

Seeing is better  
for neurosurgical  
precision and outcomes

# Intraoperative MRI: evolving surgery

IMRIS delivers high-field diagnostic quality magnetic resonance imaging to the operating rooms during the procedure — when updated visualization can support key surgical decisions in real-time. Using intraoperative MRI (iMRI), surgical precision is improved and patient risk mitigated through:

- >> Visualization of surgical progress and results — reduces re-operation rates
- >> No moving or repositioning of anesthetized patient — limits transport and image shift issues
- >> Clarity of imaging for detail and guidance into exquisite areas — eases concerns or reservations of completing planned procedure

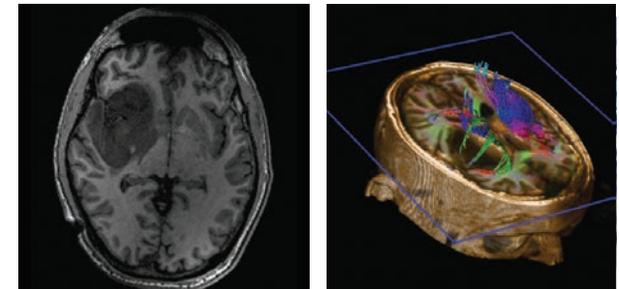
For cranial and spinal neurosurgery, the **VISIUS**® Surgical Theatre with iMRI is a seamlessly integrated environment that provides surgeons with diagnostic quality images and data — before, during or after a procedure. Featuring a high-field (1.5T or 3T) MR scanner that travels into the OR on-demand using ceiling-mounted rails, **VISIUS** iMRI delivers real-time information to clinicians while preserving optimal surgical positioning, access and techniques.

Using **VISIUS** iMRI, surgeons can visualize targeted brain tissue and accurately identify eloquent areas and white matter tracts. Surgeons can assess brain shift and refine the surgical plan, prior to closing the surgical site.

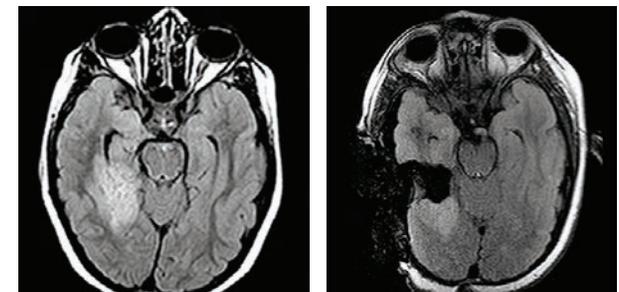
When not in use, the MR exits the OR completely, enabling surgeons to use standard surgical instruments. Specialized tables, head fixation devices (HFDs) and imaging technologies preserve preferred surgical techniques and enable optimal patient positioning for surgical access.



VISIUS iMRI moves into and out of the OR on ceiling-mounted rails.



3D T1/MPP RAGE anatomic, and Fiber tracking from DTI data used in pre-operative planning



