

Stanford



Gary K. Steinberg, MD, PhD

Bernard and Ronni Lacroute-William Randolph Hearst Professor in Neurosurgery and Neurosciences and Professor, by courtesy, of Neurology

CLINICAL OFFICES

- **Stanford Neuroscience Health Center**

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ACADEMIC CONTACT INFORMATION

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Bio

BIO

Dr. Gary Steinberg is the Chair of Neurosurgery, Director of the Stanford Moyamoya Center, and the founder and Co-Director of the Stanford Stroke Center. As a cerebrovascular and skull base neurosurgeon, he specializes in treating brain aneurysms, moyamoya disease, brain and spinal AVMs and other vascular malformations, carotid artery disease, meningiomas, skull base tumors, stroke, and hereditary hemorrhagic telangiectasia.

Dr. Steinberg has practiced neurosurgery at Stanford for more than 31 years. He has pioneered microsurgical techniques to repair intracranial vascular malformations and certain aneurysms that were previously considered untreatable. He has also refined revascularization techniques for patients with cerebrovascular arterial occlusions, as well as moyamoya disease. He is leading novel clinical trials of stem cell therapy for stroke and spinal cord injury.

CLINICAL FOCUS

- Cerebrovascular and Spinal Vascular Surgery
- Intracranial Aneurysms
- Intracranial/Intraspinal AVMs, AV fistulas, Cavernous Malformations
- Moyamoya Disease and Occlusive Cerebrovascular Disease
- Carotid Endarterectomy
- Neurological Surgery

ACADEMIC APPOINTMENTS

- Professor, Neurosurgery
- Professor (By courtesy), Neurology & Neurological Sciences
- Member, Bio-X
- Member, Stanford Neurosciences Institute

ADMINISTRATIVE APPOINTMENTS

- Chair, Stanford University School of Medicine - Neurosurgery, (1995- present)
- Founder and Co-Director, Stanford Stroke Center, (1991- present)
- Director, Stanford Moyamoya Center, (1991- present)

PROFESSIONAL EDUCATION

- Residency: Santa Clara Valley Medical Center Radiology Residency (1986) CA
- Residency: Stanford University School of Medicine Registrar (1987) CA
- Residency: Stanford University School of Medicine Registrar (1983) CA
- Internship: Stanford University School of Medicine (1980) CA
- Board Certification: Neurological Surgery, American Board of Neurological Surgery (1989)
- Fellowship: Institute Of Neurology (1981) England
- Medical Education: Stanford University School of Medicine (1980) CA

LINKS

- My Lab Site: <http://med.stanford.edu/steinberg-lab.html>
- My Blog: <http://med.stanford.edu/neurosurgery/chairmans-corner.html>
- Video Story: Choosing Medicine: <https://stanfordhealthcare.org/stanford-health-now/why-i-got-into-medicine/why-medicine-gary-steinberg-md-phd.html>
- Video Story: Alumni Award: <https://youtu.be/Sd2KV1Qtyb4>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Our laboratory is interested in elucidating the pathophysiology of acute cerebral ischemia and in developing neuroprotective treatments, as well as methods to restore neurologic function after stroke. Using rodent wild type, knock out and transgenic models of focal and global ischemia, we are investigating the physiologic processes leading from decreased blood flow after arterial occlusion to irreversible brain injury. A major focus of our work concerns the role of oxidative stress, inflammation and gene expression on necrotic and apoptotic mechanisms of ischemic cell death. Alterations in cerebral blood flow, neuronal metabolic activity, electrophysiology, and gene/protein expression are examined in relation to neurologic behavior. We are also studying the brain microenvironment during recovery after stroke and the effects of stem cell transplantation and optogenetic stimulations in promoting recovery of function.

We have been successful in attenuating ischemic cerebral damage by inducing mild brain hypothermia (30-33 degrees C) or overexpression of various genes (glucose transporter, bcl-2, hsp70, calbindin, catalase, glutathione peroxidase, SOD) either before or after stroke. Transplantation of human neural stem cells after experimental stroke results in survival, targeted migration and differentiation into appropriate neuronal and glial cell types, while anti-inflammatory treatment enhances native neurogenesis and gliogenesis following stroke. Additionally, stem cell transplantation and optogenetic stimulation restores motor-sensory behavior after stroke and we are exploring the underlying circuit plasticity and molecular changes that are responsible for recovering neurologic function.

