

Neurogenic Underactive Bladder

Evaluation and therapeutic strategies

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Conflicts of interest

Consultant, speaker, meetings invitations:

Astellas
Allergan
Wellspect
Mylan
Pierre-Fabre
Coloplast

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Neurogenic Underactive Bladder

- Definition and pathophysiology
- Etiologies
- Evaluation
- Treatments

Definition of Underactive Bladder (UAB)

- Clinical concept : UAB ≠ UAD (likewise OAB ≠ OAD)
- Underactive bladder: a voiding disorder (difficulty with bladder emptying)
- Definition of UB => inability to produce an effective voiding contraction sufficient to empty the bladder
- Various symptoms : weak stream, straining, feeling of incomplete emptying, hesitancy to start the stream, intermittency. Sometimes : poor sensation of bladder filling, infrequent voiding, frequency.
- Patients may have a high post void residual (PVR)

Fig 1. The group demonstrating presence of urinary symptoms among identified underactive bladder patients. UAB, underactive bladder.

INJ Hong et al. • Clinical Findings of Underactive Bladder. Int Neurourol J 2015;19:185-189

Definition of Detrusor underactivity (DUA)

- In contrary, DUA is Urodynamics concept (UD diagnostic tool for DUA)
- Defined (ICS) as "a contraction of reduced strength and/or duration, resulting in prolonged bladder emptying and/or failure to achieve complete bladder emptying within a normal time span"
- There are no recognized diagnostic criteria. Definition of "normal" strength of contraction and contraction duration are not specified.
- DUA can be secondary to BOO / decrease contractility (clear definitions)

	Undercontractile	Normal	Overcontractile
pdet Qmax + 5 Qmax < 100	Yes	No	No
100 < pdet Qmax + 5 Qmax < 150	No	Yes	No
pdet Qmax + 5 Qmax > 150	No	No	Yes

BOOI = PdetQmax-2Qmax
BCI = PdetQmax+5Qmax

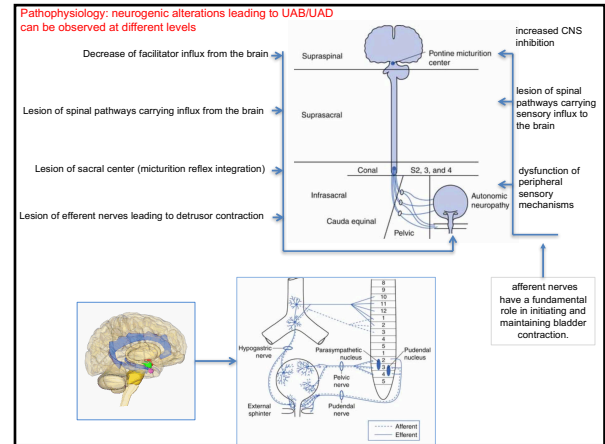
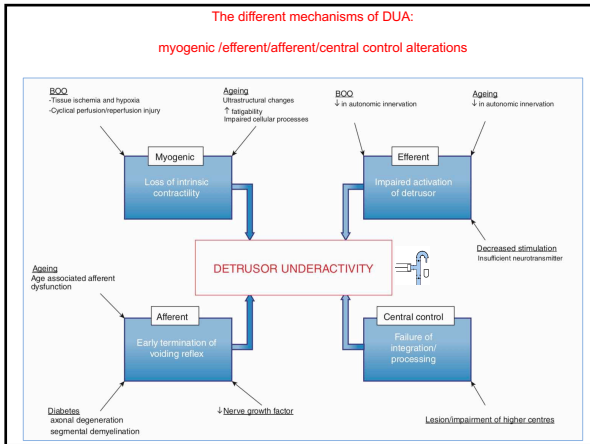
(Abrams P, Cardozo L, Fall M, Griffiths DJ, Rosen R, Ulstein U et al: The standardization of terminology of lower urinary tract function: report from the Standardisation Sub-Committee of the International Continence Society. Neurourol Urodyn 2002; 21: 167.)

