

Challenges
and Progress in
Cranial Surgeries

Robotic
Precision
Made Easy

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CLINICAL & ECONOMIC VALUE IN CRANIAL APPLICATIONS

STEALTH
AUTOGUIDE™

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CRANIAL SURGERY - A DEMANDING DISCIPLINE

Critical issues in effective neurosurgery include determining the location of the surgical target, optimal approach, intraprocedural localization of surgical instruments relative to the patient’s unique anatomy, and ideal positioning of implants such as deep brain stimulation leads^{1,2}.

A high degree of accuracy and control is required at all times to keep healthy brain tissue intact.

PROGRESS THROUGH RESEARCH

Navigation systems play a decisive role in the operating room nowadays and have been developed and refined over the last thirty years to facilitate safer and more accurate surgical procedures^{1,3,4}.

These surgical navigation systems continue to evolve in terms of accuracy, efficiency, and ergonomics, and provide surgeons with options for less invasive approaches, less time-consuming interventions, and reduced radiation exposure for surgical staff^{1,4-10}.

STATE-OF-THE-ART

The development of minimally invasive therapies is especially critical in the field of cranial surgery. For the patient, the focus is primarily on a shorter recovery time, smaller surgical accesses and less scarring. Medtronic’s navigation systems enable this minimally invasive approach combined with real-time visualization as advanced state of the art technologies designed to ensure the highest standard in cranial applications.

Source: <https://www.medtronic.com/us-en/healthcare-professionals/products/neurological/surgical-navigation-systems/stealthstation.html>

<https://www.medtronic.com/us-en/healthcare-professionals/products/neurological/surgical-navigation-systems/stealthstation/cranial-neurosurgery-navigation.html> (last accessed Sept. 2020)



ROBOTIC PRECISION MADE EASY

REAL-TIME VISUALIZATION, FEEDBACK AND ROBOTIC MOVEMENT



THE POWER OF TECHNOLOGIES. WORKING AS ONE

Seamlessly integrating StealthStation™ system and Midas Rex™ drill technology, the innovative Stealth Autoguide™ strives to improve workflow efficiency with a minimal footprint in the operating room.

ROBOTICALLY ASSISTED PLACEMENT

Perform robotically assisted alignment efficiently for biopsy, sEEG bone anchor placement for epilepsy depth electrodes, and bone anchor placement for Visualase™ MRI-Guided Laser Ablation trajectories.

Track progress continuously with real-time navigation and visual feedback for misalignment alerts.

THE ASSURANCE OF ACCURACY

Stealth Autoguide™ cranial robotic guidance platform provides stereotactic positioning and trajectory guidance for cranial procedures for consistent, repeatable, and accurate alignment to surgical plans.

Source: <https://www.medtronic.com/us-en/healthcare-professionals/products/neurological/cranial-robotics/stealth-autoguide.html> (last accessed Sept. 2020)



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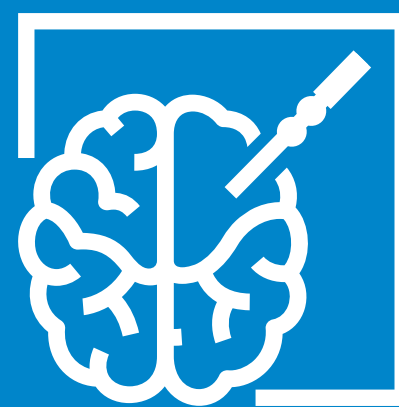
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ROBOTIC PRECISION MADE EASY

VERSATILE IN CRANIAL APPLICATIONS



BRAIN BIOPSY



sEEG* BOLT PLACEMENT



**VISUALASE™ BONE
ANCHOR PLACEMENT**

*sEEG = Stereo-Electroencephalography
Indications for use of Stealth Autoguide™

Source: <https://www.medtronic.com/us-en/healthcare-professionals/products/neurological/cranial-robotics/stealth-autoguide.html> (last accessed Sept. 2020)