Methodologies utilized in the laboratory include microsurgery, light and confocal microscopy, stereology, molecular biology techniques, FACS, magnetic resonance imaging, electrophysiology, cerebral blood flow measurements, gene transfer therapy, optogenetics, stem cell transplantation and rodent behavioral analysis.

Our clinical research efforts focus on novel approaches for treating intracranial aneurysms, intracranial and spinal vascular malformations, occlusive cerebrovascular disease such as Moyamoya disease and stroke. These include advances in microsurgery, interventional neuroradiology, stereotactic radiosurgery, 3D imaging, surgical

navigation, revascularization techniques, the use of mild brain hypothermia and other clinical neuroprotective agents, and stem cell transplantation for stroke and spinal cord injury.

CLINICAL TRIALS

- A Study of Modified Stem Cells in Traumatic Brain Injury (TBI), Recruiting
- Carotid Revascularization and Medical Management for Asymptomatic Carotid Stenosis Trial, Recruiting
- Dose Escalation Study of AST-OPC1 in Spinal Cord Injury, Recruiting
- A Study of Modified Stem Cells in Stable Ischemic Stroke, Not Recruiting
- Familial Intracranial Aneurysm Study II, Not Recruiting
- Study of Modified Stem Cells (SB623) in Patients With Chronic Motor Deficit From Ischemic Stroke, Not Recruiting

Teaching

COURSES

2017-18

- Clinical Teaching Seminar Series: SURG 257 (Aut)

STANFORD ADVISEES

Postdoctoral Faculty Sponsor

Marieke Cornelia Sophia Boshuizen, Zhijuan Cao, Shailaja Rao, Haruto Uchino, Yulia Zatulovskaia

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Neurosciences (Phd Program)

Publications

PUBLICATIONS

- **Stem Cell-Based Immunomodulation After Stroke: Effects on Brain Repair Processes** *STROKE*
Boshuizen, M. S., Steinberg, G. K.
2018; 49 (6): 1563–70
- **Engineered stem cell mimics to enhance stroke recovery.** *Biomaterials*
George, P. M., Oh, B., Dewi, R., Hua, T., Cai, L., Levinson, A., Liang, X., Krajina, B. A., Bliss, T. M., Heilshorn, S. C., Steinberg, G. K.
2018; 178: 63–72
- **Long-Term Effectiveness of Gross-Total Resection for Symptomatic Spinal Cord Cavernous Malformations.** *Neurosurgery*
Azad, T. D., Veeravagu, A., Li, A., Zhang, M., Madhugiri, V., Steinberg, G. K.
2018
- **Strategies for and Outcome of Repeat Revascularization Surgery for Moyamoya Disease: An American Institutional Series** *NEUROSURGERY*
Teo, M., Johnson, J., Steinberg, G. K.
2017; 81 (5): 852–59
- **Brainstem arteriovenous malformations: lesion characteristics and treatment outcomes.** *Journal of neurosurgery*
Madhugiri, V. S., Teo, M. K., Vavao, J., Bell-Stephens, T., Steinberg, G. K.
2017: 1-11
- **Electrical preconditioning of stem cells with a conductive polymer scaffold enhances stroke recovery.** *Biomaterials*
George, P. M., Bliss, T. M., Hua, T., Lee, A., Oh, B., Levinson, A., Mehta, S., Sun, G., Steinberg, G. K.
2017; 142: 31–40