Neurogenic Underactive Bladder: a voiding disorder observed in neurogenic conditions

Neurogenic underactive bladder

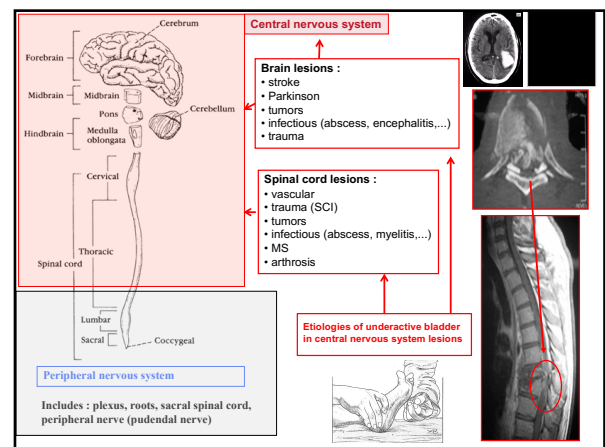
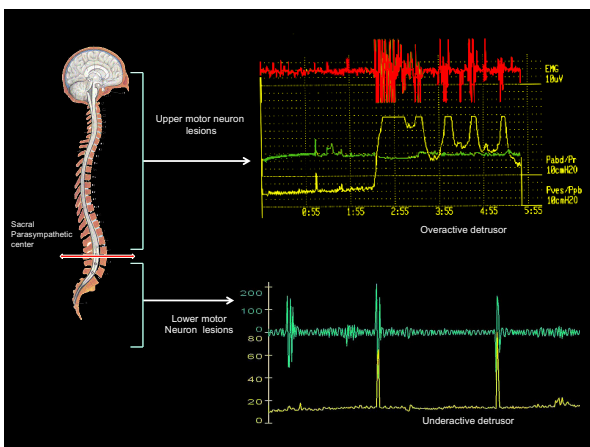
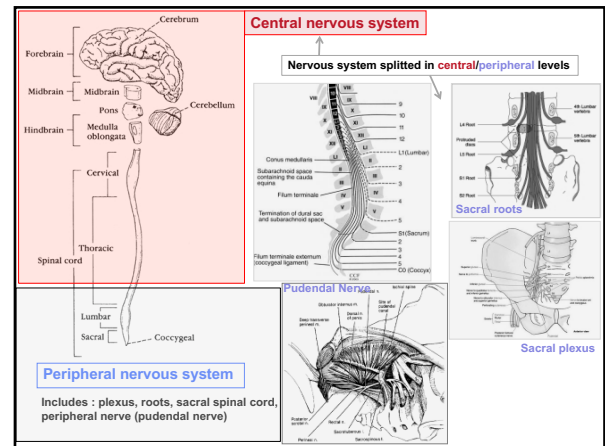
Apart from neurological causes, many other etiologies:

- chronic bladder outlet obstruction (BPH, prolapse, female surgery)
- metabolic diseases (diabetes)
- adverse effects of medications (anticholinergic drugs, antidepressant treatment, smooth muscle relaxants, spasmolytics)
- « lazy bladder »
- forced detrusor: overdistension following important retention > 1l
- age-related changes (affecting both detrusor muscle and central/peripheral innervation)
- myogenic changes: primary (« visceral myopathy ») or secondary to BOO (BPH ...) / fibrosis/collagen deposition
- idiopathic impaired detrusor contractile function



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Prevalence and Impact of Urinary Symptoms Among Community-Dwelling Stroke Survivors

K.R. Bitens, MA, S.I. Perry, PhD, SM, Post, PhD, C. Shaw, PhD, H. DeRosier, PhD, R.P. Asanua, MRCOG, K. Williams, BA, C. Jagger, PhD, J.F. Potvin, DM, FRCP, CM, Cardenas, MD, FRCP

Results—A 70% response rate was achieved with the return of 10 236 questionnaires. Prevalence of reported stroke was 4% (n=42). Prevalence of urinary symptoms was 34% (n=137). Overall, stroke survivors had a higher prevalence of symptoms than the normative population (64% to 21%, respectively). These symptoms were reported to have more of an effect on the lives of the stroke survivors compared with the normative population even when adjusted for age and sex differences. This reported impact was not related to the stroke per se but to the severity of the urinary symptoms.

