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CORRELATION BETWEEN BLADDER WALL THICKNESS AND URODYNAMIC FINDINGS IN PATIENTS WITH SPINAL CORD INJURY.

Aims of study

To investigate the correlation between ultrasonographic bladder wall thickness (BWT) and urodynamic parameters and evaluate the role of such measurements for the understanding of bladder abnormalities and also for the follow-up of patients with spinal cord injury.

Study design, materials and methods

Two hundred and fifty patients with spinal cord injury and neurogenic bladder were enrolled in the study. Only patients over 18 years of age and more than a year of spinal cord injury were included. All patients underwent renal and bladder ultrasonography to measure BWT and urodynamic evaluation. Ultrasound evaluations were performed using an HDI 5000 (ATL/Philips, Amsterdam, The Netherlands) with a linear multifrequency 2-5 MHz transducer and a precision of 0.1 mm. Ultrasound examinations were performed and reviewed by two radiologists who were blinded to urodynamics findings. Only the anterior bladder wall was measured. BWT was compared to urodynamic data (Medtronic Duet systems, version 8.20, Minneapolis). Urodynamic risk of upper urinary tract deterioration was defined as maximum detrusor pressure greater than 40 cmH2O during filling or at leakage and sphincter dyssynergia during voiding.

Results

One hundred and fifty nine (63.6%) were paraplegic and 91 (36.4%) were tetraplegic. The mean age was 37.5 years (SD of 13 years), with a range from 18 to 84 years old. The average length of time since spinal cord injury was 6.3 years with a range from 1 to 30 years. Approximately 77.0% (192 cases) of the patients emptied their bladder trough clean intermittent catheterization and 69.6% (174 cases) presented urinary incontinence. Patient characteristics are specified in table 1. The mean bladder volume by ultrasonography was 336 cm^3. The average BWT was 3.91 mm and there was no correlation between BWT and the time of spinal cord injury. The BWT was statistically higher in patients with neurogenic detrusor overactivity associated to sphincter dyssynergia (DSD) compared to those without sphincter dyssynergia (4.18 vs 3.60 mm respectively, *p<0.001*) (table 2). About 16.8% (42 cases) of the patients had hydronephrosis, and surprisingly, there was no statistically significant difference in BWT among patients with hydronephrosis and patients without (4.07 vs 3.89 mm).

Interpretation of results

This study showed that spinal cord injury is much more common in males and younger people as has already been described in the literature. We found that patients with spinal cord injury who are followed closely and treated according to international standards do acquire detrusor thickening as measured on ultrasonography when DSD is present. It is probably the result of a long-lasting obstruction of the bladder outlet that results in smooth muscle hypertrophy and changes in the connective tissue matrix along with an increase in pericellular accumulation of collagen type III within the detrusor[1]. An increase in BWT has been described in females with detrusor overactivity and in children with myelodysplasias as a risk factor for upper urinary tract deterioration[2,3]. In the current study, detrusor thickening was also statistically higher in male, patients with recurrent UTI and patients that emptied their bladder trough intermittent catheterization. On the other hand, the degree of compliance, incontinence, anticholinergic agents and length of time since spinal cord injury did not showed statistically significant difference in BWT. To our knowledge it is the first study to evaluate BWT in patients with spinal cord injury.

Concluding message

Spinal cord injury patients with neurogenic detrusor overactivity associated to sphincter dyssynergia have thicker bladder walls than those who do not present sphincter dyssynergia. Bladder thickening was also found in male, patients under clean intermittent catheterization and those that present recurrent UTI. Ultrasonographic assessment of BWT may be an optional screening tool for the management of neurogenic bladder in patients with spinal cord injury. Further studies are needed to determine the ratio of BWT and upper urinary tract damage.

Table 1 – Patient characteristics

	N	%
Male	201	80.4
Female	49	19.6
Paraplegia	159	63.6
Tetraplegia	91	36.4
Spontaneous voiding	58	23.2
Clean intermittent catheterization	192	76.8
Urinary incontinence	174	69.6
Anticholinergic agents	130	52.0
Recurrent urinary tract infection (UTI)	43	17.2
Total	250	100

Table 2 – BWT and patient evaluation

	N	Mean	SD	P^*
Male	201	4.00	1.34	*=0.003*
Female	49	3.53	0.89	
Clean intermittent catheterization	192	4.03	1.25	*=0.006*
Spontaneous voiding	58	3.51	1.28	
Incontinence	174	4.00	1.34	*=0.090*
No incontinence	76	3.70	1.11	
Recurrent UTI	43	4.26	1.54	*=0.033*
No UTI	207	3.81	1.16	
Detrusor overactivity / DSD	134	4.18	1.30	*<0.001*
No DSD	116	3.60	1.17	
Total	250	3.91	1.28	

* Paired, two-sided Student's t-test

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Was the Declaration of Helsinki followed?	**Yes**
Was informed consent obtained from the patients?	**Yes**