigeminal Neuralgia: A Computer Analysis Using the Multielectrode Technique

*Eduardo A. Karol, Marcelo Larramendy, and Juan A. Piantino.*

**Introduction:** In an attempt to minimize residual current morbidity after thermocoagulation in trigeminal neuralgia a multielectrode method and technique were described. Out of 348 thermocoagulations for trigeminal neuralgia performed since 1974, the present report describes the somatotopic organization of postgasserian fibers found using such technique in most of the last 145 consecutive procedures.

**Methods:** An outer needle is introduced into the inner third of the oval foramen avoiding blind and suboptimal positions. The multielectrode is then introduced so its four successive 2.9 mm caps protrude at the tip of the outer needle. All verbal and motor responses after electrical stimulation at each of the caps from 0.1 V at 5 and 75 Hz are registered on each procedure. Whenever feasible, verbal responses were codified within 34 possible responses corresponding to subsegments of the three trigeminal divisions. Only responses elicited under 0.5 V were considered for inclusion in the somatotopic map or the performance of lesions. The smallest safest target can then be chosen knowing which subsegment is located in front and behind. Lesions could never exceed the size of the chosen target.

**Results:** The somatotopic arrangement of postgasserian fibers is described using a computerized protocol for thermocoagulation in trigeminal neuralgia, to analyze statistically the combination of histograms.

**Conclusions:** Selective small lesions performed with a precise knowledge of the threshold, semantics and relative position of each trigeminal subsegment within a known physiological map are shown to be useful to minimize unnecessary morbidity from percutaneous thermocoagulation in trigeminal neuralgia.

### Epidural Cortical Mapping in the Treatment of Atypical Facial Pain with Epidural Motor Cortex Stimulation

*Jorge Gonzalez-Martinez, Dileep R. Nair, Ajay Gupta, Riki Matsumoto, Eric LaPresto, Ashwini Sharam, Jaimie Henderson, and Ali Rezaei.*

**Introduction:** Epidural electrical stimulation of the motor cortex has been used to treat patients with intractable facial pain. Because visualization of the cortex is not possible in this surgery a combination of cortical somatosensory evoked potentials (SSEPs), cortical stimulation, and intraoperative image guided system are used to localize the precentral cortex. The aim of this study is to identify parameters of the cortical facial SEP that best helps in the localization of the

central sulcus in epidural mapping.

**Methods:** Cortical lip SSEPs were recorded using a 4 X 4 array of electrodes placed over the perirolandic area in the epidural space in two patients undergoing intraoperative mapping for epidural motor cortex stimulation for facial pain. The largest amplitude positive and negative peaks (P1/N1) responses were measured between 12 to 30 msec. Cortical stimulation for face motor response was mapped. Central sulcus was correlated with electrode location by intraoperative 3-D MRI.

**Results:** Identification of the largest amplitude N1 late component of the lip SSEP was best correlated with localization of the central sulcus. The voltage fall off of the lip SSEPs responses appeared maximum over the precentral gyrus associated with face motor activity as determined cortical stimulation and pre-operative MRI co-registered images. The electrode associated with facial motor contractions were both one cm anterior to the electrode showing the maximum amplitude deflection on lip SSEPs. This region of face motor response as determined by cortical stimulation was immediately posterior to the intersection of the inferior frontal and pre-motor sulcus.

**Conclusions:** The maximum amplitude of the middle and late potentials for the lip SSEP best correlates with central sulcus. The lip SSEPs voltage fall off appears to be maximum over the face precentral gyrus. Whether this field of lip SSEP responses is unique to patients with facial pain or an artifact of epidural mapping is not known.

### Epidural Motor Cortex Stimulation for Atypical Facial Pain

*Jorge Gonzalez-Martinez, Ashwini Sharan, Jaimie Henderson, Massud Turbay, Dileep Nair, Michael Stanton-Hicks, and Ali Rezaei.*

**Introduction:** Atypical facial pain represents a heterogeneous group of patients and results of surgical interventions have been disappointing. We describe our experience in the treatment of medically untreatable atypical facial pain with motor cortex stimulation (MCS).

**Methods:** Between March 2000 to July 2001, 8 patients with atypical facial pain underwent motor cortex stimulation at our institution. The mean age was 50.6 years (SD 18 years) and the mean duration of the pain syndrome was 8.2 years. Intraoperative frameless stereotactic navigation and somatosensory evoked-potential mapping were used to localize the pre-motor cortex. The Visual Analogue Scale (VAS) was used to assess pain control. Patients were submitted to trial stimulation for up to 8 days before permanent implantation.