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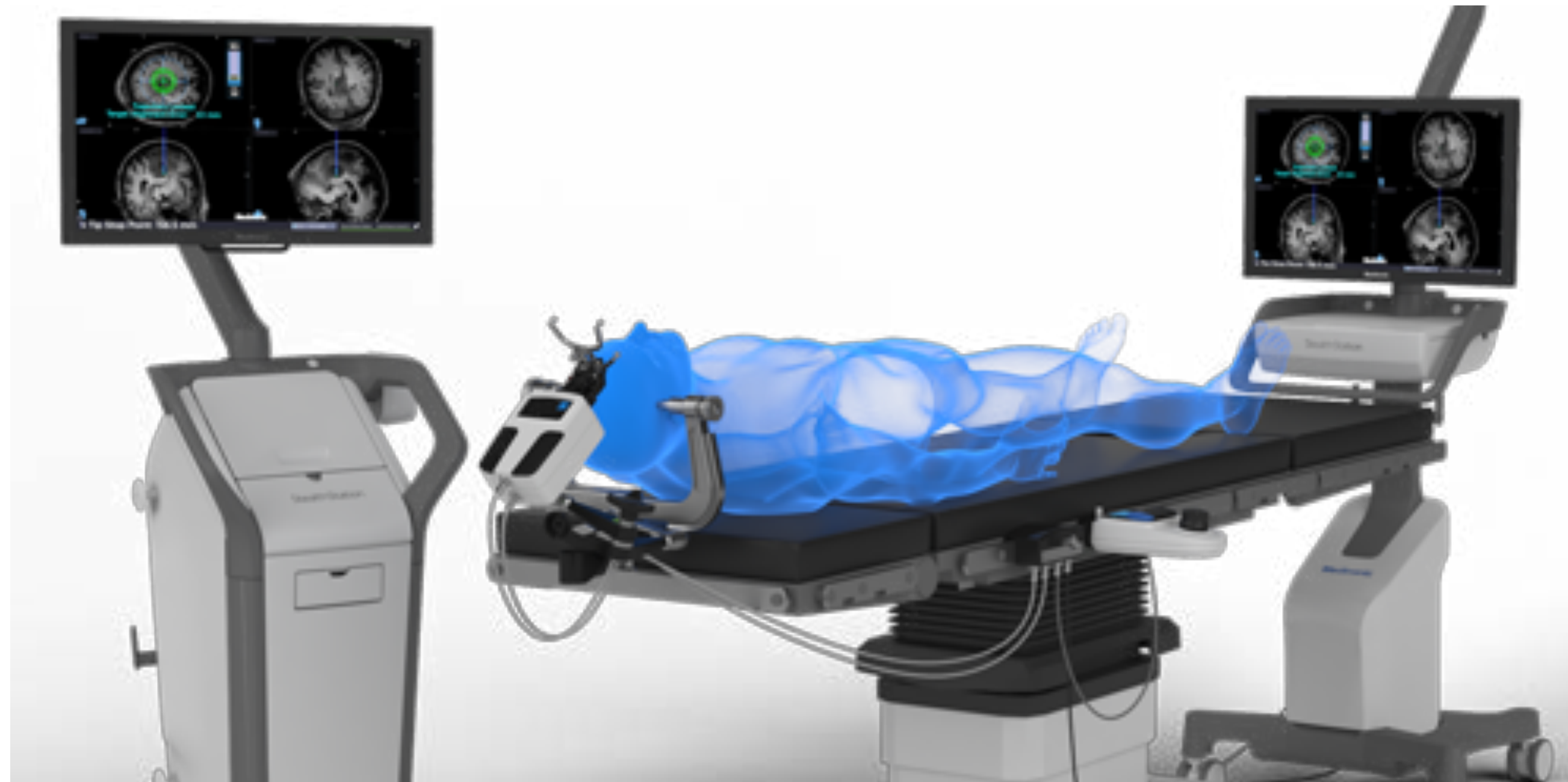
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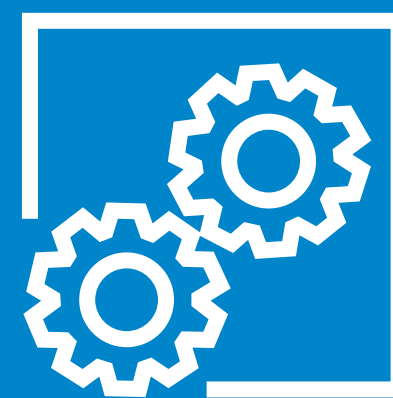
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ROBOTIC PRECISION MADE EASY

