357

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COMPARISON OF THE URETHRA AND LEVATOR ANI FUNCTION ANATOMY IN WOMEN WITH AND WITHOUT STRESS URINARY INCONTINENCE

Hypothesis / aims of study

The abnormality of vesicourethral function anatomy may associate with the failure of levator ani function. The aim of the present study was to identify the function anatomy and biometry of urethra and levator hiatus in women with and without stress urinary incontinence using three-dimension transperineal ultrasound.

Study design, materials and methods

Thirty five patients with SUI and thirty two healthy female volunteers were introduced about Valsalval manuever and levator ani contraction, and then underwent thansperineal ultrasound. Imaging was performed with the patient supine and after bladder emptying. GE Kretz Voluson 730 expert was utilised to acquire volume imaging data at rest, on maximal Valsalva and on maximal pelvic floor contraction. Measurement of urethra function anatomy was taken in the mid-sagittal plane. The junction of proximal urethra and distal urethra was defined as urethral knee. The angle formed between proximal urethra and distal urethra was defined as urethral angle. Pubovisceral muscle thickness and levator hiatus diameters were determined in the axial plane.

Results

No significant differences were found among BMI, age, parity between the two groups. Vesical neck of SUI group located dorsocaudally comparing with the control group, all P<0.005. The total length of urethra did not differ significantly. The length of proximal urethra tended to be short significantly on maximal Valsalva in SUI group comparing with the control group (P=0.000), although there was no significant difference at rest and on contraction between the groups. The urethral knee located much caudally at rest and on contraction in SUI group comparing with the control group (both P<0.05), but located much cranially on Valsalva (P=0.001). The urethral angle in SUI group tended to be smaller at rest and on Valsalva (both P<0.01), but the significant difference disappeared on maximal contraction. Transverse diameter (LR) of levator hatius did not differ significantly between the two groups. No significant differences were found in anteroposterior (AP) diameters at rest and on contraction between the two groups, but it was longer on maximal contraction (P=0.008) in SUI group. There was no significant difference in average pubovisceral muscle thickness at rest between the two groups, but pubovisceral muscle tended to be thinner on Valsava and on contraction in SUI group (both P<0.005).

Table 1:The parameters of urethra anatomy and levator hiatus.

	Rest		Valsalva		Contraction	
	Control group	SUI group	Control group	SUI group	Control group	SUI group
X coordinate（cm）	0.61±0.59	1.38±0.56*	1.38±0.57	2.14±0.77*	0.23±0.53	0.90±0.55*
y（cm）	-2.73±0.36	-2.01±0.47*	-2.13±0.51	-1.04±0.52*	-2.82±0.42	-2.08±0.53*
H（cm）	4.25±0.38	4.05±0.56	4.21±0.54	3.87±0.60	4.49±0.65	4.12±0.65
h（cm）	2.17±0.32	2.02±0.40	2.02±0.27	1.28±0.32*	2.51±0.48	2.19±0.59*
F（cm）	-0.50±0.64	-0.05±0.44*	-0.28±0.47	-0.36±0.54*	-0.33±0.55	0.04±0.46*
AP（cm）	5.63±0.51	6.00±0.71	5.60±0.63	5.95±0.65	4.79±0.43	5.26±0.60*
LR（cm）	5.24±0.71	4.73±0.73	5.41±0.70	5.20±0.92	4.97±0.73	5.27±0.52
C（cm）	1.37±0.23	1.26±0.22	1.30±0.21	1.03±0. 11*	1.54±0.24	1.26±0.20*
α（°）	157.41±18.07	137.48±22.26*	144.66±14.92	129.09±12.73*	154.91±20.90	142.78±22.56

Note: * show P<0.05. x: values of horizontal coordinate. y: values of vertical coordinate. H: The total length of urethra. h: The length of proximal urethra. F: values of vertical coordinate of urethral knee. AP: anterior-posterior diameter of levator hiatus; LR: transverse diameter of levator hiatus. C: thickness of pubovisceral muscle. α: degree of urethral angle.

Interpretation of results

Vesical neck located much dorsocaudally and urethral knee located much caudally in SUI patients comparing with control group, which provides support for the theory that stress urinary incontinence relates to defects in paraurethal fascia and ligaments. Proximal urethra tended to be shorter on maximal Vasaval in incontinence group, which may be caused by coexistence of fascia defect and muscle dysfunction. The urethral angle tended to be smaller in incontinence patients, but the significant difference disappeared on pelvic floor muscle contraction, that would be the urethra obtained additional support from contraction of pelvic floor muscle, mainly from levator ani. According to the measurements of levator hiatus diameters and levator thickness, it may be more sensitive to detect the condition of levator ani function on Valsalva or on contraction, and incontinence group tend to have poorer levator function.

Concluding message

Urethra and levator ani function anatomy can be well obtained by three- dimension ultrasound. Stress urinary incontinence associate with poor levator ani function.

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Is this a clinical trial?	**Yes**
Is this study registered in a public clinical trials registry?	**No**
What were the subjects in the study?	**HUMAN**
Was this study approved by an ethics committee?	**Yes**

Specify Name of Ethics Committee	**The Ethics Committee of Fujian Medical University**
Was the Declaration of Helsinki followed?	**Yes**
Was informed consent obtained from the patients?	**Yes**