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Clinical Application and Workflow Benefits of PelvicAssist™ in Pelvic Floor Ultrasound

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Introduction

Pelvic floor ultrasound represents a cornerstone in the functional evaluation of the female pelvic floor, particularly in the assessment of the levator ani muscle complex. With increasing attention to urogynecological health and pelvic floor disorders, the demand for standardized, objective, and reproducible imaging methods has never been more critical. In clinical practice, evaluating the dynamic behavior of pelvic structures during phases such as rest, voluntary contraction, and Valsalva is essential for detecting muscle dysfunctions, pelvic organ prolapse, and other related conditions.[1-5]

Manual measurement techniques, although effective, are operator-dependent and time-consuming. They require substantial expertise and present limitations in reproducibility, especially in longitudinal follow-ups or multicenter research protocols. The advent of artificial intelligence (AI) in ultrasound imaging provides a unique opportunity to enhance diagnostic workflows by automating complex tasks like plane alignment, structure segmentation, and anatomical measurement.

This white paper presents the clinical application of PelvicAssist™, an AI-powered measurement feature integrated within the HERA Z20 ultrasound system developed by Samsung Medison Co., Ltd. The tool is specifically designed for pelvic floor imaging and aims to streamline the measurement process by automatically aligning volume datasets and measuring key anatomical parameters. Our goal was to assess the clinical application, usability, and workflow benefits of PelvicAssist™ in a real-world outpatient setting.

Objective

To assess the clinical utility and efficiency of the PelvicAssist™ AI feature by comparing automated measurements with manual reference standards across a cohort of diverse cases. The evaluation focused on technical performance and potential impact on clinical workflows in pelvic floor sonography.

Material

PelvicAssist™ is an AI-based feature designed to help clinicians diagnose pelvic floor dysfunction by analyzing anatomical structures. Using deep learning technology, it takes a 3D transperineal ultrasound image as input to perform structural analysis and provide automatic measurements, streamlining the diagnostic workflow.

The core functionalities of PelvicAssist™ are auto-alignment, which aligns a volume including the levator ani muscle, and auto-measurement (Table 1), which estimates the key dimensions of the levator hiatus. These processes are applicable across three phases: Rest, Contraction, and Valsalva.

After a volume scan of the pelvic floor, pressing the button "Multiple Plane Detection" automatically generates tomographic images, presented as a multi-slice view. A visualization of the pubic symphysis landmarks across the "open", "closing", and "closed" appearances assists clinicians in recognizing normal anatomy versus avulsion patterns (Figure 1).

Furthermore, in a split-screen image with both the midsagittal plane and the axial plane, pressing the button "LH Measurement", the items (Table 1) are automately measured and displayed. (Figures 2A-7B) This is used to to assess the hiatal area, hiatal ballooning, and levator integrity. [6]

Within a few seconds, the software automatically recognize the structures and align the plane of pelvic floor, presenting information designed to assist clinicians in assessing puborectalis integrity or identifying focal or complete avulsion, either unilateral or bilateral. Ultimately, PelvicAssist™ improves examination efficiency in clinical practice by shortening the overall workflow.

Table 1. Automatic measurement items provided by PelvicAssist™

No.	Items	Full name	Description
1	LH Area(cm2)	Levator hiatus area	Area of the levator hiatus region
2	LH Circ. (cm)	Levator hiatus circumference length	Circumference length of the levator hiatus region
3	LH ap (cm)	Levator hiatus anterior-posterior diameter	Longest sagittal length of levator hiatus
4	LH lat. (cm)	Levator hiatus lateral diameter	Longest frontal length of levator hiatus
5	Rt LUG (cm)	Right levator-urethra gap length	Length between the urethra and right levator.
6	Lt LUG (cm)	Left levator-urethra gap length	Length between the urethra and left levator.

