

IMRIS*neuro* 70 cm Bore 3T in Intra-Operative Neurosurgery

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1 IMRIS*neuro* 3T system. (Image courtesy of: the Seaman Family MR Research Centre, Foothills Medical Centre, Calgary, Alberta, Canada.)

The first IMRIS*neuro* system using a MAGNETOM Verio 3T magnet was installed at the Foothills Medical Centre in Calgary, Canada in early 2009.

Physicians appreciate High Field MR

The Seaman Family MR Research Centre at Foothills Medical Centre, under the leadership of Dr. Garnette Sutherland recently upgraded their 10-year old prototype 1.5T magnet to the latest IMRIS-

neuro with 3T MAGNETOM Verio technology. After successfully treating more than 1,000 neurosurgical patients using the 1.5T technology, the centre was ready to upgrade its capabilities. It became clear that the 3T Verio system including Diffusion Tensor Imaging (*syngo* DTI) and functional MRI would add significant value to surgical planning and intra-operative imaging.

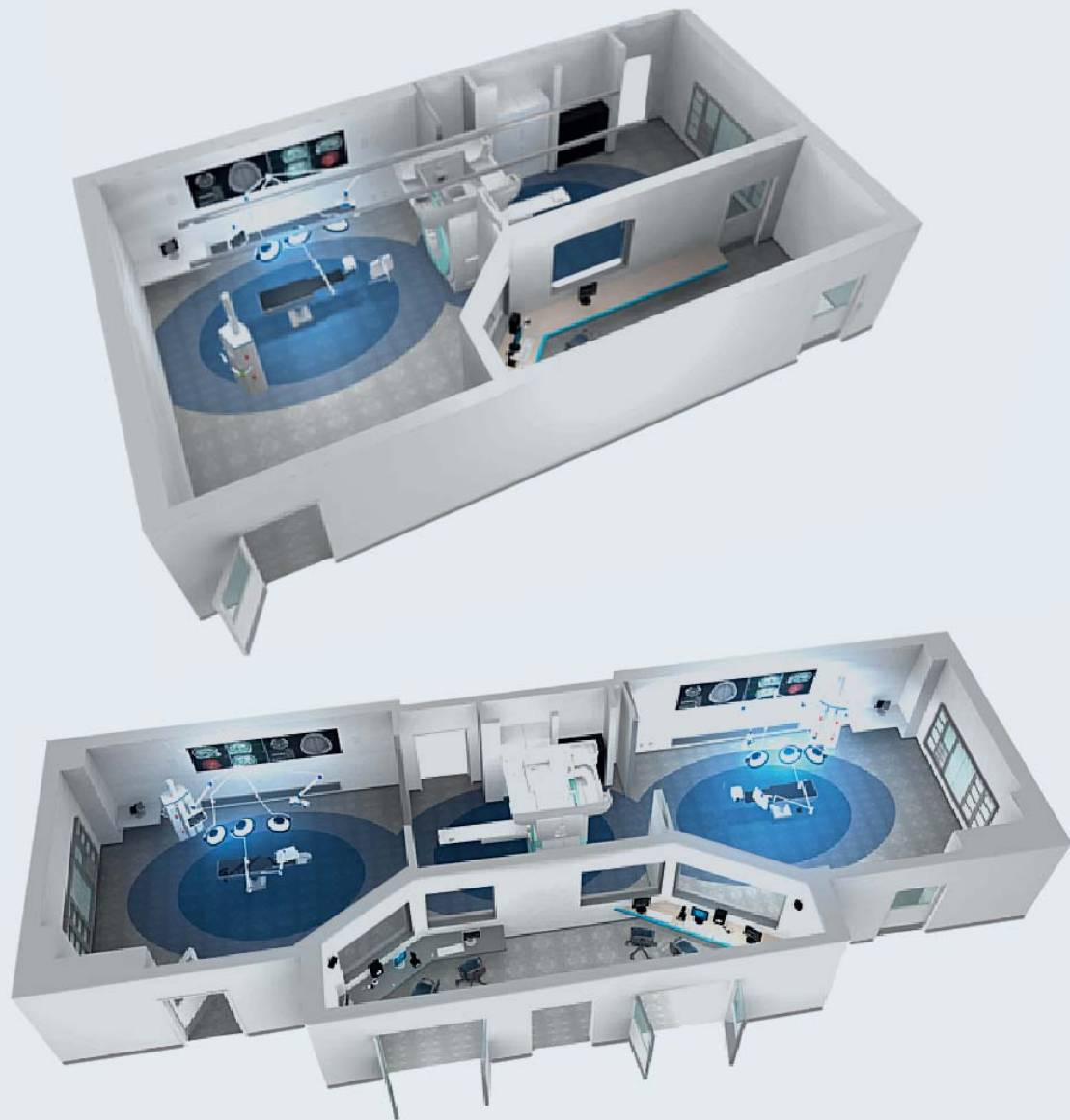
The benefits of applying MR imaging during surgery has been recognized for

