ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 08 | August - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ROLE OF VIDEO-URODYNAMICS IN FEMALE PATIENTS WITH BLADDER OUTLET OBSTRUCTION – OUR EXPERIENCE AT TERTIARY CARE HOSPITAL

Urology

Dr. Yasir Iqbal Lone	Senior Resident, Department of Urology, Government Medical College Srinagar, India.
Dr. Attar Mohammad Ismail	Consultant, Department of Urology, Kokilaben Dherubhai Ambani Hospital, Andheri West Mumbai 400053.
Dr. Sanjay Pandey	Consultant, Department of Urology, Kokilaben Dherubhai Ambani Hospital, Andheri West Mumbai 400053.
Ojas Vijayanand Potdar	Senior Resident, Grant Medical college and JJ Group of Hospitals Byculla West Mumbai 400003.
Dr. Amir Iqbal Lone	Consultant, Department of obstetrics and Gynaecology, Directorate of Health Kashmir.
Dr. Annam Qayoom*	Postgraduate Scholar, Department of Anesthesiology & Critical Care, Govt. Medical College, Srinagar, India. *Corresponding Author
Dr. Ashish Asari	Fellow Uro-Oncology, Department Uro-Oncology, Kokilaben Dherubhai Ambani Hospital, Andheri West Mumbai 400053.

ABSTRACT

Background: Bladder outlet obstruction in females remains a poorly understood condition and is much rarer as compared to males. Aim: To evaluate the role of urodynamics in the diagnosis of female patients with bladder outlet obstruction. **Methods:** Female patients above 18 years with bladder outlet obstruction were included in this study. All the patients underwent detailed clinical history, physical examination, urine analysis, uroflowmetry, ultrasonography as routine. All the patients were subjected to multichannel pressure flow studies. After identification of cause of bladder outlet obstruction as anatomical or functional, appropriate treatment was given to patients ranging from medical treatment to surgical procedure including urethral dilatation, cystoscopy, bladder neck incision, optic internal urethrotomy, urethroplasty, intra-sphincteric botulinum toxin injection, caruncle excision, and anterior colporrhaphy. Patients were followed at 2 weeks, 1month and 3 months and response to treatment was monitored by symptom score questionnaire (CLSS symptom score and QOL), PVR (in ml) and Qmax in ml/sec. **Results:** Highest percentage of participants were in the age of 51-60 years and least percentage of participants were <30 years of age. Most common medical issue was diabetes mellitus in 18.5% participants followed by 11.1% suffering from hypertension, 3.7% having IHD and 5.6% suffering from hypothyroidism. . Out of 54 women, 19 were pre-menopausal and 35 were menopausal. About 33.3% had 2 parity and 29.6% had 3 parity. Out of 54 women, 31 (57.4%) had anatomical BOO and 23 (42.6%) had functional BOO. The main cause for anatomical obstruction was urethral stricture as seen in 13 patients and the main cause for functional obstruction was dysfunctional voiding as seen in 20 patients. There was no significant difference in uroflowmetry reports of anatomical BOO and functional BOO ($p>0.05$). Pdet and BOO index was significantly higher in patients with anatomical BOO as compared to patients with functional BOO ($p<0.05$). There was no significant difference in maximum cystometric capacity, Qmax and PVR of anatomical BOO and functional BOO ($p>0.05$). There was no significant difference in percentage of participants receiving alpha blockers or other medicinal treatment when classified according to causes of BOO ($p>0.05$). **Conclusion:** Functional obstruction as a cause of BOO in female patients is not rare as was thought previously. It forms etiology of about 50% of cases in our study and for the diagnosis of BOO in females Urodynamics provide a vital role.

KEYWORDS

Bladder outlet obstruction, Urodynamics, Uroflowmetry, Functional obstruction, Video- urodynamics.

