Implementation of Invenia™ ABUS Improves Operational and Economic Benefits

Acıbadem Altunizade Hospital Radiology Clinic

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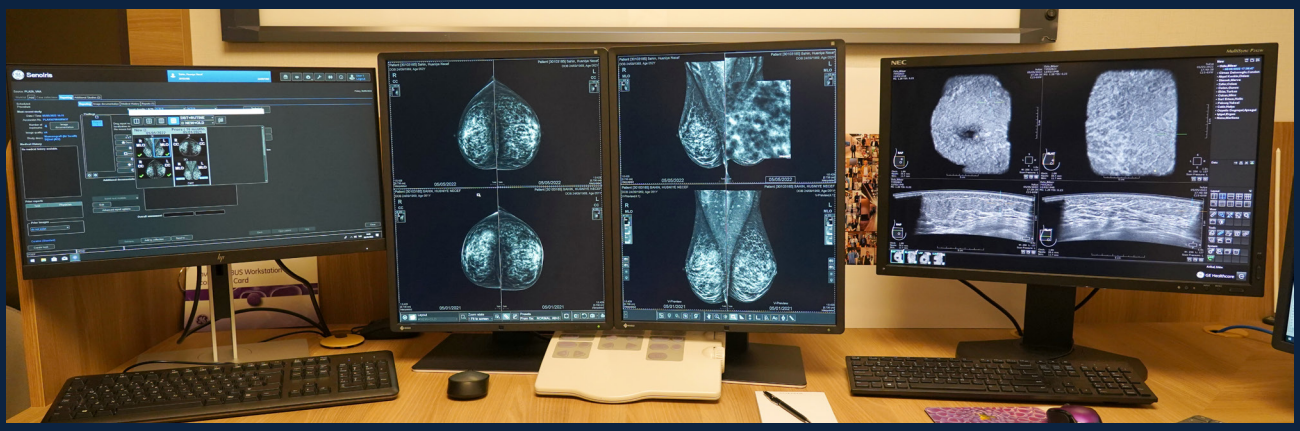


Acıbadem Altunizade Hospital Radiology Clinic realizes a 44 percent reduction in radiologist time and 18 percent savings in operational cost with Invenia ABUS

Ultrasound performed as an adjunct to mammography offers an option for women with dense breasts, with studies showing it can detect up to 4.4 additional cancers per 1,000 patients as compared to mammography alone.[1-3] Unfortunately, handheld ultrasonography (conventional ultrasound) requires a highly trained specialist, is time consuming, and lacks reproducibility and standardization.[4,5]

Automated breast ultrasound, or ABUS, is designed to overcome these limitations. It provides standardized acquisition protocols with a separation of image acquisition and interpretation, thus improving reproducibility and reducing operator dependency and radiologist workload.[4] It also provides three-dimensional imaging of the whole breast with multiplanar reconstruction, which can improve diagnostic accuracy as well as provide proper orientation and documentation for follow-up studies.[6]

