



Advanced Multimodality Image-Guided Operating Suite Designed to Enhance Procedures and Enable New Interventions

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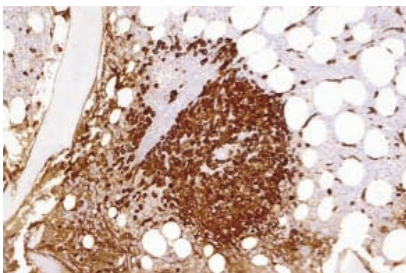
The new Advanced Multimodality Image-Guided Operating (AMIGO) suite is a state-of-the-art medical and surgical research environment that facilitates collaboration among multidisciplinary teams of specialists and houses a complete array of advanced imaging equipment and interventional surgical systems.



Innovative Evaluation and Treatment for Thyroid Diseases

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Expert endocrinologists, endocrine surgeons, cytopathologists, ultrasonographers, medical oncologists, and other specialists in the Thyroid Center provide an experienced, multidisciplinary approach to managing thyroid disease.



Mastocytosis Center Offers Advanced Approaches to Diagnosis and Treatment

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Specialists in the Mastocytosis Center have developed advanced approaches to evaluation and treatment of mast cell disease, including state-of-the-art techniques to accurately diagnose the disease.



Comprehensive Treatment Options for Erectile Dysfunction

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The Men's Sexual Health Clinic provides comprehensive treatment for men with erectile dysfunction, including those who do not benefit from oral phosphodiesterase Type 5 (PDE5) inhibitors.



Continuing Medical Education

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Learn about upcoming continuing medical education course offerings from Brigham and Women's Hospital and Dana-Farber/Brigham and Women's Cancer Center, through the Harvard Medical School Department of Continuing Education.



Advanced Multimodality Image-Guided Operating Suite Designed to Enhance Procedures and Enable New Interventions

The new Advanced Multimodality Image-Guided Operating (AMIGO) suite at Brigham and Women's Hospital (BWH) is a state-of-the-art medical and surgical research environment that houses a complete array of advanced imaging equipment and interventional surgical systems. To date, more than 60 patients have undergone procedures in the AMIGO suite, which opened in late August 2011.

This innovative operating and imaging research suite encourages collaboration among multidisciplinary teams of surgeons, interventional radiologists, radiation oncologists, imaging physicists, computer scientists, biomedical engineers, nurses, and technologists. These teams use AMIGO's unique equipment array and design to efficiently and precisely guide treatment – before, during, and after the procedure – without the patient or medical team leaving the operating room.

Brigham and Women's Hospital is home to a large National Institutes of Health (NIH) grant – the National Center for Image-Guided Therapy (NCIGT). The NCIGT is the NIH's central resource for all aspects of research into image-guided procedures, and AMIGO is instrumental to advancing the mission of the NCIGT — to provide more effective patient care.

Physicians use the suite to incorporate research protocols designed to enhance standard clinical procedures and to develop new therapeutic approaches, including image-

guided craniotomy, MR-guided prostate biopsy for cancer diagnosis, radiation treatment of prostate cancer and gynecological tumors, breast conserving therapy, MR-guided cryoablation, and brain tumor laser ablation. Using MR temperature mapping to ablate tissue, brain tumor laser ablation is a minimally invasive treatment that offers an alternative option for patients with metastatic disease in the brain.

"AMIGO represents the latest development in our more than 20-year history of discovery and innovation in image-guided therapies," said Ferenc A. Jolesz, MD, Co-Principal Investigator of the National Center for Image-Guided Therapy at BWH. "Based on our experience in this field, we designed this revolutionary new suite with specific capabilities to support new image-guided techniques."

Current procedures in AMIGO include:

- **Neurosurgical procedures** – Intra-operative MRI-assisted craniotomy and biopsy, minimally invasive interstitial laser ablation, endoscopic pituitary surgery, and anterior skull base surgery;
- **MR-guided prostate intervention** – biopsy and cancer treatment;
- **Brachytherapy** for gynecologic and cervical cancers;
- **Cryoablation** of kidney and liver tumors.