INTRODUCTION:

Bladder outlet obstruction (BOO) is defined by the International Continence Society as a "generic term for obstruction during voiding with reduced urine flow rate and/or presence of a raised post-void residual and an increased detrusor pressure." [1,2]

The symptomatology of BOO in females is complex and the classic voiding symptoms like straining, weak stream of urine, urinary hesitancy as seen in men are not seen in females leading to late reporting by female patients and difficulty in early diagnosis.[3] Bladder outlet obstruction in females remains a poorly understood condition and is much rarer as compared to males. More difficult is the objective diagnosis of this condition. When accepted criteria for men are applied to women, the diagnosis of obstruction may often be missed, which is most likely due to differences in voiding dynamics like lower detrusor pressure required to void that may be due to the fact that many women void by pelvic relaxation or by abdominal straining (by habit) without need to generate significant detrusor pressure to micturate. [4] So, voiding dynamics in female patients being complex due to multiple factors related to complex anatomy of pelvic floor and physiology of voiding in females, proper evaluation of the cause of obstruction is required.

Although the incidence of BOO is not high, but it can cause bothersome urinary tract symptoms and has negative effects on the overall well-being of female patients. Hence, BOO in female patients must be properly diagnosed and treated. [5,6]

METHODS:

In this prospective observational hospital-based study a profile of Female patients above 18 years with bladder outlet obstruction were included. All the patients underwent detailed clinical history, physical examination, urine analysis, uroflowmetry, ultrasonography as routine.

Inclusion Criteria

1. Age group: 18 and above
2. Patients who voluntarily agreed to sign informed consent form.
3. Female patients with bladder outlet obstruction
4. Female patients who underwent urodynamic study for LUTS and show signs of bladder outlet obstruction
5. Urodynamic criteria for BOO: Qmax less than 12ml/sec with Pdet Qmax greater than 20 cm of H2O

Exclusion Criteria: -

1. Female patients with urogenital malignancy.
2. Female patients with proved neurological illness.
3. Patients with symptomatic UTI.

4. Female patients with interstitial cystitis, bladder calculus.
5. Patients with history of spine surgery or known spine pathology.

Urodynamic procedures were done in patients with flow rate <12ml/sec and/or significant PVR, in accordance with the guidelines of the ICS.

A multichannel urodynamic study (UD-2000, Medical Measures Systems B. V., Enschede, the Netherlands, including a pressure-flow study (PFS) with a and a C-arm fluoroscope (Fig.a), was conducted following the discontinuation of the potential medications that could possibly affect detrusor function for at least 3 days.

Fig. a Urodynamics using MMS

A 6-Fr and 9-Fr balloon catheters were used in all of the urodynamic studies in the measurement of the intravesical and abdominal pressures. Intravesical pressure was determined under conditions of room-temperature saline containing 20% urograffin used for infusion at 20–50 mL/min depending on the bladder condition. The C-arm fluoroscope was positioned at 45 degrees from the buttocks so that the urethra could be lengthened and so that the bladder neck, urethral sphincter, and distal urethra could be clearly identifiedEMG was done using surface electrodes (Fig.b).

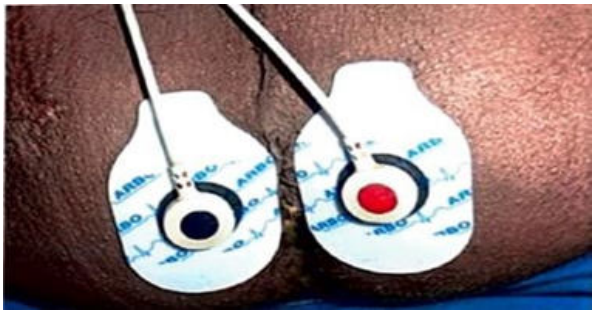

Fig. b Placement of Perineal Surface Electrodes for EMG

Bladder storage function using UDS was assessed according with ICS recommendations. Voiding phase was carried out in sitting position. For our purpose the following measurements were extracted from each study trace: detrusor pressure at maximum flow (PdetQmax), Qmax and PVR. BOOI quantification was obtained according to the formula: BOOI = PderQmax -2.2 Qmax. Maximum flow <12 ml/sec and PdetQmax> 20 cm of H_2O are suggestive of BOO using Blaivas and Groutz nomogram.[10]

Conflict of interest: Nil
Funding: Nil

RESULTS:

Mean age of study participants was 52.9±16.5 years. Highest percentage of participants were in the age of 51-60 years and least percentage of participants were <30 years of age. Most common medical issue was diabetes mellitus in 18.5% participants followed by 11.1% suffering from hypertension, 3.7% having IHD and 5.6% suffering from hypothyroidism [Table 1].

