Recently, the teams at PLA301 Hospital in Beijing, China and at Washington University & Barnes-Jewish Hospital St Louis, USA have published papers that provide compelling information about the viability and clinical benefits of the VISIUS Surgical Theatre in neurosurgery. The following summaries include the title and abstract of the paper, along with some important highlights.
Hospital Profile

» Located in St Louis, Missouri, USA

» Top 15 – U.S. News & World Report’s list of Best Hospitals for Neurology & Neurosurgery, 2011-1012

» Prof. Ralph G. Dacey is the Chairman of the Department of Neurosurgery at Washington University School of Medicine and Chief of Neurosurgery at Barnes Jewish Hospital

» Five dedicated neurosurgery operating rooms and a 20-bed neuro-intensive care unit (NICU)

» VISIUS Surgical Theatre opened April 2008

» Website: http://www.barnesjewish.org

» This is their first scientific paper with results from the VISIUS Surgical Theatre

Published Paper

Use of Movable High-Field-Strength Intraoperative Magnetic Resonance Imaging With Awake Craniotomies for Resection of Gliomas: Preliminary Experience

Key Excerpts on the Suite:

» “The IMRIS ioMRI device is ceiling mounted and movable, the operating table and patient remain in a fixed position and the device moves to the patient. This feature in our view enhances safety in terms of airway control, monitoring and head fixation”

» “The integration of ioMRI...was intended to improve the precision, efficacy and safety of neurosurgical procedures.”

» “The IMRIS operating table has the ability to elevate, rotate, flex and had allowed us to perform our operations in almost any surgical position.”

First publication of clinical experience with VISIUS Surgical Theatre:

» 16 months of clinical experience

» 180 patients

» 93% of iMRI cases achieved gross/near total resection compared to 65% for non iMRI cases

As of August 2011, the neurosurgical team had treated over 400 patients.
IMPLEMENTATION AND PRELIMINARY CLINICAL EXPERIENCE WITH THE USE OF CEILING MOUNTED MOBILE HIGH FIELD INTRAOPERATIVE MAGNETIC RESONANCE IMAGING BETWEEN TWO OPERATING ROOMS.


ABSTRACT

Intraoperative magnetic resonance imaging (ioMRI) provides immediate feedback and quality assurance enabling the neurosurgeon to improve the quality of a range of neurosurgical procedures. Implementation of ioMRI is a complex and costly process. We describe our preliminary 16 months experience with the integration of an IMRIS movable ceiling mounted high field (1.5 T) ioMRI setup with two operating rooms.

Methods: Aspects of implementation of our ioMRI and our initial 16 months of clinical experience in 180 consecutive patients were reviewed.

Results: The installation of a ceiling mounted movable ioMRI between two operating rooms was completed in April 2008 at Barnes-Jewish Hospital in St. Louis. Experience with 180 neurosurgical cases (M:F-100:80, age range 1-79 years, 71 gliomas, 57 pituitary adenomas, 9 metastases, 11 other tumor cases, 4 Chiari decompressions, 6 epilepsy resections and 22 other miscellaneous procedures) demonstrated that this device effectively provided high quality real-time intraoperative imaging. In 74 of all 180 cases (41%) and in 54% of glioma resections, the surgeon modified the procedure based upon the ioMRI. Ninety-three percent of ioMRI glioma cases achieved gross/near total resection compared to 65% of non ioMRI glioma cases in this time frame.

Conclusion: A movable high field strength ioMRI can be safely integrated between two neurosurgical operating rooms. This strategy leads to modification of the surgical procedure in a significant number of cases, particularly for glioma surgery. Long-term follow up is needed to evaluate the clinical and financial impact of this technology in the field of neurosurgery.
### Clinical Results

180 patients

- **43%** Glioma
- **34%** Pituitary adenoma

![Chart showing clinical results](chart1.png)

### Post-Publication Supplement*

444 patients

- **39%** Glioma
- **32%** Pituitary adenoma

![Chart showing post-publication supplement results](chart2.png)

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#### Modified procedures based on the findings of iMRI

<table>
<thead>
<tr>
<th>Procedure</th>
<th>180 Patients</th>
<th>444 Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional tumor resected after iMRI (all tumor types)</td>
<td>54%</td>
<td>62%</td>
</tr>
<tr>
<td>Low grade Gliomas</td>
<td>42%</td>
<td>54%</td>
</tr>
<tr>
<td>High grade Gliomas</td>
<td>65%</td>
<td>68%</td>
</tr>
<tr>
<td>Possible residual tumor after iMRI</td>
<td>65%</td>
<td>53%</td>
</tr>
<tr>
<td>Further resection performed</td>
<td>35%</td>
<td>39%</td>
</tr>
<tr>
<td>Pathology specimens with tumor confirmed</td>
<td>88%</td>
<td>83%</td>
</tr>
<tr>
<td>Patients with total resection with iMRI</td>
<td>93%</td>
<td></td>
</tr>
<tr>
<td>Patients with total resection without iMRI</td>
<td>65%</td>
<td></td>
</tr>
</tbody>
</table>