The nation's first fully integrated operating suite to offer immediate intra-procedural access to an extensive range of advanced imaging modalities, AMIGO's 5,700-square foot space is divided into three interconnected procedure rooms housing real-time anatomic, functional, and molecular imaging modalities, including 3T MRI, PET/CT, fluoroscopy, and ultrasound.

Future procedures in AMIGO will include the introduction of novel image-guided techniques, including breast cancer lumpectomies, peripheral sarcoma resections, parathyroid resections, percutaneous ablation of bone, soft-tissue and lung tumors, image-guided endoscopic procedures, and cardiac electrophysiology (EP) procedures.

“AMIGO enables clinicians to research, develop, and refine surgical and interventional techniques that are more focally targeted to the patient’s disease, are less invasive, and result in better outcomes,” said Clare Tempny, MD, Co-Principal Investigator of the National Center for Image-Guided Therapy at BWH.

The Suite also benefits from other innovative technologies available at BWH, including a Cyclotron to create novel tailored radioactive compounds. Combined with PET/CT imaging, this technology enables clinicians to visualize the metabolically active sites of disease, as well as assess treatment efficacy and other disease processes.

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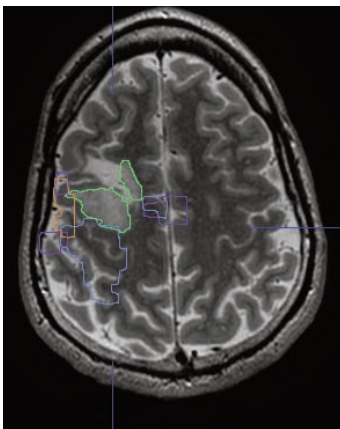
For More Information

If you have any questions, or if you would like to tour the new AMIGO suite, please email InfoBWHAMIGO@partners.org.

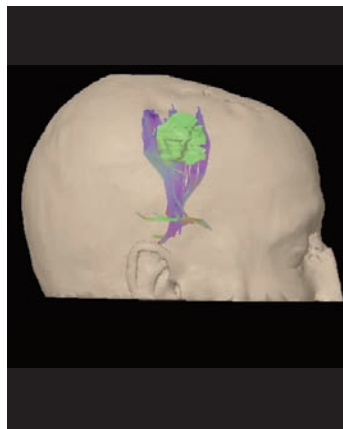
Case Study: MR identifies residual tumor for complete resection

A 43-year-old male golf professional presented with low-grade glioma recurrence in the motor cortex. The original glioma was resected at BWH in 1999 using intra-operative MR guidance. Since that time, he has performed well, continuing to work with some intermittent partial seizures. The team’s goal was to provide a safe, yet maximal resection of his tumor, recognizing the importance of his motor function to his livelihood. Preoperative structural and functional MRI images were obtained, as well as diffusion tensor imaging (DTI) with tractography to define the relationship of the tumor to adjacent motor elements, including cortical areas and the cortico-spinal tracts. He underwent an awake craniotomy, performed by Alexandra J. Golby, MD, Director,

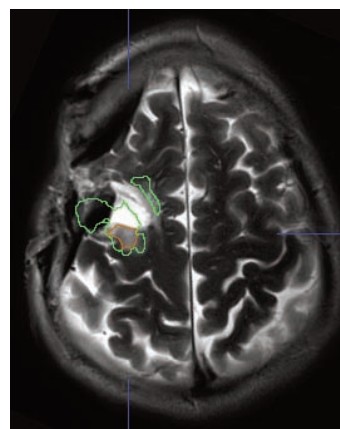
Image-guided Neurosurgery and Clinical Co-Director of AMIGO, in the AMIGO suite, which confirmed the findings of the preoperative functional MRI and tractography with electrophysiological mapping. After an initial resection, intra-operative MR demonstrated a small area of residual tumor. In addition, intra-operative DTI demonstrated the intra-operative configuration and position of the cortico-spinal tracts. The intra-operative MR images were used to localize the area of residual tumor and achieve a radiographically complete resection. The patient tolerated the procedure well and was discharged on the second postoperative day free of neurologic deficit.



