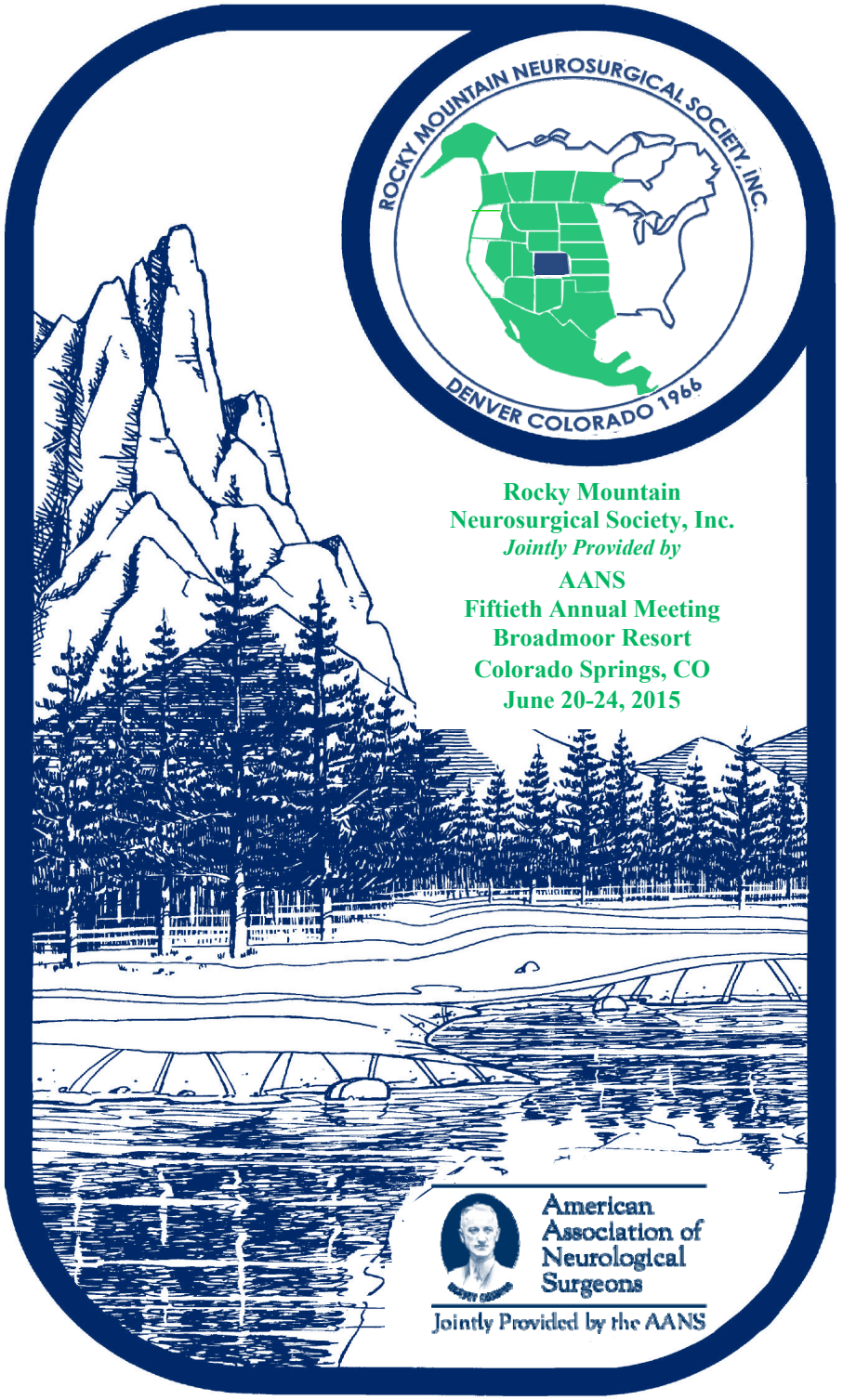
Mark your calendars, the 51th Annual Meeting of the Rocky Mountain Neurosurgical Society, Inc. will be held in:

WHITEFISH, MONTANA
THE LODGE AT WHITEFISH LAKE
JUNE 18-22, 2016



www.rmns.org

PROGRAM

FIFTIETH ANNUAL MEETING

OF

THE ROCKY MOUNTAIN NEUROSURGICAL SOCIETY, LLC

Honored Guests:

Dr. Nicholas Barbaro, MD

Dr. Randall Chesnut, MD

June 20-24, 2015

The Broadmoor Resort

Colorado Springs, CO

THE ROCKY MOUNTAIN NEUROSURGICAL SOCIETY, INC.

www.rmns.org

Founded 30 April, 1966, in Denver, Colorado
Incorporated 1974 in Houston, Texas

Officers and Executive Committee 2014-2015

President:	Paul House, MD
President Elect:	Richard Day, MD
Vice President:	Brad Duhon, MD
Secretary:	Brett Dietze, MD
Treasurer:	Kelly Schmidt, MD
Historian:	Albert H. Capanna, MD
Past President:	Paul Elliott, MD
Member at Large:	Joseph Sramek , MD

Committees 2014-2015

Scientific Program Committee:	Michael Seiff , MD
CME Committee:	Kris Smith MD
Local Arrangements:	Michael Brown, MD
Nominating Committee:	Randy Jensen, MD, PhD (2015) Stewart Levy, MD (2016) Paul Elliott, MD (2017)
Membership Committee:	Stewart Levy, MD Paul Elliott, MD Richard AA Day, MD
Website Administrator:	Joel D. MacDonald, MD
New Members:	Justin Davis, MD

MEETING AT A GLANCE

SATURDAY, JUNE 20, 2015

1:00 - 5:00 p.m.	**Registration**
1:00 - 5:00 p.m.	**Board Meeting (Russell Board Room)**
6:30 - 9:30 p.m.	**Opening Reception**
	Children's Fun Time

SUNDAY, JUNE 21, 2015

7:00 - 7:55 a.m.	**Physician Breakfast**
7:00 - 11:00 a.m.	**Spouse and Children's Breakfast**
8:00 a.m. - 12:00 p.m.	**Scientific Session: Trauma**
6:00p.m.-9:00p.m.	**Barbeque at Cheyenne Mountain Zoo**

MONDAY, JUNE 22, 2015

7:00 - 7:55 a.m.	**Physician Breakfast**
7:00 - 11:00 a.m.	**Spouse and Children's Breakfast**
8:00 a.m. - 12:00 p.m.	**Scientific Session: Neoplasia**
12:30 – 6:00 p.m.	**Tennis Tournament**
7:00 - 10:00 p.m.	**President's Dinner (executive board and guest speakers)**

TUESDAY, JUNE 23, 2015

7:00 - 7:55 a.m.	**Physician Breakfast**
7:00 - 11:00 a.m.	**Spouse and Children's Breakfast**
7:30 - 8:00 a.m.	**Annual Business Meeting**
8:00 a.m. - 12:00 p.m.	**Scientific Session : Spine**
12:30 - 4:00 p.m.	**Golf Tournament**
6:30 - 10:00 p.m.	**Annual Award Banquet and Dance**
5:30 - 9:00 p.m.	**Kids' Party**

WEDNESDAY, JUNE 24, 2015

7:00-7:55 a.m.	**Physician Breakfast**
7:00-11:00 a.m.	**Spouse and Children's Breakfast**
8:00 a.m.-12:00 p.m.	**Scientific Session: Vascular/Functional**
12:00 p.m.	**Meeting Adjournment**

***Breakfast - Patio at the Golf Club** (Physician and Exhibitors/ Spouse and Children)

Resident Award

First place award for the best resident paper presented at the meeting now includes a $750 cash award. There will also be awards for second place ($500) and third place ($250) resident papers. Each of the first 10 residents to register will receive $500 travel reimbursement.

Academy Cup

Best paper from a practicing neurosurgeon (Active or Associate member).

Firing Line

Present cases for discussion with attendees.

Raffle

This year we will hold a raffle for a *brand new* **Apple Watch.** To enter the raffle you must submit your completed entry card by 12:00 Noon, Tuesday, June 23, 2015. Entry completion requires an exhibitor sign off from each booth.

LEARNING OBJECTIVES

Upon completion of this program, participants should be able to:

1. Better understand modalities for identification and localization of eloquent cerebral tissue
2. Review the role of observation after surgical resection of atypical meningiomas
3. Understand demographic and injury characteristic differences across cause of severe TBI
4. Recognize the clinical presentation of patients with brain edema and how this relates to timing of treatment

METHODS OF INSTRUCTION

Live program with didactic lectures, case presentations/discussion, panel discussions and oral paper sessions.

INTENDED AUDIENCE

The target audience includes Attending Neurosurgeons in Academic and Private Practice, Neurosurgical Residents, Interns, Medical Students, Neurosurgical Nurses, Nurse Practitioners and Physician Assistants.

The Broadmoor Resort
1 Lake Avenue
Colorado Springs, CO 80906
Tel. (844) 513-9981

The 2015 Rocky Mountain Neurosurgical Society Meeting will be held from June 20th through June 24th at The Broadmoor Resort, Colorado Springs, Colorado. Dr. Michael Brown is serving as the local arrangements chairperson, and is putting together an exciting array of activities for members, guests, and their families at this pristine iconic Mountain Resort.

Guests are welcomed to their Five-Star Colorado Springs Resort with impeccable service and distinctive amenities. Here, the spirit of the West inspires the adventurer within, with endless opportunities to explore the picturesque mountains, streams, and canyons. Experience a truly one-of-a-kind resort where personalized luxury offers an escape from the ordinary and modern details blend seamlessly with the timeless elegance of our historic hotel.

Our superb location near the southern edge of the Rockies is surrounded by stunning natural beauty and has been described as the gateway to the West. Colorado Springs was originally a small mining town, but now counts itself as one of the top destinations in the U.S. for vacations and conferences due to its picturesque mountain backdrop, 300 days of sunshine and friendly locals. From the Top of Pikes Peak to upscale shopping, Colorado Springs offers an abundance of natural beauty as well as a variety of attractions, art galleries and activities for guests of all ages.

At The Broadmoor, our award-winning Colorado Springs hotel offers a variety of exceptional services and amenities designed to enhance your stay. Whether in your elegantly appointed guest room or around the resort, you will discover thoughtful services and eco-friendly initiatives that have helped The Broadmoor redefine modern luxury for nearly 100 years.

At The Broadmoor, culinary excellence is rooted deep within our history and continues to win the admiration of guests and critics alike at our numerous restaurants, cafés and lounges. From classic pub fare and steakhouse favorites, to fine dining at Penrose Room and our extravagant Sunday Brunch—a true culinary adventure awaits you at our Colorado Springs luxury hotel. For reservations and more information contact 866.381.8432 or 719.577.5733.