Table 1: Age and medical history of study participants

Age	Frequency	%
< 30 years	6	11.1
31 – 40 years	8	14.8
41 – 50 years	8	14.8
51 – 60 years	15	27.8
61 – 70 years	8	14.8
>71 years	9	16.7
	Medical history	
Diabetes mellitus	10	18.5
Hypertension	6	11.1
IHD	2	3.7
Hypothyroidism	3	5.6

Out of 54 women, 19 were pre-menopausal and 35 were menopausal. About 33.3% had 2 parity and 29.6% had 3 parity, 22.2% had 1 parity, 5.6% had 4 parity and 3.7% had no parity [Table 2].

Table 2: Menstrual Status and history of parity of study participants

Variables	Frequency	%
Pre-menopausal	19	35.2
Post-menopausal	35	64.8
	Parity status	
Unmarried	3	5.6
0 parity	2	3.7
1 parity	12	22.2
2 parity	18	33.3
3 parity	16	29.6
4 parity	3	5.6

Out of 54 women, 31 (57.4%) had anatomical BOO and 23 (42.6%) had functional BOO. The main cause for anatomical obstruction was urethral stricture as seen in 13 patients and the main cause for functional obstruction was dysfunctional voiding as seen in 20 patients [Table 3].

Table 3: Causes of BOO

Causes of BOO	Frequency (n=54)	%
Anatomical	31	57.4
Urethral Stricture	13	41.9
Cystocele	5	16.1
Meatal Stenosis	4	12.9
Atropic Urethritis	3	9.7
Bladder Neck Stenosis	3	9.7
Urethral Caruncle	2	6.5
Cystocele with Senile Urethritis	1	3.2
Functional	23	42.6
Dysfunctional Voiding	20	87.0
Primary Bladder Neck Obstruction	3	13.0

The most common clinical symptoms were day time frequency (94.4%), nocturia (77.8%), urgency (77.8%), slow stream (72.2%), straining (74.1%), incomplete emptying (79.6%), intermittency (64.8%) and hesitancy (53.7%). Significantly higher percentage of patients with anatomical BOO had slow stream as compared to patients with functional BOO ($p<0.05$). No other significant differences were observed in clinical symptoms between anatomical BOO and functional BOO ($p>0.05$) [Table 4].

Table 4: Clinical symptoms

Clinical symptoms	Anatomical (n=31)		Functional (n=23)		Total (n=54)		P value
	Freq	%	Freq	%	Freq	%	
Day time frequency	29	93.5	22	95.7	51	94.4	0.999
Nocturia	23	74.2	19	82.6	42	77.8	0.525
Urgency	24	77.4	18	78.3	42	77.8	0.999
Urgency incontinence	2	6.5	6	26.1	8	14.8	0.060
Stress incontinence	1	3.2	1	4.3	2	3.7	--
Nocturnal enuresis	2	6.5	3	13	5	9.3	0.640
Increased sensation	5	16.1	4	17.4	9	16.7	0.999
Reduced sensation	1	3.2	3	13	4	7.4	---
Slow Stream	26	83.9	13	56.5	39	72.2	0.035
Intermittency	20	64.5	15	65.2	35	64.8	0.999

Hesitancy	17	54.8	12	52.2	29	53.7	0.999
Straining	25	80.6	15	65.2	40	74.1	0.226
Terminal dribble	1	3.2	4	17.4	5	9.3	---
Incomplete emptying	23	74.2	20	87	43	79.6	0.319
Bladder pain	7	22.6	5	21.7	12	22.2	0.999
Urethral pain	5	16.1	1	4.3	6	11.1	---
Valval pain	1	3.2	0	0	1	1.9	---
Pelvic pain	1	3.2	1	4.3	2	3.7	---
Haematuria	1	3.2	0	0	1	1.9	---

There was no significant difference in uroflowmetry reports of anatomical BOO and functional BOO (p>0.05) [Fig 1].

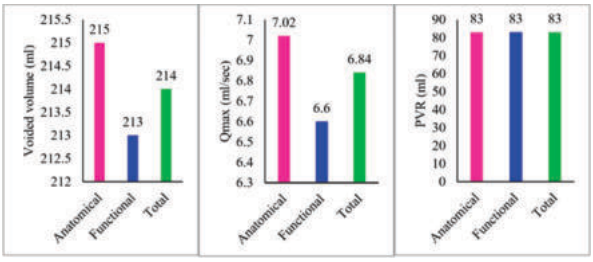

Fig 1

Pdet and BOO index was significantly higher in patients with anatomical BOO as compared to patients with functional BOO (p<0.05). There was no significant difference in maximum cystometric capacity, Qmax and PVR of anatomical BOO and functional BOO (p>0.05) [Fig2].

