



## Increasing awareness of Spinal Cord Injuries and Neurogenic Bladder. A Continence Promotion Committee Initiative (Free workshop)

W17, 15 October 2012 14:00 - 17:00

Start	End	Topic	Speakers
14:00	14:20	Continence Promotion Committee: Promoting Continence Worldwide	<ul style="list-style-type: none"> <li>• Vasan Satya Srin</li> </ul>
14:20	14:40	“Global Epidemiology and Prevalence”	<ul style="list-style-type: none"> <li>• Marie Carmela Lapitan</li> </ul>
14:40	15:00	“Assessment of the Patient with Neurogenic Bladder”	<ul style="list-style-type: none"> <li>• Jean-Jacques Wyndaele</li> </ul>
15:00	15:20	“Conservative treatments for Neurogenic Bladder”	<ul style="list-style-type: none"> <li>• Kefang Wang</li> </ul>
15:20	15:30	Discussion	All
15:30	16:00	Break	None
16:00	16:30	“Treatment of Neurogenic Bladder”	<ul style="list-style-type: none"> <li>• Yasuhiko Igawa</li> </ul>
16:30	17:00	Discussion	All

### **Aims of course/workshop**

This workshop centres around spinal cord injured patients and neurogenic Bladder. Global epidemiology and prevalence of this condition will be discussed as well as assessment of the patient. Conservative treatment and surgical and pharmacological treatment will be reviewed.

### **Educational Objectives**

Spinal cord injuries are a common occurrence in both younger and older individuals. Global Epidemiology, Demography and Prevalence rates will be discussed to give the participant an understanding of the high occurrence of neurogenic bladder problems in spinal cord injured patients. An overview of the comprehensive management, with a particular focus on diagnosis, including general and technical parameters will be given. The participant will learn evidence based conservative interventions which will help them formulate a management strategy for different patterns of neurogenic lower urinary tract dysfunction. The participants will have the opportunity to learn how to apply pharmacologic treatment and surgery to refractory cases and the advantages and disadvantages of different treatment choices.

## Continence Promotion Committee. Promoting Continence Worldwide

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The Continence Promotion Committee (CPC) was formed following a workshop at the International Continence Society (ICS) meeting in Rome in 1995. It was felt and mutually agreed that the ICS should act as a facilitator for various international continence organizations to meet and address relevant issues with continence promotion.

Since then, the CPC has grown in leaps and bounds with 20 members currently on the Committee from 16 Countries. They hail from different professions - from physicians, nurses physiotherapists, medical writers, patient advocate directors, researchers, biomedical engineers among others.

Over the years, CPC has held meetings and workshops every year in conjunction with the annual ICS meetings and produced newsletters periodically to inform the broader ICS membership about continence promotion activities around the world. Some of the themes have been around prevention, education, fund raising, promotion, and meeting the challenge of reaching the general practitioner (GP).

Continence promotion activities must target not only those suffering from incontinence and their families but also the general community, health professionals, the industry that manufactures continence products and drugs, and the Government which is responsible for funding directly or indirectly various programs. Continence promotion programs must therefore be sufficiently flexible to target these groups about what incontinence is, what can be done about it, and where to get help, and most importantly to de-stigmatise this condition. Continence promotion is undertaken globally through the efforts of the International Continence Society and locally through various national non-profit-making organisations.

Communicating to both professionals and consumers is extremely important but it is felt that it is essential to use terms, which the public/patient understands (e.g. overactive bladder versus incontinence). Marketing is essential in communication and “Direct to Consumer Advertising” using TV appears to be effective for reaching large audiences. Continence promotion in the past has emphasized on the illness and the need to refocus on “Bladder Health”. Professional education on Continence is lacking throughout the world as it remains only a small part of education of most professionals (doctors, nurses, therapists). Therefore, there is very little data currently available on whether education can be effective in increasing awareness of identification and assessment of incontinence. General practitioners need to be educated and know when and how to refer patients.

World continence week was announced in ICS Cairo meeting and was followed up with the first world continence week activities around the world in 2009 (fourth week –

Monday to Sunday of June). World continence week has been an initiative of ICS – CPC to raise awareness about continence around the world and provide a common platform for all groups working to promote continence. The first world continence week was a resounding success with several continence organizations around the world organizing programs during the week.

The key objectives is to provide common resource platform and develop a comprehensive information website of materials, leaflets, slides, posters as well as summary of successful programs in order to facilitate new ideas. The website is a great source of resource and database. This year the WCW generated keen interest in governmental agencies due to the launch of simultaneous activities in several countries and will eventful help in modifying some of the governmental policies. A common logo is being developed by the ICS for organizations and sponsors to symbolize this week and give it character. Eventually this will enable all organizations to use this week as the main event in their respective countries with the developing countries also benefiting from common sharing of resource material. Sustained and coordinated effort in creating awareness will enable promoting groups to have a unified voice.