*Source: database Washington University and Barnes-Jewish Hospital, St. Louis, MO*
PLA301 Hospital, Beijing, China

Hospital Profile:

» The most important National Healthcare Base, responsible for the medical and health work of Central leaders, Central Military Commission and Military

» More than 3,400 patient beds and a Neurosurgical department of more than 150 clinical, medical and technological personnel

» The Chairman of Neurosurgical Department, Prof. Bainan Xu is the chairman of Military Neurosurgical Society and the former Chairman of Neurosurgical Department. Prof. Dingbiao Zhou is the chairman-elected of Chinese Society of Neurosurgery

» VISIUS Surgical Theatre opened February 2009

» Website: http://202.106.73.29/english/index.jsp

Key Excerpts on Room Set-up, Procedure and Imaging Protocol:

» “….With the large-bore magnet which we used in this study, supine, prone, and oblique positions of the patient could be successfully achieved.”

» “…as smooth integration into standard surgical workflow is crucial. In our study, one of the advantages of the movable magnet iMRI suite is its easy and fast integration into the routine neurosurgical workflow, as well as the great flexibility for surgery provided by the dual-room design.”

» “ This design allows normal neurosurgical procedure to be performed without any MRI-induced restrictions.”

» “..the intraoperative magnet transport was straightforward and is obviously much easier and safer than transferring the patient with the operating table, all the catheters, and cables.”

First publication of clinical experience with VISIUS Surgical Theatre

» Two months experience and 45 patients treated

» Report gross/near total resection of 75% of gliomas, compared to 30% prior to iMRI

» Report gross/near total resection of 76.9% of pituitary adenomas, compared to 38.5% prior to iMRI

As of August 2011, the neurosurgical team had treated over 700 patients.
DUAL-ROOM 1.5-T INTRAOPERATIVE MAGNETIC RESONANCE IMAGING SUITE WITH A MOVABLE MAGNET: IMPLEMENTATION AND PRELIMINARY EXPERIENCE.

Xiaolei Chen & Bai-nan Xu & Xianghui Meng & Jun Zhang & Xingguang Yu & Dingbiao Zhou; Received: 24 September 2010 / Revised: 31 March 2011 / Accepted: 3 April 2011 # Springer-Verlag 2011

ABSTRACT

We hereby report our initial clinical experience of a dual-room intraoperative magnetic resonance imaging (iMRI) suite with a movable 1.5-T magnet for both neurosurgical and independent diagnostic uses.

The findings from the first 45 patients who underwent scheduled neurosurgical procedures with iMRI in this suite (mean age, 41.3±12.0 years; intracranial tumors, 39 patients; cerebral vascular lesions, 5 patients; epilepsy surgery, 1 patient) were reported. The extent of resection depicted at intraoperative imaging, the surgical consequences of iMRI, and the clinical practicability of the suite were analyzed.

Fourteen resections with a trans-sphenoidal/transoral approach and 31 craniotomies were performed. Eighty-two iMRI examinations were performed in the operating room, while during the same period of time, 430 diagnostic scans were finished in the diagnostic room. In 22 (48.9%) of 45 patients, iMRI revealed accessible residual tumors leading to further resection. No iMRI-related adverse event occurred. Complete lesion removal was achieved in 36 (80%) of all 45 cases.

It is concluded that the dual-room 1.5-T iMRI suite can be successfully integrated into standard neurosurgical workflow. The layout of the dual-room suite can enable the maximum use of the system and save costs by sharing use of the 1.5-T magnet between neurosurgical and diagnostic use. Intraoperative MR imaging may provide valuable information that allows intraoperative modification of the surgical strategy.
Clinical Results

45 patients
Feb Apr 2009

- 44% Glioma
- 29% Pituitary adenoma
- 9% Cavernoma

<table>
<thead>
<tr>
<th>Procedure Type</th>
<th>Gliomas</th>
<th>Pituitary Adenoma</th>
<th>Cavernoma</th>
<th>Germinoma</th>
<th>Metastasis</th>
<th>Meningioma</th>
<th>Germinoma</th>
<th>Metastasis</th>
<th>Meningioma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified procedures based on iMRI</td>
<td>49%</td>
<td>70%</td>
<td>62%</td>
<td>80%</td>
<td>75%</td>
<td>30%</td>
<td>77%</td>
<td>39%</td>
<td></td>
</tr>
<tr>
<td>Gross/near total resection with iMRI</td>
<td>80%</td>
<td>75%</td>
<td>30%</td>
<td>77%</td>
<td>39%</td>
<td></td>
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</tbody>
</table>

For more information on VISIUS Surgical Theatre contact see www.imris.com