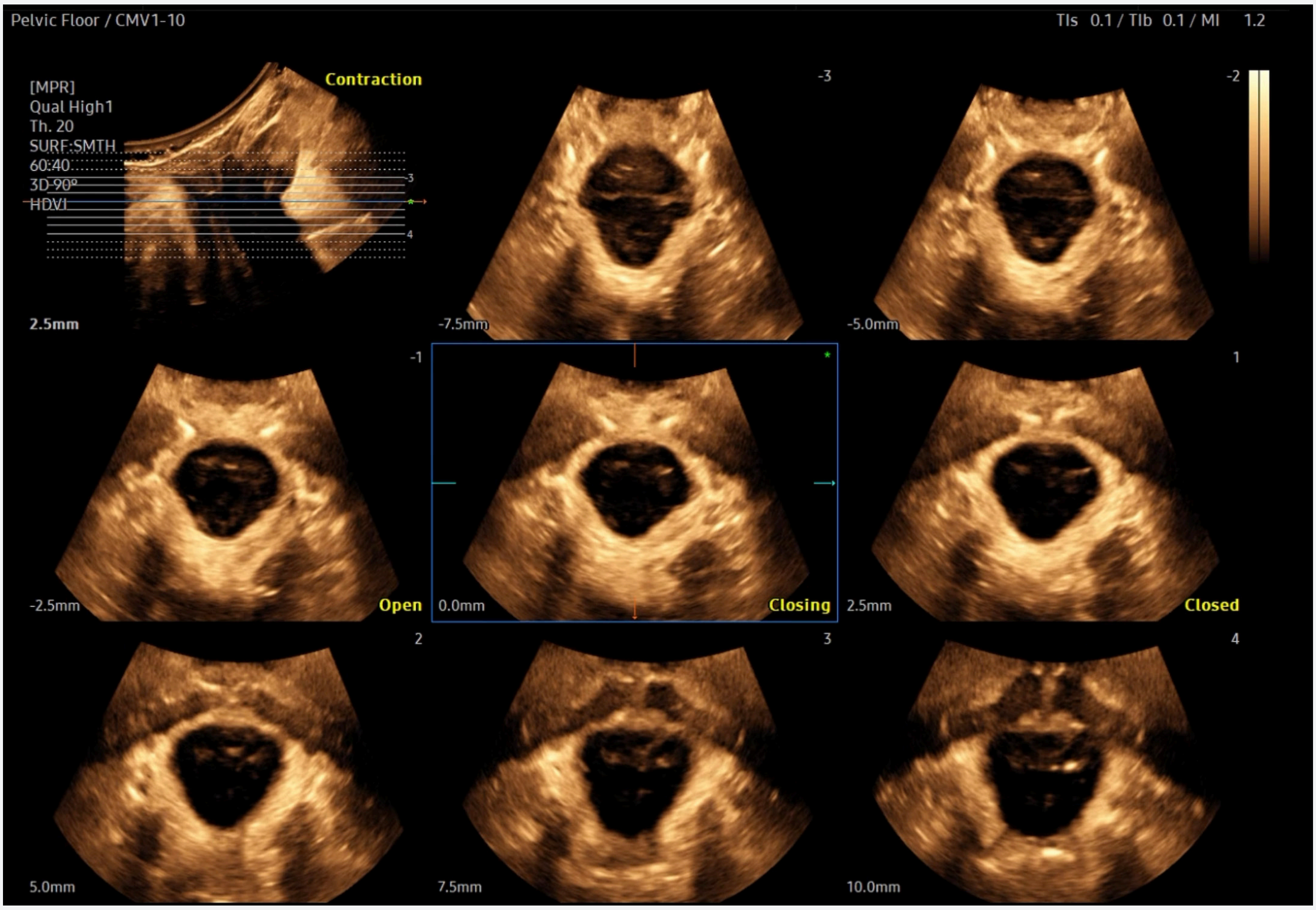

Figure 1. The 'open-closing-closed' tomographic images automatically presented as a multi-slice view by PelvicAssist™ for puborectalis integrity assessment (Contraction phase)

Methodology

The evaluation was performed using a HERA Z20 ultrasound system equipped with a CMV1-10 transducer. All examinations followed a standardized 4D pelvic floor acquisition protocol, including volumes acquired at rest, during voluntary pelvic floor contraction, and during the Valsalva maneuver.

The study cohort consisted of 35 female subjects aged 22 to 64 years, selected to reflect a broad spectrum of body mass indices and clinical indications, such as postpartum status, pelvic pain, urinary incontinence, and pelvic organ prolapse.

A 4D pelvic floor volume was acquired transperineally with the patient in the supine position. Standardized maneuvers (rest, voluntary contraction, and Valsalva) were performed, with real-time instructions provided to guide the patient throughout the examination. Each assessment began with a 2D acquisition to obtain a stable mid-sagittal plane in which the pubic symphysis, urethra/vagina, and anorectal region were clearly identifiable. The transducer was applied to the perineum with gentle pressure, and the volumetric region of interest was centered on the levator hiatus/levator complex while including both the pubic symphysis and the anorectal region. Separate volumes were acquired at rest, during the contraction plateau, and at maximal Valsalva, repeating the Valsalva maneuver when necessary to capture the strongest effort sustained for at least 6 seconds.

For each dataset, the following parameters were assessed: levator hiatus (LH) area (cm^2), LH circumference, anteroposterior (AP) and transverse diameters, and the levator–urethral gap (LUG) on both the left and right sides. Each volume was analyzed twice—first manually by an experienced operator and then using the PelvicAssist™ automated feature—while ensuring that the same volume selection was used for both approaches to maintain consistency.

Results Summary

- **Contribution to Consistency and Standardization**

First and foremost, the adoption of an automated assessment tool such as PelvicAssist™, can contribute to the operational quality of the examination, as it standardizes steps that in manual practice are more prone to inter- and intra-operator variability. Anatomical volume alignment and identification of reference structures are performed by consistently applying an automated algorithm for anatomical alignment. This minimizes operator-dependent variability in plane selection, a critical factor for achieving comparable measurements — particularly when the goal is to compare rest, contraction, and Valsalva phases or to perform longitudinal follow-up assessments. From a clinical standpoint, this translates into more homogeneous and interpretable datasets, with outputs that are immediately usable even in high-throughput outpatient settings.

- **Workflow Efficiency**

Another key characteristic is speed. A reduction in time required for the analysis was observed. Once the volume is acquired, processing and measurement generation are performed in a matter of seconds. This reduces the 'machine time' devoted to post-processing and allows the operator to move more quickly from data acquisition to clinical interpretation. This leads to a more efficient workflow, with fewer interruptions and a greater ability to maintain continuity between the examination, explanation of findings, and shared decision-making with the patient.

Time savings were observed during both data acquisition and reporting, with a tangible reduction in operator workload and fatigue and a potential increase in patient throughput. In routine practice, an experienced operator typically requires around 25 seconds for each dynamic assessment—during voluntary contraction or the Valsalva maneuver—and for measuring the key parameter. With PelvicAssist™, the overall time is reduced to approximately 10 seconds, which essentially corresponds to the time required for the patient to perform the maneuver. This represents an ~60% reduction in time compared with manual assessment (from ~25 seconds to ~10 seconds), as measurement calculations are fully autovmated and are completed in less than one second.

- **Practicality and Ease of Use**

From a practical standpoint, the feature is also well suited for routine clinical use, as it is seamlessly integrated into the HERA Z20 3D/4D PelvicFloor preset and requires minimal training. As a result, PelvicAssist™ can be adopted without disrupting established workflows, while offering immediate benefits in speed, consistency, and usability.

