Mayo Clinic Medical Devices

Interactive Breath-Hold Control System (IBC) from Mayo Clinic

The Interactive Breath-Hold Control is the first medical device of its kind in the world. The device allows physicians to more rapidly and accurately diagnose patients, reducing the need for a more invasive surgical biopsy. Clinical trials of the Interactive Breath-Hold Control were conducted at Mayo Clinic in Rochester, Minn., and in Munich, Germany. Mayo Clinic and a hospital in Munich are currently using the device.

The Interactive Breath-Hold Control device monitors the breathing of the patient using a simple light display. The wireless display device is about the size of a handheld video game and includes a simple belt with expandable bellows. The belt is wrapped around a patient's upper abdomen or lower chest and is connected to the IBC system. Individual light displays are located next to the patient, the radiologist's image monitor and the CT operator console. All displays have a wireless connection to the system control which sits next to the patient on the CT table.

"By focusing on the display, patients can easily adjust their breathing and consistently reproduce the same reference breath-hold level," says Stephanie Carlson, M.D., a Mayo Clinic radiologist and lead investigator of the project. "This allows the radiologist to conduct a more accurate and safe procedure in less time than if the target area of the lesion were moving."

KEY CHARACTERISTICS

- Increased patient care and comfort
- Increase in safety
- Potential decrease in health care expenses for patients, by avoiding the need for more invasive and costly surgical biopsy procedures
- Decrease in needle placement and procedure time
- Decrease in complications
- Increase in accuracy

Prior to the development of this device, CT-guided biopsies were more difficult for radiologists and patients because respiratory motion and inconsistent breath holding by the patients could obscure the exact target area of a lesion. This can cause the target lesion to move out of the field of view during the procedure, particularly if the lesions are small or in difficult to reach locations.

"The system also helps distract anxious patients during the procedure by giving them something to focus on other than the needle," says Dr. Carlson. "By using this device, patients become less focused on the procedure and the possible discomfort associated with it."

The Interactive Breath-Hold Control allows radiologists to perform biopsies on smaller and more difficult to access lesions during a 30- to 45-minute CT-guided procedure. The patient can return home the same day with nothing more than a band-aid. In the past, difficult lung biopsies would require a surgical procedure resulting in a two to four-day stay in the hospital.

The Interactive Breath-Hold Control has significant advantages over the traditional procedure.

The Mayo team anticipates that there will be additional applications for the Interactive Breath-Hold Control in the future, including solitary pulmonary nodule enhancement studies, other dynamic perfusion studies, tumor ablation procedures, intratumoral injections, PET/CT scanning, radiation therapy, and possibly even robotic interventional procedures.

"This entire effort represents a great collaboration between a team of Mayo clinicians and engineers with the goal of improving patient care," says Claire Bender, M.D., Mayo Clinic radiologist. "This device has improved patient care and changed our practice."

The Mayo Clinic team traveled to Munich, Germany earlier this year to work with German physicians on product testing and implementation. "The response from patients and physicians in Germany was extremely positive," says James Potter, General Manager of Mayo Clinic Medical Devices. "This entire project strongly reflects the Mayo brothers' mission to inspire innovation and technology that truly benefits patient care."

According to Potter, the Interactive Breath-Hold Control, "is another example of Mayo Clinic developing medical devices that are patient centered, high quality and on the cusp of cutting-edge technology."

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