many years. However, more recently the field has seen major growth in awareness and usage of MR guided imaging for neurosurgery. Many peer reviewed articles report the benefits of MR imaging including one, which concluded that in 41% of cases, the use of intra-operative MRI resulted in extended tumor resection. A different study concluded that in 27.5% of cases the original surgical plan was altered based on the intra-operative MR findings.

Many of the original observations were often based on past generation high field intra-operative MR technologies. They provided good image quality, but lacked the ability to deliver efficient workflow as the patient had to be moved to the MRI. Seeking the best in intra-operative MR technology, leading institutes like Barnes-Jewish Hospital (St. Louis, MO, USA), Johns Hopkins Hospital (Baltimore, MD, USA), Mayo Clinic (Jacksonville, FL, USA), Cleveland Clinic (Cleveland, OH, USA), Seaman Family MR Research Centre (Calgary, Canada), and PLA 301 Army Hospital (Beijing, China) have selected IMRIS*neuro*. These systems include the 1.5T MAGNETOM Espree or the 3T MAGNETOM Verio magnets and provide superior imaging capabilities with a technology workflow that brings MR to the patient. When the MR scanner is not in the operating room, the surgical team has full 360-degree access to the patient, and relocation of the magnetic field enhances operating room safety.

IMRIS*neuro* with the Siemens Verio or Espree magnets provide industry-leading capability and may also be used for diag-

2



2 IMRISneuro 2-room and 3-room configurations.

nostic examination of non-surgical patients who require the service of anesthesia or critical support. The IMRISneuro solution is available in five configurations that allow the use of the 3T or 1.5T magnets for routine diagnostic imaging procedures while the system is not in use intra-operatively. For centers with significant surgical volumes, the magnet can move between two separate operating rooms further enhancing efficiency and the ability to offer better patient care.