STEALTH AUTOGUIDE™ ROBOTIC PRECISION MADE EASY



FEATURES



- The robotic platform facilitates trajectory accuracy
- Continuous real-time position tracking
- Seamless integration with the StealthStation™ system
- Small operating room footprint

VALUE



- High accuracy in cranial surgeries¹¹⁻¹⁶
- High diagnostic yield¹¹⁻¹³
- Short surgical time^{11,13-15}
- Reduction in positioning time¹³

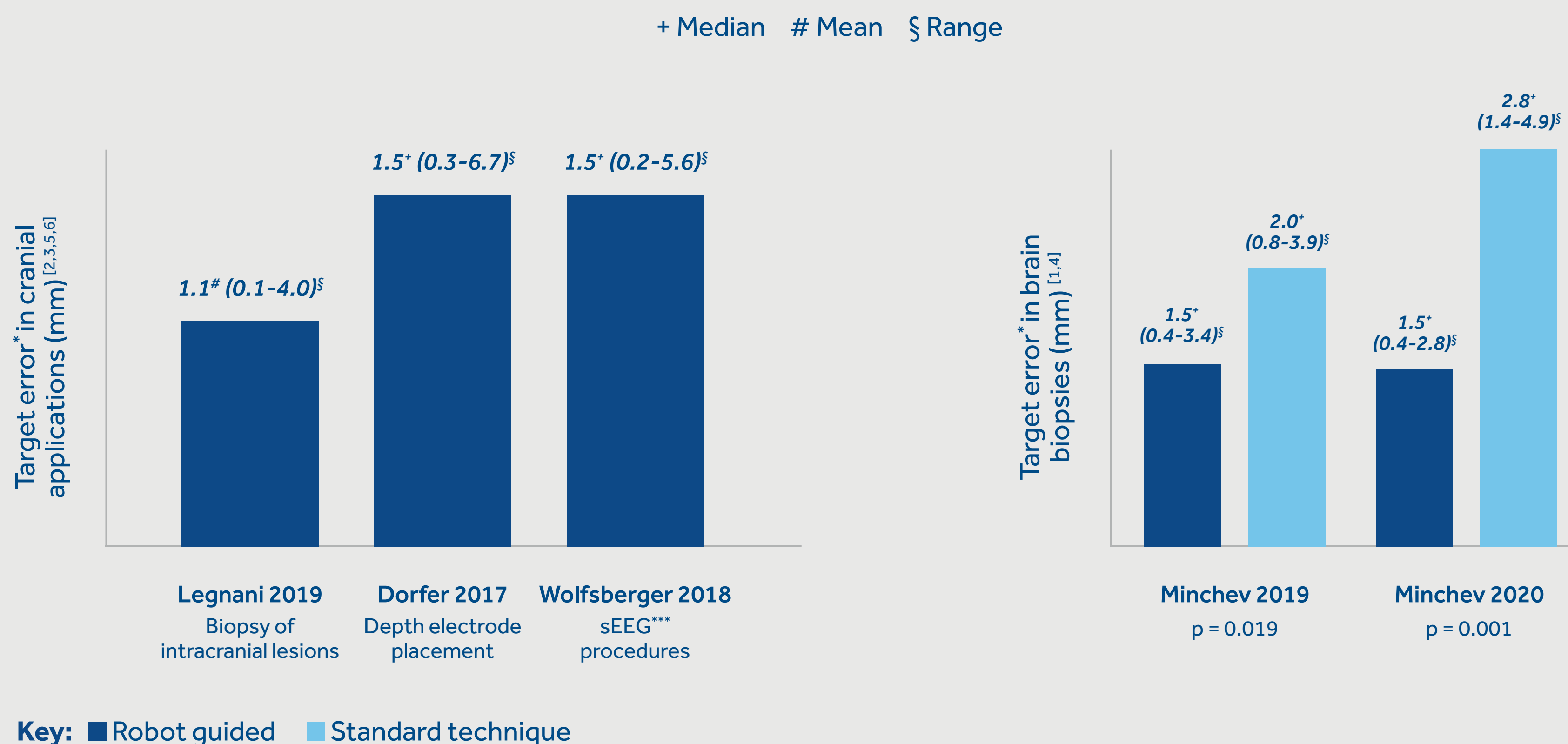
Source: <https://www.medtronic.com/us-en/healthcare-professionals/products/neurological/cranial-robotics/stealth-autoguide.html> (last accessed Sept. 2020)



