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  By Makoto Nakamura.

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  By Satoshi Tani M.D.

- **Technical Notes.**

  - **Introduction**
  Spinal arteriovenous malformation (AVM) is one of the most complicated surgical abnormalities treated

  - **CONCLUSIONS**
  Vascular orientation during spinal AVM surgery by intra-arterial injection of indigo carmine seems to

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- **RADIOSURGERY FACILITATES RESECTION OF BRAIN ARTERIOVENOUS MALFORMATIONS AND REDUCES SURGICAL MORBIDITY**
  By Rene O.Sanchez-Mejia M.D.

- **CLINICAL STUDIES.**

  - **PATIENTS AND METHODS**
  Data were obtained from an ongoing registry of AVM patients treated at our institution, maintained prospectively

  - **COMMENTS**
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**DELAYED CYST FORMATION AFTER GAMMA KNIFE RADIOSURGERY FOR BRAIN METASTASES**

*By*, Eichi Ishikawa M.D

**CLINICAL STUDIES.**

**DISCUSSION**

volume, complete nidus obliteration, and a lobar AVM location. Although there have been no previous reports

**COMMENTS**

complete radiosurgical obliteration of an arteriovenous malformation. Ishikawa et al. bring appropriate attention
Note, too, that this menu of author names can be expanded.
Radiosurgery facilitates resection of brain arteriovenous malformations and reduces surgical morbidity

By Rene O. Sanchez-Mejia M.D.

Clinical studies.

Patients and methods

Data were obtained from an ongoing registry of AVM patients treated at our institution, maintained prospectively.

Comments

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Local biological drug delivery in the brain is an innovative field of medicine that developed rapidly in recent years.

The use of mesenchymal stem cells (MSCs) has been reported to elicit neuroprotective and regenerative effects mainly through the release of neurotrophic and immunomodulatory peptides that may well be a source of trophic support, promoting endogenous repair such as neurogenesis, angiogenesis, and synaptogenesis.1

With regard to the safety of cell therapy using MSCs, a large meta-analysis of clinical trials under various pathological conditions did not show any evidence of severe side effects related to MSC transplantation, such as acute infusion-related toxicity, complications in peripheral organ systems, infection, death, and tumor formation.2 Although MSCs themselves are not tumorigenic, migration to existing primary tumors and modification or even stimulation of tumor growth due to their immunomodulatory properties cannot be completely excluded.3

Encapsulated cell biodelivery has been introduced as a novel clinical strategy for cell therapy in the central nervous system. Encapsulation with semipermeable hollow fibers4 as well as spherical polymeric microparticles5 protects cells transplanted into the brain from the immunological graft-versus-host response. Because the capsules permit the free passage of nutrients, oxygen, and smaller molecules, the cells are maintained within the capsules and can produce and deliver therapeutic peptides to the brain.4,5 Encapsulated cells have already been used for the treatment of diabetes mellitus,6 amyotrophic lateral sclerosis,7,8 chronic pain,9 Huntington disease,10 and malignant brain tumors.11–13

So far, no severe side effects have been reported concerning the use of encapsulated MSCs for biological drug delivery in the brain. Our report illustrates a unique case of the de novo development of a cerebral arteriovenous malformation (AVM) after implantation of genetically modified allogeneic MSCs.
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Spontaneous Regression of a Dural Arteriovenous Malformation
By Multiple Authors: P. Sigouin, O. B., Miguel Elfan, MD, Michael McNeil, MD, and Andrew J. Salazar MD
The case of a 30-year-old man with a supratentorial dural arteriovenous malformation (AVM) associated with intracerebral hemorrhage is reported. Angiographically confirmed spontaneous regression of the AVM occurred without any form of surgical intervention. A possible m... Show more

High Altitude: An Unusual Cause of Neurological Detriment in a Patient with an Arteriovenous Malformation
By Multiple Authors: B.I. Tamminga MD and G.W. Koelt MD
High altitude associated with neurological detriment is an unusual presentation for an arteriovenous malformation (AVM). A case report of a man with a left temporal occipital AVM who developed symptoms that were markedly intensified by exposure to high altitude is p... Show more

Total Removal of a Brain Stem Arteriovenous Malformation: Case Report
By Multiple Authors: Yasuo Yonekawa MD, Y. Hidaka MD, and S. Yamada MD
The successful total removal of a brain stem arteriovenous malformation (AVM) in a two-stage operation is reported. The importance of selection of the approach for such an AVM because of the topographical anatomy is emphasized. (Neurosurgery 13:443-446, 1986) Show more
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*By Edward Smith*

Pediatric arteriovenous malformations are increasingly being treated with multimodality teams. This paper summarizes outcomes and strategies.