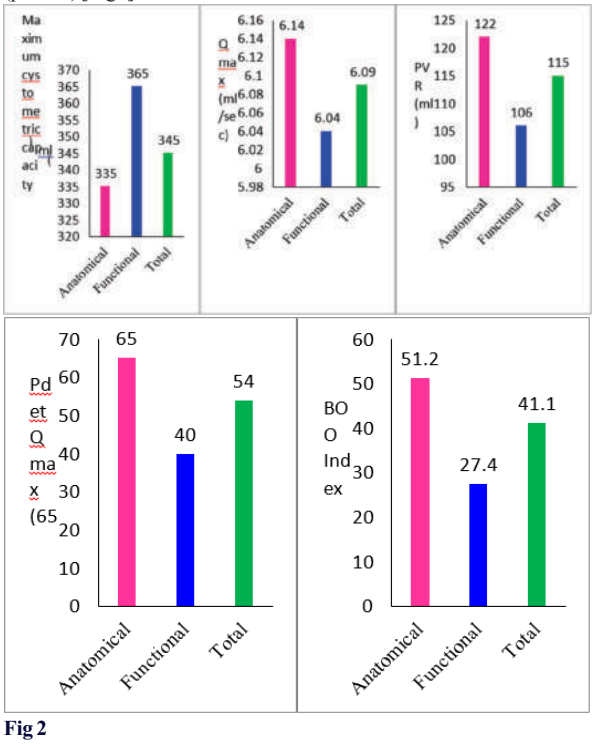

Fig 2

Significantly higher percentage of patients with functional BOO underwent pelvic floor muscle training as compared to patients with anatomical BOO (p<0.05). Significantly higher percentage of participants with anatomical BOO underwent surgery as compared to patients with functional BOO (p<0.05). There was no significant difference in percentage of participants receiving alpha blockers or other medicinal treatment when classified according to causes of BOO (p>0.05) [Table 5].

Table 5: Treatment received by patients

Treatment received	Anatomical (n=31)		Functional (n=23)		Total (n=54)		P value
	Freq	%	Freq	%	Freq	%	
Pelvic floor muscle training	4	12.9	23	100	27	50	0.001
Alpha blockers	28	90.3	23	100	51	94.4	0.253
Other medicinal treatment	7	22.6	6	26.1	13	24.1	1.000
Surgery	26	83.9	1	4.3	27	50	0.001

DISCUSSION:

Bladder outlet obstruction (BOO) in female patients has a prevalence rate ranging from 2.7% to 23%.[7] The wide range is explained by the fact that the actual prevalence remains underestimated due to multiple reasons like less reporting by female patients with lower urinary tract symptoms (LUTS), empirically treating these patients by urethral dilatation, not evaluating the underlying cause, and because of lack of definitive diagnostic criteria for diagnosis. For the proper treatment of bladder outlet obstruction (BOO) in female patients, evaluation of the cause of obstruction includes thorough clinical evaluation with understanding of symptoms of obstruction, physical examination, frequency volume charting, urine analysis, ultrasonography, uroflowmetry, cystoscopy and/or pressure flow study.[2]

The cause of obstruction can be anatomical or functional [4] and the treatment is guided as per the underlying cause and treatment options can range from medical to appropriate surgical interventions. In our study after the evaluation of cause of BOO (whether anatomical or functional cause) treatment was given (medical or surgical or both) and response to treatment was monitored with CLSS and QOL score, PVR (ml) and Qmax (ml/s) before the treatment and then at 2 weeks, 1month and 3 months.

In our study 54 patients were included. The mean age of study participants was 52.9± 16.5 years (mean ±SD) with the highest percentage of participants in the age group of 51-60 years with the minimum age of 19 and maximum age of 83. Majority of the patients (64.8%) were postmenopausal with 33.3% having parity of 2. In a study done by Malde et al (2019),[8] the mean age of the study group was 51±15. Groutz et al, [9] studied 587 women and found that 38 (6.5%) of the study population had bladder outlet obstruction (BOO). The median age of patients was 63.9±17.5 years. 29 (76%) patients were reported as postmenopausal. Blaivas et al,[10] reported mean parity of 1.8±1.3 in the obstructed group.

