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VALUE OF AMBULATORY URODYNAMICS IN DIAGNOSIS OF DETRUSOR OVERACTIVITY IN SPINAL CORD INJURY PATIENTS.

Hypothesis / aims of study

An adequate urodynamic assessment of bladder behaviour is needed in spinal cord injury (SCI) patients. Ambulatory urodynamics (AU) are better in detecting detrusor overactivity (DO) than conventional urodynamics (CU). Although the outcome of urodynamics has been reported in non-neurogenic patients, it's value in neurogenic patients remains to be determined. The primary objective of this study was to determine whether conventional urodynamics is representative enough to diagnose detrusor overactivity in spinal cord injury patients compared to ambulatory urodynamics.

Study design, materials and methods

SCI patients were included if they were suspected of DO (due to lesion level and symptoms) and CU was indicated in their regular health care. Patients underwent both CU and AU on the same day. An undesired detrusor contraction (UDC) was defined as a detrusor pressure rise of at least 10 cmH_2O, which was not related to voluntary micturition.
CU was carried out at a filling rate of 20 ml/min with saline at room temperature. Bladder filling was stopped at maximum cystometric capacity or a bladder capacity of 500 ml or a sustained UDC. AU (Luna, MMS, Enschede, the Netherlands) was started directly after CU. Patients were instructed to do daily activities and to use event buttons to mark events: micturition, catheterisation, physical activities, bladder sensations and urinary incontinence.
Recorded data of CU and AU were analysed manually for UDC diagnosis and detrusor pressures. The urodynamic results were evaluated separately for the presence of DO according to the definition of the International Continence Society (clinically denoted DO). McNemar test and Wilcoxon Signed Ranks test were used for analysis (two-tailed, $p<0.05$).

Results

21 male and 6 female SCI patients were included for urodynamics, of which 26 could be analysed. SCI was caused by trauma (16), surgery (2), hernia nucleus pulposus (2), myelum ischemia (2), intramedullar tumor (2), aorta dissecans (1) and myelitis transversa eci (1), which resulted in 13 complete (AISA A) and 13 incomplete (ASIA B-D) lesions ranging from C3 to L4.
Results of CU and AU analysis are shown in the Table. UDC were diagnosed more often during a mean of 5 hours AU (CU 69%, AU 92%, p=0.031). This difference was not significant (p=0.375) if the clinical diagnosis of DO was applied (CU 73%, AU 85%). Therapy was changed compared to the treatment before CU and AU in 15 patients when both CU and AU results were taken into account.
If ambulatory urodynamics was regarded as a gold standard for DO diagnosis, sensitivity and specificity for conventional urodynamics were 82% and 75%, respectively. Sensitivity and specificity for UDC diagnosis by conventional urodynamics were 75% and 100%, respectively.
Mean maximum detrusor pressures did not differ significantly between CU (50 cmH_2O) and AU (53 cmH_2O). Detrusor pressures over 40 cmH_2O during UDC's were present in 1.6% of AU recording time.

Interpretation of results

CU was significantly less sensitive in diagnosing UDC compared to AU. The higher sensitivity of AU for UDC can to some extent be explained by false-positive UDC diagnosis due to artefacts of catheter movement during daily activities. The difference in sensitivity between CU and AU decreased, when clinically denoted DO was taken into account.
High detrusor pressures (>40 cmH_2O) are a risk for upper urinary tract deterioration. There was only a slight difference in mean maximum detrusor pressure between CU and AU. UDC lasted for about 7.9% of recording time, but detrusor pressure exceeded 40 cmH_2O for only about 1.6%.
This questions whether AU has additional value in all SCI patients who are suspected of DO. CU can be regarded as being representative for DO monitoring in most patients and AU may be used in selected cases if CU diagnosis differs from the suspected clinical diagnosis.
More information is needed about the influence of CU and AU on treatment choice and the result of this treatment choice on long-term patient health.

Concluding message

In spinal cord injury patients conventional urodynamics are not entirely representative for detrusor behaviour in daily life and ambulatory urodynamics may remain indicated if conventional urodynamics are not conclusive for treatment decision. The exact role of conventional and ambulatory urodynamics in treatment decision and risk management of spinal cord injury patients remains to be determined.

Patient	Urodynamics		Treatment compared to the treatment before
	Conventional	Ambulatory	

	UDC	DPR ≥40 cmH_2O	Mean max UDC amplitude (cmH_2O)	Clinically denoted DO	UDC	UDC frequency (number / hour)	Mean UDC duration (s)	UDC relative duration (% of recording time)	Pdet ≥40 cmH_2O (% of recording time)	Mean max UDC amplitude (cmH_2O)	Clinically denoted DO	
1	-	-	-	-	-	-	-	-	-	-	-	-
2	+	+	69	+	+	7.7	40	8.5	2.0	56	+	Anticholinergics
3	+	-	13	+	+	2.6	25	1.8	0.0	23	+	Anticholinergics stopped
4	+	+	67	+	+	0.6	59	1.1	0.0	37	+	Anticholinergics
5	-	-	-	-	+	4.4	19	2.3	0.0	19	+	-
6	+	+	51	+	+	46.2	29	37.5	6.4	66	+	-
7	+	+	69	+	+	10.7	17	5.2	0.7	24	+	-
8	-	-	-	+	+	0.9	77	1.9	0.0	22	-	CIC + anticholinergics
9	-	-	-	-	+	4.3	34	4.0	0.0	28	+	-
10	-	-	-	-	+	7.0	43	8.3	1.6	39	+	-
11	+	-	14	+	+	5.1	119	16.8	1.9	38	+	-
12	+	+	44	+	+	0.6	88	1.5	0.1	43	+	Botulinum toxin
13	+	+	42	+	+	3.6	65	6.5	0.8	39	+	-
14	+	+	66	+	+	12.2	144	48.6	18.9	57	+	Anticholinergics
15	+	+	60	+	+	13.1	56	20.4	2.8	35	+	Anticholinergics
16	+	-	24	+	+	8.0	178	39.4	2.1	38	+	Anticholinergics
17	+	+	62	+	+	3.5	246	24.1	12.9	86	+	Anticholinergics
18	-	-	-	-	+	4.5	123	15.5	3.3	70	+	Anticholinergics
19	-	-	-	-	+	2.6	45	3.3	0.0	25	-	Pelvic floor physiotherapy
20	+	+	99	+	+	0.7	143	2.8	1.5	77	+	Tapotage
21	+	-	19	+	+	5.4	111	16.7	0.9	41	+	-
22	+	+	57	+	+	2.3	315	19.8	2.5	42	+	Botulinum toxin
23	-	-	-	-	-	-	-	-	-	-	-	-
24	+	+	69	+	+	2.1	127	7.5	4.6	77	+	Anticholinergics
25	+	+	45	+	+	5.2	113	16.3	1.6	41	+	Botulinum toxin
26	+	+	75	+	+	1.5	159	6.8	3.4	73	+	CIC + Anticholinergics

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Is this a clinical trial?	**No**
What were the subjects in the study?	**HUMAN**
Was this study approved by an ethics committee?	**Yes**
Specify Name of Ethics Committee	**Commissie Mensgebonden onderzoek (Committee Human Research) Arnhem-Nijmegen**
Was the Declaration of Helsinki followed?	**Yes**
Was informed consent obtained from the patients?	**Yes**