We love helping families create their perfect Colorado vacation. Let our friendly staff and personalized services ensure even our youngest guests leave with a lifetime of memories. There are numerous family- and child-friendly activities offered at The Broadmoor. Contact our Concierge for more information at 866.837.9482.

Social Highlights - All attendees, including exhibitors, are invited to our social program*.
Breakfast Daily at *Patio at the Golf Club*- 7:00– 11:00 AM
Opening Reception - *Main Ballroom*- **Saturday, June 20, 2015**
Barbeque– *Cheyenne Mountain Zoo*-**Sunday, June 21, 2015** (Transportation Provided)
GolfTournament - *Broadmoor East Course*- **Monday, June 22th, 2015**
President's Dinner– *The Penrose Room*– **Monday, June 22, 2015**
Tennis Tournament -Tuesday, June 23, 2015
Annual Banquet-*The Mountain Lodge*-**Tuesday, June 23, 2015** (Transportation Provided)

SCIENTIFIC PROGRAM - JUNE 20th – 24th

Rocky Mountain Neurosurgical Society

The Broadmoor, Colorado Springs, CO

SUNDAY JUNE 21th, 2015

Moderator:	**Paul House, MD**
07:00-07:55	**Breakfast**
08:00-12:00	**SCIENTIFIC SESSION I: Tumor/Functional**
08:00-08:10	**Introductory Remarks and Welcome** **President Paul A. House, MD**
08:10-08:30	**Kris Smith MD** The Role of Functional MRI/DTI Stealth Integration for resection of brain lesions involving eloquent cortex
08:30-08:50	**Randy L. Jensen MD PhD** Outcomes of patients with metastatic melanoma treated with stereotactic radiosurgery.
08:50-09:10	**Randy L. Jensen MD PhD** Correlation of meningioma volume and measures of proliferation and vascularity
09:10-09:30**	**Kyle Smith MD** Prediction of Consistency of Meningioma by Magnetic Resonance Imaging
09:30-9:50	**John B. Dietze MD** How To Be A Good Doctor – Doing The Right Thing For The Right Reason
9:50-10:25	**Break**
10:25-10:30	**Local Host Welcome to Colorado Springs, CO** **Michael Brown, MD** *Vendors Welcome*

10:30-10:50**	**Kyle Smith MD** Intradural, Extramedullary Neurosarcoid Mimicking a Cervical Intradural Tumor
10:50-11:10	**Randy L. Jensen MD PhD** Postoperative management of atypical meningiomas--to radiate or observe
11:10-11:30**	**Walavan Sivakumar MD** Selective Dorsal Rhizotomy for Spasticity in Adults: An Early, Single Institution Experience
11:30-12:00	**Paul A. House MD** Orthostatic Tremor Treated with Deep Brain Stimulation
NOON	**ADJOURN**

MONDAY JUNE 22th, 2015

MODERATOR:	**Michael Seiff MD**
07:00-07:55	**Breakfast**
08:00-12:00	**SCIENTIFIC SESSION II: Trauma/Epilepsy**
08:00-08:20	**Albert H. Capanna MD** Nonsurgical Treatment of Traumatic Cervical Spine Injuries
08:20-08:40	**David Bar-Or MD** Epidemiology Of Severe Traumatic Brain Injury With Glasgow Coma Scale 3: A Multicenter Cohort Study
08:40-9:00	**David Bar-Or MD** Aggressive Operative Neurosurgical Management is Associated with Survival Benefit in Severe Traumatic Brain Injury and Glasgow Coma Scale of 3: A Propensity Matched Analysis
09:00-09:20	**Mark A. Mahan MD** High Velocity Nerve Injury Animal Model
09:20-09:40	**Albert H. Capanna MD** Treatment of a Hydatid Cyst
09:40-10:10	**Break**
10:10-10:30	**Kris Smith MD** MEG Guided Resection of Epileptic Foci
10:30-11:15	**SPECIAL GUEST LECTURE – Randall Chesnut MD** Rational Approach to Spine Trauma
11:15-12:00	**SPECIAL GUEST LECTURE – Nicholas Barbaro MD** Surgical Treatment of Epilepsy: Novel Approaches to an Old Problem
NOON	**ADJOURN**

TUESDAY JUNE 23th, 2015

MODERATOR:	**Richard Day MD**
07:00-07:55	**Breakfast**
07:30-07:55	**ANNUAL BUSINESS MEETING FOR RMNS BOARD MEMBERS**
08:00-12:00	**SCIENTIFIC SESSION III: Spine**
08:00-08:20**	**Marcus D. Mazur MD** Adjacent Segment Degeneration after Anterior Cervical Discectomy and Fusion: A Long-Term Magnetic Resonance Imaging Follow-up Study
08:20-08:40**	**Vijay M Ravindra MD** Vitamin D Levels And One-Year Fusion Outcomes in Elective Spine Surgery: A Prospective Observational Study
08:40-09:00	**Brad Duhon MD** Updates on Minimally-Invasive SI Joint Fusion Clinical Trials
09:00-09:20	**Kelly Schmidt MD** Use Of Fibrin Glue To Prevent CSF Leak After Intrathecal Catheter Removal or Revision
9:20-9:40	**Michael E. Seiff MD** Minimally Invasive Two-Level Thoracic or Thoracolumbar Corpectomies For Spondylodiscitis
9:40-10:10	**BREAK**
10:10-10:20	**Introduction to RMNS 51st Annual Meeting in Whitefish, MT** Joseph G. Sramek MD
10:20-10:40**	**Jeremy C. Peterson MD** Reduction Of Cerebral Blood Flow With Adenosine In Treatment Of Vein Of Galen Aneurysmal Malformation
10:40-11:20	**SPECIAL GUEST LECTURE – Nicholas Barbaro MD** Surgery For Trigeminal Neuralgia – Cure vs. Palliation
11:20-12:00	**SPECIAL GUEST LECTURE – Randall Chesnut MD** Current and Historical Aspects of Head Trauma Management
NOON	**ADJOURN**

WEDNESDAY JUNE 24th, 2015

MODERATOR:	**Brad Duhon MD**
07:00-07:55	Breakfast
08:00-12:00	**SCIENTIFIC SESSION IV: Misc**
08:00-08:30	**Albert H. Capanna MD** History Of The Rocky Mountain Neurosurgical Society
08:30-9:15	**Ken Finn MD** Marijuana – What's The Deal?
09:15-09:35	**Emil Zeynalov MD** A Pre-clinical Study of the Effects of Arginine-Vasopressin Receptor Blockers Conivaptan and Tolvaptan on Stroke-Evoked Brain Edema
09:35 – 10:05	**Break**
10:05-10:50	**SPECIAL GUEST LECTURE – Randall Chesnut MD** Ongoing Developments And The Future Of Head Trauma
10:50-11:35	**SPECIAL GUEST LECTURE – Nicholas Barbaro MD** Neurosurgical Training In The 21st Century – Better Or Worse?
11:35-11:45	**Closing Remarks** **Paul House MD**
11:45	**MEETING ADJOURN**

**** Resident Award Candidate**

Vendor Participants

This year we have the pleasure of welcoming the following exhibitors to the Rocky Mountain Neurosurgical Society's Annual Meeting. Please stop by their booths to thank your representatives for their company's support.

Medtronic Spine and Biologics
Medtronic Funtional/Neuromodulation
Medtronic Surgical and Navigation
Nico Neuro and Spine
K2M
LDR
SI Bone
Mountain States Medical
Leica
Ridgeline Medical
Biomet Spine
Southwest Surgical
Integra Life Sciences
Amedica
Stryker Craniofacial
Stryker Spine
Arbor Pharmaceuticals
CSL Behring
UCB Pharmaceuticals
Mallinckrodt Pharmaceuticals
Varian Medical Systems
Orthofix International-Spine
Health Images
SeaSpine Biologics/Integra Orthobiologics Osteomed
Zimmer Spine Trilogy
Medical Partners Cyberonics

*Visit each booth and qualify to win an **Apple Watch!***

Notes

Disclosure Information

The AANS and Rocky Mountain Neurosurgical Society control the content and production of this CME activity and attempt to ensure the presentation of balanced, objective information. In accordance with the Standards for Commercial Support established by the Accreditation Council for Continuing Medical Education (ACCME), faculty, abstract reviewers, paper presenters/authors, planning committee members, staff, and any others involved in planning the educational content and the significant others of those mentioned must disclose any relationship they or their co-authors have with commercial interests which may be related to their content. The ACCME defines "relevant financial relationships" as financial relationships in any amount occurring within the past 12 months that create a conflict of interest.

Speakers, paper presenters/authors and staff (and the significant others of those mentioned) who have disclosed a relationship* with commercial interests whose products may have a relevance to their presentation are listed below.

Name	Disclosure	Type of relationship
Randy Jensen, MD, PhD*	Varian	Consultant
	Pharmacokinesis	Consultant
	Medtronic	Consultant
Kelly Schmidt, MD*	Cyberonics	Honorarium
Vinjay Ravindra, MD	Biomet	Consultant
	NIH Funding-K Award	Grant
Randall Chesnut	Orsan	Consultant
	Neuroptics	Consultant
	Innerspace	Consultant
Albert H. Capanna	KLS Martin	Grant

*Relationship refers to receipt of royalties, consultantship, funding by research grant, receiving honoraria for educational services elsewhere, or any other relationship to a commercial interest that provides sufficient reason for disclosure.

Educational committee members, Speakers, paper presenters/authors and staff (and the significant others of those mentioned) who have reported they do not have any relationships with commercial interests:

Paul House, MD*	David Bar-Or, MD	Richard Day, MD*
Brad Duhon, MD*	Brett Dietze, MD*	Nicholas Barbaro, MD
Marcus Mazur, MD	Paul Elliott, MD*	Jeremy Peterson, MD
Joseph Sramek, MD*	Ken Finn, MD	Michael Seiff, MD *
Emil Zeynalov, MD	Kris Smith, MD*	Michael Brown, MD*
Walavan SAivakumar, MD	Dennis Shrieve	Charlotte Myers*
Katy Meyer	Kyle Smith, MD	

* Educational content planner of this meeting

Accreditation/Continuing Medical Education

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (AACME) through the joint providership of the AANS and the Rocky Mountain Neurosurgical Society. The AANS is accredited by the ACCME to provide continuing medical education for physicians.

The AANS designates this live activity for a maximum of 13.25 *AMA PRA Category 1 Credits*TM. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Joint Providership Disclaimer

The material presented at the 50th Annual Rocky Mountain Neurosurgical Society Meeting has been made available by the Rocky Mountain Neurosurgical Society and the AANS for educational purposes only. The material is not intended to represent the only, nor necessarily the best, method or procedure appropriate for the medical situations discussed, but rather it is intended to present an approach, view, statement, or opinion of the faculty, which may be helpful to others who face similar situations.