OAB : urge / frequency / urge incontinence/ nycturia
voiding dysfunction 40% : slow stream / urinary retention

Review Article
VOIDING AND SEXUAL DYSFUNCTION AFTER CEREBROVASCULAR ACCIDENTS
 SERGE PETER MARINKOVIC,* and GOPAL BAULANI
 From the Department of Urology, Long Island Jewish Medical Center, New Hyde Park, New York

Stroke and LUTS : risk factors :

- importance of lesion
- bilateral lesion
- importance of motor deficit
- aphasia
- age > 75 / female / previous incontinence

Problem of associated lesion (BPH) observed in this population

Prevalence of parkinsonism and Parkinson's disease in Europe: the EUROPARKINSON collaborative study

M C de Rijk, C Teunissen, M M B Breteler, J F Deregibus, L Amaducci, S Lopez-Pouso, J M Manubens-Bertran, A Alperovich, W A Rocca, for the EUROPARKINSON Study Group*

Typical appearance of Parkinson's disease

Journal of Neurology, Neurosurgery, and Psychiatry 1997;62:10-15

Prevalence of parkinsonism and Parkinson's disease in Europe: the EUROPARKINSON collaborative study

Voiding symptoms (poor force of stream, hesitancy, incomplete emptying) are seen in 17% to 27%

Problem of associated lesion (BPH) observed in this population

Table 2: Changes in Etiology of SCI

Etiology of SCI	1973-1979	2000-Present
Motor vehicle crashes	48.7	50.4
Falls	16.5	23.8
Sports	14.4	9
Violence	13.3	11.2

NOTE: Values are percentages. Data from National Spinal Cord Injury Statistical Center.^{1,2}

Traumatic Spinal Cord Injury

Epidemiology:
80% of SCI patients have urinary disorders

Characteristics of urinary symptoms :
OAB : 80%
Voiding dysfunction-retention (complete or incomplete) : 80%

Impacts :
Quality of life ...
Urological complications : stones, infections, renal failure (more than 50% .. without specific management)

Other spinal lesions

Transverse myelitis
Chiari malformation
Syringomyelia
Spinal tumors
Cervical stenosis with myelopathy

... can lead to UAB/UAD

Conus equinus and conus tumors

Tethered cord

Tarlov

Dural ectasia

Table 1 Clinical presentation of VED in MS

Author, level of proof (LP)	Number of patients	Mean duration of MS (years)	Time since onset of VD (years)	Prevalence of urgency (%)	Prevalence of post-voiding dribbling (%)	Prevalence of incontinence/dysuria (%)	Prevalence of voiding dysfunction (%)	Prevalence of urinary retention (%)
Jankovic, 1993, LSP1	223	13.3	7.8	72	47	85	46	24
Andersen, 1976, LSP2	62	12.2	4.9	71	38.5	50	36	32.7
Awad, 1984, LSP2	47	16	U	85	65	72	36	17.5
Bemelmans, 1991, LSP2	40	5.4	U	86	60	80	28	20
Beck, 1993, LSP1	170	12	6	85	82	63	49	34
Bendix, 1976, LSP4	90	U	U	86	60	80	28	20
de Rudder, 1998, LSP2	30	U	U	36.6	36.6	80	41.6	8.3
Earley, 1991, LSP2	24	11	U	41.6	41.6	69.1	25	8.3
Callier, 1998, LSP1	149	13	6	69.1	67.7	69.1	25	8.3
Giannantonio, 1996, LSP1	116	14.5	7.1	32	32	49	79.5	52
Goldstein, 1983, LSP4	86	U	U	32	32	49	79.5	52
Gonos, 1985, LSP2	64	13	4.6	70	48	56	30	30
Hannaway, 1996, LSP1	221	U	U	71	76	19	48	73.8
Kasabian, 1995, LSP2	32	18	U	44	66	66	6	27
Koldewijn, 1995, LSP1	211	6.5	U	61	59	47	49	49
Philip, 1981, LSP2	52	10	5	61	59	47	49	49
Potvin, 1997, LSP1	120	0.1-9	U	61	59	47	49	49

VED, vesicourethral disorder; LSP, ANAES level of scientific proof [1]; U, Unknown; DSD, detrusor and sphincter disorders; VD, voiding dysfunction.