In our study out of 54 patients, 31 (57.4%) patients had anatomical cause of bladder outlet obstruction (BOO) and rest 23 (42.6%) had functional etiology of bladder outlet obstruction. In 2013 in a study conducted by Brucker et al,[11] 157 female patients were studied of which 86 (54.5%) of patients had anatomical cause of bladder outlet obstruction and 71 (45.2%) had functional cause of bladder outlet obstruction.

On uroflowmetry the mean maximum flow rate, voided volume and residual urinary volume were 6.84±3 ml/sec, 214±81 ml and 83±84 ml respectively. There was no significant difference between anatomical obstruction group and functional obstruction group (P>0.05). Groutz et al,[9] in their study found the mean flow rate, voided volume and PVR of 4.4±3.9 ml/sec, 144±72.7ml and 98.8 ml respectively. Blaivas et al, [10] reported Qmax mean of 8.9±2.3 ml/sec, voided volume of 153±93 and post-void residual (PVR) of 150±161 ml.

The mean **maximum cystometric capacity** (MCC) in urodynamics was 345±73, mean Qmax of 6.09±3.14 and post-void residual (PVR) of 115±65. No significant difference was seen in these parameters in anatomical obstruction and functional obstruction groups. Maximum flow of <12 ml/sec and PdetQmax >20 cm of H_2O was suggestive of bladder outlet obstruction using Blaivas and Groutz nomogram.[10] In Blaivas [10] study, the maximum cystometric capacity (MCC) of 208±143.7ml, Qmax of 5.6±4.2 ml/sec and post-void residual (PVR) of 153.3±136.3ml was reported.

Pdet and BOO index were higher in patients with anatomical obstruction as compared to patients with functional obstruction (P<0.05). Mean PdetQmax in anatomical obstruction group was 65±27 and 40±18 in functional obstruction group. The comparison between urodynamic parameters of anatomical obstruction group and functional obstruction group was done by Brucker et al.[11] The reported PdetQmax of 41.42±29.6 in anatomical obstruction group and 38.9±18.5 in functional obstruction groups (p =0.001).

In our study the mean bladder outlet obstruction index (BOOI) was 41.1±28.2. BOOI was calculated using **Solomon Greenwell (S-G) formula**. The bladder outlet obstruction index (BOOI) in the

anatomical obstruction group (51.2±30.1) was higher than bladder outlet obstruction index (BOOI) in the functional obstruction group (27.4±18.6) ($p<0.05$) due to the higher PdetQmax in the anatomical obstruction group.

As per the study by Solomon et al (2018) [12] a nomogram representing the probability of bladder outlet obstruction (BOO) for female patients was derived using a calculation:
BOOI = PdetQmax - 2.2 Qmax.
- <0 = <10% probability of BOO,
- >5 = 50% probability of BOO,
- >18 = >90% probability of BOO.

In our study all the patients had BOOI >18. Gravina et al, [13] compared the urodynamic parameters of voiding function between obstructed and unobstructed group and reported BOOI of +9 (IRQ of -3 TO +21) in the obstructed group and BOOI of -20.5 (IRQ of -32 to -13.2) in the unobstructed group. Prasenjit M et al, [14] in 2016 conducted a study on 100 patients including 20 patients as control, with group A (obstructive LUTS) with 27 participants and group B (irritative LUTS) with 53 participants to find out the best pressure flow criteria to define bladder outlet obstruction in Indian females. They found a bladder outlet obstruction index (BOOI) cut off of 4.7 provided 100% sensitivity and 88% specificity in defining bladder outlet obstruction (BOO) in female patients. They suggested Qmax < 13,1 ml/sec, PdetQmax > 28.5 cm of H_2O, BOOI ≥4.7 and PVR ≥68.5 ml as the cut off limits to define Bladder outlet obstruction (BOO) in females.