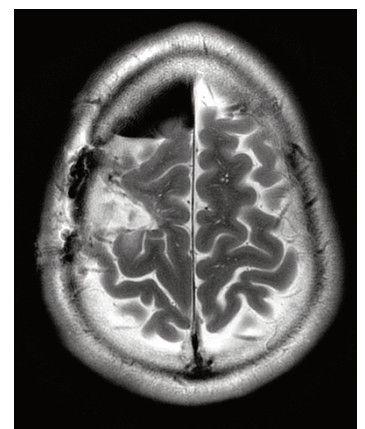
This image shows the proximity of the tumor to the motor areas. Close cropped fMRI on T2 show foot, hand, and face activations (in purple, blue, and orange), as well as the 3D segmented tumor.



Pre-op DTI shows the tumor surrounded by the white matter tracts, including one area where the tract goes through part of the tumor.



Intra-operative T2 weighted MRI shows small residual tumor marked in orange with reference to original tumor size marked in green.



Post-op T2 shows a near gross total resection.

Innovative Evaluation and Treatment for Thyroid Diseases

Comprised of expert endocrinologists, endocrine surgeons, cytopathologists, ultrasonographers, medical oncologists, and other specialists, the multidisciplinary Thyroid Center at Brigham and Women's Hospital (BWH) is dedicated to improving outcomes for patients with thyroid diseases.

"Our team provides expert evaluation, treatment, and management for thyroid disease using an experienced, multidisciplinary approach," said P. Reed Larsen, MD, Director, Thyroid Center.

Thyroid Nodule Clinic

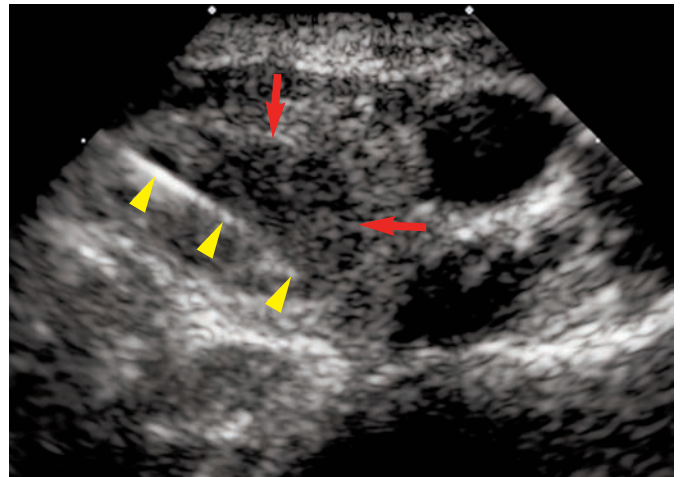
Among the largest in the nation, the Center's Thyroid Nodule Clinic, directed by Ellen Marqusee, MD, performs 30-40 diagnostic needle aspirations of thyroid nodules weekly using ultrasound guidance under the supervision of Carol B. Benson, MD, Director of Ultrasound, and Peter M. Doubilet, MD, PhD, Senior Vice Chair of Radiology. Cytological evaluation is performed by cytopathologists, led by Edmund S. Cibas, MD, Director, Cytology and Fine Needle Aspiration Center. Overseen by Endocrinologist Erik K. Alexander, MD, a registry of cytopathological results of thyroid nodule biopsies of nearly 10,000 patients is maintained. Nodules found to be benign are monitored periodically by Center specialists for growth or other changes.

Excellent Surgical Outcomes

Directed by Francis D. Moore, Jr., MD, Chief, Division of General and GI Surgery, endocrine surgeons at BWH perform more than 600 thyroid and thyroid-related procedures each year and are internationally recognized for the development of team-driven protocols and checklists that have influenced surgery worldwide. Specifically, the team has reduced the rate of surgical complications to far below national averages for recurrent laryngeal nerve injury resulting in permanent vocal cord paralysis, one percent for bleeding, and two percent for parathyroid gland dysfunction. Patients are typically able to return home the same day or the day following surgery. Upcoming surgical developments include the use of the Advanced Multimodality Image-Guided Operating (AMIGO) Suite at BWH for select parathyroid surgery cases.

