

Biofeedback Device Helps Put Respiratory Motion on Hold Nationally Recognized Interventional Radiologist Calls Breath Hold a *Game Changer*



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“In the past, patients were asked to hold their breath... and interventional radiologists just hoped,” says Anne Roberts, MD, professor of Radiology at University of California, San Diego (UCSD), Chief of Vascular Radiology at UCSD and the San Diego Veteran’s

Hospital and an internationally recognized expert in her field. But, today, a series of blinking lights that traverse a simple white panel have changed all that. “You may not fully appreciate it until you use it, but for many procedures of the chest and upper abdomen, Breath Hold is a game changer.”



The light display Dr. Roberts is discussing is the focal point of a new interactive breath control monitoring system that enables patients to easily and consistently reproduce a breath-hold reference point during imaging exams, image-guided biopsies, tumor localizations, ablations and other medical procedures affected by the motion of patient breathing.

As a highly experienced interventional radiologist, Dr. Roberts knows extremely well how important the patient’s ability to understand and control respiration is to the success of the dozens of complex image-guided procedures she performs every week on the lungs, chest, and liver—and those also performed in other institutions on the kidneys and spleen. Guided by CT and similar advanced imaging modalities, Dr. Roberts pinpoints the precise areas for her needle biopsies, as well as localizes tumors for later surgical resection.

The pre-eminent interventional radiologist also knows full well how difficult many patients--nervous, confused and often under the influence of sedatives or painkillers--find maintaining any type of breathing control. Yet, if her patients’ breath-holds during preliminary imaging scans do not match up with their hold positions during needle insertion, the results may be compromised.

Dr. Roberts and other physicians experienced with Breath Hold report the device counters these problems by promoting powerful proactive patient breathing control. It makes image-guided interventions faster and more precise, leading to lower patient radiation dose during imaging, greater departmental efficiencies, and cost savings and, most important, enhanced patient care. Breath Hold helps these physicians control an important variable left to chance when patients are left to breathe freely. The device can help experienced physicians like Dr. Roberts enhance the precision and efficiency of their efforts as well as help younger doctors master the intricacies of these complex interventions more rapidly.



According to the highly respected interventional radiologist who has rapidly become a passionate Breath Hold advocate, “Today we’re catching and treating smaller and earlier stage cancers requiring ultra-precise targeting for biopsy and treatment. A change in tumor position due to the breathing process can make a major difference in an outcome. Breath Hold provides a much needed solution that is as easy to use as it is effective,” she says. “Now, we routinely have the device on hand for every intervention impacted by lung movement. I can’t think of a single procedure of this type that wouldn’t benefit from Breath Hold.”

Requiring minimal set-up and easy-to-use, Breath Hold works by measuring changes in abdominal girth due to patient respiration. It combines an expandable bellows system and transducer tube, which wraps around the patient's chest or abdomen to gauge lung position. For monitoring, a reference point, typically an inhale, is selected. After selection, the monitor's central lights communicate to patients when they have reached their target breath-holds, while additional lights visually alert them if they stray from their desired hold positions. To support a reproducible respiratory pattern, patients strive to keep their breath-holds at a certain point of lights.



The device provides a non-intrusive, comfortable way to promote predictable breath-holds and breathing patterns that enable greater control over respiratory motion and promises to enable numerous sites—even with limited budgets—to effectively address the problems of motion due to inconsistent patient breathing.

“Breath Hold made a dramatic difference the very first time I used it, and from that point on, I was sold,” Dr. Roberts comments. Her first case involved a patient so overcome with anxiety that he was unable even to enter the CT scanner without medication. Scheduled for a lung biopsy on an extremely small lesion, he had been prescribed various sedatives in an attempt to make the exam proceed smoothly. “Once he finally succeeded in entering the CT, he was could not focus on his breathing in any meaningful way,” she says. “After attempting to have him cooperate for the procedure for more than 45 minutes, we were forced to ask him to return the following week to try again.

“On our second attempt, we introduced Breath Hold and we successfully completed the biopsy, obtaining an excellent sample from the center of the lung lesion during our first effort. The patient was focused on the display and held his breath when reaching the appropriate point in the respiratory cycle, based on the display lights.” According to Dr. Roberts, Breath Hold's sophisticated and ultra-precise biofeedback played a key role in the procedure's success.

As an unanticipated benefit, the experienced interventional radiologist also discovered that involving the patient in the treatment process through the Breath Hold device gave him a sense of control and diversion from his fears. “The difference was like day and night. This time, he was so immersed in the breathing process that we could immediately position him in the scanner and start the exam. Everything proceeded efficiently and was completed in a short time period. We were able to obtain a biopsy exactly where desired and since it was a benign lesion, he was able to avoid surgery and could be reassured that he didn't need further treatment,” she says, adding Breath Hold clearly made a major difference in the outcome for this patient. “We have found a similar benefit in many anxious patients.”

After some experience with the device, Dr. Roberts also found that Breath Hold not only fosters patient breathing control, but also allows optimization of respiration for access to difficult to reach lesions. This includes, for example, lesions blocked by a rib. “In such cases, with Breath Hold's guidance, we will have patients increase or decrease their degree of respiration to position the lesion away from the rib and into the region where we can perform the biopsy,” she explains.

Another procedure easily optimized through use of the unique biofeedback device is the insertion of localizing needles to mark tumors for surgical excision. The procedure involves placement of a hooked wire that is typically inserted by interventional radiologists on either side of a lesion to guide the surgeon during minimally invasive procedures. “Breath Hold has been invaluable during these hookwire placements, which are generally affected significantly by respiratory motion,” she notes. Without controlled breathing, placement of hook wires may not be as accurate. While the procedure may still be successful, surgeons could be forced to excise a larger area of the lung than optimal. Breath Hold potentially boosts the precision of targeting a lesion and the likelihood of a successful surgical resection.

Perhaps because the device is so straightforward and intuitive to operate, Dr. Roberts reports that at first colleagues were a bit skeptical. “But, the more they have used it, the more they feel, yes, you really have to have it,” she notes, adding that, “You can watch patients really concentrating on the device's feedback. It is also nice for them to feel they are contributing to the success of their procedures.”

In short, Dr. Roberts believes, Breath Hold is win-win proposition for all involved and a sophisticated yet simple idea that helps physicians themselves breathe a little easier, knowing that they are delivering the highest standard of patient care in challenging case.