

CLINICAL –NOT INVASIVE URODYNAMICS- INDICATORS FOR DETRUSOR UNDERACTIVITY.

Hypothesis / aims of study

A recent review concluded that '...the term detrusor underactivity (DU) and its associated symptoms and signs remain surrounded by ambiguity and confusion'. Although the ICS definition of DU '...a –voluntary voiding- contraction of reduced strength and/or duration resulting in prolonged emptying and/or failure to achieve complete bladder emptying within a normal time span.' is understandable and appears face valid, it lacks quantifying statements. Though DU is –undisputed- a urodynamic diagnosis, it is attractive to search for not invasive indicators for DU and a recent expert statement suggests that an underactive bladder symptom complex exists.¹ We have explored a dataset of urodynamic measurements to evaluate clinical not invasive urodynamic indicators for DU.

Study design, materials and methods

A dataset of patients referred for bothersome symptomatic not neurogenic lower urinary tract dysfunction was analysed. Patients were selected if they have been able to perform a representative voiding during pressure flow analysis with a voided volume between 100 and 800mL. This range was selected because this is the 'most usual' volume range. Pressure flow was categorized on the linear PURR nomogram, identical to ICS-BOOI (>40) and ICS-BCI (<100) categories. Contraction was graded very weak and weak (=DU) versus normal. Furthermore BOO was graded from 0 to 6 where grade 0 and 1 are no BOO; grade 2 is 'intermediate' and over 3 represents BOO.^{2,3} Age, IPSS, 'free' uroflowmetry before urodynamic investigation and subsequent post void residual (PVR) measurement with ultrasound were compared with the pressure flow classes. All pressure flow micturitions were done in privacy in preferred position after room temperature saline filled external transducer water pressure ICS-standard cystometry, until a strong but not uncomfortable need to void.

Results

2218 patients were included; 1482 men aged 64,7 (s.d.14,3 range 17-103) and 736 women aged 57,9 (s.d.17,4 range 18-99). The table, shows age, free flow parameters and PVR in relation with the detrusor contraction categories and the BOO grades. ANOVA indicates that age, maximum and average flow rate as well as flow time are associated with detrusor strength categories. The association with PVR is weaker as is also the association with voided volume. The ANOVA of parameters in combination with the obstruction classes indicates an association of age and maximum and average flow rate with BOO, as well as an association with voided volume but to a lesser degree with PVR and voiding time parameters. The second table shows the various IPSS questions that can be scored between 0 and 5, or 6 for the quality of life question. Average scores for the separate questions of all patients are given (total mean IPSS score was 17,9). Subjective 'slow stream' showed a fairly strong association with underactive detrusor, and in comparison with obstruction grade also frequent voiding as well as difficulties to postpone voiding associate somewhat better with DU.

Interpretation of results:

Of all patients in this cohort, 42,5% had DU and 17,5% had BOO. 33,1% had combined: DU and BOO; 34,6 had DU without BOO furthermore 22,4% had no BOO and normal contraction and 9,8% had detrusor underactivity without BOO.

If both sexes and all ages are grouped it becomes evident that some free flow parameters might become of relevance as indicator for (urodynamically demonstrable) DU, especially increased time to maximum flow and prolonged time of voiding may have diagnostic power. PVR may be a lesser discriminating indicator. Slow stream, although not very specific and difficulty in postponing to void, when scored relatively high on IPSS, may also direct to DU or to the –newly proposed- 'underactive bladder syndrome'.¹

Concluding message:

Analysis of not invasive parameters of patients with symptoms and signs of not neurogenic lower urinary tract dysfunction shows that specific (free) flow-time parameters, as well as specific questioning on voiding initiation or duration may become indicators for DU.