LUTS are observed in 32 to 97 % (Onset : 6 years (5 to 10 years))

LUTS can reveal the onset of MS in 10%

LUTS typology :
OAB = 37% to 99%
Urinary retention = 34% to 79%

Correlations LUTS and :
 • pyramidal signs - OAB
 • EDSS - OAB

Dysautonomia

Alterations of Autonomic Nervous System

Dysautonomia

Alterations of Autonomic Nervous System

Etiologies of underactive bladder in peripheral nervous system lesions

Sacral roots

Disk herniation

Cauda equina and conus lumbosacralis

sacral myelitis (herpes zoster, Lyme ...)

underactive bladder is more often secondary to a lesion of the peripheral nervous system (than central lesion)

Peripheral neuropathies

Sacral plexus

sacral plexus injury (traumatic, radiotherapy, tumors)

Sacrum fracture

Sacral tumors

TABLE 2. LUTS in diabetic women with/without MS

Variables	Non-MS group (n = 272)	MS group (n = 246)	P value*
Storage symptom score	3.8 ± 3.4	5.4 ± 3.7	<0.001 [†]
Frequency	1.1 ± 1.7	1.2 ± 1.7	0.58
Urgency	1.1 ± 1.7	2.1 ± 1.8	<0.001 [†]
Nocturia	1.6 ± 1.3	2.2 ± 1.3	0.002 [†]
Voiding symptom score	1.9 ± 2.4	1.9 ± 2.4	0.98
Incomplete emptying	0.8 ± 1.5	1.2 ± 1.7	0.05
Weak urinary stream	0.6 ± 1.5	1.0 ± 1.8	0.08
Intermittency	0.6 ± 1.5	1.2 ± 1.8	0.002 [†]
Hesitancy	0.5 ± 1.3	0.4 ± 1.1	0.31
Total symptom score	6.5 ± 6.5	9.2 ± 7.6	0.001 [†]
LUTS score (%)			
Less than 5	188 (69.4)	138 (56.1)	0.001 [†]
5 or more	62 (22.6)	80 (32.5)	
DI or greater	26 (17.5)	28 (11.4)	<0.001 [†]
Quality of life score	1.6 ± 2.1	2.3 ± 2.4	<0.001 [†]
RMS score	0.8 ± 1.2	1.6 ± 1.2	<0.001 [†]
QoL (n/%)	74 (27.2)	120 (52.0)	<0.001 [†]
Urinary incontinence, n (%)			
Stress incontinence	30 (11.0)	22 (8.9)	0.32
Urge incontinence	48 (18.0)	54 (21.9)	0.58
Uroflowmetry			
Voided volume (ml)	199.5 ± 85.2	190.3 ± 79.4	0.35
Peak flow rate (ml/s, ml/s ²)	13.5 ± 7.2	13.0 ± 7.3	0.54
PVR (ml)	74.3 ± 30.5	76.0 ± 27.3	0.92
PVR >100 (ml, n, %)	16 (7.7)	26 (10.5)	0.33

Tai HC et al., JGIM 2010; 25:1143-1150

metabolic syndrome

SYMPTOMS OF DIABETES

In DM, incidence of underactive diabetic bladder ranged 17% - 72%

Underactive Bladder

- Definition and concepts
- Etiologies
- Impact
- Evaluation
- Treatments

UAB : various impacts :

urological alterations, quality of life bothersome symptoms, renal impairment, chronic Valsalva voiding, hernia, vaginal prolapse, haemorrhoids

Underactive Bladder

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Neurologic examination : in order to track down neurogenic etiology