**Results:** Four patients underwent implantation with one quadripolar lead and four patients underwent implantation with two quadripolar leads. In all patients motor threshold were obtained in the post-operative period. Four patients had pain in the V2-V3 type region and 4 patients had pain in V3 type region. The mean follow up was 13.8 months. Pre-operatively, 7 patients had VAS score of 10 and 1 patient had VAS of 9. In 7 patients, 50-60% reduction in pain was achieved and in 1 patient, only 30% relief was noted. Stimulation parameters commonly used were 50 Hz rate, 250 ms

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# Symposium on Facial Pain

The following two abstracts provided by the authors were originally presented at the 52nd CNS Meeting, Philadelphia 2002 as part of the Symposium on Facial Pain. The other contributor, whose abstract is not included here was John Gorecki, M.D.

## Classification of Facial Pain

**Kim J. Burchiel, M.D.**

The field of pain medicine is in need of improved communication, and standardization of pain syndromes. Facial pain presents a unique opportunity, in this regard given that the patient's history is the most powerful instrument in establishing an accurate diagnosis. The facial pain syndrome, trigeminal neuralgia, a unique form of neuropathic pain, was first described over 300 years ago (1) and to date no natural history review has ever been published on the topic. Many cases of facial pain seen in a neurologist's or neurosurgeon's practice are trigeminal neuralgia, or one of its variants. As Hutchinson (2) so eloquently stated, a classification system of facial pain should be "a scientific classification, based solely upon the causes of neuralgia;" i.e. based on a comprehensive evaluation of the underlying pathophysiology of the neuralgia.

In general, TN is a condition, which is relatively easy to diagnose and proposed are seven diagnoses that can virtually describe all patients presenting themselves to a clinical neuroscience practice with a primary complaint of facial pain:

1. Trigeminal neuralgia, types 1 (TN1), spontaneous onset of facial pain, predominantly episodic.
2. Trigeminal neuralgia, types 2 (TN2), spontaneous onset of facial pain, predominantly constant.
3. Trigeminal neuropathic pain (TNP), unintentional injury to the trigeminal nerve from trauma, or surgery.
4. Trigeminal deafferentation pain (TDP), injury to the nerve by peripheral nerve ablation, gangliolysis, or rhizotomy in an intentional attempt to treat either trigeminal neuralgia or other facial pain.
5. Postherpetic neuralgia (PHN), follows a cutaneous *Herpes zoster* outbreak (shingles) in the trigeminal distribution.
6. Symptomatic trigeminal neuralgia (STN), results from multiple sclerosis.
7. \*Atypical facial pain (AFP), is synonymous with facial pain secondary to a somatoform pain disorder. Atypical facial pain can be suspected, not diagnosed, by history, and can only be diagnosed with detailed and objective psychological testing.

Using this simple and reductive process, patients can be accurately diagnosed, and be considered for therapies appropriate to their conditions. A more objective classification system will also facilitate both natural history studies and outcome studies of facial pain. It is my hope that this scheme will be used by others involved in the care of patients with facial pain, or at the very least, will serve as a catalyst for

### Diagnosis

Trigeminal neuralgia, type 1, (TN1)

Trigeminal neuralgia, type 2, (TN2)

Trigeminal neuropathic pain, (TNP)

Trigeminal deafferentation pain, (TDP)

Symptomatic trigeminal neuralgia, (STN)

Postherpetic neuralgia, (PHN)

Atypical facial pain, (AFP)\*

### History

*spontaneous onset*

◆ > 50% episodic pain

◆ > 50% constant pain

*trigeminal injury*

◆ unintentional, incidental trauma

◆ intentional deafferentation

multiple sclerosis

trigeminal Herpes zoster outbreak

somatoform pain disorder

further discussion, better classification, and more rigorous and objective natural history and outcome studies of facial pain in the future.

### References:

1. Lewy FH: The first authentic case of major trigeminal neuralgia and some comments on the history of this disease. **Ann Med Hist** 10:247-250, 1938.
2. Hutchinson, J: *The Surgical Treatment of Facial Neuralgia*. New York, Wm. Wood & Co., 1905, p1.

## Motor Cortex Stimulation for Facial Pain

**Joshua M. Rosenow, M.D., Ashwini Sharan, M.D., Ali R. Rezai, M.D.**

Many types of chronic neuropathic pain may become refractory to conventional medical therapies. In 1991, Tsubokawa *et al.* (1) first reported experience in twelve patients with deafferentation pain treated with epidural motor cortex stimulation. A stimulating electrode was placed epidurally such that stimulation of the underlying cortex produced motor contractions in the painful region. Previous experience by the same group revealed that stimulation of the post-central gyrus exacerbated the pain.

