

INTEROBSERVER AND INTERDISCIPLINARY RELIABILITY OF 3D ENDOVAGINAL ULTRASOUND ASSESSMENT OF PELVIC FLOOR ANATOMY

Hypothesis / aims of study

Our aims were to evaluate (1) the interobserver and (2) the interdisciplinary reliabilities of levator hiatus, urethral thickness and anorectal angle measurements using 3D endovaginal ultrasound (EVUS).

Study design, materials and methods

Twenty-seven nulliparous asymptomatic females were imaged with 3D-EVUS. Analyses were conducted off-line from stored 3D volumes by six readers (two radiologists, two urogynecologists and two colorectal surgeons) using a standardized technique. The following six study parameters were measured in each 3D dataset: Levator hiatus length, Levator hiatus width, Levator hiatus area, Levator ani muscle attachment to the pubic rami on both sides, Anorectal angle, and the Urethral thickness (Figure 1). The reliability analysis consisted of an overall interobserver, intradisciplinary and interdisciplinary analysis. The overall interobserver analysis compared each parameter among the six readers. Reliabilities were determined using the Intraclass Correlation Coefficient (ICC). The Institutional Ethical Committee approved this protocol.

Results

Volunteers had mean age of 32 (range, 18-55) years and mean body mass index of 22.45 (range, 19.4-25.6) kg/m². The identification in the axial plane of the anterior (lower edge of the SP) and posterior (apex of the anorectal junction) landmarks was important because the LA was seen more clearly in this than the other levels. The two limbs of the LA were identified by the six investigators attached to the two pubic rami in all females (Cohen's kappa = 1; perfect agreement). The correlation between LH length, width and area calculated for 27 patients and for six investigators was high (Cronbach's alpha = 0.970), indicating that the items were measuring the same underlying construct. The interobserver, intra- and interdisciplinary reliability data are summarized in Table 2. Overall interobserver reliability for biometric indices of LH was good for LH length (ICC = 0.655) and very good for LH width (ICC = 0.889) and LH area (ICC = 0.810). A very good intradisciplinary reliability was found for all LH measurements, with the exception of LH length for urogynecologists and radiologists, which showed a good agreement (ICC = 0.643 and 0.717, respectively). The interdisciplinary reliability was good for LH length and very good for LH width and area, with the exception of LH area between urogynecologists and colorectal surgeons (ICC = 0.783, good agreement). The overall interobserver reliability for urethral thickness was good (ICC = 0.624). For this parameter, the intradisciplinary reliability was also good as was the interdisciplinary reliability between colorectal surgeons and radiologists (ICC = 0.651) and colorectal surgeons and urogynecologists (ICC = 0.671). However, moderate agreement was found between radiologists and urogynecologists (ICC = 0.565). Anorectal angle measurement showed fair overall interobserver reliability (ICC = 0.331). Slight intradisciplinary reliability was found for urogynecologists (ICC = 0.035), fair for colorectal surgeons (ICC = 0.216) and moderate for radiologists (ICC = 0.569). Interdisciplinary reliability was moderate between radiologists and colorectal surgeons (ICC = 0.434), fair between radiologists and urogynecologists (ICC = 0.327) and slight between urogynecologists and colorectal surgeons (ICC = 0.204).

Interpretation of results

3D-EVUS yields reliable measurements of levator hiatus dimensions and urethral thickness. Using a standardized technique, measurements of levator hiatus indices and urethral thickness with 3D endovaginal ultrasound showed good or very good interobserver and interdisciplinary reliabilities.

Concluding message

To establish whether measurements with 3D-EVUS could be influenced by the specialty of the reader, we selected three different specialties (urogynecology, radiology, colorectal surgery). The evaluation of pelvic floor structures appeared to be independent from which specialty performed the measurements.

Figure 1.

Three-dimensional endovaginal ultrasound. Measurements in the axial plane of minimal hiatal dimensions: LH ap - levator hiatus anterior-posterior diameter; 2. LH ll - levator hiatus latero-lateral diameter; 3. levator hiatus area is marked with lines. AC anal canal, IPR inferior pubic ramus, LA levator ani, SP symphysis pubis, T transducer, U urethra

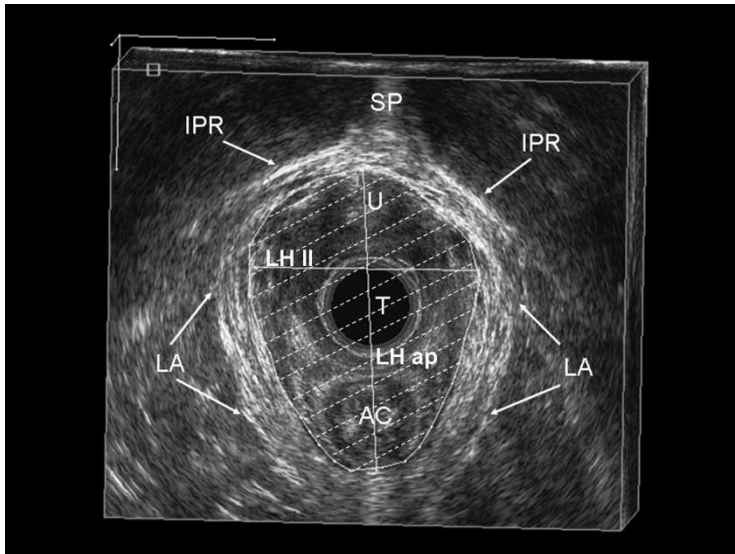


Table 1. Interobserver, Intra- and interdisciplinary reliability of three-dimensional endovaginal ultrasound

Reliability	LH length		LH width		LH area		Urethral thickness		ARA	
	ICC	95%CI	ICC	95%CI	ICC	95%CI	ICC	95%CI	ICC	95%CI
Overall	0.655	0.509-0.794	0.889	0.822-0.940	0.810	0.707-0.894	0.624	0.472-0.772	0.331	0.179-0.528
Intradisciplinary										
UGN.1 vs. UGN.2	0.643	0.359-0.819	0.889	0.773-0.948	0.857	0.713-0.932	0.660	0.385-0.829	0.035	-0.339-0.402
RAD.1 vs. RAD.2	0.717	0.473-0.860	0.981	0.958-0.991	0.893	0.781-0.950	0.601	0.298-0.795	0.569	0.252-0.777
CRS.1 vs. CRS.2	0.883	0.761-0.945	0.910	0.815-0.958	0.887	0.770-0.947	0.735	0.501-0.869	0.216	-0.167-0.544
Interdisciplinary										
RADs vs CRSs	0.677	0.514-0.815	0.915	0.855-0.956	0.831	0.724-0.909	0.651	0.482-0.798	0.434	0.241-0.639
RADs vs UGNs	0.639	0.467-0.790	0.897	0.826-0.946	0.851	0.755-0.921	0.565	0.380-0.739	0.327	0.139-0.549
UGNs vs CRSs	0.694	0.536-0.826	0.874	0.790-0.934	0.783	0.656-0.882	0.671	0.506-0.811	0.204	0.032-0.431

ARA anorectal angle, CI confidence interval, CRS colorectal surgeon, ICC intraclass correlation coefficient, LH levator hiatus, RAD radiologist, UGN urogynecologist

References

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Is this a clinical trial?	No
What were the subjects in the study?	HUMAN
Was this study approved by an ethics committee?	Yes
Specify Name of Ethics Committee	The Institutional Ethical Committee of the University of Lublin approved this protocol (KE-0245/29/2008). All subjects gave written informed consent to participate.
Was the Declaration of Helsinki followed?	Yes
Was informed consent obtained from the patients?	Yes