Follow-up Care and Novel Treatment for Advanced Disease

When indicated, adjuvant radioactive iodine is provided to patients with thyroid cancer. Post-therapy nuclear scanning is used to confirm successful treatment, particularly in patients with more aggressive disease. Long-term follow up using sensitive serum thyroglobulin assays is performed to confirm eradication of disease and to diagnose the uncommon recurrence of disease. Care for patients with advanced thyroid cancer is provided by specialists in the Head and Neck Oncology Center at Dana-Farber/Brigham and Women's Cancer Center, under the leadership of Director



An ultrasound image of a thyroid nodule (red arrows) in the left thyroid lobe, undergoing fine needle aspiration. The nodule is slightly darker than the surrounding normal thyroid tissue, and the 25 gauge needle (yellow arrowheads) is inserted into the nodule to obtain cells to be examined by cytology or for mRNA expression studies.

Robert I. Haddad, MD. The Center provides access to novel agents, including the latest clinical trials for thyroid cancer.

Genetic Studies

Genetic developments at the Center include the use of oncogene screening among patients with thyroid malignancy to help predict prognosis. BRAF mutation screening, in particular, has been shown to be useful among thyroid cancer patients. Similarly, molecular analysis of cytologically

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Indications for Referral

Thyroid Center specialists generally can provide diagnostic evaluation within two weeks and provide care for:

- Thyroid nodules or Goiter;
- Thyroid cancer;
- Hyperthyroidism and hypothyroidism.

Information and Referrals

For more information, or to refer a patient, please contact our Referral Coordinators at (617) 732-9894 or email bwhreferrals@partners.org.

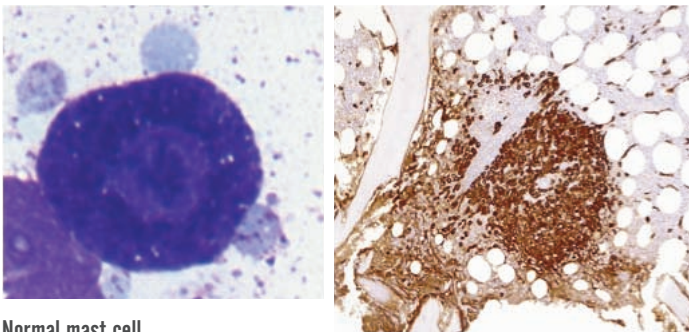


P. Reed Larsen, MD
Director,
Thyroid Center

Mastocytosis Center Offers Advanced Approaches to Diagnosis and Treatment

The Mastocytosis Center at Brigham and Women's Hospital (BWH), a first-of-its-kind center, provides expert multidisciplinary evaluation and treatment for patients from across the country. Led by Allergist and Immunologist Cem Akin, MD, PhD, specialists in the Center have developed advanced approaches to diagnosis and treatment of the disease.

"Many cases of mastocytosis are missed, especially early in the disease, leading to a delay in critical treatment," said Dr. Akin. "We are collaborating with specialized pathologists and geneticists to incorporate innovative approaches designed to ensure accurate diagnoses." Center specialists are using a state-of-the-art approach with flow cytometry to detect abnormal mast cells and also are working with geneticists to screen patients for a mutation in the c-kit gene, evident in 95 percent of adult-onset mastocytosis cases. Genetic screening is performed at the BWH Center for Advanced Molecular Diagnostics.



Normal mast cell

Increased numbers and dense clustering of mast cells in the bone marrow of a patient with systemic mastocytosis highlighted by tryptase stain

Groundbreaking Research

Researchers in the Center also are currently leading studies evaluating its correlation among patients with anaphylaxis or hypotension upon exercising; osteoporosis; or severe bee sting allergies.

These studies will help describe the frequency of mast cell disease in particular presentations and better characterize the molecular pathophysiology of mast cell disease. In addition, researchers in the Center are examining familial connections in mast cell disease among families that contain more than one member with the disease.

"There is a great deal of clinical diversity in mast cell disease," said Dr. Akin. "Further analysis will likely identify additional molecular phenotypes that will help us to develop new treatment approaches."

The Center also has comprehensively studied patients presenting with mast cell mediators in the blood or urine and related symptoms but no evidence of clonal mast cell disease.

Dr. Akin and Mariana Castells, MD, PhD, Associate Director, Mastocytosis Center, have authored several papers describing Mast Cell Activation Syndrome (MCAS) and the criteria for diagnosis and treatment (*Int Arch Allergy Immunol.* 2012; 157(3):215-25. and *J Allergy Clin Immunol.* 2010 Dec;126(6): 1099-104.e4.).