The precise mechanism of action of epidural cortical stimulation remains uncertain. The central idea underlying the therapeutic effect of MCS is activation of non-nociceptive sensory neurons that are believed to exert an inhibitory effect on their nociceptive counterparts. This type of interaction may be present at multiple levels of the somatosensory pathway along the peripheral and central nervous systems.

Modeling of the current fields demonstrated that the majority of the activating function of the stimulus reaches the crown of the gyrus, rather than deep into the sulci. Given

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# Calendar of Events

that the majority of cells comprising the motor cortex proper reside within the depths of the sulci rather than in the crown of the gyrus, then this analysis shows that these are not the predominant cell type affected by epidural stimulation. Therefore, it may be more proper to use the term precentral stimulation to reflect the fact that the primary target is not motor cortex *per se* but the precentral gyrus.



Clinical experience has proven efficacy in many patients with a variety of refractory pain syndromes. Motor cortex stimulation has been described in patients with thalamic or subcortical pain, post-stroke pain, phantom limb pain, complex regional pain syndrome, trigeminal and atypical facial pain. The short term results tend to be very good, with a majority of patients achieving >50% pain relief. However, long term follow up reveals that many patients do experience tolerance to the therapy.

For a patient to be a candidate for MCS, it is essential that cortical stimulation be possible in the homuncular region corresponding to the painful area. Patients who have suffered large cortical strokes and have significant encephalomalacia in the corresponding region of cortex are not optimal candidates. Additionally, Tsubokawa has also suggested that a beneficial response to barbiturate infusion may predict a positive response to MCS.

The procedure is performed in two stages. The electrodes are placed using frameless stereotactic guidance to center the craniotomy flap over the central sulcus. Intraoperative electrophysiology then specifically localizes the sulcus by looking for phase reversal of the N20 SSEP wave. One 4-contact electrode array is placed directly over the precentral gyrus and another just posterior to it. The patient then undergoes a 3-5 day period of externalized in-house testing to determine if the therapy is effective. The patient returns to the OR after the testing period for either implantation of a permanent pulse generator or removal of the system, depending on the results of the trial.

The most common complications include infection requiring removal of the system, a change in the electrode impedance requiring re-exploration; hardware malfunction from lead breakage, increased pain related to the stimulation, and seizures. Seizures in these patients are almost always directly related to the high energies used to obtain pain relief. They respond rapidly to a reduction in stimulation voltage and usually do not require chronic anticonvulsant coverage. We have only had 1 patient who was forced to permanently deactivate the stimulators due to seizures. Permanent complications are uncommon. More scientific evidence is warranted to understand the precise mechanism for this treatment modality. A larger organized clinical trial is desired to establish the efficacy.

## References:

1. Tsubokawa T. Katayama Y. Yamamoto T. Hirayama T. Koyama S. Chronic motor cortex stimulation for the treatment of central pain. *Acta Neurochirurgica - Supplementum* 52:137-9, 1991.

## Future AANS Annual Meetings

2003 San Diego  
2004 Orlando  
2005 New Orleans



American  
Association of  
Neurological  
Surgeons

## Future CNS Annual Meeting Sites

2003 Denver October 18-23  
2004 San Francisco October 16-21  
2005 Boston October 8-13  
2006 Chicago October 7-12  
2007 San Diego September 15-20  
2008 Orlando September 20-25  
2009 New Orleans October 24-29



## Other Pain Meetings of Interest

### February 18-23, 2003 - 19th Annual Meeting American Academy of Pain Medicine

Location: The Fairmont, New Orleans, La.  
WWW: [www.painmed.org/](http://www.painmed.org/)  
e-mail: [aapm@amctec.com](mailto:aapm@amctec.com)

### March 20-23, 2003 - 22nd Annual Scientific Meeting of the American Pain Society

Location: Hyatt Regency, Chicago, Illinois  
WWW: [www.ampainsoc.org](http://www.ampainsoc.org)  
e-mail: [info@ampainsoc.org](mailto:info@ampainsoc.org)

### April 26 - May 1, 2003 - Annual Meeting of the AANS

Location: San Diego, Calif.  
WWW: [www.neurosurgery.org/aans/meetings/2003](http://www.neurosurgery.org/aans/meetings/2003)  
Phone: 1.800.566.AANS (2267) or 847.378.0500

### October 18-23, 2003 - Annual Meeting of the CNS

Location: Denver Co.  
WWW: [www.neurosurgery.org/cns/meetings/2003/](http://www.neurosurgery.org/cns/meetings/2003/)  
**Abstract deadline April 4, 2003**