#### Reference:

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3. Koch LH. Help-seeking behaviors of women with urinary incontinence: an integrative literature review. *J Midwifery Wom Heal* 2006; 51: e39–44.
4. Newman DK, Ee CH, Gordon D, Vasan SS, Williams K. Continence promotion, education & primary prevention. In: Abrams P, Cardozo L, Khoury S, Wein A eds. *Incontinence, Proceedings from the 4th International Consultation on Incontinence*, Plymouth UK: Health Publication, 2009, 1643–84.

## EPIDEMIOLOGY OF THE NEUROGENIC BLADDER

**Definition** : lower urinary tract dysfunction due to a loss of voluntary control of the bladder, secondary to central nervous system injury or neurological diseases

**Overall Prevalence** : unknown

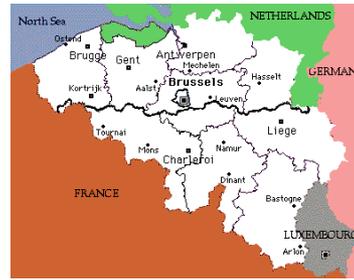
### Distribution of neurologic disease etiologies for neurogenic bladder

(\*based on US Medical Claims Survey)

Neurologic Disease	Proportion
Multiple sclerosis	17.2%
Paralytic syndromes (stroke syndrome)	16.1%
Parkinson's disease	14.6%
Cauda equine syndrome	8.1%
Spina bifida	4.3%
Spinal cord injury	3.0%
Cerebral palsy	2.0%
Unspecified	26.3%

### Prevalence and Types of Voiding Dysfunction According to Neurologic Disease

Neurologic Disease	Prevalence of voiding dysfunction	Type of voiding dysfunction
Brain tumor	24-30% UI rate : 1.9%	Detrusor overactivity Urinary retention
Dementia	UI rate : 23-48%	Detrusor overactivity
Cerebral Palsy	24-40%	Detrusor overactivity (80%) Sphincter denervation (11%) Detrusor sphincter dysnergia (5%)
Parkinson's Disease / Shy Drager syndrome	40-70%	Detrusor overactivity
Cerebrovascular disease / Stroke syndrome	20-50%	Urinary retention (in acute phase), Detrusor overactivity
Multiple sclerosis	50-90%	Detrusor hyperreflexia Detrusor sphincter dysnergia <i>(Note : pattern changes over time in 4/9 patients)</i>
Spinal Cord Disease / Spinal Cord Injury	70-88%	Detrusor overactivity Detrusor sphincter dysnergia <i>(Note : No consistent pattern of presentation)</i>
Diabetic Neuropathy	25% (43-87% in insulin-dependent diabetics)	Decreased bladder sensation (55%) Detrusor overactivity (42%) Increased bladder sensation (14%)



# How to diagnosis in neuourology

Jean- Jacques  
Wyndaele

- **Worked with all main pharmaceutical companies and equipment industry in research, education activities, grants, advisory board, lecturer**