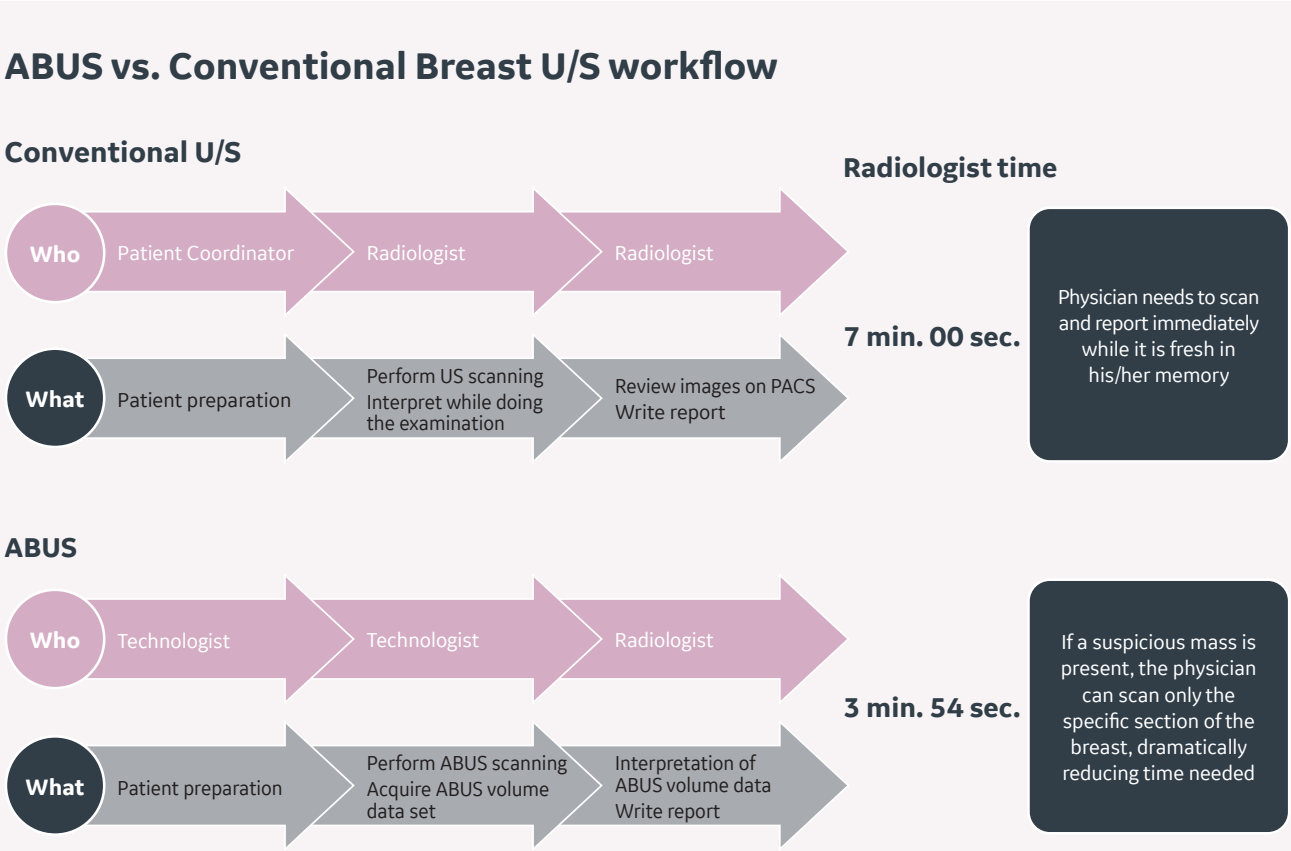
In 2017, the radiology clinic at the 365-bed Acıbadem Altunizade hospital in Istanbul, Turkey, installed GE Healthcare's Invenia™ ABUS, adding a second system in 2019. The clinic, staffed with four, part-time physicians, sees more than 6,000 patients a year for breast imaging. Of those, 60% require ultrasound compared to less than 40% in most countries, said clinic director Erkin Aribal, MD.

Acibadem Altunizade Hospital, breast clinic team

Change in ultrasound examination workflow

Use of ABUS has changed the ultrasound examination workflow at Acıbadem Hospital radiology department. While in the United States and other countries technologists perform ultrasound scanning, in Turkey the physician performs them. With ABUS, technologists were trained and empowered to perform the scanning, freeing up physicians for more complex scanning and readings (Figure 1).

Figure 1. ABUS vs conventional U/S workflow.



Since switching from conventional ultrasound to ABUS, Professor Aribal stated: "The clinic has demonstrated a significant improvement in workflow and efficiency, with unexpected benefits in diagnostic scans and even biopsies. It has also realized a significant savings in radiologist time.

Today, about 90% of clinical cases receive at the facility ABUS exams first. While the physicians still use conventional ultrasound to confirm suspicious results, "even then, the initial ABUS screening reduces the workload because the scan enables the physician to focus on the problem in the breast with the hand-held device, rather than performing a whole breast scanning" Professor Aribal said. Plus, with ABUS "it's easy to get a second look without calling the patient back. So, it's very useful for clinical patients."

Making the transition

The radiologists' transition to ABUS took about six months. There was a short learning curve, but the team needed to be convinced of the technology's benefits and become used to handing off the ultrasound scanning procedure to the technologist. "Now, however, we are all comfortable with the technology, new protocols and examination workflow," said Dr. Aribal.