Table Age and free uroflowmetry parameters versus pressure flow results:

p/Q linPURR detrusor grade		Age	Flow Q _{max}	Flow Q _{ave}	Flow vol. Voided	Flow Time	Flow time Voided	Flow time to Q _{max}	Flow time accel	Flow delay	Flow PVR
Very weak	N	35	15	15	15	15	16	15	15	15	7
	Mean	63,4	9,38	4,38	160,5	35,69	66,49	26,99	,71	38,01	62,9
	Sd	16,6	5,51	2,53	126,1	21,43	48,92	30,01	,60	27,43	100,8
Weak	N	813	577	570	577	572	570	570	523	523	196
	Mean	65,5	12,04	6,23	210,7	39,28	56,16	16,15	2,07	38,00	72,8
	Sd	13,9	7,905	13,24	170,4	32,29	47,15	23,61	5,82	42,29	115,3
Norm	N	1053	801	795	802	795	794	795	724	725	287
	Mean	62,7	15,29	7,59	220,5	30,74	42,25	11,24	3,06	32,43	54,3
	Sd	15,4	8,52	4,73	161,1	20,11	29,51	12,10	7,60	35,79	102,3
Strong	N	317	268	268	268	268	268	268	257	257	69
	Mean	53,6	20,98	10,41	212,6	23,52	34,28	9,29	4,53	32,28	35,4
	Sd	17,5	14,04	7,61	176,4	19,97	31,18	15,89	7,59	49,10	65,9
ANOVA		.000	.000	.000	.408	.000	.000	.000	.000	.084	.054
Total	N	2218	1661	1648	1662	1650	1648	1648	1519	1520	559
	Mean	62,5	15,03	7,55	215,3	32,57	46,00	12,76	2,95	34,37	58,6
	Sd	15,7	9,89	9,10	166,6	25,59	37,89	17,91	7,05	40,57	103,9
Obstruction grade											
0	N	1278	814	806	815	808	806	806	757	757	245
	Mean	61,1	17,30	8,86	226,4	30,34	45,87	13,59	3,03	30,85	49,4
	Sd	16,3	10,97	12,24	175,3	26,86	43,18	21,43	5,31	33,21	95,1
1	N	417	310	308	310	308	308	308	280	280	119
	Mean	59,6	15,84	7,81	233,7	32,66	44,11	11,48	2,47	35,18	57,5
	Sd	16,0	8,70	4,52	169,9	23,20	33,07	11,86	2,22	41,24	103,9
2	N	309	236	234	236	234	234	234	213	213	80
	Mean	64,8	12,17	5,99	218,9	36,68	48,00	13,14	2,80	35,73	51,1
	Sd	14,8	6,19	3,28	170,4	24,04	31,30	16,69	8,85	40,95	86,6
3	N	192	151	151	151	151	151	151	138	139	56
	Mean	67,9	10,87	5,35	177,4	36,13	47,75	10,60	2,66	46,66	78,7
	Sd	13,0	6,58	2,98	119,2	26,04	33,07	11,58	6,26	71,86	132,6
4	N	162	119	118	119	118	118	118	103	103	47
	Mean	68,0	10,21	4,82	158,1	35,37	46,71	13,25	3,13	35,00	86,9
	Sd	11,6	10,05	3,57	125,2	24,89	30,53	14,35	12,54	22,30	127,9
5	N	27	16	16	16	16	16	16	16	16	7
	Mean	65,9	7,52	3,52	105,1	32,99	47,68	8,03	7,63	42,89	81,4
	Sd	14,3	4,04	1,86	71,8	24,35	33,30	5,97	26,16	27,52	114,9
6	N	8	9	9	9	9	9	9	6	6	3
	Mean	59,6	8,45	4,65	158,4	35,78	37,68	15,77	1,19	38,64	139,0
	Sd	13,7	4,08	2,56	127,2	17,11	18,87	18,75	,96	22,85	133,8
ANOVA		.000	.000	.000	.000	.009	.885	.238	.006	.001	.109
Total	N	2218	1655	1642	1656	1644	1642	1642	1513	1514	557
	Mean	62,4	15,05	7,57	215,8	32,62	46,05	12,79	2,91	34,23	58,4
	Sd	15,7	9,90	9,11	166,7	25,62	37,93	17,93	6,87	40,43	104,0

Table Mann Whitney Tests of IPSS symptoms versus pressure flow results:

IPSS Question	Q 1 Sensat. Residual	Q 2 Frequent	Q 3 Restarting	Q 4 Post-poning	Q 5 Slow stream	Q 6 Straining to start	Q 7 Nocturia	Q 8 Daytime frequency	Qual of life
Mean	2,5	3,1	2,2	2,5	3,3	1,6	2,8	3,8	3,7
Contraction	.844	.845	.551	.056	.120	.992	.376	.647	.449
Obstruction	.091	.825	.777	.240	.295	.803	.852	.615	.086

References

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