KEY VALUE MESSAGES

STEALTH AUTOGUIDE™ FOR PRECISION IN THE OPERATING ROOM

- Several studies reported a **95% up to 100% diagnostic yield** from biopsies using Stealth Autoguide™.¹¹⁻¹³
- The use of Stealth Autoguide™ resulted in **significantly lower target error*** compared to manual standard techniques in brain biopsies (p = 0.001¹¹ and p = 0.019¹⁴).

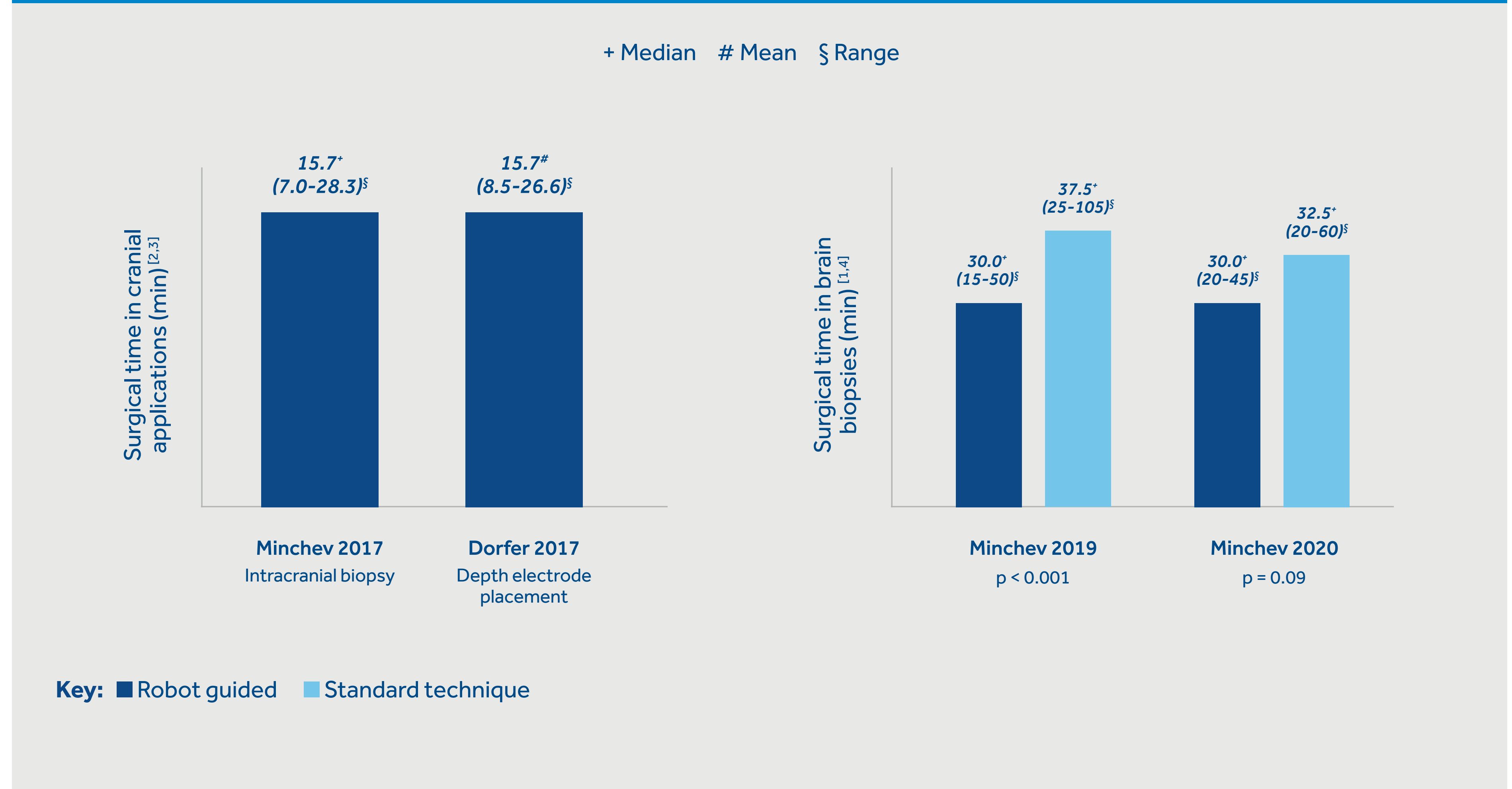


*The target error defines how accurately a procedure reaches the target within a given patient.¹³
 **sEEG = Stereo-Electroencephalography

KEY VALUE MESSAGES

STEALTH AUTOGUIDE™ ADVANCED ROBOTICS FOR EFFECTIVE SURGERY

- The use of Stealth Autoguide™ has been associated with significantly **shorter median surgical time** ($p < 0.001$)¹⁴ and resulted in a **30% reduction in positioning time** in several cranial applications.¹³
- Stealth Autoguide™ showed excellent tolerability and low complication rates in multiple studies.¹¹⁻¹⁶



RISKS

STEALTH™ NAVIGATION SYSTEMS MANAGEABLE RISKS IN CRANIAL APPLICATION

INACCURACY DUE TO ALTERED PATIENT ANATOMY (BRAIN SHIFT)

In cranial applications, one of the major hurdles to navigation is the issue of “brain shift,” a phenomenon wherein surgical manipulation during the procedure alters patient anatomy, thus creating a disparity between preoperatively acquired patient images and the intraoperative patient anatomy^{17,18}.

In an effort to overcome this obstacle, contemporary surgical navigation platforms have been designed to be compatible with various intraoperative imaging modalities and may be used to complement information provided during the procedure^{19,20}.

INACCURACY DUE TO PATIENT REGISTRATION ERROR

Registration error can be described as a discrepancy in the linkage between the preoperative or intraoperative image data and the patient’s anatomy. A registration error less than 2 mm is desirable but is not necessarily synonymous with clinical accuracy^{21,22}.

ADDITIONAL RISKS

A few studies have reported the following potential risks of navigation in neurosurgical procedures: ferromagnetic interference with EM navigation tracking^{23,24}, line-of-sight issues with optical navigation tracking^{25,26}, increased procedure duration due to the time needed to set up the navigation system²⁷⁻²⁹, and interference with neurophysiological monitoring^{22,26}.