Technologists had a shorter learning curve, said Özge Kovan, the technologist at Acıbadem Hospital. They embraced the additional responsibility. "It's been empowering," she said. It was also easy to learn. "In the beginning, we were unfamiliar with this technique as technologists. But over time, by learning the technique and practicing, this process started to progress very quickly and more comfortably. It was a fast-learning curve."

"We have definitely seen that we have much more involvement and play an active role as technologists. It feels good that this is a new task for us. Since it is an easy and comfortable device in terms of use, we enjoy the examinations with ABUS."

Özge Kovan, Technologist & Lecturer, Acıbadem University, Istanbul

In addition, she added, ABUS exams are standardized compared to conventional ultrasound, which may differ in quality based on the physician performing the scanning. "ABUS is our preferred device because it provides user-independent standardization and allows images to be examined retrospectively."

GE Healthcare offers a dedicated, FDA-required curriculum which includes comprehensive coaching by a dedicated breast imager to support physicians during ABUS implementation. In parallel, acquisition training is also offered to the technician to ensure they can efficiently perform high-quality acquisition.

Clinical confidence with ABUS

The Acıbadem clinic conducted a study from July 2017 to August 2019 comparing ABUS and conventional ultrasound. They enrolled 592 consecutive women with dense breasts to undergo ABUS exams followed by exams using conventional ultrasound. The two methods yielded similar results when detecting cystic lesions, solid mass lesions, and suspicious lesions. ABUS detected all malignant lesions but fewer benign lesions compared to conventional ultrasound, thus reducing the false positive rate.[4]

"It's easier to see the malignant lesion with ABUS. Hand-held ultrasound detects more benign lesions."

Prof. M Erkin Aribal, MD, Head of Breast Imaging Unit, Acıbadem Altunizade Hospital, Istanbul

ABUS also improved diagnostic confidence, Professor Aribal said. "I feel more comfortable with ABUS images because I can see the whole volume. When you use handheld, you may skip some areas, particularly with larger breasts."

In addition, he feels that the ABUS coronal images show the margins of lesions better than conventional ultrasound transverse images.

"Another reason for the improved images," he said, is the equal pressure on the breast available with ABUS. "With the handheld only part of the probe that presses the breast, but ABUS presses the whole area. And that provides better visibility for finding lesions."

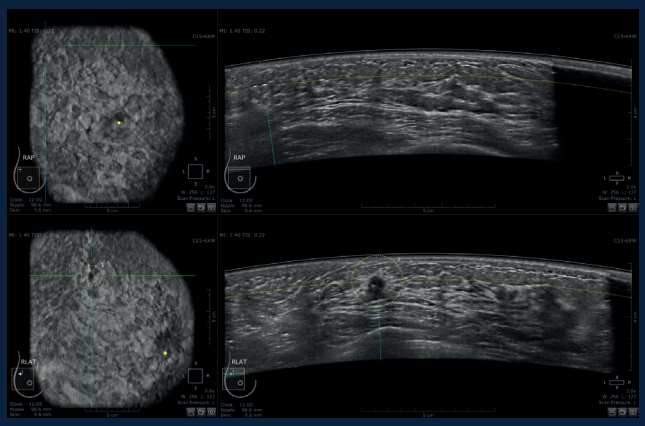
He even uses ABUS for women with fatty breasts. "In fatty breasts ABUS works well because you can see the disturbance in the architecture of the fat tissue better than on conventional ultrasound." In addition, he said, while the literature recommends ABUS for women with BI-RADS® C and D density, his clinic finds it also works well for women with B density.

According to the preliminary findings of the prospective study conducted between November 2018 and March 2020, on 2,678 women, presented at RSNA 2020 as an electronic poster, ABUS finds more cancers at an earlier stage than Tomosynthesis. "I am more confident that I won't miss a lesion with ABUS," he said. "When I'm with the patient using conventional ultrasound I may miss the lesion because I may talk to the patient, the patient may move, you may get distracted." And once the scanning is over, he said, the patient is gone. "But with ABUS, the image with the volume data is always there."