Clinical cases with IMRISneuro 3T MAGNETOM Verio

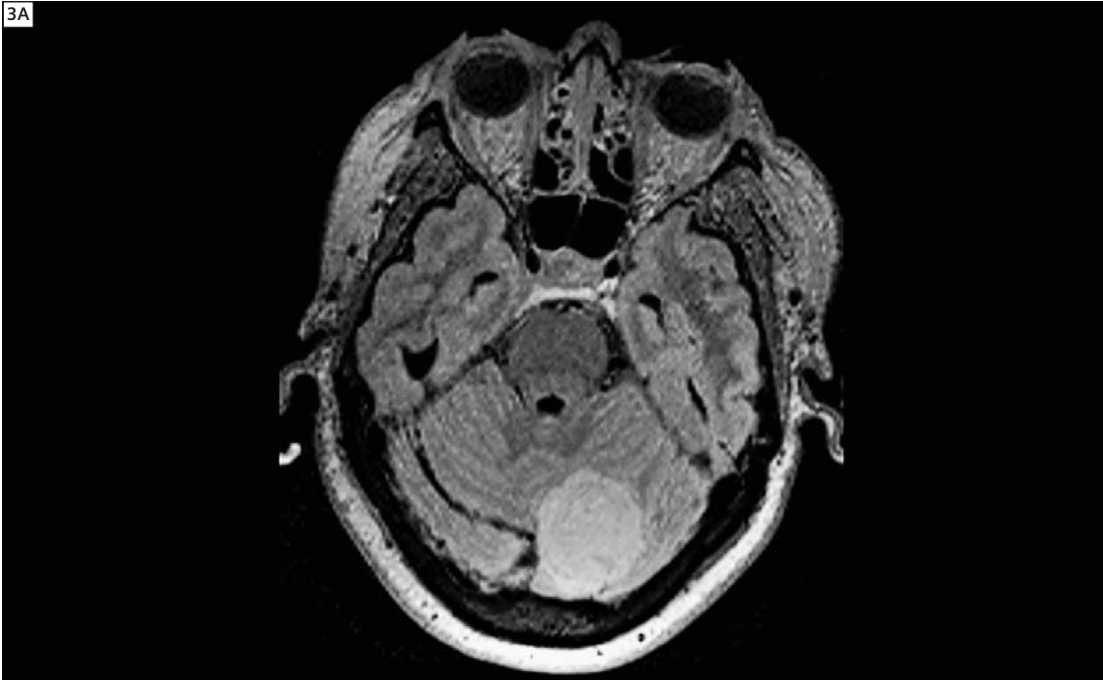
The moving magnet concept began with Dr. Garnette Sutherland's desire to bring the imaging benefits of an MRI to the neurosurgical operating room environment. His motivation was to preserve the current surgical workflow and to avoid moving the positioned surgical patient. IMRIS translated Dr. Sutherland's concept to pioneer the original 1.5T moving magnet design. More than 10-years later,

Dr. Sutherland is also the first in the world to use the advanced IMRISneuro with 3T MAGNETOM Verio: "The images obtained using the upgraded 3T intra-operative MRI system are of remarkable quality. The new system has been used for over 75 surgeries, in surgical planning, assessment during surgical dissection and for quality assurance. We have taken advantage of complex imaging techniques including fibre tracking, MR angiography and the rapid image pro-

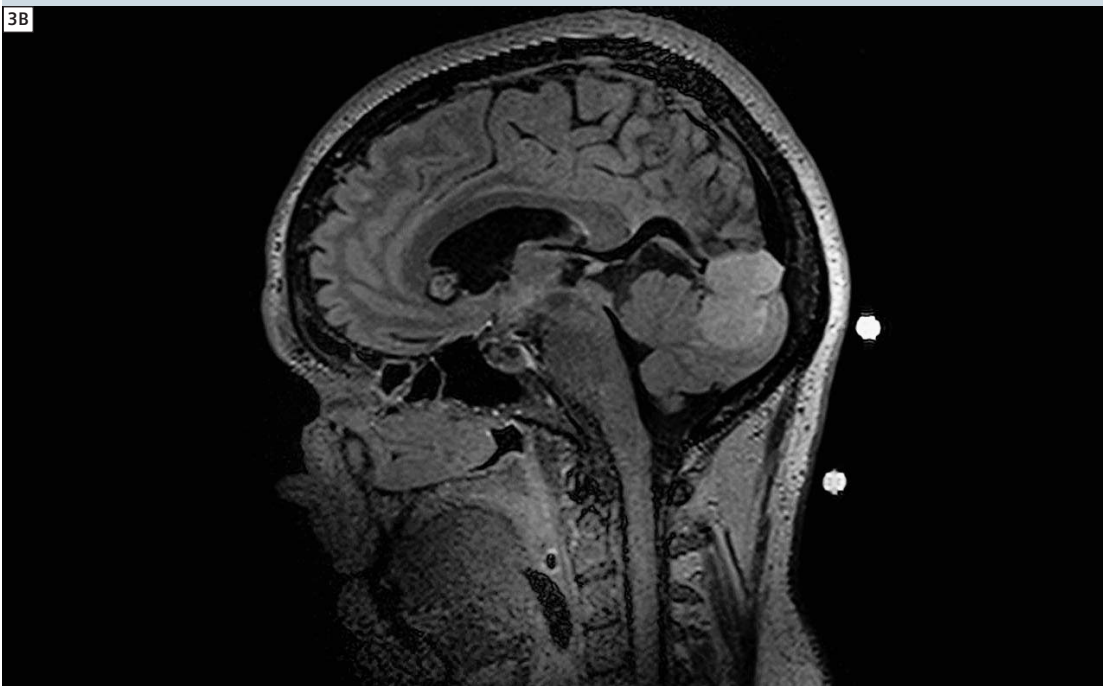
cessing software. I am pleased that this innovation has turned into a commercial product that has gone on to benefit close to 3000 patients throughout the world." It is well understood in normal MR diagnostic scans that 3T image quality offers superior resolution and definition of soft tissue structures in the brain versus 1.5T. Initial intra-operative experience with