PelvicAssist™ also benefits from a "zoom-friendly" workflow: clinicians can activate zoom to enhance visual inspection of anatomical details without affecting the automated measurements (Figure 6). Importantly, zoom changes only the on-screen magnification, while AI measurements are performed on the underlying 3D/4D dataset and reference plane, thereby preserving measurement consistency and preventing user-dependent scaling effects. This feature improves interpretability and confidence in reporting, especially in challenging or enlarged hiatus cases during Valsalva.

Conclusion

PelvicAssist™, as a time-efficient feature, offers a practical approach to enhancing standardization of pelvic floor assessments in both routine and research-based ultrasound exams. It is particularly useful in busy clinical settings, pelvic floor rehabilitation pathways, and educational programs where consistency and objectivity are paramount.

The AI-powered PelvicAssist™ module on HERA Z20 provided measurements that were clinically comparable to those of manual experts across a wide range of cases. Its implementation introduces new possibilities for the automation of pelvic floor ultrasound diagnostics. By through its process of providing consistent and rapid measurements with minimal operator input, PelvicAssist™ can support a more standardized diagnostic process and streamlined clinical workflows.

Case Examples

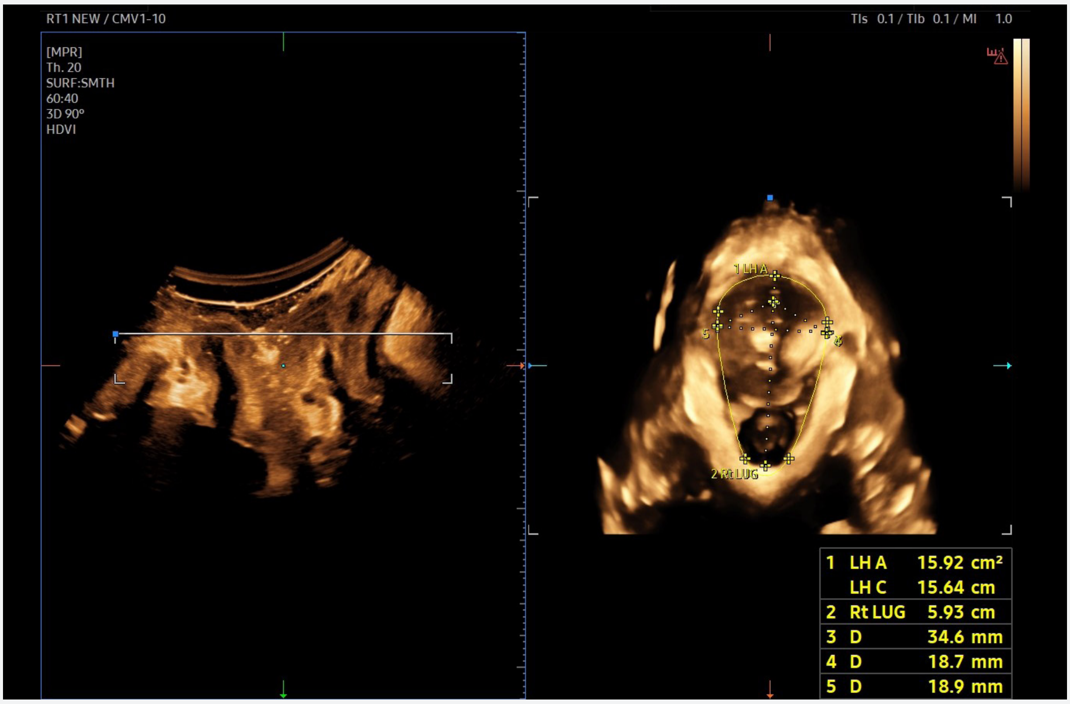

Figure 2A : Manual measurement of genital hiatus diameters at rest

The volume is reviewed with an oblique view with OVIX (Oblique View eXtended) to obtain the correct levator ani muscle plane, then the inner hiatal plane is selected and the levator hiatus is manually delineated and annotated. The operator-driven tracing and caliper placement provide the reference measurements of hiatus sizeand diameters (and LUG); they require time and are inherently more operator-dependent.

