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Virseda M[1], Castro-Díaz D M[2], Salinas J[3], Barroso Á[4], Gutiérrez P[5], Méndez S[6], Esteban M[7], Gómez A[4]
1. *Paraplejic´s Hospital Toledo Spain,* ***2.*** *University Hospital of the Canary Islands (Spain),* ***3.*** *Hospital Clínico de San Carlos Madrid (Spain),* ***4.*** *Hospital Virgen de la Salud Toledo (Spain),* ***5.*** *Hospital Nuestra Señora del Prado Talavera (Spain),* ***6.*** *Hospital Sanitas La Moraleja Madrid (Spain),* ***7.*** *Paraplejic's Hospital Toledo Spain*

INFLUENCE OF URINARY LITHIASIS ON LOWER URINARY TRACT DYNAMICS IN PATIENTS WITH SPINAL CORD INJURY

Hypothesis / aims of study

Spinal cord injury (SCI) is a chronic disease which causes neurogenic lower urinary tract dysfunction in many patients. Among urological complication of these patients we find bladder stone disease. Urodynamic studies are the gold standard for the evaluation of lower urinary tract dysfunction. It has been demonstrated that some urological complications, such as lower urinary tract infection, may have significant effect on the bladder function, but as far as we are concerned, it remains unknown whether the bladder lithiasis affects the reliability of the urodynamic results in spinal cord injured patients

Our hypothesis is that bladder lithiasis makes an influence over the bladder function. Therefore our objective is to assess urodynamic data with stone in the bladder and to compare these data with those obtained from a second urodynamic study without stone. As secondary objective, our aim will be to determine whether or not, the patients with SCI who develop bladder lithiasis, have urodynamic features different from those who do not develop this complication.

Study design, materials and methods

We have carried out an urodynamic study in 30 SCI patients with calculus in their bladder and we repeated the study, three month later, after an endoscopic lithotripsy. This second study was compared with the urodynamic findings of a different group of 30 SCI patients, without history of bladder lithiasis, paired with cases by gender and date of urodynamic study.The necessary sample size was calculated considering a mean difference in maximum detrusor voiding pressure of 1.5 cm H2O and standard deviation in patients with spinal cord injuries of 10 cm H2O[1]. We decided an alpha error of 5% and a statistical power of 80%. The sample size required was 30 patients.

The urodynamic examination was performed with a Solar polygraph MMS (Enshede, The Netherlands), following International Continence Society specifications[2], except where specifically noted. Urethral resistance was measured by URA parameter and detrusor contractility by Wmax and W8020 parameters. These parameters were obtained from the computer software incorporated in the urodynamic equipment and manually checked by the urologic to dismiss artefacts.Transurethral endoscopic litotripsy was carried out in all patients by a Calcutrip 27080 hidraulic litotriptor Karl Storz (Tuttlingen, Germany). The patients were discharged after assessing the absence of lithiasis by simple radiology and ultrasonography

Results

There was no significant difference regarding the age between cases and controls. However, the cases showed a significant greater time from SCI than controls (p= 0.015).Table 1 compares the urodynamic data found in patients with lithiasis in their bladder and after stone-free. Involuntary detrusor contractions during the filling phase (detrusor overactivity), was found more frequently with bladder stone than without lithiasis, while cystometric capacity was significantly lower with bladder stone.Table 2 compares urodynamic data between cases and controls. There were statistical significant differences in the following items: maximum flow rate (lower in lithiasis group), maximum voiding detrusor pressure (lower in lithiasis group), maximum abdominal voiding pressure (greater in lithiasis group), and the contraction detrusor parameter Wmax (lower in lithiasis group).