- **Proton Beam Stereotactic Radiosurgery for Pediatric Cerebral Arteriovenous Malformations**
  
The use of radiation is a key therapeutic modality in the management of pediatric arteriovenous malformations, with summary of proton beam therapy reviewed in this article.

- **Outcomes of Multimodality Therapy in Pediatric Patients With Ruptured and Unruptured Brain Arteriovenous Malformations**
  
Pediatric arteriovenous malformations are increasingly being treated with multimodality teams. This paper summarizes outcomes and strategies.

**Intracranial Hemorrhage**  
*By Edward Smith*

Hemianectomy remains an important technique in the management of trauma, stroke and hemorrhage in children. This article reviews the data relevant to its use.

- **Proton Beam Stereotactic Radiosurgery for Pediatric Cerebral Arteriovenous Malformations**
  
The use of radiation is a key therapeutic modality in the management of pediatric arteriovenous malformations, with summary of proton beam therapy reviewed in this article.

**Spinal Vascular Malformations**  
*By Joseph Gemmela*

- **EXTRADURAL THORACIC ARTERIOVENOUS MALFORMATION IN A PATIENT WITH KLIPPEL-TRENENAY-WEBER SYNDROME: CASE REPORT**


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**Intracranial Epidural Hematoma in Newborn Infants: Clinical Study of 15 Cases**

**Objective:** Epidural hematoma (EDH) in newborn infants is rare. We have described the history of 15 newborns with EDH to provide a better understanding of this pathology.

**Methods:** This is a descriptive case series study using a retrospective review of the medical records of newborns who were admitted to the Pediatric Intensive Care Unit and Neurosurgery Department with the diagnosis of birth EDH over a 24-year period (1979–2002).

**Results:** There was no sex predominance, and most of the mothers were young, nulliparous women. The time latency from birth to the first signs varied from 0 to 24 hours. Clinical presentation was nonspecific: seizures and hypotonia were the main symptoms. The parietal area was the most frequent location. Surgical drainage was required in nine patients, and no deaths were reported.

**Conclusion:** This report highlights the clinical-radiological characteristics of newborn EDH, which occurs more frequently in newborns that experienced difficult delivery from a nulliparous mother. Surgery is not a rule; some patients can be managed with conservative treatment. The outcome is generally good.

**Key Words:** Birth trauma, Difficult delivery, Epidural hematoma, Intracranial, Newborn infants, Treatment

Epidural hematoma (EDH) in newborn infants is rare (2, 5, 24). According to Yamamoto et al. (38), only 31 cases have been reported and most often as case reports (4, 14, 20, 21, 22, 29).

The present study reports a descriptive case series study using a retrospective review of 15 cases of EDH to provide a better understanding of the clinical-radiological significance and to give a prognosis for newborns with EDH. To our knowledge, this is the largest series of and all had a computed tomographic (CT) scan or a magnetic resonance imaging (MRI) scan between Day 1 and Day 5, which revealed the EDH. Patient outcome was classified based on the follow-up evaluation assessed by neurological and neuropsychometric examinations. The Denver Developmental Screening Test is widely used in pediatric units for screening developmental delays in newborns and children. We have retrospectively classified these patients into three groups: Group 1 (G1) had a normal neurological and psychometric
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Reprint requests: Abderrahmane Hamlat, M.D., Service de Neurochirurgie, CHRU Pontchaillou, Rue Henri Le Guilloux, 35231 Rennes cedex, France

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CONCLUSION: This large prospective clinical study shows that surgical treatment for CSM is associated with significant improvements in generic and patient-specific outcome measures at 1 year, which are sustained at 2-year follow-up. Surgical treatment appears to be a highly effective option for patients with symptomatic CSM and is an approach which can be recommended based on objective clinical and patient reported outcomes data from this study.