Pre- and intraoperative FLAIR images during tumor resection

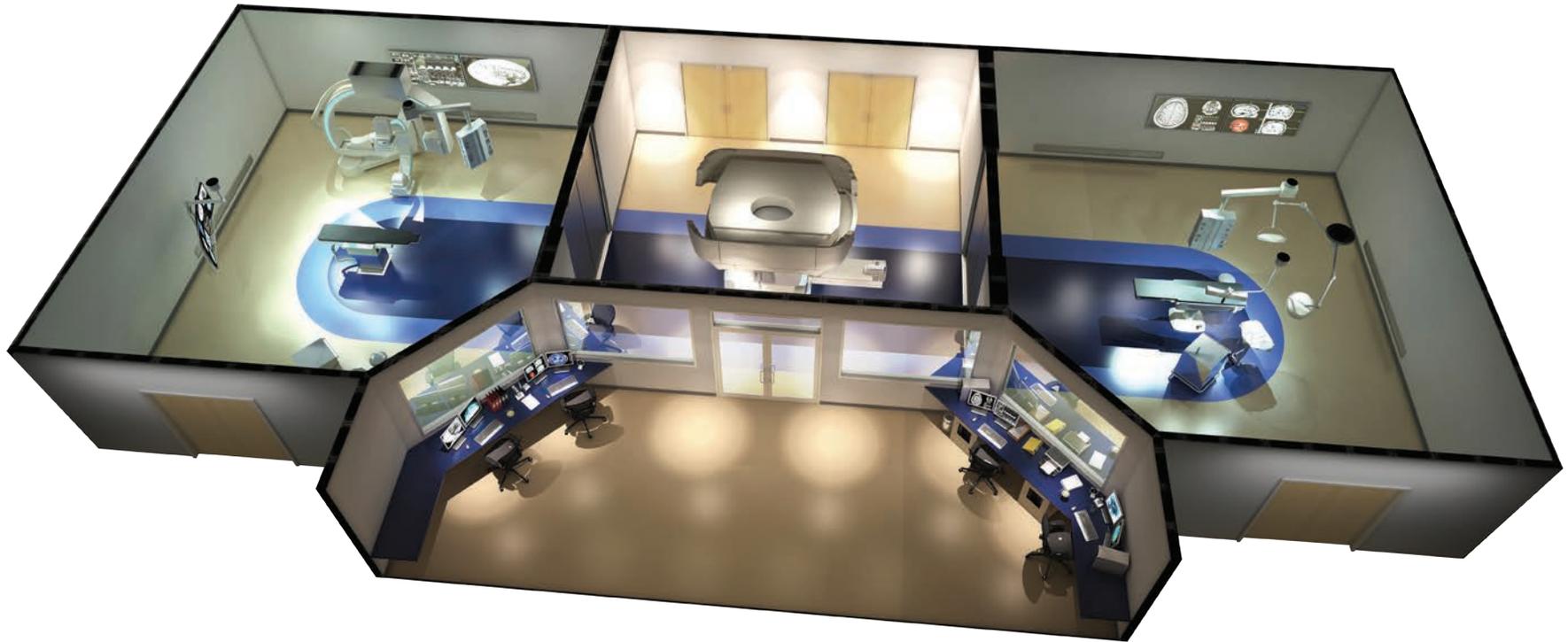
# The true intraoperative advantage

The American Hospital Association<sup>1</sup> defines intraoperative MRI as:

An integrated system with an MRI (low-field or high-field) allowing immediate evaluation of the degree of tumor resection during surgery without moving the patient from the operating theater.

The **VISIUS** Surgical Theatre is the only iMRI system that meets this definition.

Two- and three-room multifunctional theaters are designed for image-guided and non-image guided neurosurgery. With a single MR scanner for diagnostic and intraoperative imaging, and a technology platform that enables endovascular procedures, the **VISIUS** Surgical Theatre is a flexible, scalable solution for a wide range of clinical applications.



1. American Hospital Association, 2011 Annual AHA Survey

# Seeing is better

The VISIUS Surgical Theatre makes iMRI practical for integration into surgical workflow. Clinical literature highlights the impact of iMRI:

## 40%

In 40% of all cases, the surgeon modified the procedure based upon the findings of iMR – information that would not have been available until post procedure.<sup>1-3</sup>

## 55%

In 55% of glioma cases, the surgeon resected additional tumor that was identified using iMR.<sup>1-6</sup>

## 30%

Surgeons achieved a 30-point increase in the percentage of patients with gross/total resection when iMR was used.<sup>1, 2, 7 - 10</sup>

For example:

- Chicoine et al, 2011: 65% without iMR; 93% with iMR
- Chen et al, 2011: 52% without iMR; 88% with iMR

VISIUS Surgical Theatre is making a significant difference in neurosurgery today, considering:

- >> “Improved outcome among adult patients with hemispheric LGG [glioma] is predicted by greater EOR [extent of resection]”, and
- >> “Patients with at least 90% EOR had 5- and 8-year overall survival (OS) rates of 97% and 91%, respectively, whereas patients with less than 90% EOR had 5- and 8-year OS rates of 76% and 60%, respectively.”<sup>9</sup>

1. \*Chicoine MR et al, *Acta Neurochir Suppl.* 2011

2. \*Chen et al, *Springer-Verlag* 2011

3. \*Database at Washington University and Barnes-Jewish Hospital, St. Louis, MO (Not published, 444 patients)

4. Bohinski et al, *Neurosurgery*, 2001

5. Wirtz et al, *Neurosurgery*, 2000

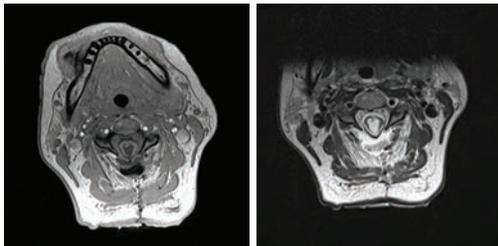
6. Lenaburg et al, *Technol Cancer Res Treat* 2009

7. Knauth et al, *AJNR Am J Neuroradiol* 1999

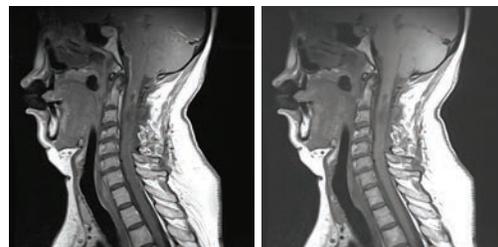
8. Hatiboglu et al, *Neurosurgery* 2009

9. \* Wu et al, Fudan University, CNS Presentation 2013

10. \* Mohammadi AM et al, Cleveland Clinic, *Neurosurgery* 2014



Axial T1 VIBE post, and Axial TSE T2 — both used in resection



Sagittal T1 pre-contrast and post contrast images

Leading neurosurgical institutions worldwide are using **VISIUS** iMRI state-of-the-art suites for:

- >> Upper C-spine
- >> Aneurysm
- >> Arteriovenous Malformation
- >> Deep Brain Stimulation (DBS)
- >> Drug Delivery
- >> Tumor resection
- >> Tumor ablation
- >> Chiari Malformation
- >> Epilepsy

# Complete iMRI neurosurgical solution

## Safe & Efficient Imaging On Demand

Safety interlocks and advanced collision detection system control the MR scanner movement for the safety of the patient and clinical team.