Antihistamines, sodium cromolyn, anti-leukotrienes, and epinephrine, as well as avoidance of triggers, are used to control symptoms. For the 20 percent of patients with mastocytosis who develop leukemia or aggressive mast cell disease, cytoreductive therapy is used to destroy mast cells (*Blood.* 2010 Dec 23;116(26):5812-7.). Care for these patients is coordinated among specialists in the Center for Hematologic Oncology at Dana-Farber/Brigham and Women's Cancer Center. A new multicenter trial, led by Daniel J. DeAngelo, MD, PhD, Clinical Director, Adult Leukemia Services, Center for Hematologic Oncology, is using PKC412 to target the mutated c-kit gene in patients with aggressive mastocytosis with a high degree of mast cell infiltration in the bone marrow, spleen, or liver. For children with mast cell disease, Center specialists collaborate with Children's Hospital Boston.

Indications for Referral

Center specialists provide specialized evaluation and care for patients with suspected or confirmed mast cell disease, including patients with:

- Established diagnosis of cutaneous or systemic mastocytosis;
- Unexplained recurrent anaphylaxis;
- Elevated tryptase, histamine or prostaglandins levels;
- Severe hypotensive bee sting allergies.



Cem Akin, MD, PhD,
Director, Mastocytosis Center



Mariana Castells, MD, PhD
Associate Director, Mastocytosis Center



Daniel J. DeAngelo, MD, PhD
Clinical Director, Adult Leukemia Services
Center for Hematologic Oncology,
Dana-Farber/Brigham and Women's Cancer Center

Access and Information

For more information, or to refer a patient, please contact our Referral Coordinator at (617) 732-9894 or bwhreferrals@partners.org.

Comprehensive Treatment Options for Erectile Dysfunction

Directed by Urologist Michael P. O'Leary, MD, the Men's Sexual Health Clinic at Brigham and Women's Hospital provides comprehensive evaluation and treatment for men with erectile dysfunction (ED).

"Approximately half of men with erectile dysfunction don't benefit from oral phosphodiesterase Type 5 (PDE5) inhibitors, presenting a more complex scenario for both patients and their physicians," said Dr. O'Leary. "When these medications aren't effective, we work with referring physicians and their patients to present a range of other options."

Clinic specialists generally determine underlying causes of erectile dysfunction through neurologic testing, hormonal evaluations, and vascular testing. Doppler ultrasound imaging is routinely used. Clinic specialists also evaluate and care for patients with erectile dysfunction due to cancer treatment as part of Dana-Farber/Brigham and Women's Cancer Center.

ED Treatment Options

For men who do not respond to PDE5 inhibitors, or when these medications are contraindicated, Clinic specialists offer numerous alternatives, including:

- **Injection therapy** – This therapy is highly effective, with about 80 percent of men responding to treatment and with few side effects. Patient education and training is required for proper use;

- **Vacuum device** – This device uses a manual pump to increase blood flow and a ring to prevent blood from draining before the desired time;
- **Penile implant** – The Clinic is a high-volume center for this option, performing more than 50 implant procedures each year. This two-piece inflatable device pushes fluid from a reservoir into cylinders in the penis. A release valve transfers fluid back to the reservoir. This option has a high satisfaction rate among most men and does not require an abdominal incision. While risk of infection is low (approximately three percent), many Centers do not perform salvage procedures when infection occurs. Dr. O'Leary is one of few specialists to perform salvage procedures, removing the old device, cleaning the area, and implanting a new device.

Expert Care for Peyronie's Disease

Patients with Peyronie's disease also benefit from penile implants, and a new treatment that has been approved for Dupuytren's contracture is currently under investigation for Peyronie's disease. The treatment uses Xiaflex, an enzyme therapy that dissolves excess collagen leading to Peyronie's disease and Dupuytren's contracture. In select cases, surgery also may be used to correct Peyronie's disease.



Information and Referrals

For more information, or to refer a patient, please contact our Referral Coordinators at (617) 732-9894 or email bwhreferrals@partners.org.