the 3T MAGNETOM Verio shows the same advantages existing in image quality before, during and after surgery. The state-of-the-art imaging techniques and rapid processing times characteristic of the 1.5T are enhanced through the inherent higher signal-to-noise ratio (SNR) of the 3T. Surgical planning intra-operative MR images were obtained from a 61-year-old

woman with a left subtentorial meningioma. Diffusion tensor imaging (syngo DTI) sequences show well the relationship of fibers to the tumor. Interdissection images (not shown) demonstrated deformation for the fiber tracks as a result of tumor removal. Knowledge of these relationships increased the safety of tumor resection.



3 3T intra-operative. (Images courtesy of the Seaman Family MR Research Centre, Foothills Medical Centre, Calgary, Alberta Canada 2009).



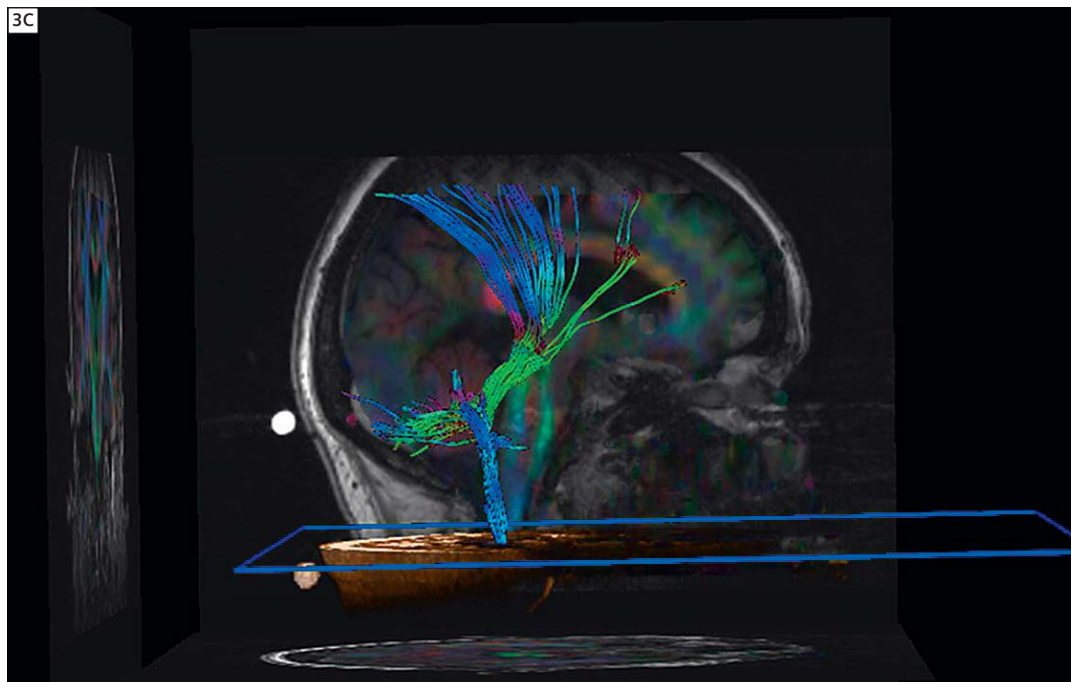
New and additional clinical applications