### June 6-9, 2004 - Joint APS and Canadian Pain Society Annual Meeting (23rd APS Annual Scientific Meeting)

Location: Vancouver, British Columbia Canada  
WWW: [www.ampainsoc.org](http://www.ampainsoc.org)  
e-mail: [info@ampainsoc.org](mailto:info@ampainsoc.org)

### August 21-26, 2005 - 11th World Congress on Pain®

Location: Sydney, Australia  
WWW: <http://www.iasp-pain.org/05Cong.html>  
e-mail: [iaspdesk@juno.com](mailto:iaspdesk@juno.com)

# Trigeminal Neuralgia and Other Cranial Nerve Syndromes: Multimodality Approaches

The following materials and text provided by Ronald Brisman, M.D. in this issue were originally presented at the 52nd CNS Meeting, Philadelphia 2002 as part of the Luncheon Seminar "Trigeminal Neuralgia and Other Cranial Nerve Syndromes: Multimodality Approaches". This represents one of the three presentations, the others, not summarized here included, Jeffrey A Brown, M.D. and Peter Jannetta, M.D., DSc.

## Trigeminal Neuralgia and Gamma Knife Radiosurgery Ronald Brisman, M.D.

**Introduction and Method:** Three hundred and three patients with typical trigeminal neuralgia were treated by the author with gamma knife radiosurgery between May 1998 and July 2002 with 75 Gy maximum dose. There was recurrence that required further surgery for trigeminal neuralgia, either with gamma knife radiosurgery or a different procedure, in 60 (20%) patients. Questionnaires were filled out by the remaining 80% of patients. There were 175 patients from this group who did not have another surgery and were available for at least 3 months of follow up.

**Results:** Of the above 175 patients, 96.4% felt they had some improvement from the procedure, 90% had at least 50% improvement, 80% had at least 75% improvement, and 68% had at least 90% improvement. Patients graded their pain relief, (Table 1). Patients also reported on their percent of pain relief, (Table 2). Of the 21 patients who had 75 to 89% pain relief, 3 (14.3%) considered their pain relief as excellent, 17 (80.9%) said it was good, and 1 (4.8%) said it was fair. Of 18 patients who had 50 to 74% pain relief, 6 (33.3%) considered their pain relief as good, 11 (61.1%) said it was fair, and 1 (5.6%) said it was poor.

**Conclusion:** Most patients with trigeminal neuralgia treated with gamma knife radiosurgery have some pain relief. Those who have 75 to 89% pain relief usually describe their pain relief as excellent or good. Most of those with 50 to 74% pain relief describe their pain relief as fair.

Graded pain relief	No. of patients	% of patients (n=175)
Excellent	102	58.3%
Good	43	24.6%
Fair	18	10.3%
Poor	12	6.9%

Table 1. Patient graded pain relief

Percent of pain relief	No. of patients	% of patients (n=175)
90-100%	119	68%
75-89%	21	12%
50-74%	18	10.3%
1-49%	11	6.3%
0	6	3.4%

Table 2. Percent of pain relief

### Selected Open Papers (cont. from Page 3 ...)

pulse width, and amplitude at 80% of the motor threshold. No major complications were observed. Two patients experienced transient seizures associated with stimulation. One patient required revision of the system.

**Conclusions:** Our experience confirms that MCS is safe, and most patients can experience >50% pain relief. Achieving motor threshold with stimulation appears essential to the success of the therapy. Recurrent symptoms could be recaptured with revision surgery and localization of face area is easily achieved with sensorimotor mapping with image-guided orientation.

## Treatment of Chronic Pain by Intrathecal Drug Therapy versus Conventional Pain Therapies: A Cost-effective Analysis

Krishna Kumar, Gary Hunter, Denny Demeria, Samaad Malik.

**Introduction:** The object of this study is to compare the

cost-effectiveness of intrathecal drug therapy (IDT) to chronic pain therapy (CPT) in patients with chronic back pain secondary to failed back syndrome. In this study, we have tabulated actual costs, in Canadian dollars, of consecutive series of IDT patients and have compared it to a control group. The influence of treatments on quality of life is also analyzed.