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Combined Results of the 3 US IDE Randomized Cervical Arthroplasty Trials With 2-Years of Follow-up

Cheerag D. Upadhyaya, MD, MSc; Jau-Ching Wu; Gopalakrishnan Balamurali, MD, FRCS(SN); Regis W. Haid, MD; Vincent C. Traynelis, MD; Bobby Tay MD; Domagoj Coric, MD; Gregory R. Trost, MD; Praveen V. Mummaneni, MD, PhD

INTRODUCTION: There have been 3 prospective, randomized, multi-center trials of cervical disc arthroplasty evaluating the PRESTIGE cervical disc, the Bryan cervical disc, and the Pro-Disc C cervical disc. The 24-month data from these randomized, controlled trials has been published and all have found that cervical disc replacement is a reasonable alternative to anterior cervical discectomy and fusion. We performed an analysis of these 3 trials with unpublished 24-month follow-up from the PRESTIGE cervical disc trial.

METHODS: All included studies had at least 24 months of available follow-up. Heller et al evaluated the Bryan cervical disc enrolling 242 patients in the study arm and 221 in the control arm. Murray et al studied the ProDisc-C implant with 103 in the study arm and 106 in the...
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METHODS

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First successful case of AVM radiosurgery

Steiner et al. (81) reported the first successful case of arteriovenous malformation (AVM) radiosurgery in 1972. Their subsequent publications provided additional strong evidence that radiosurgery, even without computerized dosimetry, could yield reasonable success rates for the treatment of carefully selected AVMs (78–80, 82). The gamma knife experience with radiosurgery for the treatment of AVMs is extensive and well documented (1, 8, 9, 16, 36, 42, 49, 53–55, 57–60, 64, 69).

Particle-beam radiosurgery has also been successfully used for the treatment of AVMs, as extensively documented (18–20, 34,

First reported the use of a linear accelerator radiosurgical system for the treatment of AVMs. Again, extensive literature has documented generally successful experiences (10–13, 27–29, 31, 32, 56, 70, 71, 74, 75, 83, 87, 88). Gamma knife, particle-beam, and linear accelerator radiosurgery have become increasingly important tools for the multimodality treatment of AVMs. In experienced hands, all three approaches have produced relatively high (60–80%) occlusion rates and relatively low (2%) radiation-induced complication rates. The practice of radiosurgery has radically changed since the first report by Steiner et al. (81), however; stereotactic angiography (a two-dimensional...
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In addition, a number of patient and treatment factors, including Spetzler-Martin grade, presenting symptoms, dose, number of isocenters, radiological outcome, and clinical outcome, were subjected to multivariate analysis.

RESULTS: Two hundred twenty-five patients were treated with radiosurgery for the first time, and 44 patients underwent radiosurgical retreatment. One hundred forty-three patients had AVMs located in or near eloquent brain areas and 126 patients did not. Seventy patients demonstrated preoperative neurological findings related to the AVM and 199 did not. Twenty-six patients had previously undergone endovascular treatment and 10 patients had previously undergone surgical treatment of their AVMs. Of the 269 patients studied, 228 experienced no complication, 10 (3.7%) experienced a transient radiation-induced complication, 3 (1%) experienced a permanent radiation-induced complication, and 28 (10%) experienced posttreatment hemorrhage.

CONCLUSION: None of the analyzed factors was predictive of hemorrhage after radiosurgery in this study. The 12-Gy volume was predictive of permanent radiation-induced complications. Eloquent AVM location and 12-Gy volume were correlated with the occurrence of transient radiation-induced complications. Better conformity was correlated with a reduced incidence of transient complications. Lower Spetzler-Martin grades, higher doses, and steeper dose gradients were correlated with radiological success.

KEY WORDS: Aneurysm, malformation, Radiosurgery

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KEY WORDS: Aneurysmal malformation, Radiosurgery

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