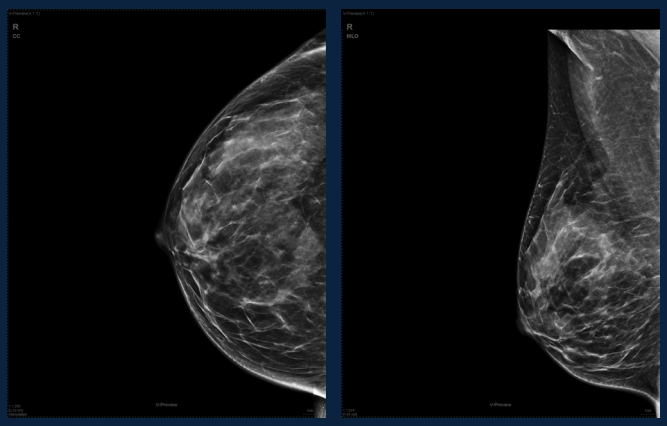
Clinical cases

Figure 2 highlights the improved imaging with ABUS. A 44-year-old screening patient's biopsy proved histologically to be an invasive dual carcinoma luminal A type. The lesion is not visible in the screening mammogram and tomosynthesis image on the right, however the ABUS image on the left clearly shows the lesion.

Figure 02. Clinical case



ABUS image



Mammography image

Patient experience

Breast cancer survivor, Gulsen Eray shared her experience when she was diagnosed with breast cancer a month before she turned 40 years old. She went for an annual health screening and added a mammography examination. Prof. Aribal recommended to her an ABUS examination due to her high breast density. ABUS showed a suspicious lesion on her both breasts which the biopsy proved to show was malignant. Due to the early detection and the immediate treatment she received, she recovered from the disease and has been going for routine follow-up since then.

"I think that my doctor's attention and ABUS played an important role in the early diagnosis of my breast cancer which made it possible to start my treatment immediately. I cannot imagine what would happen without his dedicated care and without the ABUS exam. Now that I look back I am really grateful for the decision I made to have my breast cancer screening early.

The ABUS examination was comfortable and easy, there was no pain. My advice to all women is don't skip your breast cancer screening."

Gulsen Eray

ABUS and enhanced productivity

In 2021, the clinic conducted a workflow study to evaluate how ABUS might impact radiologists workload and operational costs.* They enrolled 153 patients (age range: 21-81 years) who received examinations with conventional ultrasound and ABUS. They recorded the time required for the ABUS scanning and radiologist interpretation and the combined scanning with interpretation time for conventional ultrasound for screening and diagnostic exams (Table 1). They then compared the economic value of the two methods using current radiologists' salaries.

The study showed that ABUS significantly reduced the amount of time required by the radiologist, since technologists were now able to perform the scans.

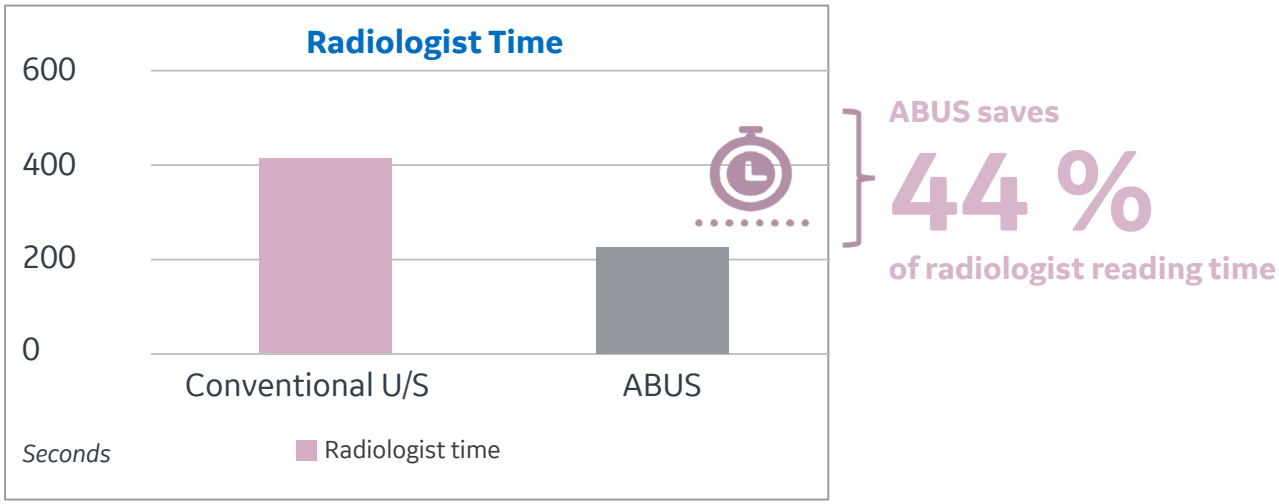
The overall mean time required for screening using ABUS (scanning, interpretation and reporting time) was 11 minutes and 16 seconds. The scan time which was performed by the technologists was 6 minutes 52 seconds; and the mean radiologists time was 3 minutes and 54 seconds. The mean examination time required for conventional ultrasound was 7 minutes 33 seconds, since the conventional ultrasound scan is performed by the radiologist, the mean radiologists' scan time was 7 minutes and 00 seconds. ABUS scanning is performed by a technologist whereas interpretation and reporting are conducted by the radiologist; therefore, ABUS saved an average of 3 minutes of radiologist time for each patient (Table 1 and Figure 3).

