#20401 What is the most accurate way to assess the true bladder wall thickness?

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Aim

- To assess the most accurate method of Bladder wall thickness (BWT) measurement.
- To assess the impact of different frequency probes on BWT measurements.

Methods

- 18 bladder dome specimens were harvested from cadavers with ethical approval.
- Scanned with 3 ultrasound probes
  - AB27D (TA 2D, 7MHz)
  - RAB25D (TA 2/3D, 5MHz)
  - RIC59D (TVS 2/3D, 9MHz)
- GE Voluson E8 scanner.
- Minimum and Maximum width measurements were taken for all specimens using a micrometer calliper.
- 18 samples were scanned on 2 separate occasions by 2 operators.
- All specimens were scanned with 2 methods as shown in Figure 1.

Results

- Spearman's rho correlation coefficient was used to assess the agreement on the readings between the different probes (Table 1) .
- 9MHz gave closest readings to micrometre calliper.

	TVS 9MHz Detrusor muscle only	TVS 9MHz Full thickness	TA 7MHz Detrusor muscle only	TA 7MHz Full thickness	TA 5Mz Detrusor muscle only	TA 5MHz Full thickness	Calliper min	Calliper max
TVS 9MHz Detrusor muscle only	1	**ρ=0.911 P<0.000***	**ρ=0.593 P=0.009***	**ρ=0.579 P=0.012***	ρ=0.579 P=0.012	ρ=0.454 P=0.058	ρ=0.543 P=0.020	**ρ=0.641 P=0.004***
TVS 9MHz Full thickness		1	ρ=0.485 P=0.041	ρ=0.441 P=0.067	ρ=0.441 P<0.067	ρ=0.486 P=0.041	ρ=0.362 P=0.139	ρ=0.399 P=0.101
TA 7MHz Detrusor muscle only			1	**ρ=0.773 P<0.000***	**ρ=0.681 P=0.002***	ρ=0.227 P=0.364	**ρ=0.899 P<0.000***	**ρ=0.864 P<0.000***
TA 7MHz Full thickness				1	ρ=0.555 P=0.017	ρ=0.223 P=0.373	**ρ=0.679 P=0.002***	**ρ=0.706 P=0.001***
TA 5Mz Detrusor muscle only					1	ρ=0.140 P=0.581	**ρ=0.725 P=0.001***	**ρ=0.719 P=0.001***
TA 5Mz Full thickness						1	ρ=0.200 P=0.426	ρ=0.178 P=0.479
Calliper min							1	**ρ=0.874 P<0.000**
Calliper max								1

Table 1: BWT measurements with 5MHz, 7MHz and 9MHz ultrasound, using 2 measurement techniques. One measurement was full thickness from the outside of the bright echo, and the inside of the bright echo, as shown in Figure 1.

Interpretation

- The 9MHz TVS probe casts the least acoustic shadows.
- Higher frequency probes delineate more tissue detail giving a sharper image for measurements to be taken.
- The 5MHz and 7MHz probes were curved arrays. The 9MHz probe was an endo array. The inherent technological differences in transmitting the ultrasound waves may have also influenced the measurements.
- Non-invasive method of predicting detrusor over-activity.
- Accurate BWT assessment may reduce the need for invasive and costly urodynamic investigations.[1]
- In men BWT is measured abdominally, where peritoneal acoustic shadows can be very prominent.
- The peritoneal surface of the bladder was found to cast an acoustic shadow leading over-estimation of BWT.

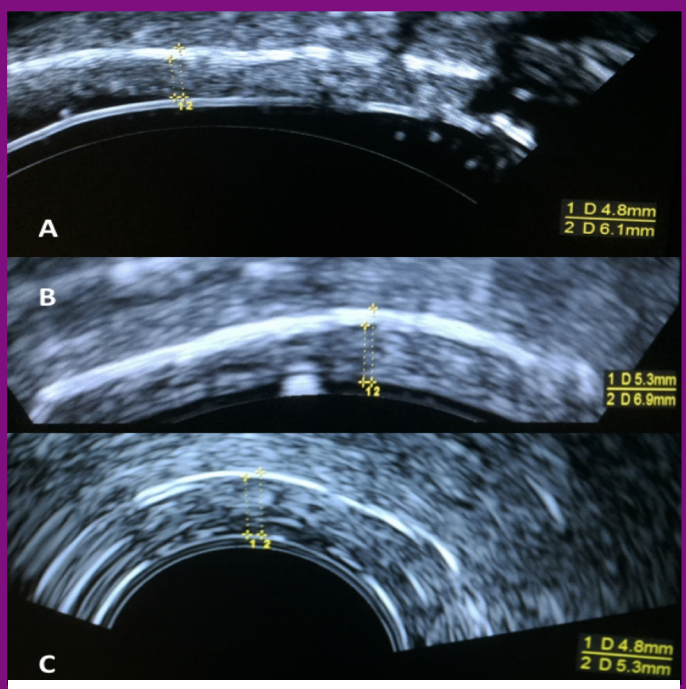

Figure 1: BWT ultrasound images measured on a single specimen using 2 techniques: full thickness (including peritoneal bright echo), and detrusor muscle only (without the brightness). A. 7MHz (AB27D); B. 5MHz (RAB25D); C. 9MHz (RIC50D).

Conclusion

Measurement of the detrusor muscle only (without the bright echo) was more accurately correlated with micrometer caliper measurements. The 5MHz scanning showed less reliable results.

Reference

Latthe P et al, Ultrasound bladder wall thickness and detrusor overactivity: a multicentre test accuracy study. BJOG 2017:124:1422-1429