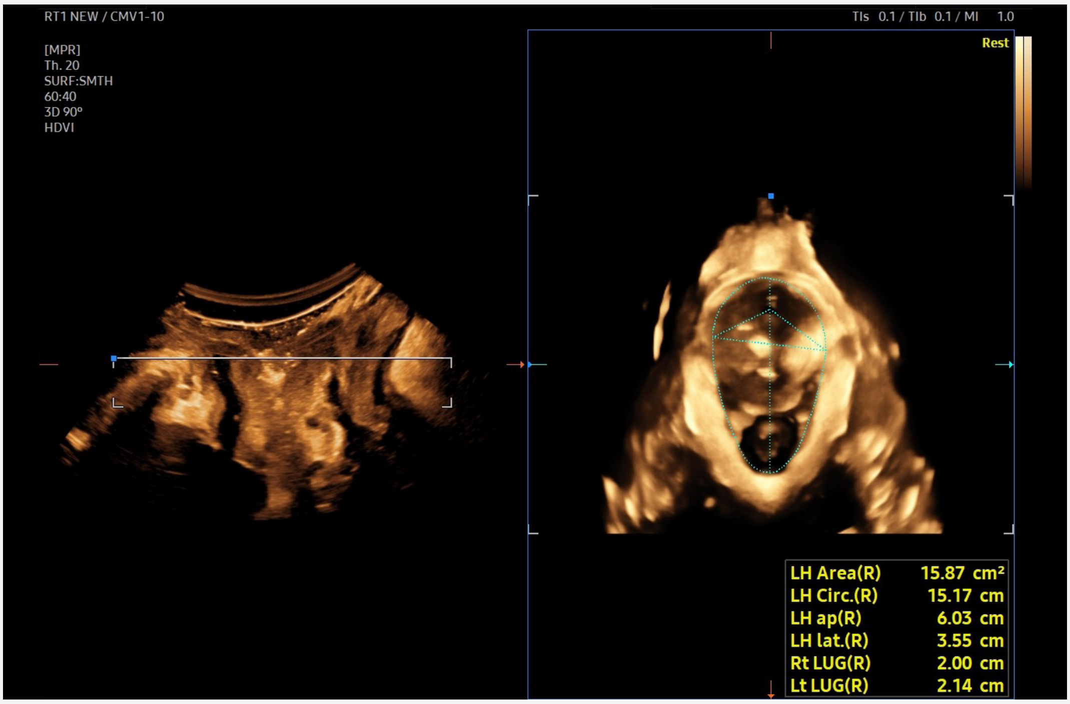

Figure 2B: Automated measurements at rest

PelvicAssist™ automatically identifies the correct plane, segments the levator hiatus, and generates the key parameters (LH area, circumference, AP/transverse diameters, and bilateral LUG) in real time. The overlay contour and measurement panel illustrate a standardized, immediately interpretable output that supports faster reporting and improved consistency.

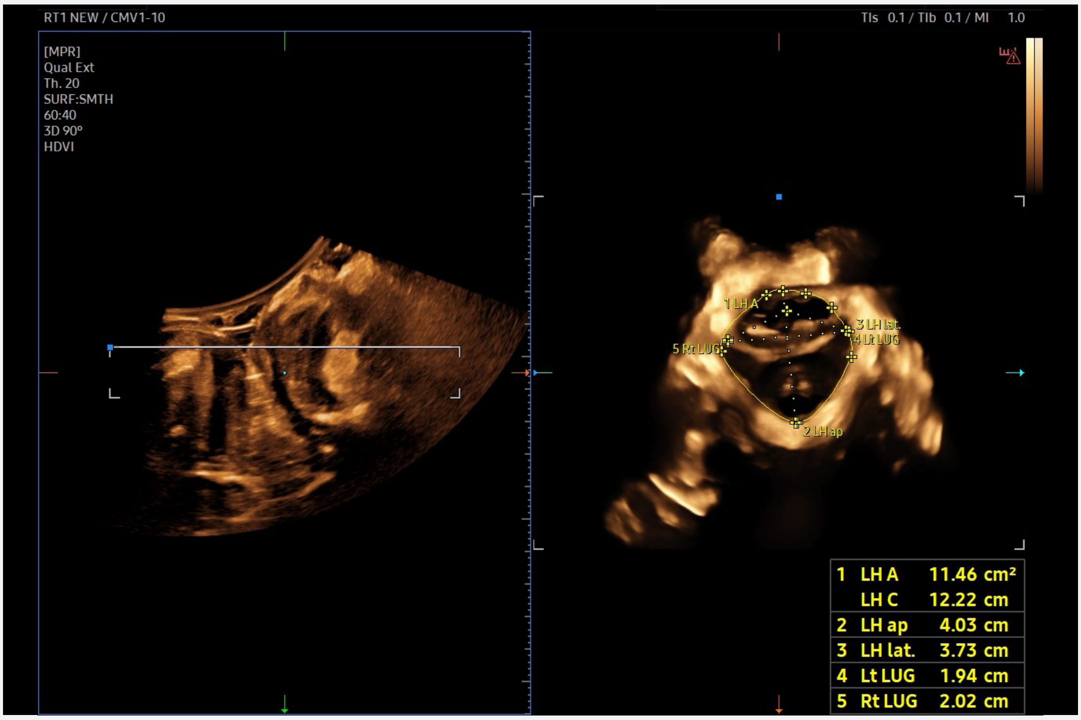

Figure 3A : Manual measurement of genital hiatus diameters during contraction

The minimal hiatal plane is selected manually, and the levator hiatus is outlined by the operator, with calipers and trace used to derive area and diameters. This approach provides a reliable reference but is inherently operator-dependent and more time-consuming.

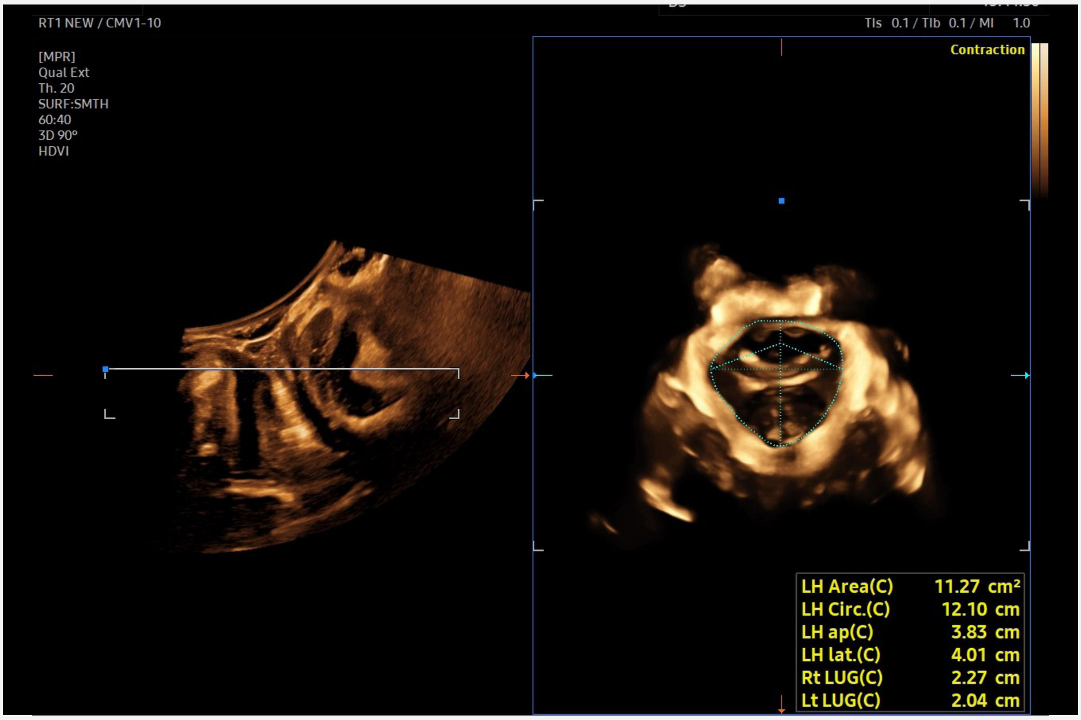

Figure 3B : Automated measurements during contraction

PelvicAssist™ automatically identifies the appropriate plane and generates a standardized hiatus contour with immediate output of key parameters (area, circumference, AP/transverse diameters, and LUG when applicable). The automated workflow supports faster reporting and reduces variability during the contraction phase.