The unique wide bore 70 cm 3T MAGNETOM Verio system is extremely valuable for intra-operative and interventional procedures. More often than not, interventional procedures require specialized patient positioning that can only be fully achieved with the 70 cm

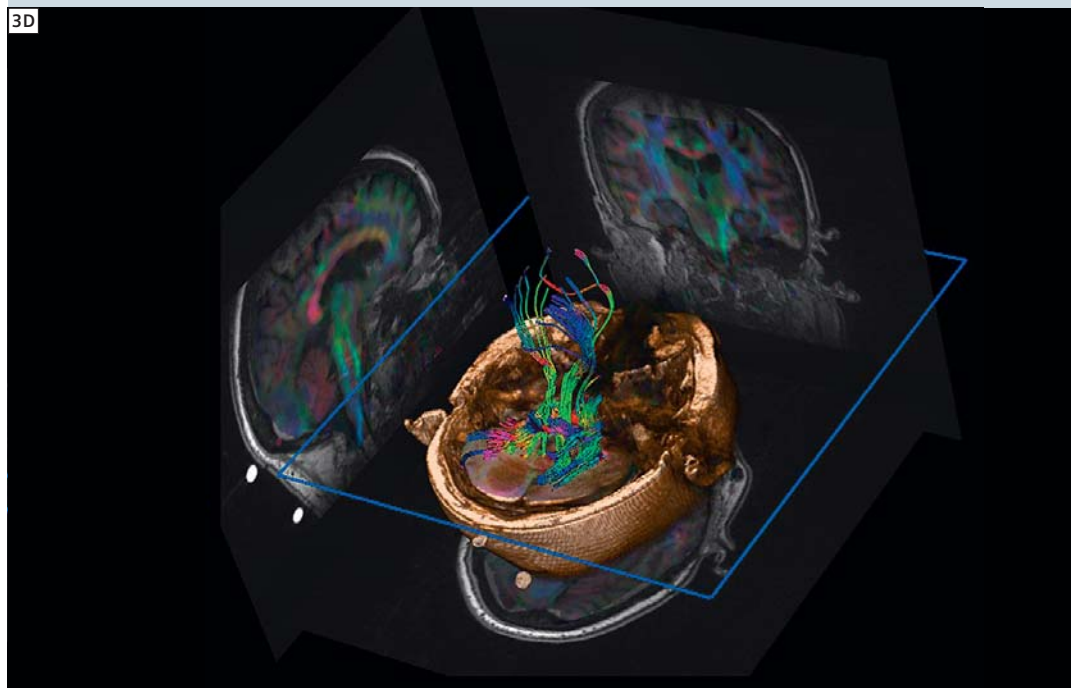
bore MAGNETOM Verio and Espree magnets. Positioning patients in lateral or prone positions is easily achievable with the use of wide bore, moving MR technology from IMRIS.

Excellent patient positioning and imaging capability is further supported by the enhancements made to the IMRIS*neuro* surgical bed. This newly developed sur-

gical table is MR-compatible and X-Ray translucent for spine imaging and applications. The bed allows use of a single plane X-ray system in combination with MR imaging in the operating room (OR).



3 3T intra-operative. (Images courtesy of the Seaman Family MR Research Centre, Foothills Medical Centre, Calgary, Alberta Canada 2009).



4 IMRISneuro surgical bed and collage images of prone/lateral/supine positioning. (Images courtesy of IMRIS, Inc., Canada, 2009.)