Michael P. O'Leary, MD
Director, Men's Sexual Health Clinic

Access to Brigham and Women's Hospital

Physician Referral Service

(617) 732-9894 or 1-800-MD-T0-BWH (1-800-638-6294)

Experienced referral coordinators assist with outpatient appointments, access to our physicians, and information regarding our specialists and services.

Physician Liaison

Physician Liaison Ellen Steward provides direct assistance with patient referrals and consultations with our specialists. Ellen is available to meet with you in person and can be reached at (617) 732-9598, esteward@partners.org, or pager (617) 732-5700, ID #36031.

MD Connect

(Inpatient Transfers and Transportation Services)
1-877-637-3337

Care Coordination

(Facilitation of Care Plan and Discharge Planning)
(617) 732-6469

Cardiovascular Access Managers

Cardiovascular Access Managers Lisa Downey, MSN, RN, and Gail Jamieson, MSN, RN, assist with inpatient transfers and consultations with our team of cardiovascular experts. They can be reached at (617) 543-4170.

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Case Study: MR Guides Brachytherapy Treatment

A 67-year-old female (BRCA 1 positive, post hysterectomy, bilateral salpingo-oophorectomy and radical vulvectomy) was diagnosed with recurrent vulvar carcinoma. Diagnostic multi-sequence MRI of the pelvis performed before and after 20cc of IV Magnevist showed a 3cm non-circumferential left-sided thickening of vaginal cuff ending into a nodular oval shaped mass, which was T1 isointense, predominantly T2 isointense with some T2 hyperintense areas, and demonstrated heterogeneous enhancement and restriction of diffusion (*Image 1*). The vaginal component was closely related to the left bladder base anteriorly in close proximity with the rectum posteriorly. Intra-operative AMIGO MR images were obtained prior to entering the needle-guided interstitial brachytherapy catheter placement, performed by Radiation Oncologist Akila N. Viswanathan, MD, MPH, in consultation with Dr. Tempny. Imaging sequences consist of gradient-echo, T2-weighted diffusion imaging and multiplanar reconstructions.

The preliminary T2W images showed a foley catheter in good position (*Image 2*) and again demonstrate the previously described 3 cm vaginal mass. Three-dimensional assessment of this was made prior to the placement of the template and catheters. The template was then positioned and catheters inserted and, using real-time MR guidance, was modified and adapted according to the tumor position. Catheters with radioactive seeds were selectively placed in the center of the tumor. The axial and sagittal images were correlated for appropriate depth and placement of all catheters. The catheters were kept below the sigmoid colon loop just above the vaginal cuff. At the completion of the procedure, all catheters were noted to be in good position with none located in the sigmoid. The final radiation dose covered the entire tumor (*Image 3*). Now at six months post procedure, the patient shows no clinical evidence of residual disease.

Image 1

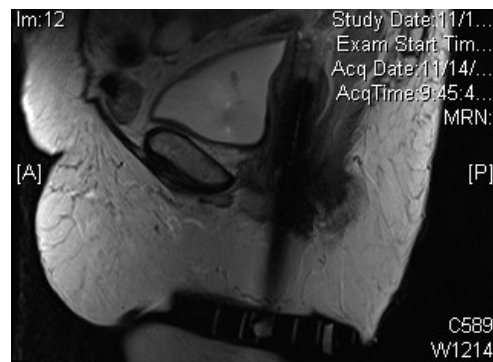


Image 2

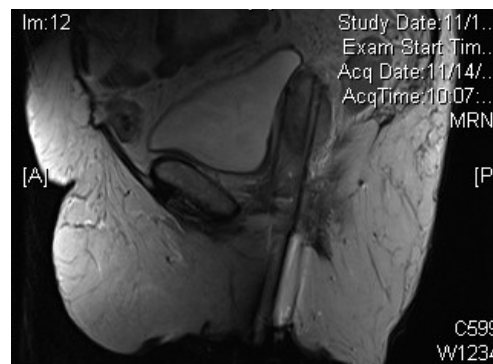
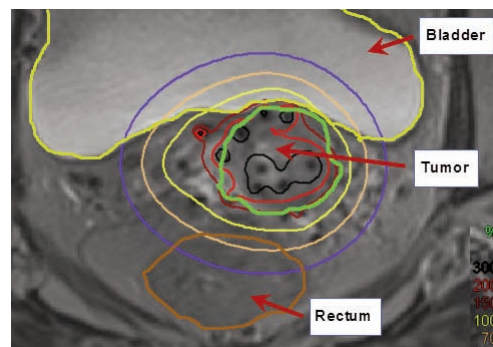