Neither the content (whether written or oral) of any course, seminar or other presentation in the program, nor the use of specific product in conjunction therewith, nor the exhibition of any materials by any parties coincident with the program, should be construed as indicating endorsement or approval of the views presented, the products used, or the materials exhibited by the Rocky Mountain Neurosurgical Society and jointly provided by the AANS, or its Committees, Commissions, or Affiliates.

Neither the AANS nor the Annual Rocky Mountain Neurosurgical Society makes any statements, representations or warranties (whether written or oral) regarding the Food and Drug Administration (FDA) status of any product used or referred to in conjunction with any course, seminar or other presentation being made available as part of the 50th Annual Rocky Mountain Neurosurgical Society Meeting. Faculty members shall have sole responsibility to inform attendees of the FDA status of each product that is used in conjunction with any course, seminar or presentation and whether such use of the product is in compliance with FDA regulations.

Historical Notes

Eight neurological surgeons from the Rocky Mountain States met informally in Denver, CO on April 30, 1966, and a Founders meeting was held which established The Rocky Mountain Neurosurgical Society.

Harry Boyd, MD	Denver, CO
Thomas Craigmile, MD	Denver, CO
Charles Elkins, MD	Tucson, AZ
Robert Imler, MD	Tulsa, OK
Alexander Johnson, MD	Great Falls, MT
Homer McClintock	Denver, CO
Chester Powell, MD	Salt Lake City, UT
William McKinney, MD	Fort Worth, TX

Because of the growth and complexity of the society in which we now live, Articles of Incorporation were approved in December 1974, in the State of Texas as a non-profit organization and The Rocky Mountain Neurosurgical Society, Inc. was established and obtained a tax exempt status.

RMNS Constitution - Revised June 1999

Article I - Name
The organization shall be known as The Rocky Mountain Neurosurgical Society, Inc.

Article II - Purpose
The corporation is organized for exclusively educational and other charitable purposes, and is a nonprofit corporation and the period of its duration is perpetual. The purpose of the Society shall be (1) to promote knowledge within the fields of neurological surgery and allied branches of medicine. It shall be within the purposes of the corporation to use any means to such end as may from time to time seem expedient to its members or trustees, including study, investigation, research, publication, publicity, instruction, the organization of educational or other charitable activities, agencies and institutions and the aid of any such educational or other charitable activities, agencies and institutions already established; (2) the promotion of fellowship and the exchange of ideas among its members.

Article III - Membership
Section 1 - The membership of Society shall consist of five categories: ACTIVE, ASSOCIATE, SENIOR, INACTIVE, and HONORARY.
(A) ACTIVE MEMBERS shall consist of neurological surgeons who have been certified by the American or Mexican Board of Neurological Surgery, or Fellowship in the Royal College of Surgeons (Canada), and also members of allied fields who have been certified by their appropriate board in that allied specialty. Active members in allied fields shall not exceed twenty per cent (20%) of the total membership of the Society.

(B) ASSOCIATE MEMBERS will include physicians and doctors of philosophy qualifying in one of the following categories:

1) Neurological surgeons living in the geographic confines of the Society who have completed their training and have met all the requirement for Board Certification but who have not been certified by the American or Mexican Board of Neurological Surgery, or Fellowship in the Royal College of Surgeons (Canada). Following certification an Associate Member shall become eligible for Active Membership and may apply to the Membership Committee for change in classification.

2) Neurological surgeons who have an outstanding record in the field over a period of years due to high standard and quality of work.

3) Members in the Neurosciences who have had acceptable academic training equivalent to the requirements for board certification in that field.

(C) SENIOR MEMBERSHIP shall be accorded to those members over the age of sixty who have been active dues-paying members for ten (10) years or greater. Senior members will be relieved of the payment of dues and rules of attendance. They may not hold office but will retain all other privileges of membership.

(D) INACTIVE MEMBERSHIP shall be accorded to members who no longer practice in the geographic domain of the Society or members who are physically disabled or retired from practice. Inactive members shall be relieved of payment of dues. They may attend meetings of the Society but shall not vote or hold office.

(E) HONORARY MEMBERS shall be chosen from recognized leaders in the field of neurological surgery and allied fields who are neither active nor associate members. They shall not be required to pay initiation fees or dues and shall enjoy all of the privileges of active membership except those of voting or holding office. There shall be no limitation on their selection.

Section 2- Membership, except for Honorary and Inactive Members, shall consist of those physicians residing in Alaska, Arizona, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah, Wyoming, adjacent provinces of Canada, and The Republic of Mexico.

Article IV Founders Group - Executive Committee

The Founders Group shall act as an Executive Committee until the time of the First Annual Meeting. They will assume all the duties of the Executive Committee, including those of the Nominating Committee, the Program Committee, and any other duties being deemed necessary. This committee will submit a nomination slate, which will be voted upon by all the Active Members. This committee has the power to accept as members of the Society any that they feel meet the requirements as outlined by the By-Laws. The power is given to the committee until the First Annual Meeting, after which time all membership applications will be acted upon as outlined in the By-Laws.

Article V - Officers

Section 1 - The officers of the Society shall consist of a President, President-Elect, Vice-President, Secretary, Treasurer and Historian. The President and Vice-President shall be elected for a period of one year and neither may succeed himself. The President-Elect shall succeed to the office of President one year following his election. The Secretary and Treasurer shall be elected for a period of three years and the Historian shall be elected for a period of five years.

Section 2 - The Executive Committee (9) shall be comprised of the President, Immediate Past-President, the President-Elect, Vice-President, Secretary, Treasurer, Historian and one Member-at-Large appointed by the President and a Continuing Medical Education (CME) liaison also appointed by the President.

Article VI - Duties of Officers

Section 1 - The President shall preside at all meetings of the Society and of the Executive Committee. He shall appoint all committees. He shall cast the deciding vote in any ties resulting from balloting of the members of the Society.

Section 2 - The Vice-President shall preside in the absence of the President and be the Society Parliamentarian.

Section 3 - The Secretary shall record the proceedings and attendance of each meeting and shall report this record at the succeeding meetings. He shall collect an preserve all records, including the membership roll, and shall forward to the Historian all paper which are of documentary or historical value to the Society. He shall send notice to the membership of all meetings two months in advance, and shall notify all members of appointments and assigned duties. He shall carry on all other correspondence and business essential for the proper function of the Society. The Secretary shall forward to the Membership Committee all completed applications for membership within three months prior to the date of the Annual Meeting.

Section 4 - The Treasurer shall collect the dues and assessments and carry out the fiscal transactions of the Society. The Treasurer shall keep an accurate record of these transactions and render an annual report. The Treasurer shall submit records annually to a certified public accountant for report to the President. The Treasurer shall notify all members who are delinquent in payment of dues or assessments.

Section 5 - The Historian shall compile and retain all pertinent data relative to the founding, programs and functioning of the Society.

Section 6 - The Executive Committee shall have general supervision over the affairs of the Society. They shall:

(A) Make recommendations as to the time and place of the Annual Meeting.

(B) Review all applications from the Membership Committee and make their recommendations at the Annual Meeting.

(C) Have the power of decision in the consideration of each candidate's personal and professional qualifications.

(D) Upon request make a careful investigation as to a candidate's personal and professional qualifications.

(E) Call special meetings when deemed necessary.

(F) Invite official guests and, in consideration with the host for said meeting, limit their number.

(G) Review all matters concerning fiscal delinquency and absence of members and make appropriate recommendations to the Society regarding these matters.

Article VII - The Constitution

The Constitution shall be in effect from the time of its adoption. It shall be amended only by written resolution at an annual Meeting. Such resolutions must be circularized to the membership by the Secretary two months before the Annual Meeting at which time a vote will be taken. Approval by three-fourths of the voting members present will be necessary for acceptance.

RMNS By-Laws - Revised June 1999

Article I - Application and Election to Membership

Section 1 - The President shall appoint a Membership Committee of three members whose duties shall be to review all applications for membership and to conduct careful investigations as to personal and professional qualifications of all applicants. The recommendations of this Committee shall be presented to the Executive Committee at the Annual Meeting.

Section 2 - Every candidate for active, associate, senior, inactive or honorary membership shall be proposed by at least two active, associate or senior members of the Society on the required application form furnished by the Society. Appropriately completed membership applications shall be in the hands of the Secretary at least four months before the date of the Annual Meeting. Two months before the Annual Meeting the Secretary shall send to each member of the Society a list of all candidates for membership. Members are urged to submit to the Executive Committee written comments on the candidate's qualifications for membership.

Section 3 - The Executive Committee shall have power of decision in the consideration of each candidate's eligibility and its judgment upon each eligibility shall be final. No candidate for membership shall be voted upon at the Executive Session of the Society unless recommended by the Executive Committee.

Section 4 - Election to the membership shall be at the Executive Session of each Annual Meeting and if three-fourths of the votes are favorable, the candidate shall be declared elected.

Section 5 -The names of all candidates who have not been recommended for membership by the Executive Committee three years after nomination shall be withdrawn and their sponsor notified. A subsequent application of such candidate can be made after a period of two years. Any candidate for membership who has been recommended by the Executive Committee but not elected by the Society cannot be proposed again for a period of two years.

Section 6 - Any Active or Senior member in good-standing may prefer charges alleging that a member is failing to maintain good professional conduct. Such charges may be made against any class of member. All charges shall be in writing and shall specify the basis thereof. These charges shall be delivered to the Secretary who shall immediately forward a copy to the accused, by registered mail sent to his last known address, a copy to the Executive Committee, and retain the original copy. The Executive Committee shall investigate the charges and shall call on the members who file the charges for such information, witnesses, evidence etc. as may be necessary for a full investigation. Both the accused and accuser or accusers shall be given a full hearing by the Executive Committee at its next regularly scheduled meeting. The accused may conduct his own defense or shall be entitled to counsel of his own selection, but counsel for the accused shall also be allowed to secure, at the Society's expense, through the use of a competent stenographer, a verbatim report of the hearing of his case by the Executive Committee in the absence of the accused at the hearing, unless he expressly waives participation therein, the Presiding Officer shall appoint a member to represent him and the hearing shall proceed as though he were present. The hearing shall be closed to all except members of the Society and the counselors chosen for the purpose of this hearing.

Provided the investigation is satisfactorily completed and the accused has been given a hearing, if he so desires, the Executive Committee shall within ten days of the completion of the hearing, determine:

(A) That the charges are not sustained, and that no further action be taken; or

(B) That the charges are sustained and that the accused be:

1) censured, or
2) suspended for a definite time, or
3) expelled from the society.