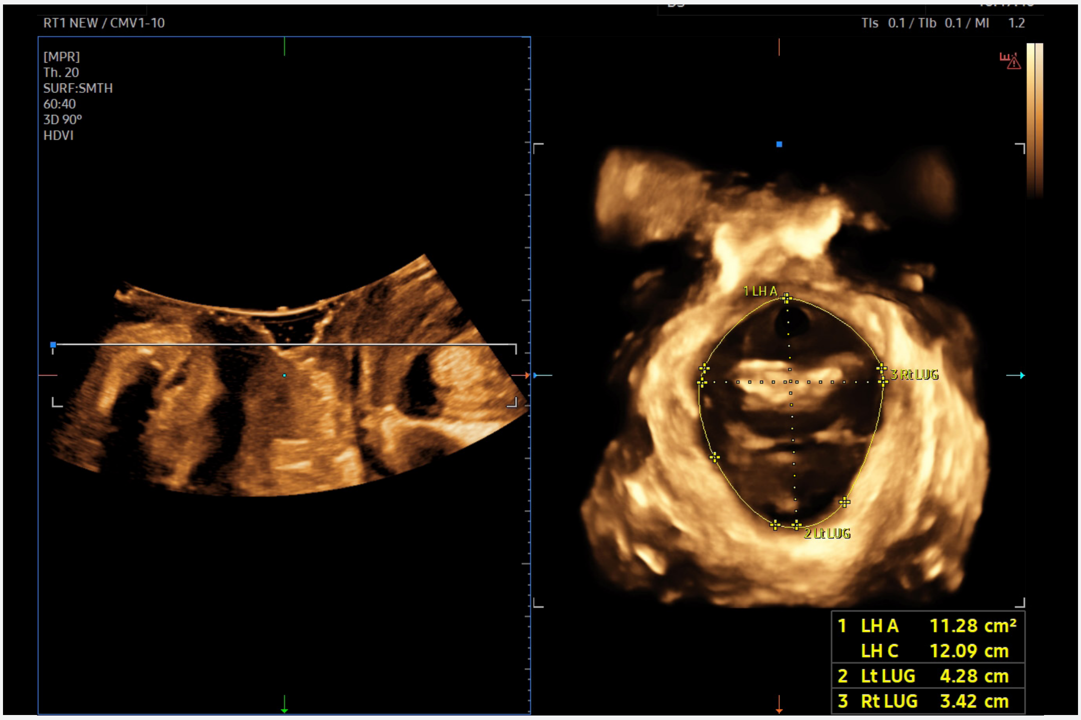

Figure 4A : Manual measurement of genital hiatus diameters during Valsalva

During maximal Valsalva, the operator manually aligns the dataset and performs the hiatus measurements on the selected plane.

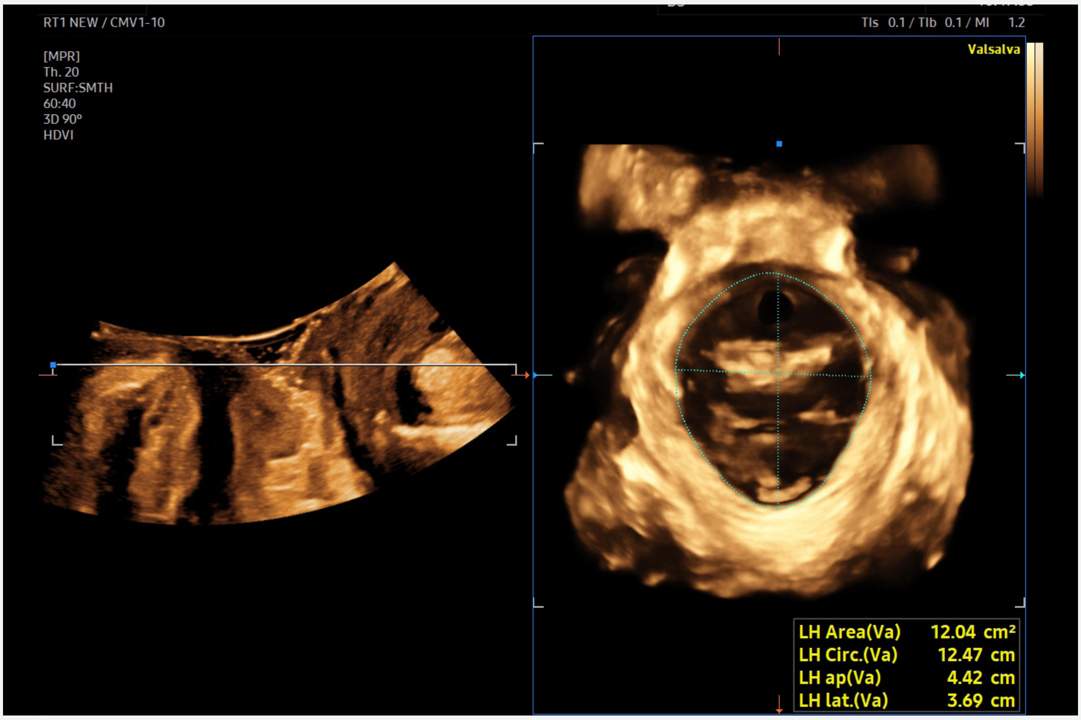

Figure 4B : Automated measurements during Valsalva

The AI-based tool maintains consistent plane selection and provides an instant segmentation of the enlarged hiatus during Valsalva, with automatic measurements of the relevant biometric parameters. This facilitates objective quantification of dynamic changes while minimizing operator workload.