- **Clinical Outcomes of Transplanted Modified Bone Marrow-Derived Mesenchymal Stem Cells in Stroke A Phase 1/2a Study** *STROKE*
Steinberg, G. K., Kondziolka, D., Wechsler, L. R., Lunsford, L. D., Coburn, M. L., Billigen, J. B., Kim, A. S., Johnson, J. N., Bates, D., King, B., Case, C., McGrogan, M., Yankee, et al
2016; 47 (7): 1817-1824
- **Optogenetic Approaches to Target Specific Neural Circuits in Post-stroke Recovery** *NEUROTHERAPEUTICS*
Cheng, M. Y., Aswendt, M., Steinberg, G. K.
2016; 13 (2): 325-340
- **Enhanced phasic GABA inhibition during the repair phase of stroke: a novel therapeutic target** *BRAIN*
Hiu, T., Farzampour, Z., Paz, J. T., Wang, E. H., Badgely, C., Olson, A., Micheva, K. D., Wang, G., Lemmens, R., Tran, K. V., Nishiyama, Y., Liang, X., Hamilton, et al
2016; 139: 468-480
- **Novel Stroke Therapeutics: Unraveling Stroke Pathophysiology and Its Impact on Clinical Treatments.** *Neuron*
George, P. M., Steinberg, G. K.
2015; 87 (2): 297-309
- **Is local hypoperfusion the reason for transient neurological deficits after STA-MCA bypass for moyamoya disease?** *JOURNAL OF NEUROSURGERY*
Mukerji, N., Cook, D. J., Steinberg, G. K.
2015; 122 (1): 90-94
- **Disease Variant Landscape of a Large Multiethnic Population of Moyamoya Patients by Exome Sequencing.** *G3 (Bethesda, Md.)*
Shoemaker, L. D., Clark, M. J., Patwardhan, A., Chandratillake, G., Garcia, S., Chen, R., Morgan, A. A., Leng, N., Kirk, S., Chen, R., Cook, D. J., Snyder, M., Steinberg, et al
2015; 6 (1): 41-49
- **Optogenetic neuronal stimulation promotes functional recovery after stroke** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Cheng, M. Y., Wang, E. H., Woodson, W. J., Wang, S., Sun, G., Lee, A. G., Arac, A., Fenno, L. E., Deisseroth, K., Steinberg, G. K.
2014; 111 (35): 12913-12918
- **Flexible Omnidirectional Carbon Dioxide Laser as an Effective Tool for Resection of Brainstem, Supratentorial, and Intramedullary Cavernous Malformations** *NEUROSURGERY*
Choudhri, O., Karamchandani, J., Gooderham, P., Steinberg, G. K.
2014; 10 (1): 34-44
- **Less invasive pedicled omental-cranial transposition in pediatric patients with moyamoya disease and failed prior revascularization.** *Neurosurgery*
Navarro, R., Chao, K., Gooderham, P. A., Bruzoni, M., Dutta, S., Steinberg, G. K.
2014; 10: 1-14
- **Cavernous malformation of brainstem, thalamus, and basal ganglia: a series of 176 patients.** *Neurosurgery*
Pandey, P., Westbroek, E. M., Gooderham, P. A., Steinberg, G. K.
2013; 72 (4): 573-589
- **Multimodality management of Spetzler-Martin Grade III arteriovenous malformations** *JOURNAL OF NEUROSURGERY*
Pandey, P., Marks, M. P., Harraher, C. D., Westbroek, E. M., Chang, S. D., Do, H. M., Levy, R. P., Dodd, R. L., Steinberg, G. K.
2012; 116 (6): 1279-1288
- **Arterial Spin-Labeling MRI Can Identify the Presence and Intensity of Collateral Perfusion in Patients With Moyamoya Disease** *STROKE*
Zaharchuk, G., Do, H. M., Marks, M. P., Rosenberg, J., Moseley, M. E., Steinberg, G. K.
2011; 42 (9): 2485-U183
- **Management of Pediatric Intracranial Arteriovenous Malformations: Experience With Multimodality Therapy** *NEUROSURGERY*
Darsaut, T. E., Guzman, R., Marcellus, M. L., Edwards, M. S., Tian, L., Do, H. M., Chang, S. D., Levy, R. P., Adler, J. R., Marks, M. P., Steinberg, G. K.
2011; 69 (3): 540-556
- **Human neural stem cells enhance structural plasticity and axonal transport in the ischaemic brain** *BRAIN*
Andres, R. H., Horie, N., Slikker, W., Keren-Gill, H., Zhan, K., Sun, G., Manley, N. C., Pereira, M. P., Sheikh, L. A., McMillan, E. L., Schaar, B. T., Svendsen, C. N., Bliss, et al