Image 3



Ferenc A. Jolesz, MD
Co-Principal Investigator,
National Center for Image-Guided Therapy,
Brigham and Women's Hospital



Clare Tempny, MD
Co-Principal Investigator,
National Center for Image-Guided Therapy,
Brigham and Women's Hospital;
Radiologist, Dana-Farber/Brigham and Women's Cancer Center



Alexandra J. Golby, MD
Director, Image-guided Neurosurgery,
Clinical Co-Director,
Advanced Multimodality Image-Guided Operating (AMIGO) Suite,
Brigham and Women's Hospital



Akila N. Viswanathan, MD, MPH
Radiation Oncologist,
Dana-Farber/Brigham and Women's Cancer Center

Continuing Medical Education

Brigham and Women's Hospital and Dana-Farber/Brigham and Women's Cancer Center are pleased to offer the following courses, occurring in May 2012, through the Harvard Medical School Department of Continuing Education. Please call (617) 384-8600 or visit www.cme.hms.harvard.edu for more information.

May 4 – 5

An Update and Review of Cardiovascular Disease in Women

Location: Joseph B. Martin Conference Center, Harvard Medical School, 77 Avenue Louis Pasteur, Boston, MA

Directors: Joanne Foody, MD, FACC, FAHA; Nandita S. Scott, MD, FACC; Malissa J. Wood, MD, FACC, FAHA, FASE

Offered by: Brigham and Women's Hospital, Department of Medicine; Massachusetts General Hospital, Department of Medicine and Heart Center, Corrigan Women's Heart Health Program

May 5

Advances in the Treatment of Genitourinary Cancers

Location: Dana-Farber Cancer Institute, 450 Brookline Avenue, Boston, MA

Directors: Philip W. Kantoff, MD; Christopher J. Sweeney, MD

Offered by: Dana-Farber/Brigham and Women's Cancer Center

For more information, or to register for this course, please call (800) 553-3787 or visit dfbwcc.org.



**HARVARD
MEDICAL SCHOOL**
DEPARTMENT OF CONTINUING EDUCATION

Innovative Evaluation and Treatment for Thyroid Diseases . . . continued from page 4

indeterminate FNA material is provided. In the unusual circumstance when adequate cytology remains abnormal but raises the suspicion of malignancy, molecular analysis of thyroid tissue has been shown to more accurately predict benign or malignant disease. This strategy may assist in modifying clinical recommendations to those affected patients. The BWH Center for Molecular Diagnostics routinely analyzes cellular material for BRAF, RAS, RET/PTC, and PAX8-PPAR gamma mutations, and further research collaborations are underway to allow even broader diagnostic evidence that nodules are benign.

Thyroid Disease and Pregnancy

Many thyroid issues first appear or worsen during pregnancy, and the many pregnant women being followed by obstetricians at BWH have permitted systematic clinical studies of these issues. For example, BWH specialists have helped to establish national guidelines for thyroid hormone treatment during pregnancy. Dr. Alexander led a groundbreaking study published in the *New England Journal of Medicine* that established guidelines for managing thyroid disease during pregnancy. The study found that women with hypothyroidism receiving thyroid hormone replacement who became pregnant typically required a 20 to 40 percent increase in levothyroxine dose to maintain a normal thyroid status in both the mother and fetus. Importantly, these results also indicated that the increased requirement for thyroid hormones begins very early in pregnancy – often by week six or seven.

“These data provide guidance for affected women to reach out to their endocrinologist or primary care physician immediately upon a missed menstrual cycle or positive home pregnancy test – to allow proactive testing and levothyroxine dose adjustment as soon as possible,” said Dr. Larsen.

New Online Resource:



MDvideocenter.brighamandwomens.org

Visit our online center for videos featuring surgeries, procedures and Grand Rounds presentations from BWH experts.



**BRIGHAM AND
WOMEN'S HOSPITAL**

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