The accused shall be notified by the President in writing, by registered mail sent to his last known address, the date of the meeting in which the recommendation of the Executive Committee will be made. At that meeting the accused shall be given an opportunity to make any statement that he desires before action is taken on the recommendations of the Executive Committee. The President may also make a statement and explain and define findings of the Executive Committee, but there shall be no examination of witnesses or introduction of further evidence before the Executive

Committee. Censure or supervision shall require an affirmative vote of at least 2/3 of the voting members of the Executive Committee present. Expulsion shall require an affirmative vote of at least 3/4 of the voting members of the Executive Committee. Any members of this Society who may feel aggrieved by the action of the Executive Committee in censuring, suspending, or expelling him shall have the right to appeal to the entire membership at the time of the next annual meeting. At this time, the accused shall be given the opportunity to make any statements he desires and may have counsel present if he so desires. The President of the Rocky Mountain Neurosurgical Society may also make a statement and explain and define the findings of the Executive Committee, but here shall be no examination of witnesses or introduction of further evidence before the membership. At the conclusion of the meeting, the Membership shall, by secret ballot, determine whether it will sustain or change the action of the Executive Committee. An affirmative vote of at least a majority of the voting members present shall sustain or change the action of the Executive committee.

Article II - Election of Officers

Section 1 - The officers of the Society shall be elected from the Active Membership at each Annual Meeting and shall take office at the close of that meeting. The President shall not be eligible for re-election at any time. The Vice-President, as well, may not be re-elected to the Vice-Presidency but may be eligible for any other office in the Society. The nominating committee shall notify the membership of a proposed slate of officers before the Annual Meeting. Additional nominations may be made from the floor. The election shall be by ballot and the member receiving the greatest number of votes shall be declared elected to the office for which he was a candidate.

Section 2 - In the case of a vacancy in an office, it shall be filled by appointment by the Executive Committee.

Article III - Initiation Fees and Dues

Section 1 - Every Active and Associate Member on his election to membership shall pay an initiation fee of twenty-five dollars ($25.00) by which act he acknowledges and accepts the Constitution and By-Laws. Honorary members shall not pay an initiation fee.

Section 2 - Every Active and Associate member shall pay annual dues. The amount of the dues shall be determined by the vote of the Executive Committee, so as to maintain the Society in a financially stable condition. Payment of dues shall be received by January 1 and if unpaid by March 1, shall become delinquent.

Section 3 - Any member in arrears for two years shall be notified by the Treasurer in writing, and if he fails to pay his dues within two months thereafter shall forfeit his membership. It shall be the duty of the Treasurer to notify the Executive Committee of this forfeiture.

Section 4 -The expenses of the Annual Meeting shall be paid principally from funds received as registration fees for that meeting. The amount of the registration fee for each Annual Meeting will be set by the Executive Committee.

Section 5 - The prorated expense of an invited guest shall be borne by his host.

Section 6 - While on temporary duty with the Armed Forces, any Active or Associate Member shall be exempt from paying dues.

Article IV - Guests

Section 1 - Any member may invite a guest to attend the annual meeting. The fees for non-member guests are set by the Executive Committee.

Section 2 - The Executive Committee shall be empowered to select official guests. These shall be local physicians and surgeons at the place of the meeting or especially invited guests to participate in the program.

Section 3 - The prorate share of the officially invited guests will be borne by the Society, and determined/limited at the time of the invitation.
Section 4 - The limitation of the number of guests to attend any given meeting shall be at the discretion of the Executive Committee and the host for said meeting.
Section 5 - Invited guests shall be entitled to all the privileges of the Society during the annual session except attendance at business or Executive Sessions.

Article V - Meetings
Section 1 - The Rocky Mountain Neurosurgical Society, Inc. shall meet annually at such time and place as may be designated by the Executive Committee.
Section 2 - There shall be at least one annual Executive Session of Active Members of the Society at which the order of business shall be as follows:

1. Reading of the minutes of the last meeting.
2. Report of the Secretary.
3. Report of the Treasurer.
4. Report of the Executive Committee.
5. Report of the Historian.
6. Report of the review of the Treasurer's Account
7. Reports of Special Committees.
8. Unfinished Business.
9. New Business.
10. Election of Members.
11. Report of the Nominating Committee.
12. Election of Officers.

Section 3 - Members shall sign the permanent register of the Society as a record of their attendance. A special register shall be provided for guests.
Section 4 - Special meetings of the Society may be called on the advice of the Executive Committee. Every member shall be notified of the place and time of the meeting at least two weeks in advance.

Article VI - Quorum
Only Active Members shall attend any Business Session and shall constitute a quorum for business.
Article VII Parliamentary Authority
"Robert's Rules of Order - Revised Edition" shall be parliamentary authority in all matters not specified by the Constitution or By-Laws.

Article VIII - Committees
Section 1- The President shall appoint with the approval of the Executive Committee, the following committees:
(A) Program Committee, of which the Secretary is a member ex officio;
(B) Committee on Arrangements for the Annual Meeting;
(C) Membership Committee, consisting of three members;
(D) Nominating Committee, consisting of the immediate three Past Presidents.
Section 2 - The President shall appoint such other committees as indicated.

Article IX - Forfeiture of Membership
Membership may be forfeited for reasons deemed sufficient by the Society, which may be effected by a three-fourths majority vote.

Article X - Scientific Papers

Section 1 - An abstract of all papers to be read must be submitted to the Program Committee three months before the meeting, excluding those presented by invited guests of the Society. The Committee shall exercise the right of accepting or rejecting papers.

Section 2 -The time allotted for the presentation and discussion of a paper shall be at the discretion of the Program Committee subject to approval of the Executive Committee. A tentative program shall be sent to each member by the Secretary two weeks prior to the stated meeting.

Section 3 - A Resident award paper will be selected for presentation t the Annual Meeting by the Program Committee and an award will be given.

Article XI - Amendments

These By-Laws may be amended at the Annual Meeting by approval of three-fourths of the voting members present, provided due notice of the proposed changes has been given to the membership at least two months before said meeting.

Past Meetings of the Society

1966	Colorado Springs, CO	1991	Jackson Hole, WY
1967	Tucson, AZ	1992	Sedona, AZ
1968	Banff, AB	1993	Bigfork, MT
1969	McAllen, TX	1994	Snowmass, CO
1970	Sun Valley, ID	1995	Sun Valley, ID
1971	Colorado Springs, CO	1996	Telluride, CO
1972	Guadalajara, Mexico	1997	Jasper Park Lodge, AB
1973	Scottsdale, AZ	1998	Vail, CO
1974	Victoria, BC	1999	Coeur D'Alene, ID
1975	Cozumel-Merida, Mexico	2000	Alyeska, AK
1976	Las Vegas, NV	2001	Steamboat Springs, CO
1977	Lake Tahoe, NV	2002	Santa Ana Pueblo, NM
1978	Colorado Springs, CO	2003	Big Sky, MT
1979	Jackson Hole, WY	2004	Squaw Creek, CA
1980	Park City, UT	2005	Whistler, BC
1981	Durango, CO	2006	Sedona, AZ
1982	Big Sky, MO	2007	Jackson Hole, WY
1983	Mescalero, NM	2008	Park City, UT
1984	Colorado Springs, CO	2009	Girdwood, AK
1985	Banff, AB	2010	Telluride, CO
1986	Keystone, CO	2011	Taos, NM
1987	Deer Valley, UT	2012	Maui, HI
1988	Lake Tahoe, NV	2013	Sun Valley, ID
1989	Durango, CO	2014	Victoria, BC
1990	Vail, CO		

Past Presidents

1966	Homer G. McClintock	Denver, CO
1967	Charles Elkins	Tucson, AZ
1968	William McKinney	Ft. Worth, TX
1969	Chester Powell	Salt Lake City, UT
1970	Thomas K. Craigmile	Denver, CO
1971	Alexander C. Johnson	Great Falls, MT
1972	Joseph W. Robertson	Houston, TX
1973	Robert G. Fisher	Oklahoma City, OK
1974	Michael Pollay	Albuquerque, NM
1975	Robert L. Imler, Jr.	Tulsa, OK
1976	Javier Verdura	Mexico City, Mexico
1977	George T. Hoffman	Phoenix, AZ
1978	Michael McNally	Colorado Springs, CO
1979	Richard Moiel	Houston, TX
1980	R. Barton Carl	Oklahoma City, OK
1981	Ralph J. Kaplan	Oklahoma City, OK
1982	Paul Turner	Roswell, NM
1983	Charles Clough	Kansas City, MO
1984	Robert Partain, III	San Antonio, TX
1985	Ronald D. Clark	Greeley, CO
1986	Richard F. Tenney	Tulsa, OK
1987	Robert S. Hood	Salt Lake City, UT
1988	Henry Fieger	Denver, CO
1989	Franco Erculei	Las Vegas, NV
1990	Harry B. Tate	Oklahoma City, OK
1991	David Fell	Tulsa, OK
1992	Wayne Paullus	Amarillo, TX
1993	Kenyon Kugler	Tulsa, OK
1994	Volker Sonntag	Phoenix, AZ
1995	Lee Krauth	Denver, CO
1996	Robert Morelli	Reno, NV
1997	Larry Tice	Grand Junction, CO
1998	Ronald Apfelbaum	Salt Lake City, UT
1999	Charles Fullenwider	Muskogee, OK
2000	Kevin Lillihei	Denver, CO
2001	Howard Morgan	Dallas, TX
2002	Al Capanna	Las Vegas, NV
2003	Vance MacDonald	Las Vegas, NV
2004	Richard Schmidt	Salt Lake City, UT
2005	John McVicker	Englewood, CO
2006	Mary Kay Gumerlock	Oklahoma City, OK
2007	Robert Beatty	Kansas City, KS
2008	Joel MacDonald	Salt Lake City, UT
2009	Jonathan White	Dallas, TX
2010	Michael Brown	Colorado Springs, CO
2011	Randy Jensen	Salt Lake City, UT
2012	Stewart Levy	Denver, CO
2013	Paul Elliott	Denver, CO
2014	Paul House	Salt Lake, **UT**

TITLE: The Role of Functional MRI/DTI Stealth Integration for resection of brain lesions involving eloquent cortex

AUTHORS: Kris Smith

STUDY DESIGN: Retrospective chart review

INTRODUCTION:
Various methods exist for the identification and localization of eloquent tissue, including: direct stimulation/mapping with awake craniotomy, grid implant ECoG, PET CT scan, MEG, DTI Tractography and Functional MRI. Functional MRI is best at depicting which direction functional tissue is displaced and is useful with stereotactic registration to identify functional gyral anatomy.