**Methods:** Sixty-seven patients suffering from failed back syndrome, of which 23 underwent implantation of a programmable drug delivery pump, while 44 patients acted as controls. We followed these patients for a five-year period and tabulated the actual costs incurred in diagnostic imaging, professional fees, implantation costs including hardware, nursing visits for pump maintenance, alternative therapies, and hospitalization costs for breakthrough pain. From this data, cumulative costs for each group were calculated for a five-year period. An analysis of the Oswestry questionnaire

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# Hightlighting Pain at the AANS Meeting 2003

041

Sunday, April 27

8:00 AM – 5:00 PM

## Practical Clinic

### Trigeminal Neuralgia: Surgical Indications and Alternative Treatment of Vascular Compression Syndrome

**CO-DIRECTOR:** Jeffrey A. Brown, MD, Peter J. Jannetta

**FACULTY:** Kenneth F. Casey, Hae-Dong Jho, G. Robert Nugent, Jamal M. Taha, Harry R. Van Loveren

**Clinic Fee:** \$350

**Material Fee:** \$450

**Total:** \$800

Participants will practice placement of a spinal needle or cannula at the foramen ovale for balloon compression and RC rhizotomy of the 5th nerve. They will also practice the posterior fossa approach for microvascular decompression of the 5th nerve.

5:00 – 6:00 PM

## Executive Council Meeting

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Monday, April 28

7:30 – 9:30 AM

## Breakfast Seminar

### Neurosurgical Management of Intractable Pain:

## Techniques and Outcomes

**MODERATOR:** Kenneth A. Follett,

**PANELIST(S):** Nicholas M. Barbaro, Jaimie M. Henderson, Marc P. Sindou.

This seminar will review indications, techniques, and outcomes of augmentative and ablative neurosurgical procedures for the treatment of intractable pain. Attention will be directed toward therapies that can be used in a general neurosurgical practice, including cordotomy, drez lesioning, neuraxial drug infusion and neurostimulation.

721

4:30 – 4:45 PM

## Scientific Session II Prognostic Factors for Radiofrequency Facet Rhizotomy for Chronic Low Back Pain

**AUTHORS:** Jung Y. Park, Se H. Kim, Dong J. Lim, Sung K. Ha, Jung S. Suh

**DISCUSSANT:** Richard B. North

AANS/CNS Section on Pain

Tuesday, April 29

2:45 – 5:30 PM

**MODERATOR:** Jaimie M. Henderson

This session will serve as a forum for the presentation of topics on the neurosurgical management of pain.

## LEARNING OBJECTIVES:

After completing this session participants should be able to discuss the latest advances in the neurosurgical management of pain.

2:45 – 4:00 PM

## Special Symposium:

### Interventional Techniques vs. Spinal Fusion in Low Back Pain

**MODERATOR:** Oren Sagher

**SPEAKERS:** Steve L. Ondra, Robert M. Levy

4:00 – 4:15 PM

## William H. Sweet

### Young Investigator's

### Award Motor Cortex

Stimulation for Neuropathic Facial pain: Results of Multidimensional Pain Scale Evaluation and Observations of Sensory and Motor Improvement during Stimulation

**RECIPIENT:** Julie G. Pilitsis

813 – 817

4:15 – 5:30 PM

## Scientific Session

5:30 – 6:30 PM

## Buisness Meeting

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Wednesday, April 30

7:30 – 9:30 AM

## Breakfast Seminar

### Treatment of Complex Regional Pain Syndrome and Hyperhidrosis

**MODERATOR:** J. Patrick Johnson

**PANELIST(S):** Samuel J. Hassenbusch,

Joshua Prager, Ali R. Rezai  
This seminar will present current management concepts and emerging state-of-the-art techniques and technology to treat symptomatically mediated disorders that include complex region pain syndrome and hyperhidrosis.

## LEARNING OBJECTIVES:

After completing this seminar, participants should be able to:

- Recognize and diagnose complex regional pain syndrome
- Describe treatment options for complex regional pain syndrome
- Discuss current treatment of hyperhidrosis

2:00 – 2:45 PM

## Pain Posters

## Letters to the Editor

One of the main purposes of *Pain News* is to promote communication among section members. Your questions, comments and insights increase the value of the section for all. Please send your input to Kim J. Burchiel, M.D., editor, *Pain News* at [burchiek@ohsu.edu](mailto:burchiek@ohsu.edu) or by fax to (503) 494-7161.

## Correction:

Jon T. Ledlie, M.D. was mistakenly affiliated with Silent Partners in Austin, TX, in the previous issue of this newsletter. Jon T. Ledlie, M.D. is in fact affiliated with Tyler Neurosurgical Associates in Tyler, TX.

## Member News Wanted !!!

AANS/CNS Pain Section wants to recognize the accomplishments of its members. Submit your information for the fall 2003 issue of the Joint Section on Pain Newsletter to Shirley McCartney, Ph.D., at [mccartns@ohsu.edu](mailto:mccartns@ohsu.edu)

## Moved? New E-mail?

Notify AANS, CNS and ABNS of changes to your contact information on-line. Go to [www.neurosurgery.org/directory](http://www.neurosurgery.org/directory), locate your record by searching on your name, click the "update your listing" button, and follow the instructions to quickly and easily update your listing for all three organizations at once.

