354

Lim B[1]
1. Echcua Regional Health

VOIDING SONOGRAPHY – A RELIABLE WAY TO OBSERVE PELVIC FLOOR ACTIVITY IN WOMEN.

Hypothesis / aims of study

The length of the symphysis pubis can be seen in both CT and ultrasound in the mid-sagittal plane. CT measurements are reproducible and reliable. However, voiding cannot be assessed with CT.

It is hypothesised that the measurement of the long axis of the fibrocartilagenous symphysis pubis (SP) can be used as a fixed plane to assess the bladder neck opening and pelvic floor activity during voiding under ultrasound guidance.

The levator ani forms the floor of the pelvis and arises from the dorsal surface of the pubis along a line extending from the lower part of the pubic symphysis to the coccyx, which is known as the SCIPP line. The angle between the SCIPP line and the long axis of the SP can be easily measured in CT.

To support the hypothesis, the study will benchmark the reliability of the ultrasound technique (not a comparison of CT and ultrasound technique) by stating fixed references of 1) ultrasound as compared to CT measurements of a) the long axis of the SP, and b) the angle between the SP and the SCIPP line in CT (only), and in voiding sonography 2) establish the angle between the long axis of the SP and the bladder neck a) at rest and b) during voiding in women.

Study design, materials and methods

A random sample of 31 (females who have clinical indication to undergo a CT scan and are not related to this study) CT measurements of the long axis of the SP and the angle between the SP and SCIPP line was obtained with a high speed NXI Twin GE CT machine. Reformatted sagittal images through the SP sacrum and midline in 3mm thickness were obtained.

13 nulliparous and 7 multiparous asymptomatic and symptomatic women were recruited from the community. The women were invited to voiding in a sitting position under ultrasound. Local state (Victoria) ethical approval was received. All volunteers were instructed to come with a comfortably full bladder. 3-measurement volume of the bladder was obtained in transabdominal ultrasound and the voided volume was measured.

A qualified sonographer performed this study using the GE logic 9 ultrasound machine with a covered C4 curved transducer. The transducer was placed transperineally and voiding was recorded. DVD recording was the media of choice. The full length of the SP was seen and measured at rest and during voiding. The bladder neck diameter was measured. The angle between the SP and the bladder neck was measured at rest and during voiding.

Results

Using the SCP XL Demo Package for Statistical Analysis, the following results were obtained for the length of the long axis of the SP.

Table 1

	Sample size	Mean SP (mm)	95% CI (mm)
CT	31	40.48	39.082 – 41.877
Ultrasound	18	37.2	36.148 – 38.406

The results for the angle between the SP and the SCIPP line in CT are shown in Table 2. The ultrasound angle (Start & during voiding) between the SP and the Bladder neck are also presented in table 2.

Table 2

	Sample size	Mean angles	95%CI (angle)
CT (angle between SP & SCIPP line)	31	114.32	111.308 – 117.331
US start angle between SP and Bladder Neck	18	126.76	119.681 – 133.847
US angle during voiding	18	130.47	122.712 – 138.232

Interpretation of results

The preliminary result for the mean of the long axis of the SP obtained from the sample of ultrasound is 91.9% of the mean obtained from the CT.
This result shows that ultrasound can possibly visualise the long axis of the SP as accurately as the CT.
Further work on a larger sample size could establish using the long axis of the SP as a reliable reference for voiding sonography.

The preliminary result for the mean of the starting voiding angle of the ultrasound is 10.8% greater than the mean angle obtained from the CT.
Again further work on a larger sample size could confirm the usefulness of this voiding sonography technique to assess pelvic floor activity.

Concluding message

This is a simple non-invasive dynamic ultrasound imaging technique to visualise pelvic floor activity during voiding, however larger sample size will give a better indication of its worth.

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HUMAN SUBJECTS: **This study was approved by the Echcua Regional Health and followed the Declaration of Helsinki Informed consent was obtained from the patients.**