METHODS:
Retrospective review of imaging and medical records of 81 patients who underwent craniotomy for resection of brain lesion using pre-operative functional MRI for mapping. Surgical resection of intra-axial lesions was done by senior author. We determined motor/speech/visual deficits pre-operatively, immediate post-operatively (during hospital stay) and permanent – clinical status up to 6 months post-op. We also determined the extent of resection and overall survival.

RESULTS:
Radiographic follow-up showed extent of resection, Gross total (66%) and Subtotal (34%). The proximity of resection cavity to fMRI signal: Violation (23%), Adjacent (36%), < 1 cm (7%) and > 1 cm (34%). Immediate post-operative period: (72%) no new deficits and (28%) new or worsened deficit, of which 21 motor, 6 speech and 4 both speech and motor. Long-term follow-up (minimum 6 months): (9.8%) permanent deficit, 3.8% speech and 6% motor (6 decrease of 1 point or less on motor exam and 2 decrease of 2 points, 2 decrease of 3 points or more (capsular infarct).

CONCLUSIONS:
fMRI is useful as a surgical tool for pre-operative planning, Intra-

operative guidance and is of a patient consultation benefit. Aggressive resection of intra-axial lesions with the aid of fMRI is possible without awake mapping. Most deficits were temporary and well tolerated. Only capsular infarcts were unacceptable and were not related to fMRI guidance.

KEYWORDS: functional MRI, brain tumors, eloquent cortex

OBJECTIVES: 1. The participant will better understand modalities for identification and localization of eloquent cerebral tissue.□2. The participant will understand the role of pre-operative fMRI prior to resection of intra-axial lesions.

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TITLE: Nonsurgical Treatment of Traumatic Cervical Spine Injuries

AUTHORS: Albert H. Capanna; Dawn M. Capanna

STUDY DESIGN:

INTRODUCTION:
Traumatic cervical spine injuries are usually treated by surgical intervention. There are occasions when surgical treatment, while it may be desired, is not done because of various comorbidities.

METHODS:
A series of patients with traumatic cervical spine injuries presented which were treated non-surgically and had good long term results. The patients were treated with immobilization by either fixed or semi-fixed devises, or had closed reduction of fractures followed by non-surgical stabilization.

RESULTS:
All patients did well and obtained the desired treatment goal. All cases will be presented with initial and follow up radiographic studies. The patients had good results without surgical intervention.

CONCLUSIONS:
It is possible to treat patients who have extenuating circumstances with non-surgical management and achieve good fusion and clinical results.

KEYWORDS: Trauma, Spine, Cervical, Nonsurgical

OBJECTIVES: Recognize comorbidities with cervical spine fractures. Understand treatment without surgical intervention for cervical spine fractures. Be aware of alternative methods of managing difficult clinical cases with cervical spine fractures.

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TITLE: Treatment of Hydatid Cyst

AUTHORS: Albert H. Capanna; Dawn M. Capanna

STUDY DESIGN: Case report

INTRODUCTION:
Hydatid cysts from Echinococcus granulosus are rare in the United States but being seen more frequently. Our patient presented with a first time seizure and left hemiparesis.

METHODS:
The patient was placed on antiepileptic medication and an MRI revealed a mass lesion in the right parietal area with mass effect.

RESULTS:
The patient was taken for a craniotomy and the cyst was completely removed. There were no further seizures and the patient's hemiparesis cleared over the next two months completely.

CONCLUSIONS:
Complete surgical excision is the objective. This can result in a reversal of symptoms and a complete cure.

KEYWORDS: Infection, Seizures, Hydatid cyst

OBJECTIVES: What a hydatid cyst is and how to treat it. The origin of the cyst. What nonsurgical treatment may be required as well as resection. Prevention of the cyst as a public health measure.

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TITLE: Outcomes of patients with metastatic melanoma treated with stereotactic radiosurgery.

AUTHORS: Randy L. Jensen; Dennis C Shrieve

STUDY DESIGN: Retrospective chart review

INTRODUCTION:
We examine our institutional experience treating melanoma brain metastases and factors associated with treatment success and complications

METHODS:
185 patients with 435 brain metastases from metastatic melanoma were identified that were treated with SRS as first line therapy for their brain disease. A cohort of 110 patients with 358 melanoma brain metastases was identified for examination of the incidence of hemorrhage before and after SRS. Local control, progression free survival, and overall survival analyses were performed using the Kaplan Meier analysis and Logrank test for significance. Prognostic factors, including B-RAF mutation status, hemorrhage pre- or post-SRS were also analyzed.

RESULTS:
Median follow up was 41.07 months with 18.73 months median freedom from local failure, 7.8 months median overall survival and 4.33 months median time to intracranial progression. Local control was improved with smaller volume lesions and survival was improved with a fewer number of metastases at intracranial metastatic diagnosis. At presentation 83 of 358 (23.2%) melanoma metastases had hemorrhaged. Following SRS, 73 hemorrhages occurred in 358 treated tumors (20.4%). These rates were not significantly different; $p=0.362$, HR=0.846 (95% CI 0.591-1.211). Conditional logistic regression modeling showed no influence of SRS on the risk of hemorrhage of a given lesion ($p=0.99$). LC was significantly lower for metastases demonstrating hemorrhage either pre-SRS (51.7% vs 64.9%, $p=0.03$) or post-SRS (32.7% vs. 67.8%, $p<0.001$). At 1-year, the local control for brain metastases in BRAF mutated patients with BRAF treatment was 85.0%, while local control for brain metastases in BRAF mutated patients without BRAF treatment was 51.5% ($p=0.0077$). Distant brain failure, freedom from whole brain radiation, and overall survival was not different based upon BRAF mutation status or inhibitor therapy. New intratumoral hemorrhage after SRS was significantly increased in

patients with BRAF treatment.

CONCLUSIONS:
SRS is an effective method of treatment for metastatic melanoma but does not alter the risk of subsequent hemorrhage. However, hemorrhage may complicate follow-up assessment of response and LC following SRS. Treatment with BRAF inhibitor was associated with improved local control but higher rate of intratumoral hemorrhage.

KEYWORDS: Melanoma, radiosurgery, B-raf, hemorrhage

OBJECTIVES: 1. Understand the expected local control of melanoma lesions treated with radio surgery□2. Explain patterns of hemorrhage rate before and after radio surgery□3. Review the effect of B-raf mutation and inhibitors of that pathway on radio surgically treated melanoma lesion

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TITLE: Correlation of meningioma volume and measures of proliferation and vascularity

AUTHORS: Randy L. Jensen

STUDY DESIGN: Retrospective chart review

INTRODUCTION:
The natural history of surgically treated intracranial meningiomas can be quite variable. Recurrence and patient outcome cannot currently be predicted with accuracy. We explore the correlation of volumetric tumor measurement on preoperative imaging with measures of proliferation and angiogenesis.

METHODS:
We examined preoperative imaging and tissue from 263 patients with an average follow-up 90 months. Tumor size was obtained by two methods. The first by estimation using measures of maximal diameter in three planes and multiply these measure using the formula length X width X height X 0.5. The second method was by volumetric measures using OSRIX software. Tissue was examined for measures proliferation (MIB-1); and three methods of computer assisted measures of microvascular density (MVD) using antibodies for Factor VIII, CD 31 and CD 105.

RESULTS:
There is high correlation between tumor volume measured by the cross sectional diameter measures and volumetric measures. Both are positively correlated with MIB-1 measurement ($p=0.011$). In a similar manner, higher tumor volumes are associated with higher MVD measures ($p=0.037$). We also found a correlation between the three methods of MVD measurements but comparison of the accuracy of methods still needs to be examined. Progression-free survival (PFS) was associated with higher grade ($p<0.001$), □MIB-labeling index ($p<0.001$) on pairwise comparisons. Using multivariate analysis, PFS was associated with MIB-labeling index (HR 1.68, $p=0.005$). Shorter overall survival was associated with MIB-labeling index (HR 1.87, $p<0.001$) when controlled for age.

CONCLUSIONS:
MIB-1 and MVD measures correlate with tumor volume measured by a two methods. With further refinement these molecular markers may

be used to predict outcome for patients with intracranial meningiomas.

KEYWORDS: MIB-1, microvascular density, volumetric,

OBJECTIVES: 1. Understand the relationship of tumor volume and measures of vascularity and proliferation□2. Explain methods of measuring tumor volume.□3. Review the different methodology of measures of vascularity and proliferation in meningiomas

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TITLE: A Pre-clinical Study of the Effects of Arginine-Vasopressin Receptor Blockers Conivaptan and Tolvaptan on Stroke-Evoked Brain Edema

AUTHORS: Emil Zeynalov; Susan M Jones; Jeong-Woo Seo; Lawrence D Snell; J.Paul Elliott

STUDY DESIGN: Case report

INTRODUCTION:
Stroke is a major cause of morbidity and mortality. Stroke is complicated by brain edema, blood-brain barrier (BBB) disruption, and is often accompanied by increased release of arginine-vasopressin (AVP). AVP acts through V1a and V2 receptors to trigger hyponatremia, vasospasm, and platelet aggregation which can exacerbate brain edema. The AVP receptor blockers Conivaptan (V1a and V2) and Tolvaptan (V2) are used to correct hyponatremia, but their effect on post-ischemic brain edema and BBB disruption remains to be elucidated. Therefore, we conducted a study to investigate if these drugs can prevent or alleviate brain edema and BBB disruption in mice after stroke.

METHODS:
Experimental mice underwent the filament model of middle cerebral artery occlusion (MCAO) with reperfusion. Mice were treated for 48 hours with Conivaptan, Tolvaptan, or vehicle. Treatments were initiated immediately at reperfusion and administered via continuous IV infusion for Conivaptan or oral gavage for Tolvaptan. Physiological variables, neurological deficit scores (NDS), plasma and urine sodium and osmolality were recorded during the experiment. Brain water content (BWC) and Evans Blue extravasation were evaluated at the end point.

RESULTS:
Both Conivaptan and Tolvaptan produced aquaresis as indicated by changes in plasma and urine sodium levels. However plasma and urine osmolality was changed only in animals treated by Conivaptan. Unlike Tolvaptan, Conivaptan improved NDS and reduced BWC in the ipsilateral hemisphere: from 81.66 ± 0.43% (vehicle) to 78.28 ± 0.48% (Conivaptan, 0.2 mg, $p < 0.05$ vs vehicle). Conivaptan also attenuated the EB extravasation index from 1.22 ± 0.08 (NS) to 1.01 ± 0.02 (Conivaptan, 0.2 mg, $p < 0.05$).