# Pain Books



## Thieme Medical Publishers 2003

Effective July 1, 2002, Thieme became the official book publisher of the AANS.

Resnick / Haid

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(Distributed by Thieme for the American Association of Neurological Surgeons)

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Burchiel

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Mongini

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O'Shea

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Edited by Blaine S. Nashold Jr., Robert D. Pearlstein Ph.D.,

Allan H. Friedman M.D., Janice Ovelmen-Levitt Ph.D.

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## Consultants' Corner (cont. from Page 2 ...)

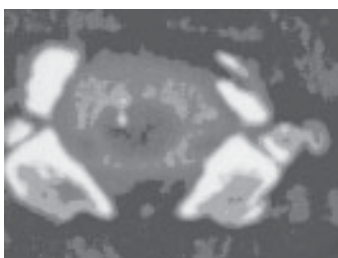


Fig.1: Postero-lateral localization of electrode in occiput - C1 level in nucleus caudalis and descending trigeminal tractus in CT-guided tractotomy-nucleotomy.

I recommended trigeminal tractotomy-nucleotomy for this patient's central pain problem. With the help of CT-guidance, the procedures can be performed safely and effectively (1-2). Destruction of the oral pole of the nucleus caudalis decreases the discharge in the nucleus and alleviates the central pain problem (Fig. 1). I performed CT-guided trigeminal tractotomy-nucleotomy on 50 cases between 1988-2002, with no mortality. Fourteen

cases were atypical facial pain, and complete or partial pain relief was obtained in 10 cases. In two cases in which results were unsatisfactory, I used the nucleus caudalis DREZ operation, and it was partially effective. In conclusion, no peripheral destructive procedure is proposed for this patient. I recommend, firstly trigeminal tractotomy-nucleotomy, followed by nucleus caudalis DREZ, only if the first procedure was insufficiently effective.

### References:

1. Kanpolat Y. in Burchiel KJ (ed): *Percutaneous Stereotactic Pain Procedures: Surgical Management of Pain*. New York, Thieme 2002;745-762.
2. Kanpolat Y, Savas A, Caglar S, Aydin V, Tascioglu B, Akyar S: Computed Tomography-Guided Percutaneous Trigeminal Tractotomy-Nucleotomy, Techniques in Neurosurgery (Vol. 5) 3:244-251, 1999

was done to assess impact of treatment on quality of life.

**Results:** The actual cumulative costs for IDT over a five-year period were \$29,410, versus \$38,029 for CPT. High initial costs of equipment required for IDT are recovered by 28 months. After this point, managing patients using CPT became the more expensive treatment option for the remainder of the follow up period. The Oswestry Index showed a 27% improvement with 3 patients resumed employment for the IDT group, as compared to 12% improvement with no patient returning to employment in controls.

**Conclusions:** IDT is cost-effective in the long term despite high initial costs of implantable devices.

## The Economics of Trigeminal Neuralgia

*Robert D. Ecker, Bruce E. Pollock, and Deborah A. Gorman.*

**Introduction:** Due to surgeon experience, patient preference and medical condition the paradigm for the treatment of trigeminal neuralgia is variable. Paralleling the treatment variability, outcome assessment is difficult due to frequent treatment failure and the intermittent natural history of trigeminal neuralgia pain. We have reviewed our results for the treatment of trigeminal neuralgia focusing the relative cost efficacy for gamma knife (GK), glycerol rhizotomy (PRGR) and microvascular decompression (MVD).

**Methods:** Between 7/29/99 – 6/29/01 101 patients with idiopathic trigeminal neuralgia underwent 120 operations (MVD, n =23; PRGR, n =39; SR, n =58). Mean age was 66.7 years. Pre-operative pain duration, prior surgeries and atypical features were similar between the groups. The MVD group was younger (54.1 years vs. 69.6 years,  $p < 0.001$ ).

Patients were then interviewed over the phone at regular intervals. Outcomes were classified as excellent (no pain, no medications), good (no pain, reduced medications), fair (>50% pain reduction), and poor. A cost effectiveness analysis comparing the three treatments was then performed based on actual institutional cost data. Mean follow-up was 18.2 months.