Loss of touch sensation

Sensory function is evaluated by testing the lumbar-sacral dermatomes

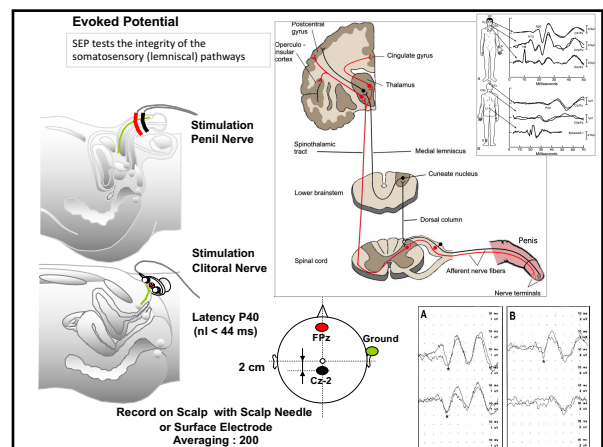
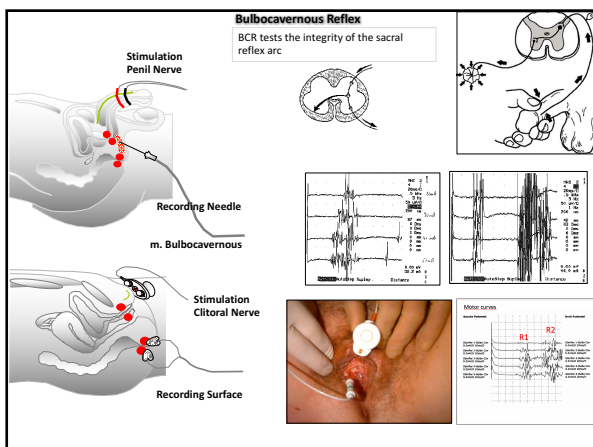
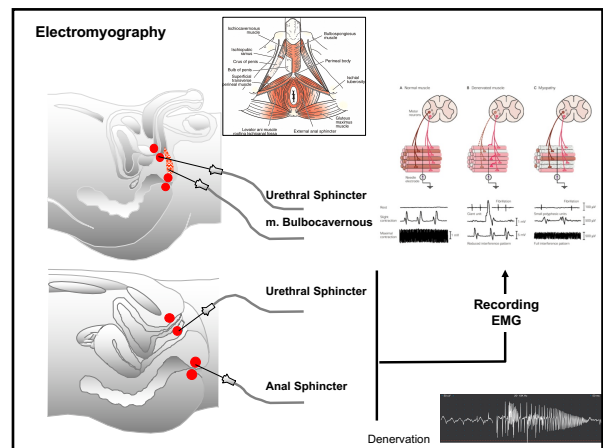
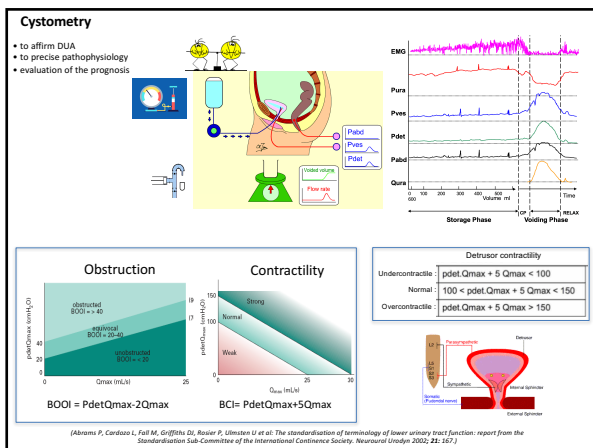
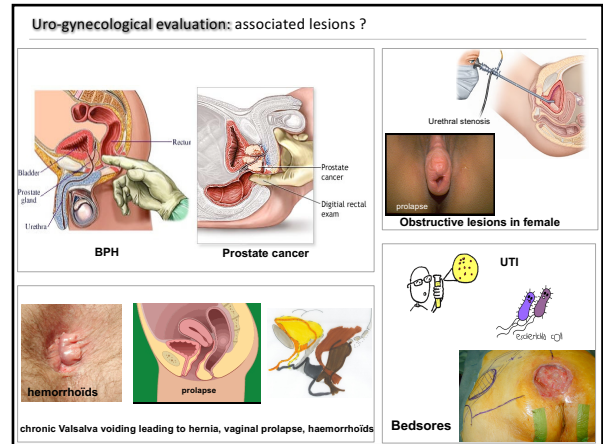
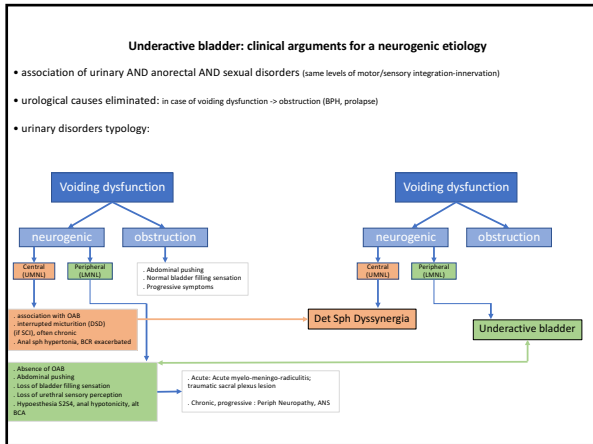
Anal tone

Motor function is evaluated by testing the muscle strength and tone

Babinski sign

BC reflex

Muscle strenght (plantar flexion), tendinous reflexes ...