2011; 134: 1777-1789

- **Predictors of Clinical and Angiographic Outcome After Surgical or Endovascular Therapy of Very Large and Giant Intracranial Aneurysms** *NEUROSURGERY*
Darsaut, T. E., Darsaut, N. M., Chang, S. D., Silverberg, G. D., Shuer, L. M., Tian, L., Dodd, R. L., Do, H. M., Marks, M. P., Steinberg, G. K.
2011; 68 (4): 903-915
- **Intraoperative blood flow analysis of direct revascularization procedures in patients with moyamoya disease** *JOURNAL OF CEREBRAL BLOOD FLOW AND METABOLISM*
Lee, M., Guzman, R., Bell-Stephens, T., Steinberg, G. K.
2011; 31 (1): 262-274
- **Transplanted Stem Cell-Secreted VEGF Effects Post-Stroke Recovery, Inflammation, and Vascular Repair.** *Stem cells (Dayton, Ohio)*
Horie, N., Pereira, M. P., Niizuma, K., Sun, G., Keren-Gill, H., Encarnacion, A., Shamloo, M., Hamilton, S. A., Jiang, K., Huhn, S., Palmer, T. D., Bliss, T. M., Steinberg, et al
2011
- **Long-term monitoring of transplanted human neural stem cells in developmental and pathological contexts with MRI** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Guzman, R., Uchida, N., Bliss, T. M., He, D., Christopherson, K. K., Stellwagen, D., Capela, A., Greve, J., Malenka, R. C., Moseley, M. E., Palmer, T. D., Steinberg, G. K.
2007; 104 (24): 10211-10216
- **Nurse Telephonic Triage Service for After-hour Patient Calls in Neurosurgery.** *Annals of surgery*
Escobedo-Wu, E. L., Dhebar, F., Harsh, G., Steinberg, G., Vyas, A., Katznelson, L., Ho, A. L., Pendharkar, A. V., Sussman, E. S., Rohatgi, N.
2018; 267 (4): e67-e68
- **The Utility of Collaterals as a Biomarker in Pediatric Unilateral Intracranial Arteriopathy** *PEDIATRIC NEUROLOGY*
Elbers, J., Armstrong, D., Benseler, S. M., Dlamini, N., Steinberg, G. K., Yeom, K. W.
2018; 78: 27-34
- **Reduced Intravoxel Incoherent Motion Microvascular Perfusion Predicts Delayed Cerebral Ischemia and Vasospasm After Aneurysm Rupture.** *Stroke*
Heit, J. J., Wintermark, M., Martin, B. W., Zhu, G., Marks, M. P., Zaharchuk, G., Dodd, R. L., Do, H. M., Steinberg, G. K., Lansberg, M. G., Albers, G. W., Federau, C.
2018
- **Management of Arteriovenous Malformations Associated with Developmental Venous Anomalies: A Literature Review and Report of 2 Cases** *WORLD NEUROSURGERY*
Zhang, M., Connolly, I. D., Teo, M. K., Yang, G., Dodd, R., Marks, M., Zuccarello, M., Steinberg, G. K.
2017; 106: 563-69
- **Ipsilateral Pupillary Dilation Following Carotid Endarterectomy: A Temporary and Benign Phenomenon.** *Neurosurgery*
Steinberg, J. A., Carter, B. S., Lee, M. B., Steinberg, G. K.
2017; 80 (5): E239-E244
- **Disrupting the CD47-SIRP alpha anti-phagocytic axis by a humanized anti-CD47 antibody is an efficacious treatment for malignant pediatric brain tumors** *SCIENCE TRANSLATIONAL MEDICINE*
Gholamin, S., Mitra, S. S., Feroze, A. H., Liu, J., Kahn, S. A., Zhang, M., Esparza, R., Richard, C., Ramaswamy, V., Remke, M., Volkmer, A. K., Willingham, S., Ponnuswami, et al
2017; 9 (381)
- **Interventional therapy for brain arteriovenous malformations before and after ARUBA** *JOURNAL OF CLINICAL NEUROSCIENCE*
Sussman, E. S., Iyer, A. K., Teo, M., Pendharkar, A. V., Ho, A. L., Steinberg, G. K.
2017; 37: 54-56
- **Embolization Followed by Radiosurgery for the Treatment of Brain Arteriovenous Malformations (AVMs)** *WORLD NEUROSURGERY*
Marks, M. P., Marcellus, M. L., Santarelli, J., Dodd, R. L., Do, H. M., Chang, S. D., Adler, J. R., Mlynash, M., Steinberg, G. K.
2017; 99: 471-476
- **Measuring Cerebral Blood Flow in Moyamoya Angiopathy by Quantitative Magnetic Resonance Angiography Noninvasive Optimal Vessel Analysis.** *Neurosurgery*
Khan, N., Lober, R. M., Ostergren, L., Petralia, J., Bell-Stephens, T., Navarro, R., Feroze, A., Steinberg, G. K.