Table 1. ABUS vs conventional U/S statistical analysis

	Mean (minutes)	Standard Deviation	P-value
Report Time			
CONVENTIONAL U/S	00:00:33	00:00:38	<0.05
ABUS	00:00:30	00:00:35	
Radiologist Time			
CONVENTIONAL U/S	00:07:00	00:02:23	0.55
ABUS	00:03:54	00:01:22	
Scan Time			
CONVENTIONAL U/S (Radiologist time)	00:07:00	00:02:23	0.54
ABUS (Technologist time)	00:06:52	00:01:08	
Overall Examination Time			
CONVENTIONAL U/S	00:07:33	00:02:51	<0.05
ABUS	00:11:16	00:02:25	

The one-way ANOVA test was used to determine differences between the two methods, and Cohen's kappa coefficient to achieve agreement levels. Negative kappa ratios indicate no agreement or disagreement; 0-0.20 as slight; 0.21-0.39 as minimal; 0.40-0.59 as weak; 0.60-0.79 as moderate; 0.80-0.90 as strong; and above 0.90 as almost perfect. The one-way ANOVA test was used to determine P values with a confidence interval of 95% (p value <0.05 considered statistically significant). The statistical analytics are conducted by and courtesy of Istanbul Technical University Faculty of Business staff.

Figure 3. ABUS vs Conventional U/S Radiologist Time



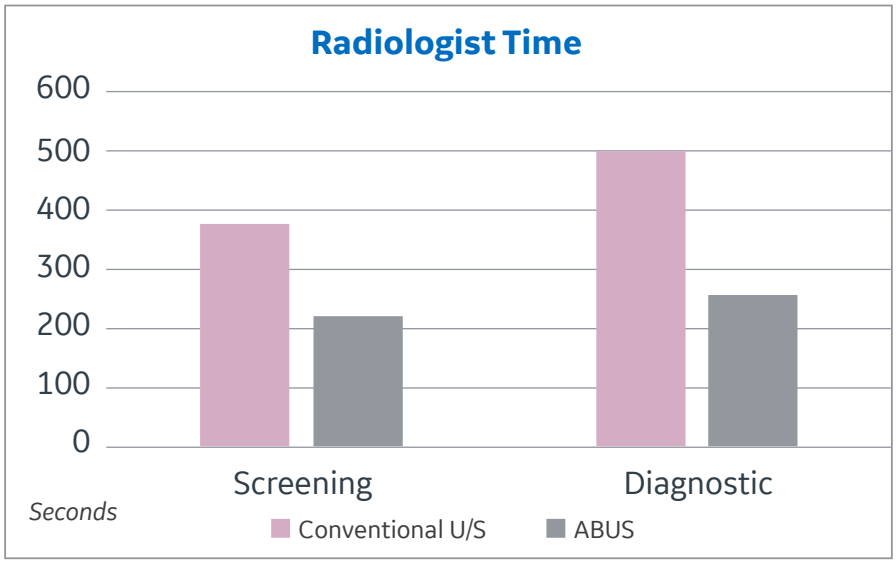
The time savings for radiologists were demonstrated for both screening or diagnostic exams as shown in Table 2 and Figure 4. While a second-look conventional ultrasound is typically required for diagnostic cases, ABUS still saved radiologist time by allowing a targeted approach on the specific section of the breast rather than the full breast evaluation that would have otherwise been required.