Motor E.P.

MEP tests the integrity of the motor pathways

TMS coil - High current
 Magnetic field
 Induced electric field

Magnetic Stimulation
 Descending
 Motor Nerve
 Muscle

Trigger
 Record

Amplitude (mV)
 TMS Pulse Max Coiled Proximal

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Fecal impaction
 paraosteal osteomyelitis
 stone
 bed sore
 Incriminated nail

First : eliminate and treat Irritative lesions

Underactive Bladder Treatment

Alpha-blockers, BTA sphincter
 Self cath
 Derivation
 Surgery
 Fecal impaction, UTI, stone
 Sacral neuromodulation

To discriminate neurogenic and obstructive lesions: Urethral stent inserted within urethra

Underactive bladder Underactive detrusor
 Urinary retention
 Urethral stent
 Micturition +
 Micturition -
 Urological obstruction
 Neurological voiding dysfunction

Reappearance of micturition = obstruction!

Neuromodulation

Electrical stimulator
 Bladder
 Tailbone
 Nerves

A
 B
 C
 D

Neurology and Urodynamics 29:578-583 (2005)

Sacral Neuromodulation in Diabetic Patients: Success and Complications in the Treatment of Voiding Dysfunction
 David H. Daniells, Charles R. Powell, Matthew R. Braasch, and Karl J. Kroeder
 Department of Urology, University of Iowa, Iowa City, Iowa

Neurology and Uroynamics 23:246–251 (2004)

Posterior Tibial Nerve Stimulation in the Treatment of Voiding Dysfunction: Urodynamic Data

Vera Vandorinck,¹ Michiel R. van Balken,¹ Enrico Finazzi Agro,³ John P.F.A. Heesakkers,¹ Frans M.J. Debruyne,¹ Lambertus A.L.M. Kiemeny,² and Bart L.H. Bemmelans^{4*}

Posterior tibial nerve stimulation

... few data

Parasympathomimetic drugs (cholinomimetic drugs)

Direct-acting
These act by stimulating the nicotinic or muscarinic receptors.

Choline esters
Acetylcholine (all acetylcholine receptors)
Bethanechol (M3 receptors)
Carbachol (all muscarinic receptors and some nicotinic receptor)
Methacholine (all muscarinic receptors)

Plant alkaloids
Nicotine
Muscarine
Pilocarpine (M3 receptors)

Indirect-acting
cholinesterase inhibitors, or drugs that promote ACh release.

Reversible cholinesterase inhibitors
Donepezil, Edrophonium, Neostigmine, Physostigmine, Pyridostigmine, Rivastigmine, Tacrine, Caffeine (non-competitive)
Huperzine A

Irreversible cholinesterase inhibitors
Echothiophate, Isoflurophate, Malathion, ACh release promoters, Cisapride, Droperidol, Domperidone

But : no evidence based medicine / poor efficacy / important side effects => not used / recommended in clinical practice

Self Intermittent catheterization

- the gold standard in case of urinary retention
- safe and effective (specially with new devices)
- improve quality of life (decrease UI, allows specific treatment of OAB/OAD)
- CISC avoids urological complications : decrease renal risk, UTI

Specific surgery can help CIC !

Reconstructive hand surgery

Continent cystostomy

Reconstructive hand surgery

Urethral device with inside a turbine activated by magnetic remote control

- inFlow™ is normally replaced every 29 days
- Activator : a hand-held magnetic remote control required to operate the internal valve-pump mechanism in the inFlow device
- today, no available in many countries in Europe.

Just after activation, turbine, (pump) empties the bladder

To treat and PREVENT complications ...

D-Mannose

Cranberry

E. Coli

(ATB : only symptomatic UTI +++)