2017

- **Comparison of porcine and bovine collagen dural substitutes in posterior fossa decompression for Chiari I malformation in adults.** *World neurosurgery*
Lee, C. K., Mokhtari, T., Connolly, I. D., Li, G., Shuer, L. M., Chang, S. D., Steinberg, G. K., Gephart, M. H.
2017
- **Pipeline embolization device retraction and foreshortening after internal carotid artery blister aneurysm treatment.** *Interventional neuroradiology : journal of peritherapeutic neuroradiology, surgical procedures and related neurosciences*
Heit, J. J., Telischak, N. A., Do, H. M., Dodd, R. L., Steinberg, G. K., Marks, M. P.
2017; 23 (6): 614–19
- **Patient Outcomes and Cerebral Infarction after Ruptured Anterior Communicating Artery Aneurysm Treatment.** *AJNR. American journal of neuroradiology*
Heit, J. J., Ball, R. L., Telischak, N. A., Do, H. M., Dodd, R. L., Steinberg, G. K., Chang, S. D., Wintermark, M., Marks, M. P.
2017; 38 (11): 2119–25
- **Clinical and Arterial Spin Labeling Brain MRI Features of Transitional Venous Anomalies.** *Journal of neuroimaging : official journal of the American Society of Neuroimaging*
Zhang, M., Telischak, N. A., Fischbein, N. J., Steinberg, G. K., Marks, M., Zaharchuk, G., Heit, J. J., Iv, M.
2017
- **Surgical outcomes of Majewski osteodysplastic primordial dwarfism Type II with intracranial vascular anomalies** *JOURNAL OF NEUROSURGERY-PEDIATRICS*
Teo, M., Johnson, J. N., Bell-Stephens, T. E., Marks, M. P., Do, H. M., Dodd, R. L., Bober, M. B., Steinberg, G. K.
2016; 18 (6): 717-723
- **Interventional therapy for brain arteriovenous malformations before and after ARUBA.** *Journal of clinical neuroscience*
Sussman, E. S., Iyer, A. K., Teo, M., Pendharkar, A. V., Ho, A. L., Steinberg, G. K.
2016
- **Quality of Life in Pediatric Moyamoya Disease.** *Pediatric neurology*
Ball, A. J., Steinberg, G. K., Elbers, J.
2016; 63: 60-65
- **Editorial: Direct versus indirect bypass for moyamoya disease: ongoing controversy.** *Journal of neurosurgery*
Teo, M. K., Madhugiri, V. S., Steinberg, G. K.
2016: 1-3
- **The strokes that killed Churchill, Roosevelt, and Stalin.** *Neurosurgical focus*
Ali, R., Connolly, I. D., Li, A., Choudhri, O. A., Pendharkar, A. V., Steinberg, G. K.
2016; 41 (1): E7-?
- **Management of moyamoya syndrome in patients with Noonan syndrome** *JOURNAL OF CLINICAL NEUROSCIENCE*
Gupta, M., Choudhri, O. A., Feroze, A. H., Do, H. M., Grant, G. A., Steinberg, G. K.
2016; 28: 107-111
- **Multiple Subsets of Brain Tumor Initiating Cells Coexist in Glioblastoma** *STEM CELLS*
Rennert, R. C., Achrol, A. S., Januszyn, M., Kahn, S. A., Liu, T. T., Liu, Y., Sahoo, D., Rodrigues, M., Maan, Z. N., Wong, V. W., Cheshier, S. H., Chang, S. D., Steinberg, et al
2016; 34 (6): 1702-1707
- **Optogenetic modulation in stroke recovery** *NEUROSURGICAL FOCUS*
Pendharkar, A. V., Levy, S. L., Ho, A. L., Sussman, E. S., Cheng, M. Y., Steinberg, G. K.
2016; 40 (5)
- **Neurorestoration after stroke** *NEUROSURGICAL FOCUS*
Azad, T. D., Veeravagu, A., Steinberg, G. K.
2016; 40 (5)
- **Impaired Arm Function and Finger Dexterity in a Nonhuman Primate Model of Stroke Motor and Cognitive Assessments** *STROKE*
McEntire, C. R., Choudhury, G. R., Torres, A., Steinberg, G. K., Redmond, D. E., Daadi, M. M.