The time savings is particularly critical since many women come to the clinic without an appointment, said Professor Aribal. "With ABUS it is possible to do the scanning and send the patient home, then you can make a batch review," he said. "We're able to see more patients and use ultrasound more effectively for the patient that deserves your attention, not one with a harmless benign lesion."

Table 2. Statistical analysis according to examination type

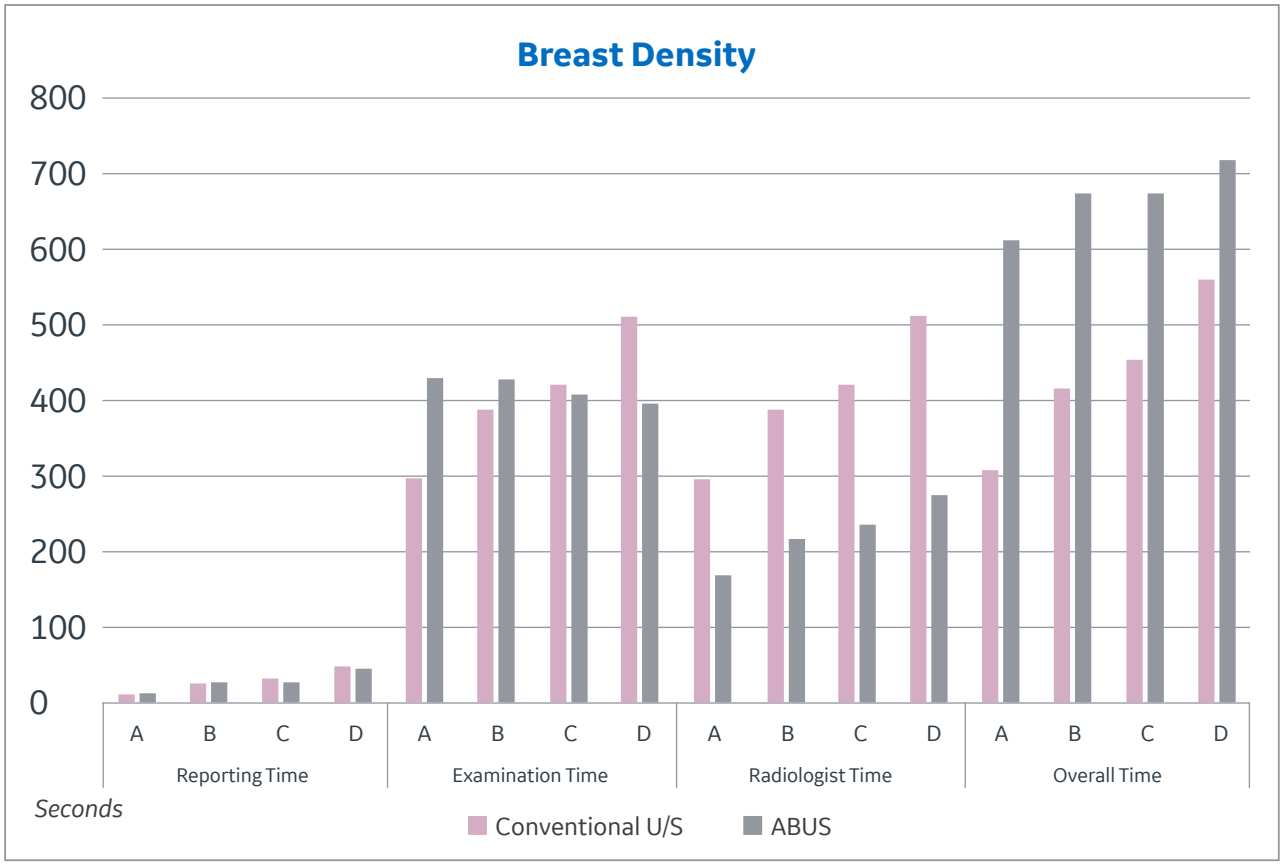
	Screening			Diagnostic		
	Mean (minutes)	**Standard Deviation**	**P-value**	**Mean (minutes)**	**Standard Deviation**	**P-value**
Report Time						
CONVENTIONAL U/S	00:00:21	00:00:23	0.97	00:00:54	00:00:50	0.44
ABUS	00:00:21	00:00:20		00:00:44	00:00:44	
Radiologist Time						
CONVENTIONAL U/S	00:06:15	00:01:50	<0.05	00:08:16	00:02:45	<0.05
ABUS	00:03:37	00:00:58		00:04:14	00:01:33	
Scan Time	00:00:00					
CONVENTIONAL U/S (Radiologist time)	00:06:15	00:01:50	0.05	00:08:16	00:01:50	0.05
ABUS (Technologist time)	00:06:42	00:01:11		00:07:11	00:01:11	
Overall Examination Time						
CONVENTIONAL U/S	00:06:37	00:02:05	<0.05	00:09:10	00:03:21	<0.05
ABUS	00:10:40	00:01:53		00:12:09	00:02:37	