CONCLUSIONS:
Continuous IV infusion with Conivaptan for 48 hours after experimental stroke reduces brain edema and BBB disruption. Conivaptan may potentially be used in patients to prevent brain edema after stroke.

KEYWORDS: Stroke, Conivaptan, Brain Edema

OBJECTIVES: 1. Discuss strategies for the treatment of brain edema□2. Present ongoing pre-clinical data on the ability of AVP receptor□antagonism to reduce cerebral edema.□3. Explore feasibility of treatment with Conivaptan following stroke.

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TITLE: Selective Dorsal Rhizotomy for Spasticity in Adults: An Early, Single Institution Experience

AUTHORS: Walavan Sivakumar; Joel D. Mac Donald; Allison Whipple

STUDY DESIGN: Case report

INTRODUCTION:
Selective dorsal rhizotomy (SDR) is a well-accepted surgical treatment for lower-extremity spasticity in children with spastic diplegia. Historically, early intervention in young children (ages 3-8) improves motor function and prevents the progression of spasticity into adulthood and has been reserved for this population. Long-term follow-up (>5 years) have confirmed sustained improvements in the activities of daily living and overall ease of care. The effects of the SDR in the adult are far less studied. Early reports have suggested similar improvements in lower extremity spasticity and tightness.

METHODS:
We have recently begun to perform selective dorsal rhizotomy in carefully selected adult patients with spastic diplegia.

RESULTS:
Interestingly, subjective improvements in ambulatory ability, coordination, and independence have been suggested.

CONCLUSIONS:
Indications, operative course, and early post-operative outcome data will be discussed

KEYWORDS: Rhizotomy, SDR, Spasticity

OBJECTIVES: 1. Understand the indications for selective dorsal rhizotomy for spasticity in children and adults.□2. Understand the differences of treatment courses of selective dorsal rhizotomy in children vs. adults.□3. Understand the need for more long-term follow-up in adults undergoing selective dorsal rhizotomy.

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RESIDENT AWARD CANDIDATE

TITLE: Adjacent Segment Degeneration after Anterior Cervical Discectomy and Fusion: A Long-Term Magnetic Resonance Imaging Follow-up Study

AUTHORS: Marcus D. Mazur; Joel D. MacDonald

STUDY DESIGN: Retrospective chart review

INTRODUCTION:
Recently, a large body of research has focused on the development of new surgical techniques and devices to avoid adjacent segment degeneration (ASD) in patients with cervical spine disorders. However, the extent that age-related change contributes to post-operative ASD remains unclear. We evaluated patients undergoing ACDF who had postoperative MRI performed 3 or more years later to characterize the radiological appearance of degenerative changes at the adjacent segments.

METHODS:
We conducted a retrospective review of adult patients who underwent an ACDF and received pre- and postoperative MRI 3 years or later. MRI was scored for degeneration at the adjacent levels using an 11-point scale, evaluating disk space intensity, anterior compression of the thecal sac or spinal cord, posterior disk protrusion, disk space narrowing, and foraminal stenosis. Scores in patients with minimal signs of disk degeneration on preoperative MRI (score <2) were compared to those with more advanced degeneration (score ≥ 3).

RESULTS:
40 patients were identified who had MRI after an ACDF (mean follow-up 87 months, range 39–156 months). Postoperative degeneration scores were similar between patients with minimal preoperative disease and those with more advanced preoperative disease (postoperative score: 3.9 vs. 4.7, p=0.30). However, accelerated degeneration was observed in patients with minimal disease on preoperative MRI when compared to that in patients with more advanced preoperative disease (score increase: 2.7 vs. 0.88, p=0.028). Patients undergoing an ACDF demonstrated increased degeneration at the superior adjacent level independent to the length of follow-up (Odds ratio [95% CI]: 6.3 [1.8–22.2]. At the inferior adjacent level, there was no association between rate of degeneration and length of follow-up (2.3 [0.7–7.1]).

CONCLUSIONS:
Long-term effects of an ACDF have a greater impact at the superior adjacent segment than the inferior adjacent segment. Patients with a healthy appearing disk superiorly may experience greater degeneration than expected from age-related changes.

KEYWORDS: ACDF, cervical spine, adjacent segment disease, MRI

OBJECTIVES: 1. Evaluate the importance of adjacent segment degeneration on preoperative MRI□2. Quantify appearance of adjacent segment degeneration on MRI□3. Identify locations most likely to be affected by adjacent segment degeneration

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RESIDENT AWARD CANDIDATE

TITLE: Vitamin D Levels And One-Year Fusion Outcomes in Elective Spine Surgery: A Prospective Observational Study

AUTHORS: Vijay M Ravindra; Jakub Godzik; Andrew Dailey; Meic H Schmidt; Erica Bisson; Robert Hood; Wilson Ray

STUDY DESIGN: Prospective controlled trial

INTRODUCTION:
Although there is a clear link between bone mineral density and the risk of osteoporosis, it is unclear whether low vitamin D levels affect rates and timing of spinal fusion.

METHODS:
Serum 25-OH vitamin D levels were measured peri-operatively in adults undergoing elective spinal fusion between 2011 and 2012. Vitamin D levels <20 ng/mL were considered deficient. Univariate and multivariate logistic regression were performed to identify independent predictors of pseudoarthrosis/nonunion within a minimum follow-up period of 12 months. Kaplan-Meier analysis was used to compare time to fusion between groups.

RESULTS:
Of the 133 patients, 31 (23%) demonstrated vitamin D deficiency. Mean patient age was 57±13 years; 44% were female and 94% were Caucasian. The cervical spine was fused in 49%, the lumbar spine in 47%, and the thoracic spine in 4%. Mean construct length was 2 levels (range 1–16). At 12-month follow-up, 112/133 (84%) patients demonstrated fusion (median time to fusion 8.4 months). Nonunion at 12 months was associated with vitamin D deficiency (20% of patients with adequate vitamin D level vs. 38% of vitamin D–deficient patients, p=0.063). Kaplan-Meier survival analysis demonstrated time to fusion was significantly longer in the vitamin D–deficient group (12 vs. 6 months, p=0.001). On multivariate analysis, vitamin D deficiency was an independent predictor of nonunion (OR 3.449, p=0.045) when adjusted for age, sex, obesity, fusion length, location, graft type, smoking, and bone morphogenetic protein use.

CONCLUSIONS:
Vitamin D levels may affect nonunion rate and time to fusion. These results offer insight into the importance of the metabolic milieu for

KEYWORDS: Vitamin D, Fusion, Deficiency, Insufficiency

OBJECTIVES: 1. Understand the importance of Vitamin D is critical to bone health and may promote fusion.☐2. Understand that perioperative vitamin D levels may affect fusion rate and time to fusion.☐3. Realize the potential for vitamin D supplementation as a potential therapeutic intervention to improve fusion rates.

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RESIDENT AWARD CANDIDATE

TITLE: Reduction Of Cerebral Blood Flow With Adenosine In Treatment Of Vein Of Galen Aneurysmal Malformation

AUTHORS: Jeremy C Peterson; John Clough; Koji Ebersole

STUDY DESIGN: Case report

INTRODUCTION:
Vein of Galen Aneurysmal Malformations (VGAM) are congenital high flow shunt systems that have been well described since the late 1800's. These lesions most commonly present in the neonatal and infancy stages of life and account for <1% of cerebrovascular lesions. The treatment paradigm has had many changes from open vascular to endovascular to combined treatment. The primary goal is reduction of clinical symptoms and not full obliteration of the lesion especially early in life.□Our patient presented at two months of age with signs of ocular bobbing for three weeks and was found to have hydrocephalus and a VGAM on MRI. During hospitalization there was concern for decreasing level of consciousness and intubation was required. The decision at this time was to proceed toward endovascular treatment of the lesion.

METHODS:
The patient was taken to the IR suite and by Seldinger technique a 4F Terumo angled catheter was advanced to the distal left internal carotid artery. Next, an SL-10 microcatheter and microwire were used to access the right pericallosal artery by way of the anterior communicating artery. Once the level of the fistula was approached maximal Esmolol drip was used to decrease flow to the lesion without success. At this time, induced cardiac pause with adenosine to allow controlled embolization was employed. NBCA glue was prepared and once half of the catheter dead space was reached adenosine provided five seconds of asystole and 5 seconds of bradycardia allowing complete occlusion of the pedicle. This process was repeated for the left pericallosal and left posterior choroidal pedicles resulting in significant flow reduction to the lesion. Patient recovered well post procedure.

RESULTS:
Follow-up cranial imaging showed continued decrease in the VGAM and complete resolution of hydrocephalus. At two years of age he continues to do well developmentally and has not required shunting.

CONCLUSIONS:
Adenosine induced asystole is a safe option for high flow VGAM treatment with NBCA glue even in patients as young as two months of age.

KEYWORDS: Child, Galen, Endovascular, Adenosine

OBJECTIVES: 1. Discuss the common treatment methods for Vein of Galen Aneurysmal Malformation.□2. Describe the physiological difficulties with treating these high flow lesions endovascularly.□3. Recognize the clinical presentation of these patients and how this relates to timing of treatment.

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RESIDENT AWARD CANDIDATE

TITLE: Aggressive Operative Neurosurgical Management is Associated with Survival Benefit in Severe Traumatic Brain Injury and Glasgow Coma Scale of 3: A Propensity Matched Analysis

AUTHORS: Kristin Salottolo; Matthew Carrick; Andrew S Levy; Brent C Morgan; Denetta S Slone; David Bar-Or

STUDY DESIGN: Retrospective chart review

INTRODUCTION:
Prognosis in patients with traumatic brain injury (TBI) and a Glasgow Coma Scale (GCS) score of 3 is poor, doubting the necessity of aggressive operative neurosurgical management. The purpose of this study was to describe outcomes in a propensity matched population with TBI and GCS3 by use of operative neurosurgical procedures of craniotomy and craniectomy (CRANI).

METHODS:
We conducted a five-year, multicenter retrospective cohort study of patients with an ED GCS 3 and a positive head CT identified by ICD-9CM diagnosis codes. Propensity score techniques with a caliper distance of 0.001 were used to match patients 1:1 by CRANI, and the following outcomes were analyzed with McNemar's exact tests and conditional logistic regression: survival, favorable hospital disposition (home or rehabilitation vs. acute disposition [hospice, LTAC, SNF] or morgue), and development of complications. Two populations were examined: 1) patients WITH mass lesion (subdural or epidural hematoma), 2) patients WITHOUT mass lesion (subarachnoid hemorrhage, intraventricular hemorrhage, diffuse axonal injury).