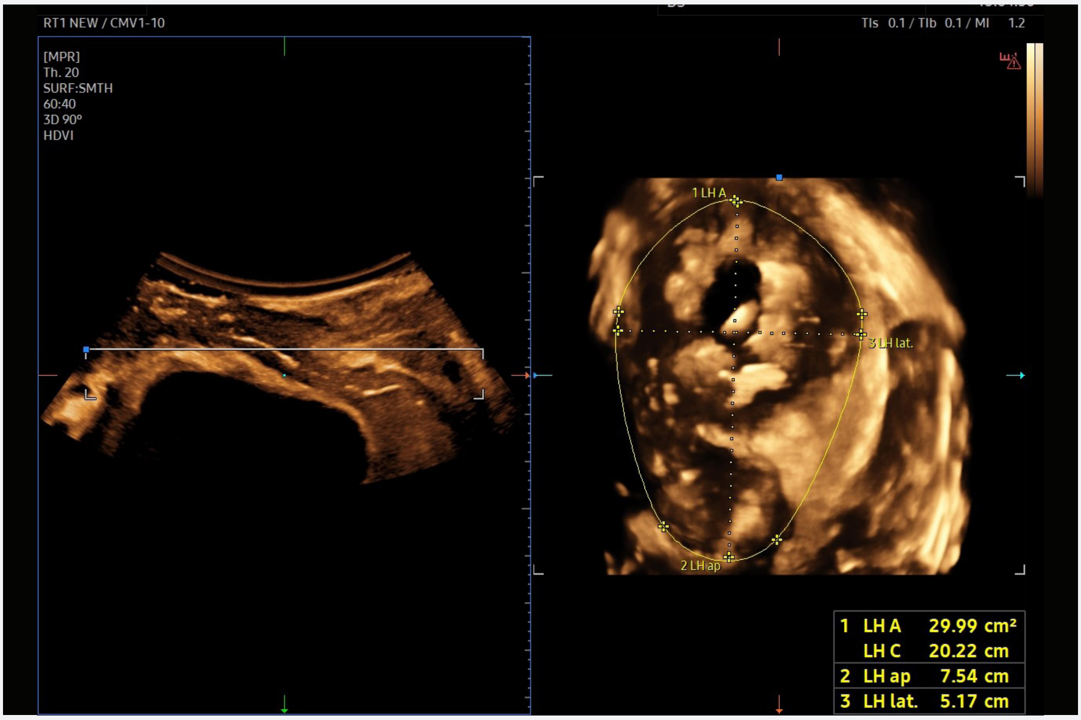

Figure 5A : Manually measured values in a patient presenting with ballooning during Valsalva and concomitant grade I cystocele

This example illustrates pronounced hiatal ballooning under Valsalva, with manual measurements capturing the marked enlargement of the levator hiatus. While clinically informative, the manual approach requires careful alignment and can be affected by the extreme anatomy and motion during the maneuver.

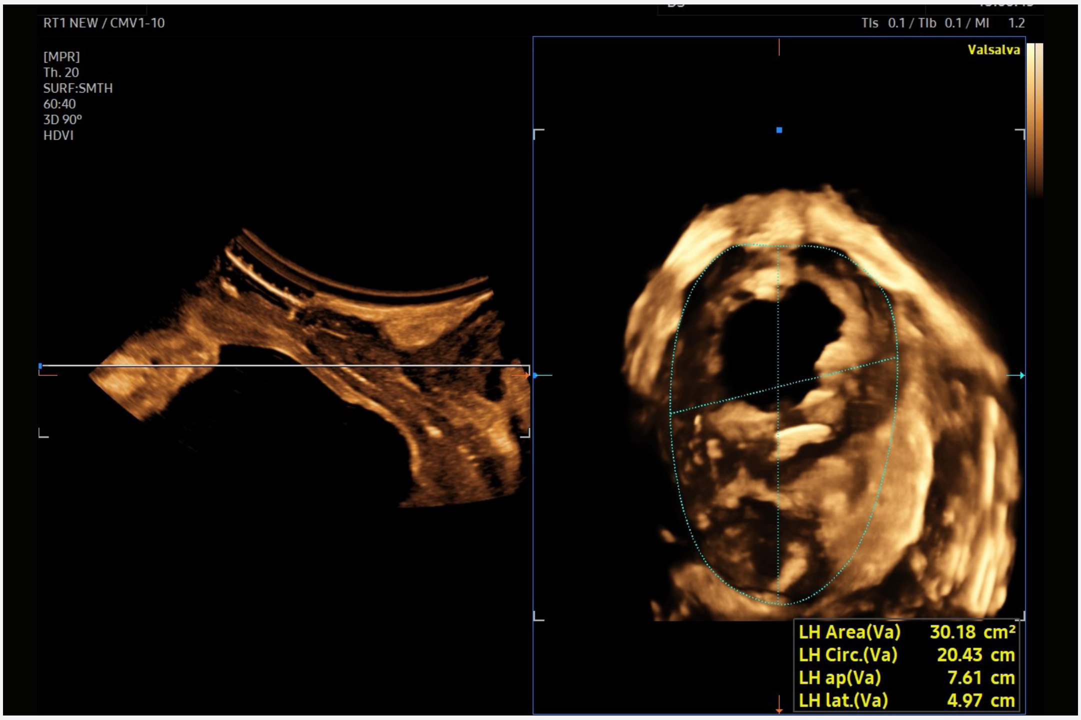

Figure 5B : Automated assessment of the correct plane and measurements in a patient with ballooning during Valsalva and concomitant grade I cystocele

PelvicAssist™ stably identifies the measurement plane and provides a consistent contour even in a challenging "ballooning" scenario, delivering an immediately interpretable quantitative output. This supports rapid documentation of severity and improves consistency in complex cases.