4B



4C

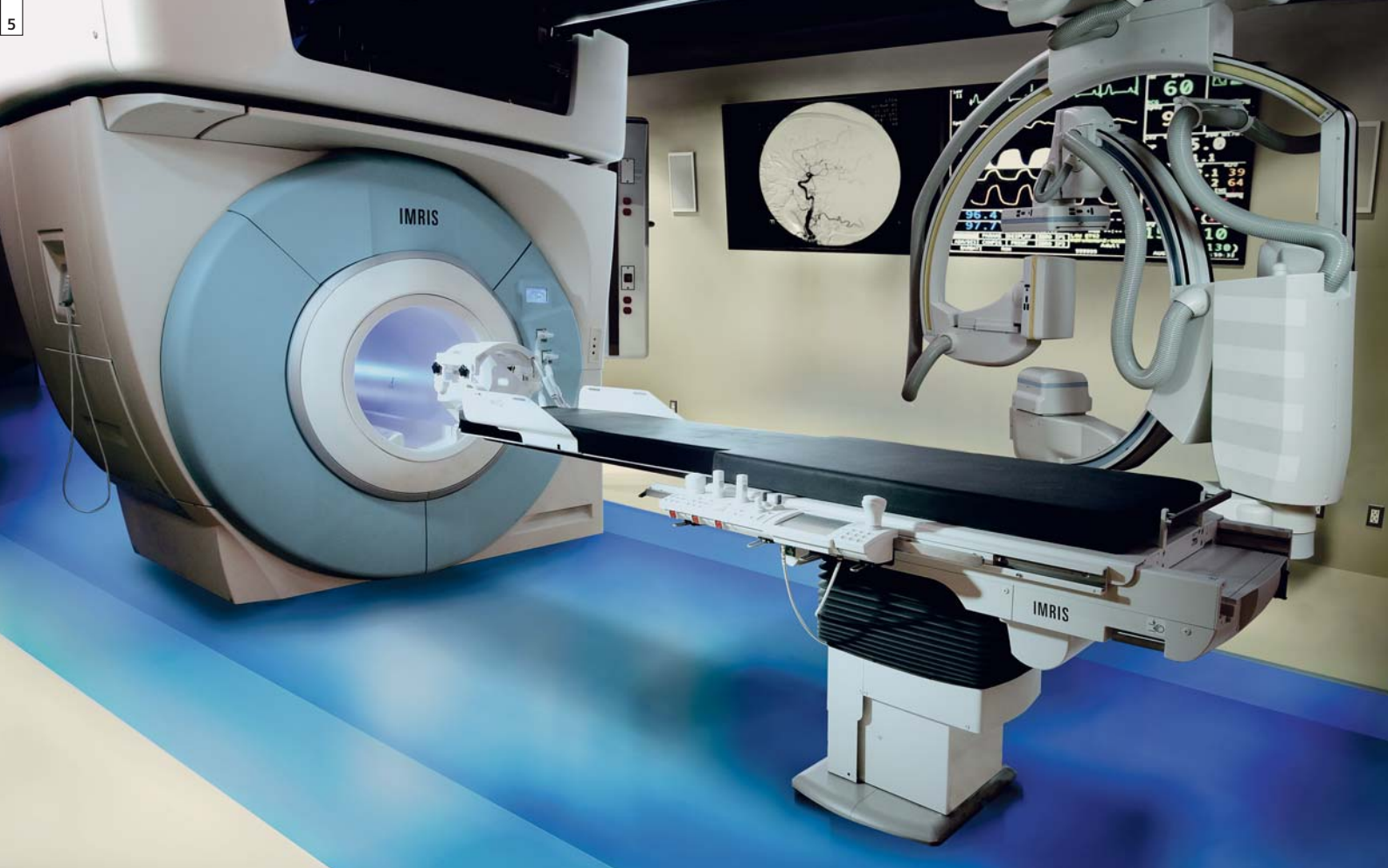


4D



4E





5 IMRIS_{NV} and IMRIS_{cardio}

Future applications and technologies

IMRIS is widening the use of its image guided therapy solutions by expanding into new applications, combining 3T or 1.5T MR with single and bi-plane X-ray systems. IMRIS_{NV} and IMRIS_{cardio} are unique and advanced interventional suites providing an imaging environment that physicians may apply in providing stroke management and neurovascular care and in performing structural cardiac and minimally invasive procedures.

References

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