Figure 4. Radiologist time by examination type



As breast density increases the scanning time and radiologist interpretation time increases significantly on conventional ultrasound. However, for ABUS, the radiologist interpretation time increases but the scanning time for the technologist remains similar. The variation in scanning time due to breast density is reduced. (Figure 5).

Figure 5. Time required for scanning and interpretation based on breast density



Economic implications of time savings with ABUS

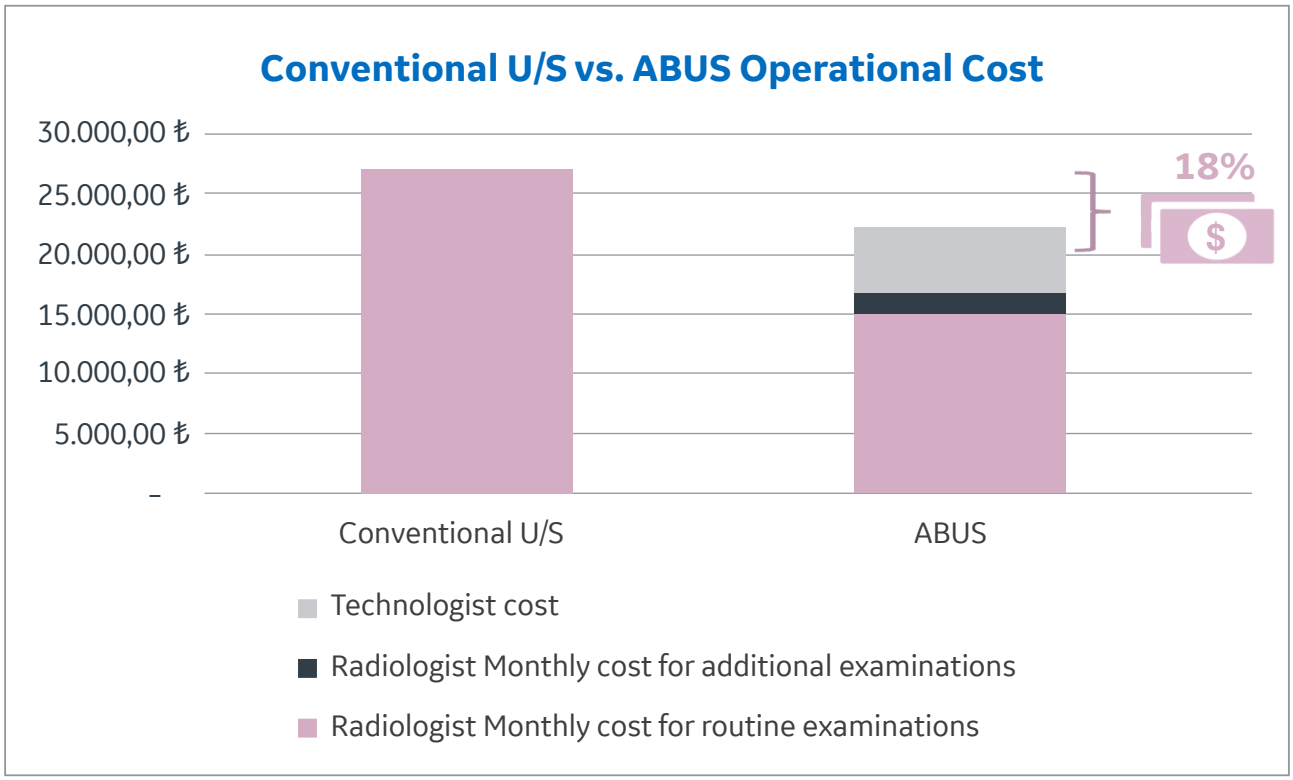
In a daily workflow, ABUS saves the radiologist time in screening cases. An exam can be performed and the images can be evaluated after the patient leaves the clinic. This allows evaluation to take place during less busy times at the clinic. However, ABUS aids in saving the time of the radiologists by enabling a targeted approach instead of the full evaluation of both breasts by conventional ultrasound. The reduced time radiologists spent performing scans translated into savings of 4,836 TL (about 300 USD; conversion rate 16,12 TL to USD) based on 665 patients per month. That includes both radiologist time as well as technologist time cost.