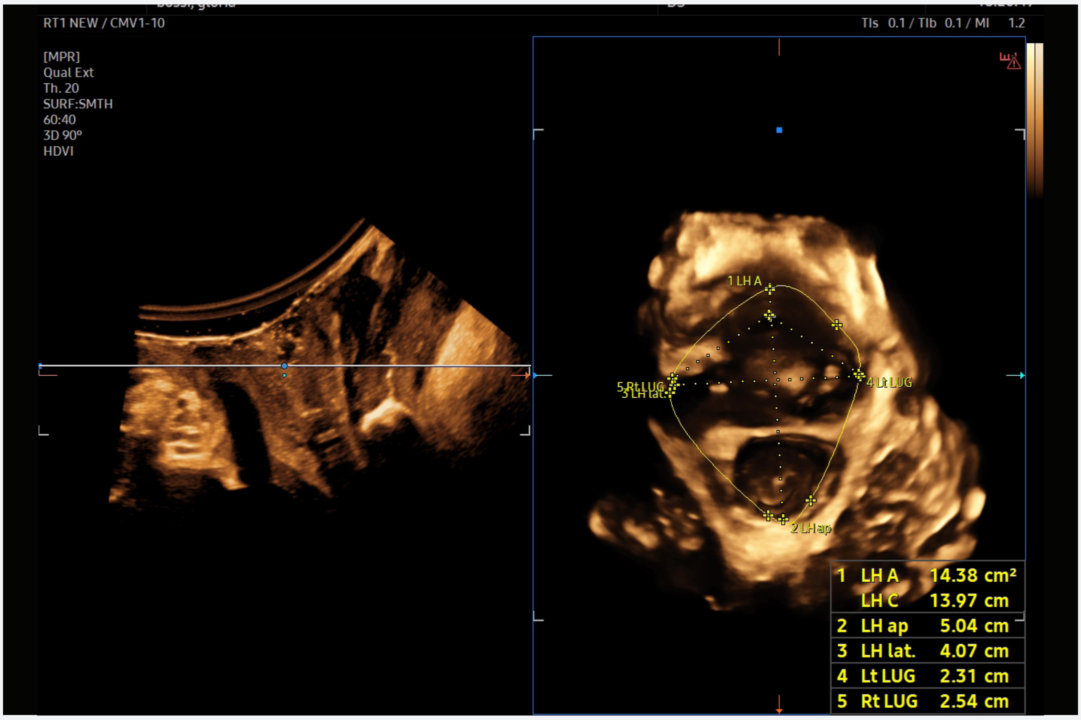

Figure 6A : Manual measurement of the diameters during contraction in a patient with right-sided unilateral puborectalis muscle avulsion

Manual assessment highlights an asymmetric hiatal configuration consistent with unilateral levator trauma, requiring meticulous plane selection and point placement to avoid bias. The manual workflow is accurate but particularly sensitive to operator experience in such non-standard anatomy

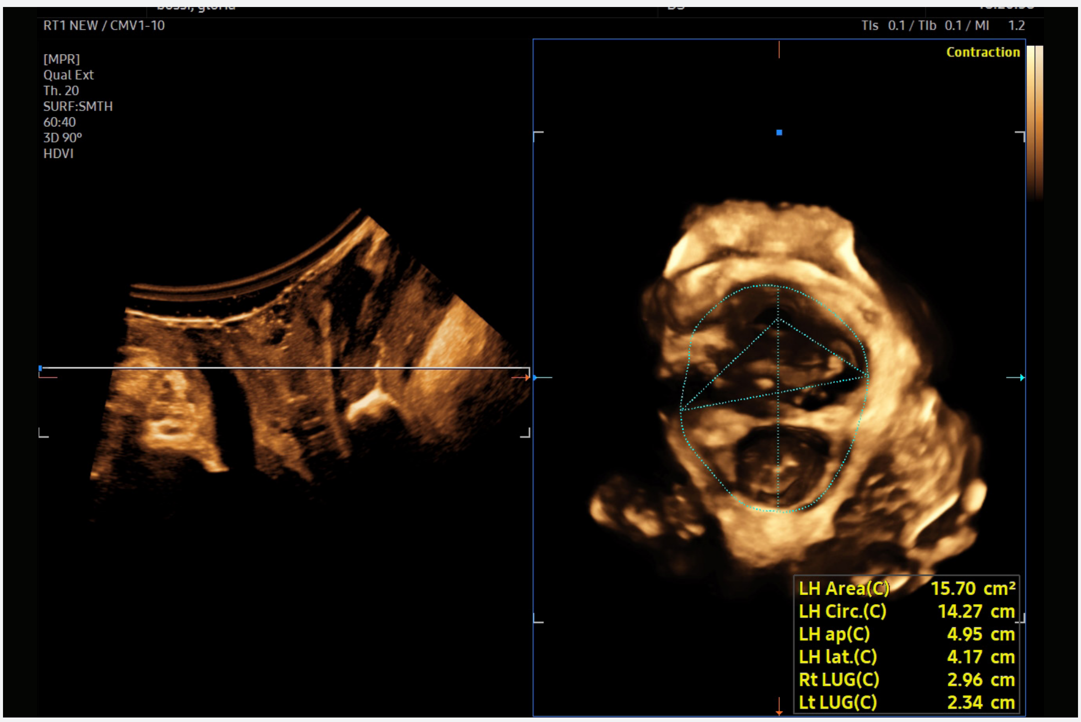

Figure 6B : Automated measurement of measurements during contraction in a patient with right-sided unilateral puborectalis muscle avulsion

The automated feature provides a stable plane and standardized segmentation despite asymmetry, with rapid calculation of the biometric parameters (including side-specific metrics such as LUG). This helps streamline assessment and improves consistency when evaluating levator defects in daily practice.