In our study, the functional group (n=23), 20 (37%) patients had dysfunctional voiding (DV) and 3 (5.5%) patients had primary bladder neck obstruction (PBNO). Brucker et al, [11] reported dysfunctional voiding (DV) in 21.7%, 10.2% as primary bladder neck obstruction (PBNO) and 14% as sphincter obstruction. In literature the incidence of dysfunctional voiding (DV) ranges from 10.5-36.3%,[15] primary bladder neck obstruction (PBNO) in 5-8.7%.[3]

Fifty percent of the patients underwent surgical treatment and rest were managed by medical therapy and/or physiotherapy.

In the non-surgical group (alpha blockers &/or PFMT &/or other medicines) i.e 27 patients, after a follow of 3 months there was significant decrease of 9.4±4.3 and 2.7±1.6 in CLSS and QOL score respectively. PVR decreased from baseline of 76±40 ml to 25.8±16ml with average decrease of 48.4±42.3; Qmax improved from 6.9±2.9 ml/sec to 15.2±3 ml/sec with an average improvement in the Qmax of 8.3±3.8. There was no significant difference in these parameters between anatomical obstruction and functional obstruction groups.

CONCLUSION

Functional obstruction as a cause of BOO in female patients is not rare as was thought previously. It forms etiology og about 50% of cases in our study and for the diagnosis of BOO in females Urodynamics provide a vital role.

REFERENCES:

1. Dr. R. M. Kulkarni, Dr. Sainath Mishall, Dr. Shambhav Chandra et al. Clinical profile of bladder outlet obstruction (BOO) in female. Int. J. Adv. Res. 5(3), 398-404.
2. ShirishYande, Maya Joshi et al; Bladder outlet obstruction in Women; Journal of Midlife Health, Year 2011, Volume 2, Issue 1: pages 11-17.
3. Kuo HC. Videourodynamic characteristics and lower urinary tract symptoms of female bladder outlet obstruction. Urology. 2005;66(5):1005–1009.
4. Patel R, Nitti V, et al. Bladder outlet obstruction in women: prevalence, recognition and management. CurrUrol Rep 2001Oct;2(5):379-87.
5. Bennet Jones, M. J et al; treatment of Cystitis in Females; Lancet, I (1962), 299-302.
6. Roger R Dmochowskiw et al; Bladder Outlet Obstruction Etiology and Evaluation; Review in Urology 2005; 7 (Suppl 6): pages S3–S13.
7. Kristen Meiera, Priya Padmanabhanb et al: Female bladder outlet obstruction: an update on diagnosis and management. CurrOpinUrol 2016, 26:334–341.
8. Malde S, Solomon E, Spilotros M, et al. Female bladder outflow obstruction: common symptoms masking an uncommon cause. Low Urin Tract Symptoms. 2019;11(1):72-77.
9. Groutz A, Blaivas JG, Chaikin DC. Bladder outlet obstruction in women: defnition and characteristics. Neurourol Urodyn. 2000;19(3):213–20.
10. Blaivas JG, Groutz A. Bladder outlet obstruction nomogram for women with lower urinary tract symptomatology. Neurourol Urodyn. 2000;19(5):553–564.
11. Brucker BM, Shah S, Mitchell S, Fong E, Nitti MD, Kelly CE, et al. Comparison of urodynamic findings in women with anatomical versus functional bladder outlet obstruction. Female Pelvic Med Reconstr Surg. 2013;19(1):46–50.
12. Solomon E, Yasmin H, Duffy M, Rashid T, Akinluyi E, Greenwell TJ. Developing and validating a new nomogram for diagnosing bladder outlet obstruction in women. Neurourol Urodyn. 2018;37(1):368–78.
13. Gravina GL, et al. Bladder outlet obstruction index and maximal flow rate during urodynamic study as powerful predictors for the detection of urodynamic obstruction in women. Neurourol Urodyn. 2007; 26:247–253.
14. Prasenjit Majee, Ranjit Kumar Das, Arpan Chowdhury et al.In search of best pressure flow criteria to define bladder outlet obstruction in Indian females.J. Evolution Med. Dent. Aug. 14,2017 /Vol. 6/ Issue 65/ Sci./eISSN- 2278-4802.
15. Ashley B. King, Howard B. Goldman et al. Bladder Outlet Obstruction in Women: Functional Causes Curr Urol Rep (2014) 15:436 DOI 10.1007/s11934-014-0436-z.