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BLADDER SHAPE TEST 'BLaST': A STUDY TO EVALUATE BLADDER SHAPE AND ASSOCIATED INVOLUNTARY DETRUSOR CONTRACTIONS USING TRANS-ABDOMINAL ULTRASOUND

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Background

Detrusor overactivity is diagnosed by uroflowmetry, cystometry and pressure flow studies (urodynamics). This can be undignified, invasive and expensive. Over half of patients with OAB symptoms do not demonstrate detrusor overactivity (bladder contraction) during conventional urodynamics[1].

We hypothesised trans-abdominal ultrasound could be used to identify bladder shape change associated with involuntary detrusor contractions during physiological bladder filling, which may offer a non-invasive modality for diagnosing detrusor overactivity{2}.

Methods

Bladder Shape Test (BLaST) Study captured ultrasound (USS) images of bladder contraction during two modes of bladder filling:

1. Natural Filling: 49 women with overactive bladder symptoms underwent serial trans-abdominal USS during physiological bladder filling to evaluate bladder shape changes indicative of involuntary detrusor contractions. Patients additionally underwent conventional urodynamics for comparison along with completing bladder diaries, ePAQ-PF and patient acceptability questionnaires.
2. Mechanical Filling: 43 women who attended for urodynamic studies had serial trans-abdominal USS during mechanical bladder filling. Images were captured during acontractile phases and throughout any pressure rises indicative of detrusor contraction.

Results

Detrusor contractions were identified by shape changes in nine women during physiological filling, eleven women had detrusor overactivity during mechanical bladder filling, with shape changes captured on USS.

Images were captured showing acontractile, typically square-shaped bladders, which followed the contours of the pelvis and typically had width > height. During a detrusor contraction it was noted that there was shape change to more spheroidal or in some cases ovoid bladders with height > width.

Conclusion

Bladder shape changes are detectable and measurable using trans-abdominal ultrasound. Further testing is required to characterise the features of shape changes associated with detrusor contractions. Serial 3D ultrasound may provide greater understanding of these parameters and is subject to further investigation.

References

- 1) Radley SC, Rosario DJ, Chapple CR, Farkas AG. Conventional and ambulatory urodynamic findings in women with symptoms suggestive of bladder overactivity. J Urol. 2001 Dec;166(6):2253-8. PMID: 11696746

2) 2) Gray T, Phillips L, Li W, Buchanan C, Campbell P, Farkas A, Abdi S, Radley S. Evaluation of bladder shape using transabdominal ultrasound: feasibility of a novel approach for the detection of involuntary detrusor contractions. *Ultrasound*. 2019;27(3):167-75.