2016; 47 (4): 1109-1116

- **Laparoscopic harvesting of omental pedicle flap for cerebral revascularization in children with moyamoya disease** *JOURNAL OF PEDIATRIC SURGERY*
Bruzoni, M., Steinberg, G. K., Dutta, S.
2016; 51 (4): 592-597
- **High-Resolution Microfluidic Single-Cell Transcriptional Profiling Reveals Clinically Relevant Subtypes among Human Stem Cell Populations Commonly Utilized in Cell-Based Therapies** *FRONTIERS IN NEUROLOGY*
Rennert, R. C., Schaefer, R., Bliss, T., Januszyk, M., Sorkin, M., Achrol, A. S., Rodrigues, M., Maan, Z. N., Kluba, T., Steinberg, G. K., Gurtner, G. C.
2016; 7
- **Acute Preoperative Infarcts and Poor Cerebrovascular Reserve Are Independent Risk Factors for Severe Ischemic Complications following Direct Extracranial-Intracranial Bypass for Moyamoya Disease** *AMERICAN JOURNAL OF NEURORADIOLOGY*
Antonucci, M. U., Burns, T. C., Pulling, T. M., Rosenberg, J., Marks, M. P., Steinberg, G. K., Zaharchuk, G.
2016; 37 (2): 228-235
- **Purification and Characterization of Progenitor and Mature Human Astrocytes Reveals Transcriptional and Functional Differences with Mouse** *NEURON*
Zhang, Y., Sloan, S. A., Clarke, L. E., Caneda, C., Plaza, C. A., Blumenthal, P. D., Vogel, H., Steinberg, G. K., Edwards, M. S., Li, G., Duncan, J. A., Cheshier, S. H., Shuer, et al
2016; 89 (1): 37-53
- **Disease Variant Landscape of a Large Multiethnic Population of Moyamoya Patients by Exome Sequencing** *G3-GENES GENOMES GENETICS*
Shoemaker, L. D., Clark, M. J., Patwardhan, A., Chandratillake, G., Garcia, S., Chen, R., Morgan, A. A., Leng, N., Kirk, S., Chen, R., Cook, D. J., Snyder, M., Steinberg, et al
2016; 6 (1): 41-49
- **Personalized Medicine in Cerebrovascular Neurosurgery: Precision Neurosurgical Management of Cerebral Aneurysms and Subarachnoid Hemorrhage.** *Frontiers in surgery*
Achrol, A. S., Steinberg, G. K.
2016; 3: 34-?
- **Microsurgical treatment of a tentorial galenic dural arteriovenous fistula** *NEUROSURGICAL FOCUS*
Choudhri, O., Steinberg, G. K.
2016; 40
- **Optogenetic Stimulation of Neural Grafts Enhances Neurotransmission and Downregulates the Inflammatory Response in Experimental Stroke Model.** *Cell transplantation*
Daadi, M. M., Klausner, J. Q., Bajar, B., Goshen, I., Lee-Messer, C., Lee, S. Y., Winge, M. C., Ramakrishnan, C., Lo, M., Sun, G., Deisseroth, K., Steinberg, G. K.
2016; 25 (7): 1371-1380
- **Microsurgical treatment of a tentorial galenic dural arteriovenous fistula.** *Neurosurgical focus*
Choudhri, O., Steinberg, G. K.
2016; 40 Video: 1-?
- **An Alternative Display Could Lead to Earlier Diagnosis of Intracerebral Pathology with a Hemedex Flow Probe In Situ** *WORLD NEUROSURGERY*
Mukerji, N., Cook, D. J., Steinberg, G. K.
2015; 84 (6)
- **Extracorporeal membrane oxygenation for cardiac arrest during moyamoya cerebral revascularization surgery: case report** *JOURNAL OF NEUROSURGERY*
Choudhri, O., Shah, A., Basarab-Tung, J., Jaffe, R. A., Steinberg, G. K.
2015; 123 (3): 693-698
- **Glioblastoma Multiforme: Exploratory Radiogenomic Analysis by Using Quantitative Image Features.** *Radiology*
Gevaert, O., Mitchell, L. A., Achrol, A. S., Xu, J., Echeagaray, S., Steinberg, G. K., Cheshier, S. H., Napel, S., Zaharchuk, G., Plevritis, S. K.
2015; 276 (1): 313-?
- **Use of thromboelastography to tailor dual-antiplatelet therapy in patients undergoing treatment of intracranial aneurysms with the Pipeline embolization device.** *Journal of neurointerventional surgery*
McTaggart, R. A., Choudhri, O. A., Marcellus, M. L., Brennan, T., Steinberg, G. K., Dodd, R. L., Do, H. M., Marks, M. P.
2015; 7 (6): 425-430