# Reflections before start

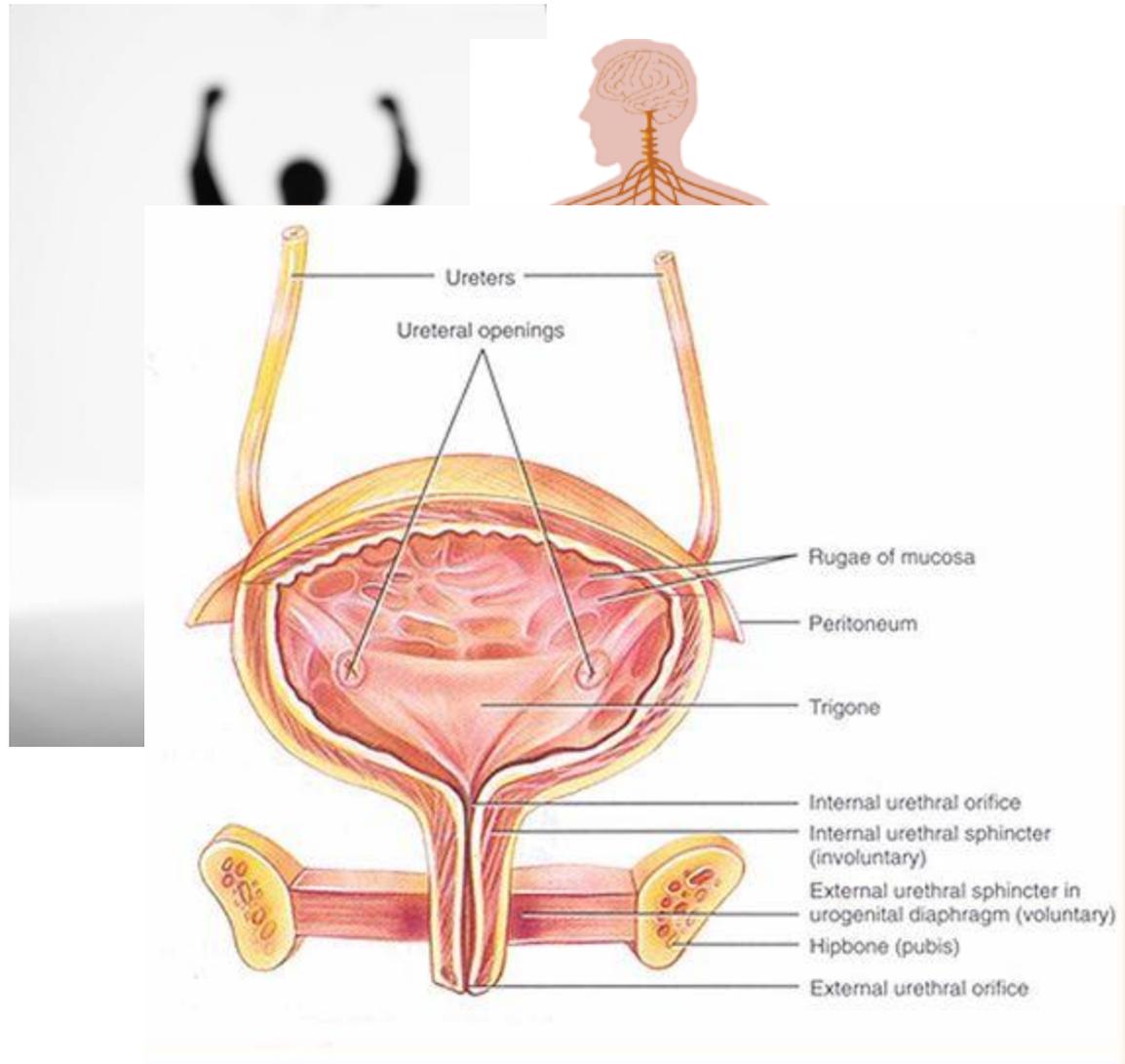
- neurologic patients are special group
- LUT problems relate not necessarily to the neurologic pathology.
- Diagnostic workout as much as needed (to tailor an individual treatment)

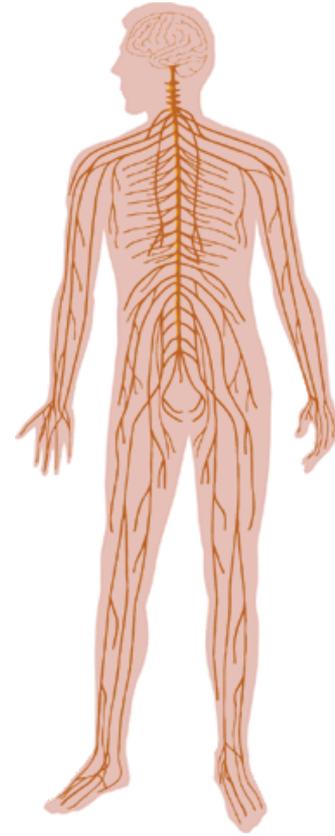
# Diagnosis

- WHO ?

- WHAT ?

- HOW ?