**Results:** Patients having MVD (83%, 79% at 6 and 24 months, respectively) more commonly achieved an excellent outcome than PRGR (64%; 55%,  $p = 0.05$ ) or SR (59%; 50%,  $p = 0.01$ ). No statistical difference was detected between PRGR and SR. The cost per quality adjusted pain free year was \$3,800, \$8,561 and \$9,538 for PRGR, MVD and SR, respectively. The cost-effectiveness of MVD was similar to PRGR ( $p = 0.17$ ) and SR ( $p = 0.57$ ). PRGR was more cost-effective than SR ( $p < 0.05$ ).

**Conclusions:** At 18.2 month follow-up, despite costing between \$4,000 and \$11,000 more than other surgeries, MVD was equally cost-effective. Based on historical controls, MVD should prove the most cost-effective operation at long-term follow-up due to greater initial efficacy and low pain recurrence rate.

## A Novel Model of Neuroma Pain

*Lun Chen, Michael Dorsi, Esther Pogatzki, and Allan J. Belzberg.*

**Introduction:** Peripheral nerve injury may lead to the formation of a painful neuroma. Patients present with symptoms and signs of neuropathic pain including tenderness

to palpation of the skin overlying the neuroma, spontaneous burning pain, and allodynia and hyperalgesia in the distribution of the injured nerve.

The structural and electrophysiological changes that characterize a neuroma have been well described. Microscopic examination of the neuroma reveals loss of normal fascicular organization and an increase in connective tissue. The nerve fibers trapped in the neuroma develop aberrant activity, such as, spontaneous activity, crosstalk, and hypersensitivity to mechanical, chemical, and metabolic stimuli.

Several animal models have been developed to study pain following nerve injury. In general, such models involve interruption of a peripheral or spinal nerve by transaction, ligation, or crush. Pain is measured by quantifying the behavioral responses evoked by applying mechanical or thermal stimuli to the distribution of the injured nerve. These behavioral models do not involve direct mechanical stimulation of the neuroma.

Although current animal models of nerve injury pain have succeeded in producing a reliable behavioral change, several lines of evidence question their validity as models of human painful neuroma. For example, the hyperalgesia following spinal nerve ligation and cut can develop and persist independent of input from the neuroma. Further, the same behavioral change (i.e., mechanical hyperalgesia) can be produced following lesions that do not lead to the formation of a neuroma, such as dorsal root ganglionectomy. Finally, the behavioral responses characteristic of the current models are evoked by applying stimuli at a site that is distant from the neuroma. There is currently no model measuring the behavioral effect of directly applying stimuli to the neuroma.

The aim of the current investigation was to design a new model of neuroma pain. An ideal model would involve the formation of a neuroma that demonstrated the characteristic pathological and electrophysiological changes. In addition such a model would produce consistent, severe, and lasting behavioral changes that modeled those seen in human patients following nerve injury (i.e. pain evoked by palpation of the skin overlying the neuroma).

**Methods:** Male Sprague-Dawley rats were used in the study. Following habituation and baseline testing the animals were randomly divided into four surgical groups.

Group One represents the neuroma model group. To produce a neuroma, the posterior tibial nerve of the rat was exposed in the region of the division into lateral and medial plantar branches, tightly ligated with silk suture just proximal to the branching, and transected. To allow for easy application of mechanical stimuli, as well as to avoid the confounding hyperalgesia observed in the distribution of the injured nerve, the ligated nerve stump was tunneled subcutaneously across the anterior aspect of the leg to a position just superior to the lateral malleolus. This placed the neuroma well outside of the innervation territory of the tibial nerve.

Three control groups were included to account for various aspects of the surgical manipulation. To control for the subcutaneous passage of the posterior tibial nerve, surgery was performed as described above for Group Two, but following tunneling the nerve was ligated and transected a

cont. on Page 10 ...

second time at the entrance to the subcutaneous tunnel. This led to the formation of a neuroma at the entrance of the tunnel as opposed to the lateral aspect of the leg. To control for the effect of ligating and cutting the tibial nerve and forming a subcutaneous tunnel, animals in Group Three underwent posterior tibial nerve ligation and transection, but the nerve stump was left in place. A small piece of connective tissue was dissected, ligated and passed through the subcutaneous tunnel. Finally to control for exposure of the posterior tibial nerve and tunnel formation, animals in Group Four had the posterior tibial nerve dissected free but left intact. Again, connective tissue was passed through the subcutaneous tunnel as described above for Group Three.

Behavioral testing was performed in a blinded fashion with the different surgical groups being tested concurrently. The suture tied around the rotated nerve or connective tissue was visualized through the skin and served as the target for application of mechanical stimuli. An analogous site served as the target on the contralateral hindlimb. A 15 gm von Frey filament was applied to the target test site for 2 s. A positive response was defined as a rapid withdrawal of the hindpaw, or slow withdrawal with licking or shaking of the hindpaw. The frequency of response to six applications of the von Frey probe was determined. Testing began 2 days postoperatively and continued for three months.