Interpretation of results

This study confirms our hypothesis that urodymanic study is affected by the presence of bladder stones, but only in the filling phase. Therefore, neurogenic detrusor overactivity was more frequent in patients with calculus in the bladder than without it, as a result of this, their cystometric bladder capacity was lower. The differences between the results of cystometry with and without stone, suggest that we should wait until bladder is stone-free to assess actual bladder function

Regarding our secondary objective, the main finding observed in our study is that detrusor contraction was lower in patients who developed bladder lithiasis than in control group. Other authors as Millan-Rodriguez et al[3] also refer that detrusor underactivity is the main lower urinary tract dysfunction in non neurogenic patients with bladder lithiasis. Time from SCI was significantly greater in patients who developed bladder lithiasis compared to controls. This fact could explain the lower bladder contractility among these patients

Table 1.- Urodynamic data with calculus in bladder and after stone-free.

	With calculus	Stone-free	Significance
Cystometric capacity (ml)*	274 (164.5)	375 (191.0)	0.010†
Bladder pressure at cystometric capacity (cm H2O)*	6 (7..2)	4 (5.8)	0.289
Involuntary detrusor contraction during the filling phase (IC)	Yes: 24/ 30 No: 6/ 30	Yes: 21/ 30 No: 9/30	0.005†
Cystometric capacity at first (ml)*	215 (126.8)	243 (131.5)	0.509
Maximum detrusor pressure during IC (cm H2O)*	57 (28.0)	51 (20.7)	0.416
Urodynamic stress urinary incontinence	Yes: 3/30 No 27/30	Yes: 1/30 No: 29/30	0.900
Maximum flow rate (ml/s)	3 (3,0)	2 (3,2)	0.420

Voided volume (ml)*	36 (49.4)	42 (88.4)	0.258
Postvoiding residual volume (ml)*	250 (162.1)	285 (207.6)	0.690
Maximum voiding detrusor pressure (cm H2O)*	44 (34.7)	35 (49.4)	0.126
Maximum abdominal voiding pressure (cm H2O)*	24 (36.8)	28 (38.1)	0.530
URA (cm H2O)*	29 (8.7)	32 (13.8)	0.514
Wmax (W/M2)*	6 (3.0)	5 (1.7)	0.563
W8020 (W/M2)*	-3 (2.9)	-3 (1.7)	0.729

* Mean (Between parenthesis standard deviation) †. Significantly

Table 2.- Urodynamic data in patients who develop bladder calculus (Cases) and in those who do not (Controls).

	Cases	Controls	Significance
Cystometric capacity (ml)*	375 (191.0)	330 (182.8)	0.356
Bladder pressure at cystometric capacity (cm H2O)*	4 (5.8)	3 (3.0)	0.544
Involuntary detrusor contraction during the filling phase (IC)	Yes: 21/ 30 No: 9/30	Yes: 26/30 No: 4/30	0.209
Cystometric capacity at first (ml)*	243 (131.5)	204 (130.7)	0.401
Maximum detrusor pressure during IC (cm H2O)*	51 (20.7)	65 (26.6)	0.055
Urodynamic stress urinary incontinence	Yes: 1/30 No: 29/30	Yes: 2/ 30 No 28/ 30	1.000
Maximum flow rate (ml/s)	2 (3.2)	7 (8.7)	0.013†
Voided volume (ml)*	42 (88.4)	73 (101.1)	0.212
Postvoiding residual volume (ml)*	285 (207.6)	264 (218.0)	0.517
Maximum voiding detrusor pressure (cm H2O)*	35 (49.4)	64 (33.8)	0.010†
Maximum abdominal voiding pressure (cm H2O)*	28 (38.1)	12.7 (17.6)	0.026†
URA (cm H2O)*	32 (13.8)	28 (12.9)	0.822
Wmax (W/M2)*	5 (1.7)	10 (6.9)	0.023†
W8020 (W/M2)*	-3 (1.7)	-1.4 (4.2)	0.265

* Mean (Between parenthesis standard deviation) †. Significantly

Concluding message

Bladder lithiasis in SCI patients is associated with specific lower urinary tract findings. We have found that, at filling phase, the bladder lithiasis triggers neurogenic detrusor overactivity, while, at voiding phase, patients who developed bladder lithiasis had a significantly lower detrusor contraction power than those without this complication.

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