Calculations are based on the assumption of 665 patients/month going through US examination at radiologist time of 7'02" minutes per exam with conventional US and 3'55"minutes per exam with ABUS, at radiologist cost of 350 TL/hour. Overall, the clinic realized a 18% savings in operational costs with ABUS.

-18%
Reduction in operational costs with ABUS

4,836TL (~300 USD)
Savings Acibadem Altunizade Breast Clinic per month

Figure 6. Cost savings with ABUS



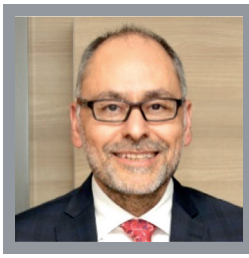
Conclusion

ABUS has empowered technologists to perform routine ultrasound breast scanning and has changed the clinic's exam workflow by shifting those routine exams from radiologists to technologists. The change in the ultrasound examination workflow enabled by ABUS has optimized the use of human resources in the department. The study showed that using ABUS versus conventional ultrasound for ultrasound exams saved an average of 3.06 minutes per patient in radiologist time, including 2.6 minutes for screening exams and 4.04 minutes for diagnostic exams. This resulted in an overall savings of 4,836 TL (300 USD) per month. The clinic realized a 18% savings in operational costs with ABUS.

ABUS has freed physicians for more complex examinations and interpretations, allowing the time savings from the new workflow to benefit patients who need more focused care the most.

"ABUS is a volume imaging tool similar to CT and MRI therefore I believe there is a lot of potential in ABUS to be explored and all radiologists should embrace this technology."

Prof. M Erkin Aribal, MD, Head of Breast Imaging Unit, Acıbadem Altunizade Hospital, Istanbul



Prof. M. Erkin Aribal is an experienced breast radiologist based in Istanbul Turkey. He is a Professor in the Radiology Department of Acıbadem University School of Medicine and currently leading the Breast Imaging Unit in Acıbadem Altunizade Hospital. He is also a member of Multidisciplinary Breast Team and has more than 50 peer reviewed scientific. Throughout his career he has been an active contributor of major scientific projects in the study of breast cancer.

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Follow this QR code to learn about Gulsen's breast cancer journey

Follow this QR code to experience the breast care patient journey in Acibadem Altunizade Hospital

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About Invenia ABUS

Invenia ABUS (Automated Breast Ultrasound) is the first ultrasound system approved by the FDA for breast screening. It is a comfortable, non-ionizing alternative to other supplemental screening options for women with dense breast tissue. When used in addition to mammography,

Invenia ABUS can improve invasive breast cancer detection by a 37.5% relative increase over mammography alone.[7]