RESULTS:
Nineteen percent of 541 patients had CRANI, of which 83% were performed within 4 hours of arrival. In those WITH mass lesion 27% (91/338) had a CRANI; after matching, there was a significant survival benefit (64% vs. 33% survival, OR: 4.7 (1.9-13.8) $p<.0001$), increased complications (57% vs. 40%, OR: 2.3 (1.02-5.8), $p=0.04$) and a borderline increased odds of favorable disposition (43% vs. 28%, OR: 2.4 (0.99-6.3, $p=0.05$) with CRANI vs. without CRANI. In patients WITHOUT mass lesion, only 6% (12/203) had a CRANI; after matching, there were no significant differences in outcomes, although this population was underpowered.

CONCLUSIONS:
In patients with GCS 3, prompt operative neurosurgical management of mass lesion is warranted and contributes to a significant 5-fold survival benefit. In the absence of mass lesion the effect of immediate neurosurgery on outcomes is inconclusive. These results demonstrate that craniotomy can improve survival even in patients with an extra-axial hematoma and ED GCS 3.

KEYWORDS: Glasgow coma score; mortality; traumatic brain injury; craniotomy.

OBJECTIVES: 1. Outcomes in patients with operative neurosurgical intervention and subdural or epidural hematoma.□2. Outcomes in patients with operative neurosurgical intervention without mass lesion.□3. Prognosis in patients with GCS3 and TBI.

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TITLE: Epidemiology Of Severe Traumatic Brain Injury With Glasgow Coma Scale 3: A Multicenter Cohort Study

AUTHORS: Kristin Salottolo; Charles Mains; David Bar-Or

STUDY DESIGN: Retrospective chart review

INTRODUCTION:
Severe traumatic brain injury (TBI), commonly defined as a Glasgow coma scale (GCS) score of 3-8, accounts for approximately 9% of TBI injuries. Among those, the most severe patients presenting with a GCS 3 have been inadequately described. Prior studies are largely represented by transportation-related TBI, whereas now several cohorts of TBI have emerged, including elderly falls from low height. Our purpose was to examine the epidemiology of TBI and GCS 3.

METHODS:
We examined all patients presenting to the ED with a GCS 3 and a TBI (ICD-9-CM diagnosis of 851.0-854.2) to three community trauma centers (2 L1, 1 L2) over 5 years. We analyzed demographic and injury characteristics, neurosurgical management, and in-hospital mortality across injury cohorts. Pearson chi-square tests and cochran-Armitage trend tests were used for analysis.

RESULTS:
We identified 663 patients with TBI and GCS 3. Vehicular accidents (46%), falls (31%) and sporting injuries (12%) were most common; however, cause of injury changed over time, most notably a significant increase in falls from 24% to 38% ($p = 0.009$). Vehicular injuries remained constant over time ($p=0.93$). Demographic and injury characteristics and outcomes differed by cause of injury (table). Of note and as expected, patients suffering falls were significantly older, patients with sporting injuries had the lowest presence of comorbidities, patients with vehicular injuries suffered the most extracranial injuries, and patients with GSW had the greatest fatality and abnormal vital signs. Interestingly, 13% of patients had a concussion and no other intracranial injury, which was greatest in assault injuries (table 1). In-hospital mortality was 41% and differed significantly based on injury: 100% of patients with GSW died, compared to 19% in patients with a sporting injury.

CONCLUSIONS:
This large multicenter cohort of patients with GCS 3 demonstrates a severe TBI population heterogeneous for injury characteristics but reflective of the broader severe TBI population with GCS 3-8. Despite a GCS 3, survival was high and a surprising number of patients suffered a concussion intracranial injury only. These injury characteristics can be used for clinician's decisions requiring aggressive management and allotment of resources.

KEYWORDS: Glasgow Coma Score; Epidemiology; mechanism

OBJECTIVES: 1. Changes in injury patterns of TBI and GCS 3 population over time□2. Mortality differences across cause of injury□3. Demographic and injury characteristic differences across cause of injury

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TITLE: Prediction of Consistency of Meningioma by Magnetic Resonance Imaging

AUTHORS: Kyle A Smith; John D Leever; Roukoz Chamoun

STUDY DESIGN: Retrospective chart review

INTRODUCTION:
Meningioma consistency is important, as it affects the difficulty of surgery. Regarding preoperative prediction of consistency, several methods have been proposed; however, they lack objectivity and reproducibility. We propose a new method for prediction based on Tumor to Cerebellar peduncle T2-weighted imaging Intensity (TCTI) ratios.

METHODS:
The MR images of 71 consecutive patients were evaluated pre-operatively. An intraoperative consistency scale was applied to these lesions prospectively by the operating surgeon based on Cavitron ultrasonic aspirator (CUSA) intensity. Tumors were classified as A, very soft; B, intermediate; or C, fibrous. Using T2-weighted MR sequence, the TCTI ratio was calculated. Tumor consistency grades and TCTI ratios were then correlated.

RESULTS:
Of the 71 tumors evaluated prospectively, 35 were classified as very soft, 16 as soft/intermediate, and 20 as fibrous. TCTI ratio median values for fibrous tumors was 0.91; intermediate tumors was 1.46; and very soft tumors was 1.83. One-way ANOVA analysis comparing TCTI ratios for these groups soft, intermediate, and fibrous was found to be statistically significant ($p<0.0001$).

CONCLUSIONS:
We propose a method using quantifiable region-of-interest (ROI) intensity ratios (TCTI), as a uniform and reproducible way to predict tumor consistency. The intraoperative consistency was graded in an objective and clinically significant way and could lead to more efficient tumor resection.

KEYWORDS: Meningioma, MRI, consistency

OBJECTIVES: 1) Review imaging characteristics of meningiomas□2) Understand MRI characteristics that contribute to intensity variation□3) Apply a new method of meningioma consistency prediction

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TITLE: Intradural, Extramedullary Neurosarcoid Mimicking a Cervical Intradural Tumor

AUTHORS: Kyle A Smith; John Clough

STUDY DESIGN: Case report

INTRODUCTION:
Neurosarcoidosis is the central nervous system (CNS) manifestation of a chronic, granulomatous condition. The CNS is involved in approximately 5-10% of cases, with the spine involved much more rarely (< 1%). Extramedullary spinal involvement is extremely rare with only several cases previously reported. We describe the case of a cervical extramedullary sarcoid lesion mimicking a cervical tumor and review the literature on spinal sarcoidosis.

METHODS:
This case is a 39 year-old male patient with a 3-month history of neck pain and cervical myelopathy. Neck pain radiated into both upper extremities. Upper extremity weakness was present on examination with progressive fine motor decline. MRI demonstrated ventrolateral enhancing mass causing severe spinal stenosis. The patient underwent laminectomy and partial facetectomy for gross total resection of this lesion. Pathology was sarcoid.

RESULTS:
A paucity of spinal, particularly extramedullary, sarcoid cases exist. Approximately 20 cases of isolated spinal sarcoid are previously reported. Our patient demonstrated remarkable recovery in extremity strength, sensation and gait. His neuraxis was screened and imaging demonstrated hilar lymphadenopathy and mild brain involvement. Systemic steroids were started, and the patient was discharged home.

CONCLUSIONS:
Extramedullary sarcoid lesions are extremely rare. These lesions can present as compressive lesions, mimicking the appearance of slow-growing spinal tumors. Gross-total resection is often necessary and possible with these extramedullary lesions. Neurologic recovery with decompression was profound. The importance of spinal decompression, systemic screening, and inclusion of sarcoidosis in the

differential diagnosis of spinal masses is stressed in this case.

KEYWORDS: Sarcoid, Spinal tumor

OBJECTIVES: 1) Describe the appearance of spinal neurosarcoidosis on imaging□2) Describe the prevalence of spinal neurosarcoidosis□3) Describe the treatment for spinal neurosarcoidosis

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TITLE: Updates on Minimally-Invasive SI Joint Fusion Clinical Trials

AUTHORS: Brad Duhon; Daniel J Cher

STUDY DESIGN: Prospective randomized controlled trial

INTRODUCTION:
Minimally-Invasive SI Joint Fusion has exploded in popularity over the last 5 years. Despite case reports demonstrating safety and efficacy, there has been a paucity of prospective data. This presentation will review interim outcomes of 2 prospective clinical trials on the iFuse technique.

METHODS:
2 prospective multicenter clinical trials (one randomized, and one single-arm) will be discussed. Outcomes, complications, and comparisons to conservative treatment will be discussed.

RESULTS:
SIFI which is the single-arm multicenter prospective clinical trial has reached 12-month f/u in all patients. Mean SI joint pain improved from 80 at baseline to 29 and 30 and six and twelve months, respectively (mean improvements of 50 and 49 points, $p<0.0001$ each). Mean ODI improved from 55.2 at baseline to 32.5 and 31.5 at six and twelve months (improvements of 22.7 and 23.6 points, $p<0.0001$ each). SF-36 physical component summary (PCS) improved from 31.7 at baseline to 40.2 and 40.3 at six and 12 months ($p<.0001$). At six and twelve months, 93 and 87% of subjects, respectively, were somewhat or very satisfied and 92 and 91%, respectively, would have the procedure again.☐INSITE has reached 6 month f/u and outcomes are as follows:

CONCLUSIONS:
While it is still relatively early in the follow-up period, minimally-invasive SI Joint fusion with the iFuse procedure has demonstrated efficacy up to most recent follow-up. In addition, it appears to be superior to continued conservative therapy in the initial 6-month follow-up window.

KEYWORDS: SI Joint, Minimally-Invasive, Fusion

OBJECTIVES: 1. Efficacy of minimally-invasive SI Joint fusion□2. Safety and revision rates of minimally-invasive SI Joint fusion□3. Comparison of minimally-invasive SI joint fusion to continued conservative therapies over a 6-month period.

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TITLE: How To Be A Good Doctor, Doing The Right Thing For The Right Reason

AUTHORS: John B Dietze

STUDY DESIGN:

INTRODUCTION:
The assault on physicians' ability to treat patients continues to escalate amidst the war that rages over how healthcare will be provided in the future.

METHODS:
The number of fronts upon which the struggle is occuring continues to increase as the problem seems to be getting more complex by the day. Concerns over falling reimbursment, smothering compliance mandates, the ever-looming threat of liability and the general fatigue associated with trying to cope with the stress of practicing medicine in this day and age are but a few of the issues that impact the ability to competently and compassionately treat patients.

RESULTS:
Due to these and other challenges, it has become increasingly difficult to recall what it means to be a "good doctor". As such, there is a need to reflect on the basics of care that is directed toward relieving suffering and promoting wellbeing rather than fulfilling agendas that are more concerned with controlling costs, limiting liability and improving the financial bottom line.