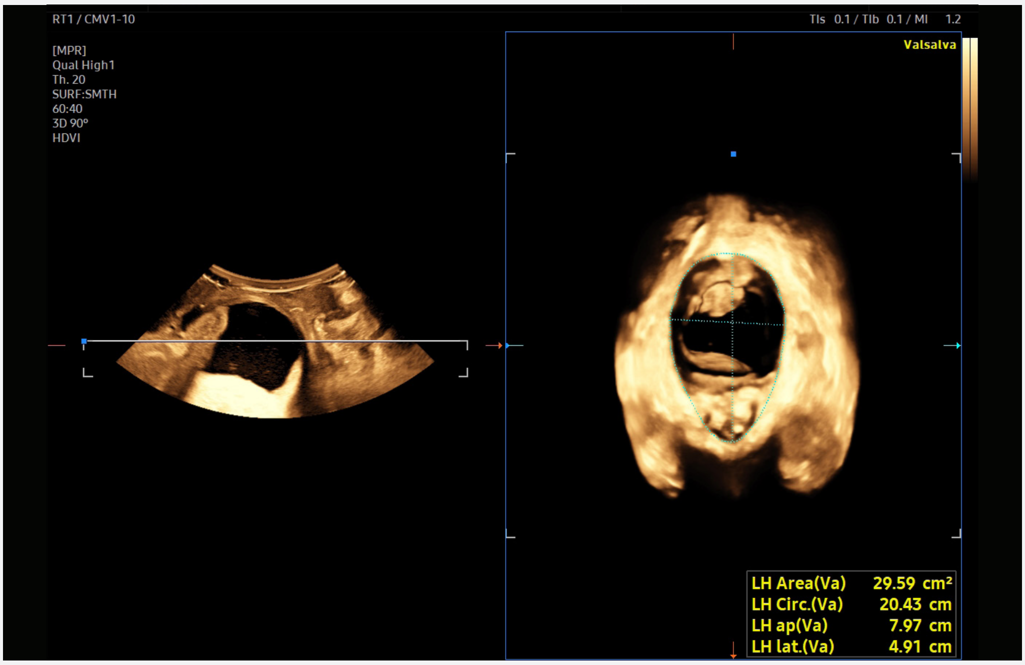

Figure 7A : Automated Valsalva assessment (standard view)

This image shows PelvicAssist™ performing automatic plane selection and levator hiatus segmentation during maximal Valsalva in the standard display layout. The AI-generated contour remains anatomically aligned with the anatomical structures, and the key parameters (LH area, circumference, AP and transverse diameters) are computed automatically and presented immediately for clinical interpretation. In this case a mild (grade I) cystocele is visible.

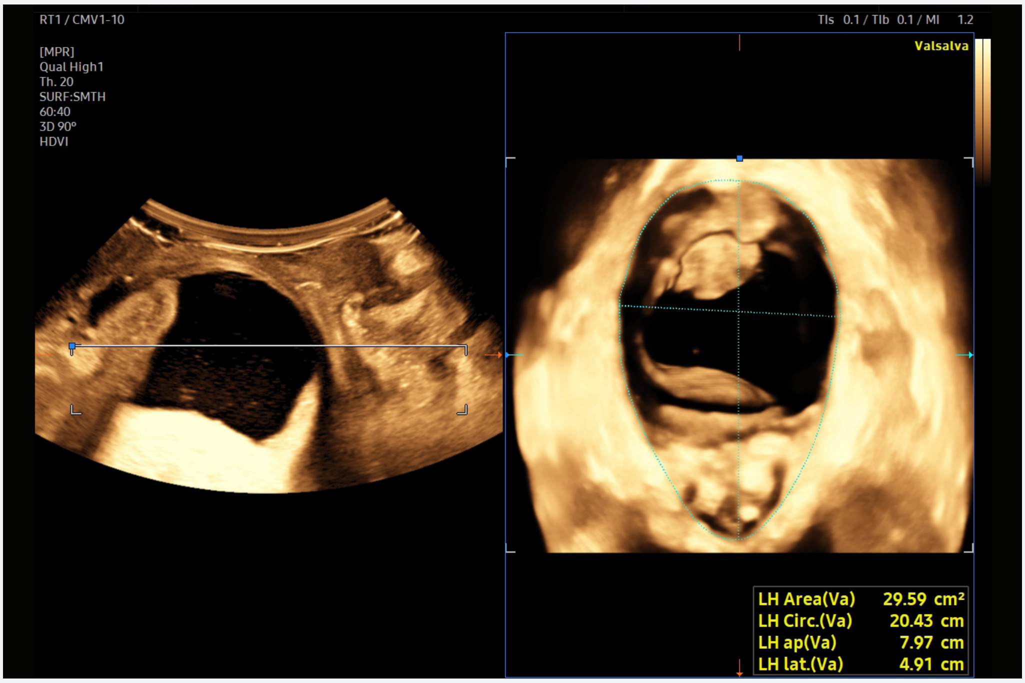

Figure 7B : Automated Valsalva assessment with zoom (measurement preserved)

After activating zoom to improve visual inspection of the hiatus margins and surrounding anatomy, PelvicAssist™ maintains the same segmentation and automatically reported measurements. Importantly, zoom affects only the on-screen visualization, while the AI measurements are performed on the underlying 3D/4D dataset and reference plane—therefore preserving measurement consistency and avoiding user-dependent scaling errors. This combination of enhanced visibility and stable automated quantification supports clear and rapid reporting even in challenging Valsalva datasets.

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