- **Electroencephalographic features of moyamoya in adults** *CLINICAL NEUROPHYSIOLOGY*
Frechette, E. S., Bell-Stephens, T. E., Steinberg, G. K., Fisher, R. S.
2015; 126 (3): 481-485
- **Development of Arteriovenous Fistula After Revascularization Bypass for Moyamoya Disease: Case Report** *OPERATIVE NEUROSURGERY*
Feroze, A. H., Kushkuley, J., Choudhri, O., Heit, J. J., Steinberg, G. K., Do, H. M.
2015; 11 (1): E202-E206
- **Persistent trigeminal artery supply to an intrinsic trigeminal nerve arteriovenous malformation: A rare cause of trigeminal neuralgia.** *Journal of clinical neuroscience*
Choudhri, O., Heit, J. J., Feroze, A. H., Chang, S. D., Dodd, R. L., Steinberg, G. K.
2015; 22 (2): 409-412
- **Internal carotid artery surgical revascularization in a pediatric patient with Schimke immuno-osseous dysplasia** *JOURNAL OF NEUROSURGERY-PEDIATRICS*
Westbroek, E. M., Mukerji, N., Kalanithi, P., Steinberg, G. K.
2015; 15 (2): 189-191
- **Optogenetic approaches to study stroke recovery.** *ACS chemical neuroscience*
Cheng, M. Y., Wang, E. H., Steinberg, G. K.
2014; 5 (12): 1144-1145
- **Human brain arteriovenous malformations express lymphatic-associated genes.** *Annals of clinical and translational neurology*
Shoemaker, L. D., Fuentes, L. F., Santiago, S. M., Allen, B. M., Cook, D. J., Steinberg, G. K., Chang, S. D.
2014; 1 (12): 982-995
- **Human brain arteriovenous malformations express lymphatic-associated genes** *ANNALS OF CLINICAL AND TRANSLATIONAL NEUROLOGY*
Shoemaker, L. D., Fuentes, L. F., Santiago, S. M., Allen, B. M., Cook, D. J., Steinberg, G. K., Chang, S. D.
2014; 1 (12): 982-995
- **RNF213 Rare Variants in an Ethnically Diverse Population With Moyamoya Disease** *STROKE*
Cecchi, A. C., Guo, D., Ren, Z., Flynn, K., Santos-Cortez, R. L., Leal, S. M., Wang, G. T., Regalado, E. S., Steinberg, G. K., Shendure, J., Bamshad, M. J., Grotta, J. C., Nickerson, et al
2014; 45 (11): 3200-3207
- **Glioblastoma Multiforme: Exploratory Radiogenomic Analysis by Using Quantitative Image Features** *RADIOLOGY*
Gevaert, O., Mitchell, L. A., Achrol, A. S., Xu, J., Echegaray, S., Steinberg, G. K., Cheshier, S. H., Napel, S., Zaharchuk, G., Plevritis, S. K.
2014; 273 (1): 168-174
- **Temporary clipping for unruptured aneurysms.** *World neurosurgery*
Mukerji, N., Cook, D. J., Steinberg, G. K.
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