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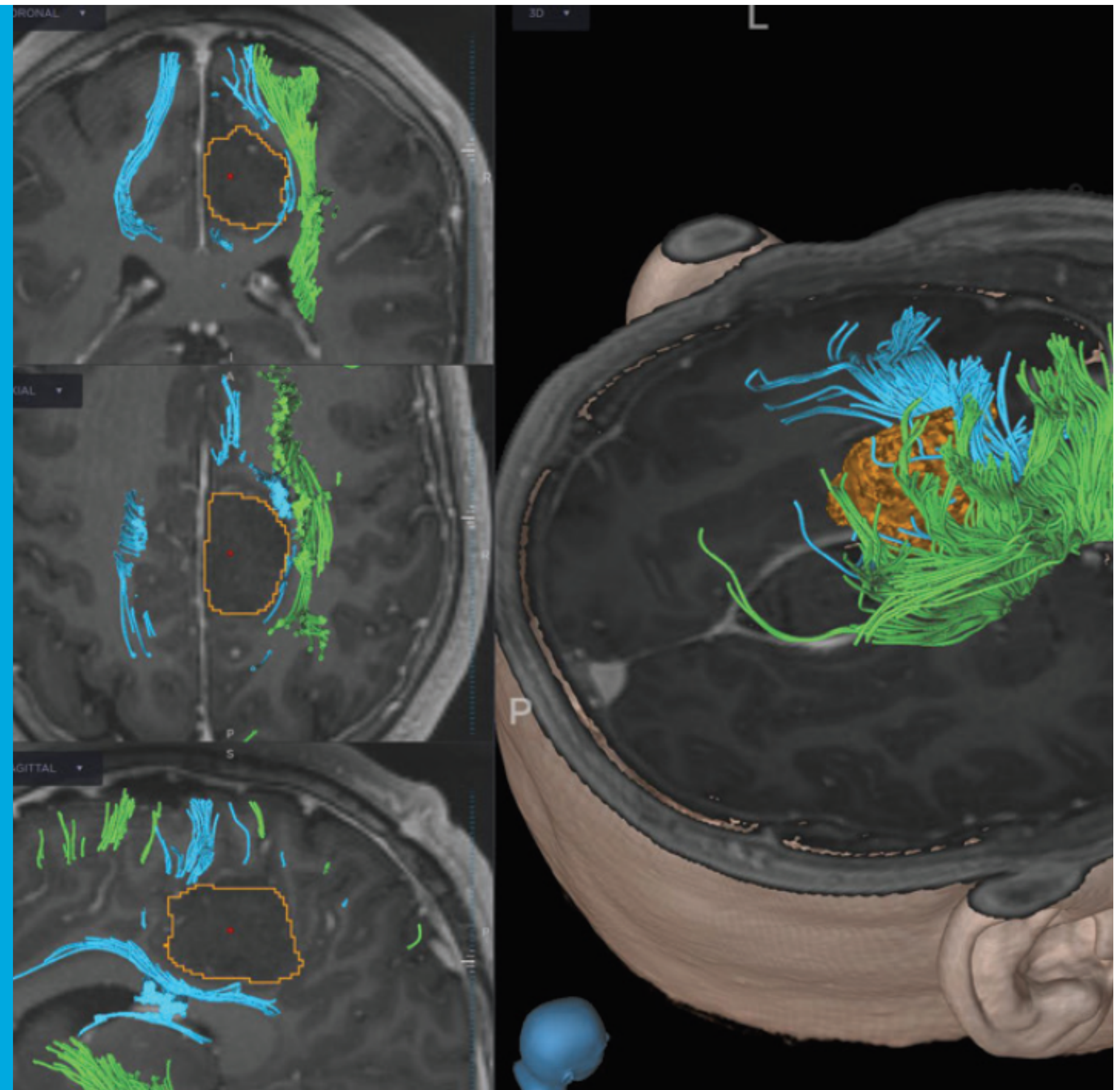
STEALTH™ SYSTEMS IN CRANIAL APPLICATION CONCLUSIONS

Stealth™ cranial solutions enable an intuitive, proven, simple and fast navigation experience. Together with the Stealth Autoguide™, Stealth™ technology provides a complete procedural solution for trajectory alignment.

A substantial body of high-quality evidence indicates that Stealth™ systems are an effective, cost-saving, and safe technical solution in cranial surgeries^{2, 35, 36}.

Master the daily challenges in cranial surgeries with state of the art technology thanks to high precision and low complication rates^{30-32,33,34,36,37}.

Provide the best care for your patients with technologies that match your needs. Now.



Source: <https://www.medtronic.com/us-en/healthcare-professionals/products/neurological/cranial-robotics/stealth-autoguide.html> (last accessed Sept. 2020)



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See the device manual for information regarding the instructions for use, indications, contraindications, warnings, precautions, and potential adverse events. For further information, contact your local Medtronic representative and/or consult the Medtronic website at medtronic.eu

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