## Optimized for Intraoperative Imaging

The MR scanner is customized for imaging in multiple locations with patented shimming technology. The system supports DTI, MRA, MPRAGE, diffusion and 3D T1/T2 sequences with minimal acquisition time for intraoperative imaging.

IMRIS flexible imaging coils are specifically designed for neurosurgical intraoperative imaging. Two-piece design allows full surgical access and enhances patient comfort. The posterior element can be left in position during surgery while the anterior section can be easily positioned and removed at any time, streamlining the transitions between surgery and imaging. The ability to conform the coil to the anatomy and position it independent of the angle of the patient provides an enhanced signal-to-noise ratio for diagnostic quality images.

Fully functional, MR-compatible operating room tables are uniquely designed for surgery and intraoperative imaging of the head, neck and spine. The MR-safe HFD enables adult and pediatric patients to be placed in prone, supine and lateral positions. The low profile design makes it easy to position the head in the MR iso-center for optimal imaging, and allows a prone patient to be imaged with the head lower than the table.

With integrated tools and technology for specific clinical applications, the **VISIUS** Surgical Theatre is an optimized environment for true intraoperative imaging and image guided treatment.



Integrated head fixation and flexible imaging coils maximize surgical access and iMRI image quality.

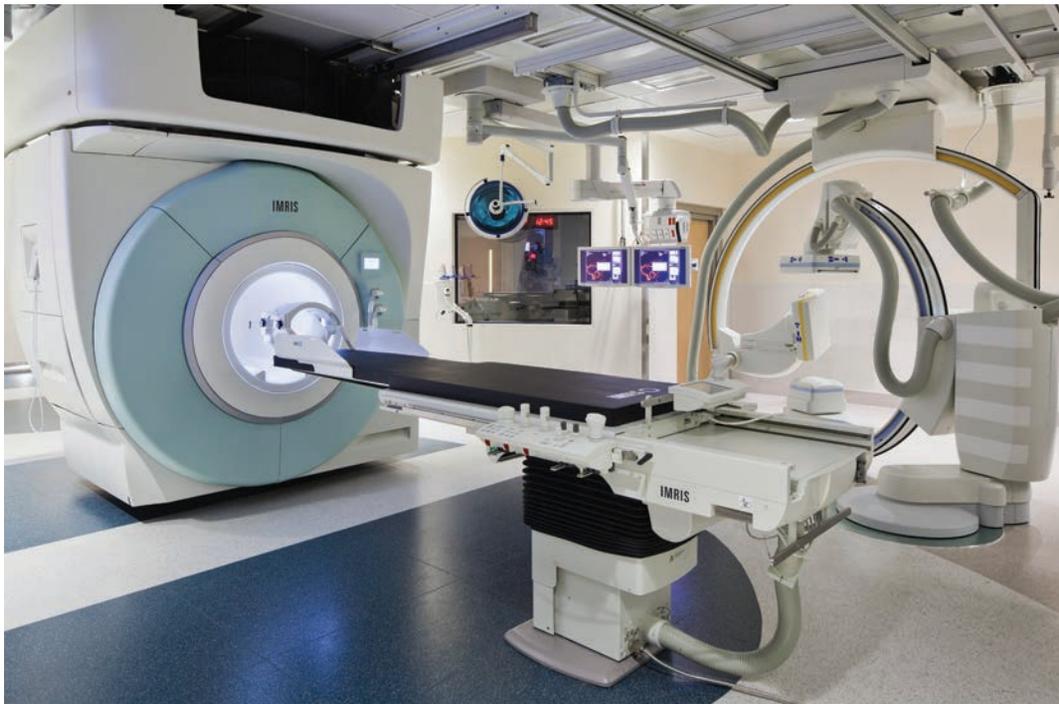


Fixed and removable OR tables with optimal positioning and scanning ranges streamline workflow.



A custom-designed cart allows for easy transport and storage of the table.

# A platform for Neurosurgery and Endovascular Interventions



X-ray angiography is another modality available for endovascular imaging. When this option is added to a **VISIUS** Surgical Theatre along with a ceiling-mounted MR scanner, it becomes the only OR in the world where patients can be scanned in the MR, treated percutaneously or surgically on the angio system, and scanned again in the MR to verify treatment – without ever leaving the table.

The ability to perform open surgical applications and catheter-based treatments in this environment creates opportunities for multiple departments to collaborate on its investment and to optimize its utilization.

# Integrating the Surgical Theatre

Unique safety, workflow, room controls and data management are built into each surgical suite with VISIUSmatrix® featuring KARL STORZ OR1® and can be adaptable for each surgeon and procedure:

- >> Routing, recording, streaming and archiving of video feeds
- >> Internal and external communication with voice and data
- >> Remote monitoring and diagnostics
- >> Variable room lighting controls
- >> Custom RF shielding system
- >> Unique MR access doors, shielded openings and electronic filters



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