CONCLUSIONS:
The opportunity for distraction from the tenets of treating patients is relentless. Without a united and intentional effort by all who provide care to redirect the emphasis away from these competing interests, the sustainability of a system that has historically been the standard of excellence throughout the world will likely soon be lost.

KEYWORDS: Ethics, Compassion, Agenda

OBJECTIVES: 1. Better understand distacting agendas that interfere with the ability to care for patients□2. Identify areas in their own practices that ensure that patient care is of utmost concern□3.

Improve communication with colleges to ensure that common goals are established that are constructive toward improving the healthcare system

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TITLE: Postoperative management of atypical meningiomas--to radiate or observe

AUTHORS: Randy L. Jensen; Dennis C Shrieve

STUDY DESIGN: Retrospective chart review

INTRODUCTION:
The postoperative management of atypical meningioma remains controversial. We evaluate outcomes of patients with atypical meningiomas treated with surgery alone compared to surgery and radiotherapy at initial diagnosis, and at time of recurrence.

METHODS:
Patients with pathologically confirmed atypical meningioma treated from 1991 to 2014 were retrospectively reviewed. Local control and overall survival were assessed Outcomes for patients receiving adjuvant radiotherapy were compared to those treated with surgery alone. Kaplan Meier and Log-rank test for significance were used for local control and survival analyses.

RESULTS:
Sixty-one patients with 65 tumors met inclusion criteria. The initial therapy for 68% (44/65) was surgery alone, 32% (21/65) underwent surgery and radiotherapy. Of those patients treated with radiation, 18 received stereotactic fractionated radiotherapy and 3 received stereotactic radiosurgery. At a median follow-up of 41 months, 53 patients were alive. The crude local control was 58% (38/65) with a median time to local failure of 50 months. Seventy six percent (16/21) of tumors treated with upfront surgery and radiotherapy were controlled with a median time to local failure of 180 months, whereas only 50% (22/44) of tumors treated with surgery alone were controlled with a median time to local failure of 46 months (p=0.0388). Gross total resection was obtained for 71% (46/65) of tumors and of these, 100% (10/10) treated with adjuvant radiotherapy were controlled, whereas only 58% (21/32) of tumors treated with gross total resection alone were controlled (p=0.0163). Eighty eight percent of tumors (7/8) treated with subtotal resection alone failed, but 55% (6/11) of those treated with subtotal resection and adjuvant radiotherapy were controlled. Twenty-seven tumors were identified that failed initial treatment, and 74% (20/27) failed salvage therapy with a median time to local failure of 26 months.

CONCLUSIONS:
Gross total resection has historically been considered a critical intervention for patients with atypical meningioma. Our findings suggest the addition of adjuvant radiotherapy following GTR confers a local control benefit. Recurrent disease is difficult to control underscoring the importance of aggressive initial treatment.

KEYWORDS: meningiomas, radiation, outcome

OBJECTIVES: 1. Understand the outcomes of patients with atypical meningiomas□2. Discuss the role of radiation therapy in the post operative care of patients with atypical meningiomas□3. Review the role of observation after surgical resection of atypical meningiomas

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TITLE: Orthostatic Tremor Treated with Deep Brain Stimulation

AUTHORS: Lauren Schrock; Tyler Davis; Paul A. House

STUDY DESIGN: Case report

INTRODUCTION:
Orthostatic tremor is an unusualy form of tremor primarily causing lower extremity tremor and weakness. This under-recognized entity can become severely disabling.

METHODS:
We will present a case report of severe orthostatic tremor treated with deep brain stimulation. We will present first in human microelectrode recordings with EMG correlate of movements.

RESULTS:
Single unit and local field potential recordings revealed an unexpected bursting pattern in the frequency range of classic orthostatic tremor. This bursting activity is not typical of the pattern observed in other forms of tremor suggesting a different pathophysiology.

CONCLUSIONS:
Orthostatic tremor was successfully treated with deep brain stimulation and new insights into the disease will be discussed.

KEYWORDS: DBS, Tremor, EMG

OBJECTIVES: ...realize orthostatic tremor as a disctinct clinical entity.☐...discuss the use of deep brain stimulation to treat tremor.

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TITLE: High-Velocity Nerve Injury Animal Model

AUTHORS: Mark A. Mahan

STUDY DESIGN:

INTRODUCTION:
The most frequent cause of severe nerve injuries result from high velocity injuries, which may result in graded injury from stretch, rupture or tearing, to avulsion. As to date, there are no animal models that reproduce the pathology seen in high velocity injuries.□

METHODS:
The sciatic nerves of adult Sprague-Daley rats were subjected to both high-velocity and low-velocity stretch injuries. Biomechanical data was collected using high speed video camera and image analysis. Histological data was obtained and analyzed.

RESULTS:
Rate of acceleration determined maximal strain and predicted nerve failure. The vector of force determined ultimate strain to failure, with longitudinally directed force yielding lower strain as compared to non-longitudinal vector (24% versus 65%, respectively, $P<0.05$), independent of velocity of injury. Periarticular regions of the nerve demonstrated the greatest strain accommodation. Persistent length deformation develops when high-speed strain is increased above 30%. Non-longitudinal vectors demonstrated predominant injury at proximal nerve branch locations, including preferential rupture at proximal branches. Microdamage to endoneurial contents extends along the injured nerve.

CONCLUSIONS:
Biomechanical and histologic data suggest that high-speed nerve injuries are unique, as compared to low-velocity injuries. Endoneurial fibers are the primary tensile material of nerves. Animal models may help elucidate factors controlling potential for nerve recovery and healing.

KEYWORDS: Peripheral Nerve, Trauma, Animal Model, Regeneration

OBJECTIVES: Understand the prevalence of high-velocity nerve injuries.□Understand the biomechanical forces on nerves.□Understand the basis for categorizing nerve injuries

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TITLE: Use Of Fibrin Glue To Prevent CSF Leak After Intrathecal Catheter Removal or Revision

AUTHORS: Kelly Schmidt

STUDY DESIGN: Retrospective chart review

INTRODUCTION:
CSF leak is a well known complication of placement of intrathecal catheters for drug delivery. It is also an identified risk with any type of catheter revision or particularly catheter removal procedure.

METHODS:
A retrospective chart review of an almost 6 year experience with intrathecal pump and catheter implantations was performed. A subset of patients that required intrathecal catheter removal or replacement/revision were identified. A standard protocol of overnight hospital admission with 24 hours of flat bedrest was employed for every patient undergoing any catheter placement or removal with their procedure. The number of post-operative CSF leak complications was determined both before and after mid-2011 when injection of fibrin glue became a standard part of the procedure.

RESULTS:
Several persistent CSF leaks occurred early in the time frame of the study when old intrathecal catheters were either tied off on the muscle fascia or fully removed. Fibrin glue was ultimately used in these seemingly refractory CSF leak cases with resolution of the CSF leak. Fibrin glue was then injected at the dural exit site of the catheter and along the intramuscular tract in every catheter removal or revision procedure performed after early 2012. No additional post-operative CSF leaks have occurred. Additionally, no complications from injection of the fibrin glue were observed.

CONCLUSIONS:
Using fluoroscopic guidance, injection of fibrin glue at the site of intrathecal catheter exit from the dura and along the intramuscular tract of the catheter is a safe and effective way to prevent post-operative CSF leak after a catheter revision or removal procedure.

KEYWORDS: Intrathecal catheter, CSF leak, Fibrin glue

OBJECTIVES: 1. Describe known complications of intrathecal catheter placement, revision, and removal.□2. Describe the technique of injecting fibrin glue during an intrathecal catheter removal or revision procedure.□3. Identify appropriate patients who may benefit from injection of fibrin glue as a means to prevent or treat CSF leak.

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TITLE: Marijuana: What's the Deal?

AUTHORS: Ken Finn

STUDY DESIGN: Retrospective chart review

INTRODUCTION:
As marijuana is becoming more widely accepted and used, there are some significant sequelae being noted across the state. Recently the Colorado Medical Marijuana Scientific Advisory Council approved $9 million in research funding for a variety of medical conditions.

METHODS:
Will review the Colorado MMJ program, outlining a broad base of sequelae, and noting the recent approved studies

RESULTS:
Will be presented

CONCLUSIONS:
Will be presented

KEYWORDS: Marijuana, Pain

OBJECTIVES: 1. Assess science of cannabis□2. Identify potential side effects of use□3. Recognize physicians role in patient monitoring

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TITLE: Minimally Invasive Two-Level Thoracic or Thoracolumbar Corpectomies For Spondylodiscitis

AUTHORS: Michael E Seiff

STUDY DESIGN: Retrospective chart review

INTRODUCTION:
The incidence of spondylodiscitis is increasing. Management is predominantly medical, though indications for surgical intervention, other than for biopsy, include neural compression, structural instability, and failed medical management. Surgical techniques include anterior, posterior, and combined approaches. Recent literature has validated the use of expandable titanium cages for reconstruction. In the thoracic spine, a trans-thoracic anterolateral approach can be performed safely via a minimally invasive technique allowing for a two-level corpectomy, with subsequent stabilization utilizing an expandible cage and anterolateral plating. Posterior supplementation can be performed open or percutaneously. Likewise, at the thoracolumbar junction an anterolateral thoraco-abdominal approach with diaphragmatic takedown can be performed safely.

METHODS:
A retrospective chart review of thirteen thoracic and thoracolumbar corpectomies over a 2.5 year period since adopting a minimally invasive approach revealed five cases of two-level corpectomies performed for spondylodiscitis either refractory to medical management, or for post-treatment kyphotic deformity. Clinical presentations, operative management, and outcomes are discussed.

RESULTS:
Patients ages ranged from 47 to 71 years (3 male, 2 female). Three cases werre refractory to antibiotic therapy, two were for post-treatment deformity. There was one case of T9-10 corpectomies (T8-11 fusion), one of T11-12 corpectomies (T10-L1 fusion), two T12-L1 corpectomies (T11-L2 fusion), and one of L1-2 corpectomies (T12-L3 fusion). Anterolateral incisions were approximately 7-8 cm. Posterior surgery may be staged if blood loss was high. Surgical technique and indices, pre-and post-operative radiographs, and outcomes are presented.

CONCLUSIONS:

Two-level thoraic and thoracolumbar corpectomies can be performed via a minimally invasive anterolateral thoracic or thoracolumbar approach. Diaphragmatic takedown, when necessary, is not technically difficult. Blood loss can be high, but the procedures are well-tolerated.

KEYWORDS: Spondylodiscitis, Corpectomies

OBJECTIVES: 1. Descibe the surgical indications for spondylodiscitis. □2. Describe the surgical technique for a trans-thoracic anterolateral approach for two-level corpectomies□3. Describe the pertinent diaphragmatic anatomy for thoraco-lumbar corpectomies

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