3D ULTRASOUND PROVING TO BE A GAME CHANGER

Clinical Efficacy Combines with Time and Cost Benefits to Make Volume Navigation a Preferred Option


By Steven K. Wagner

Historically, clinical potential has driven the development of new imaging technology. Products that appear capable of helping physicians better diagnose or treat patients are more likely to become clinical—and, ultimately, commercial—successes.

Certainly, other issues also are important, as Ascension Technology (www.ascension-tech.com) of Burlington, VT, has found. Not only are the company’s breakthrough miniature sensors, which permit 3D ultrasound guidance with precision, a rousing clinical success, but they reduce procedure and save money too.

One believer is Dr. Marnix van Holsbeeck, world-renowned director of musculoskeletal radiology in the Department of Radiology and director of radiology in the Department of Orthopaedic Surgery at Henry Ford Health System, Detroit, MI. Over the past year, Van Holsbeeck and his colleagues completed an estimated 120 ultrasound exams using sensor guidance. Ascension Technology sensors combine with advanced ultrasound technology help clinicians guide pain management injections, perform aspirations to identify and localize infection, ablations, and soft tissue and bone biopsies.

“Volume guidance has helped us do challenging bone biopsies that we couldn’t do before.”

- Dr. Marnix van Holsbeeck
  Henry Ford Health System

Ultrasound procedures are gaining in popularity and use with the addition of image-guided procedures.
**Ultrasound Evolution**

Through the years, van Holsbeeck has witnessed a significant evolution in ultrasound technology. During his tenure as a physician, transducers have improved noticeably, as has needle visualization, and tricks have emerged that enhance the ability of clinicians to visually track needles, such as roughing their surface. CT, for many years a primary guidance tool, also has improved. Still, until recently one shortcoming remained: guidance was done in only two dimensions. Van Holsbeeck was a skeptic of volume navigation until he saw it demonstrated in Europe. When that occurred and he recognized its capability to assist in difficult cases, he became a believer.

Sensor guidance – aided by preoperative imaging – eliminates CT and MRI guesswork by simultaneously tracking the needle tip and transducer in 3D.

Attention has since shifted to the U.S., where ultrasound guidance is commanding increased attention - thanks largely to Ascension’s development of the world’s smallest 0.55 mm and 0.9 mm six-degrees-of-freedom (6DOF) sensors. Previously, ultrasound was unable to independently ensure that a biopsy needle tip or ablation probe electrodes would accurately penetrate their target. However, sensor guidance—aided by preoperative imaging—eliminates guesswork by simultaneously tracking the needle tip and transducer in 3D.

As van Holsbeeck learned early on, sensor technology facilitates the use of multiple modalities during procedures, allowing anatomic and functional imaging to be combined and functional or metabolic information to be used for real-time feedback. Systems are poised to achieve clinical application beyond his own experience, including deep venous access to facilitate multiple therapies and endoscopic fine-needle injection for gene therapy.

**Technology Companies Join Forces**

While a key contributor, Ascension Technology, an established developer of 3D tracking devices for medical guidance has not acted alone in bringing about such application. The company’s sensor technology is married to CIVCO Medical Solutions’ proprietary tracking needle with protective reusable sensor housing. High-end ultrasound systems with visualization software developed by GE Healthcare, or Hitachi Medical, Toshiba, Siemens, Ultrasonix Medical and Esaote, among others complete the package. The results have been astonishing.
Not only from a clinical standpoint. Since acquiring the technology, van Holsbeeck has seen a variety of improvements. Biopsy accuracy has increased, often resulting in a reduction in overall procedure time. Time to schedule, plan and complete procedures has dropped from up to four days down to two. Throughput has also improved. Physician and patient exposure to radiation has been minimized, physician confidence has improved, and volume guidance has significantly impacted the way van Holsbeeck and his colleagues practice—saving time and money.

Economic Implications Broad

According to van Holsbeeck, the ultrasound with volume navigation paid for itself within a relatively short period of time. He estimated that savings during the first year totaled at least several hundred thousand dollars.

W. Dennis Foley, professor of radiology at the Medical College of Wisconsin (MCW) and director of the Body Imaging Section, began using sensor guidance in 2009. Since then, he and his colleagues have completed about 30 procedures, mostly to guide liver biopsies and renal ablations. During 2011 the hospital may expand its use of sensor guidance to facilitate the evaluation of stent grafts for leakage.

According to Foley, sensor guidance enables pinpoint accuracy every time; as a result, physician confidence is significantly enhanced. At MCW, procedure time is comparable to that using CT-guidance, although more data is acquired because two modalities—CT and ultrasound—are incorporated. And, sensor guidance has enabled Foley and his colleagues to biopsy lesions that were difficult to see using ultrasound alone. Finally, using CT combined with ultrasound, he is better able to see the stomach and diaphragm, which are less well depicted using just ultrasound. “That is helpful in telling us where to pass the needle through the skin,” Foley said.

Unlike van Holsbeeck, Foley said the economic implications are so far theoretic, since the number of procedures performed at MCW is small. As more ablations are completed, the cost/benefit ratio may become increasingly favorable, he said. The bottom line: while not yet a homerun for Foley and his colleagues, sensor guidance “is an extra quiver in my bow.”
“...Sensor guidance helps us eliminate complications. Eventually, I think sensor guidance may prove to be useful in every case, not just in select cases.”
- Dr. W. Dennis Foley

“There are going to be cases that would not be possible for us to execute if sensor guidance were not available,” Foley said. “With ultrasound there are two issues: the lesion may be large enough to see by adding contrast, or the lesion may have good contrast but be small. If we’re going to successfully complete the most difficult cases, we need to have all the quivers in our bow immediately available.”

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