At the conclusion of the behavioral testing, several animals were selected for electrophysiological and histological evaluation. Teased fiber techniques were used to record from single A fibers and C fibers in the tibial nerve of the anesthetized rat. Mechanical stimuli were applied to the skin overlaying the neuroma. The nerve fibers were assessed for spontaneous activity, mechanical sensitivity, and electrical coupling. For histological evaluation, the tibial nerve was harvested.

**Results & Discussion:** Application of the von Frey probe to the test site near the lateral malleolus led to behavioral signs of pain only for animals in the neuroma-model group. A significant increase in the behavioral response frequency was initially evident on post-operative day 3 and persisted throughout the duration of the study. In contrast, none of the three control groups exhibited a significant change in behavioral response frequency with respect to baseline or each other. There was no change in behavior response frequency for any of the groups following application of stimuli to the contralateral paw.

Von Frey stimulation of the neuroma led to an evoked response in some A fiber and C fiber afferents. Some A fiber and C fiber afferents also exhibited spontaneous activity. Coupling between nerve fibers was also observed suggesting the possibility of *backwards* regeneration of fibers from the neuroma.

Microscopic examination of the sections cut through the neuromas demonstrated findings typical for a neuroma: disordered distribution of myelinated fibers, multiple fibers cut longitudinally, and dense connective tissue.

**Conclusions:** We have developed a novel animal model of neuroma pain. Unique to this model is the ability to study behavior in response to stimulation applied to the neuroma as opposed to an anatomic region supplied by injured nerve.

training. The American Board of Neurological Surgery (ABNS), a member accreditation body of the American Board of Medical Specialties (ABMS), specifically list "the operative and non-operative management of pain" as within the purview of certified ABNS Diplomates. Neurosurgeons are well qualified to treat pain and offer a host of contemporary strategies including interventional procedures for selected patients that may be unavailable to other medical specialists.

**2** The participation in or completion of a designated Fellowship in Pain Management is not required of ABNS certified neurological surgeons who wish to practice pain management. Neurosurgeons are uniquely qualified to treat all aspects of pain syndromes due to structural, anatomic and physiological causes within the human nervous system.

**3** There is no justification to restrict any neurosurgeon from practicing pain management or performing interventional procedures in the treatment of patients with pain, based on training and primary board certification.

Members of the Pain Section also continue to work toward improving Medicare reimbursement for pain-related procedures. We are currently lobbying Medicare to allow review of certain procedures outside of the usual 5-year window, allowing us to hopefully increase reimbursement for extremely undervalued procedures such as peripheral nerve stimulation. There are also indications that Medicare is planning to markedly increase reimbursement for surgical specialties, increasing the conversion factor by 1.6%. This translates to over \$100 million per year for America's neurosurgeons. At a time when some specialties are experiencing decreasing reimbursements, these advancements are good news for neurosurgeons who treat pain.

A new Section Chairman will be elected at the AANS meeting in April. It has been my pleasure and privilege to work with Vice-Chairman Oren Sagher, Secretary-Treasurer Kim Burchiel, and the rest of the executive committee. I'm certain that our strong Section leadership will continue to assure that neurosurgical pain management is well represented both in our parent organizations and in the medical community at large, and will continue to advance our understanding of pain and the application of sophisticated neurosurgical techniques to its effective treatment.



Jaimie Henderson, M.D.

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# Application for Membership



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**Eligibility:** Members of the AANS and/or CNS who are actively interested in the management of pain problems.

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- Phone: \_\_\_\_\_ Fax: \_\_\_\_\_
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### II. Category of Membership Requested:

- Active       Associate       International

### III. Membership, Certification and Practice:

- (A) Are you now certified by the American Board of Neurological Surgery?       Yes    No
- (B) Are you a member of
1. The American Medical Association?       Yes       No
  2. A Local or Regional Medical Society?       Yes       No
  3. A State or Provincial Medical Society?       Yes       No  
Name: \_\_\_\_\_
  4. American Association of Neurological Surgeons?       Yes       No
  5. Congress of Neurological Surgeons?       Yes       No
  6. The American Academy of Pain Medicine?       Yes       No
  7. International Association for the Study of Pain?       Yes       No
  8. American Pain Society?       Yes       No

\_\_\_\_\_  
Signature of Applicant

\_\_\_\_\_  
Date

**Please return completed application with your membership fee of \$50 to:  
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