# History

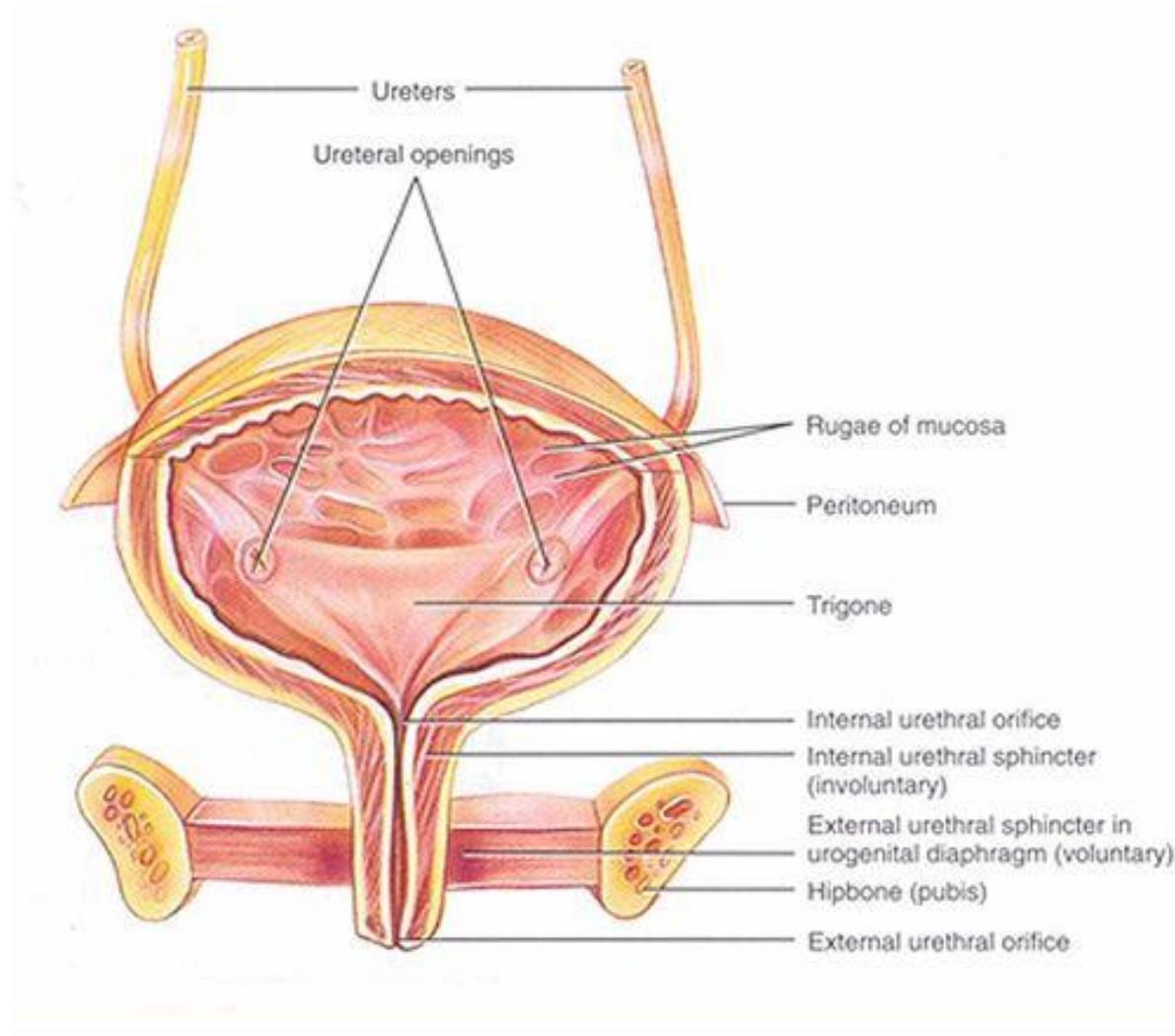
- **Female-male-age**
- **What is the neurological diagnosis (MS, Parkinson, CVA, SCI ....)**
- **Since when**
- **What is the extent/ grade of the lesion**
- **What is the disease progression**
- **General condition**
  - **Somatomotor**
  - **Central-brain**

# History

- **Previous history**
- **Previous treatments (drugs, surgery, catheterization)**
- **Quality of life**
- **Social situation (family, work, financial)**
  
- **Family history**



# How is LUT affected ?



# History

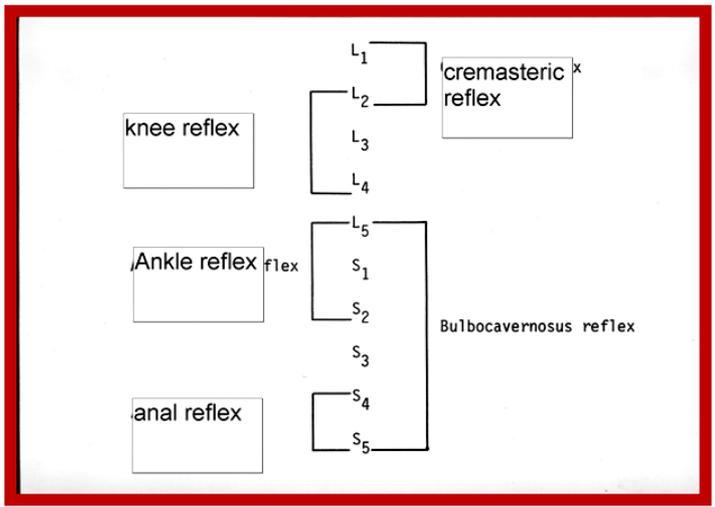
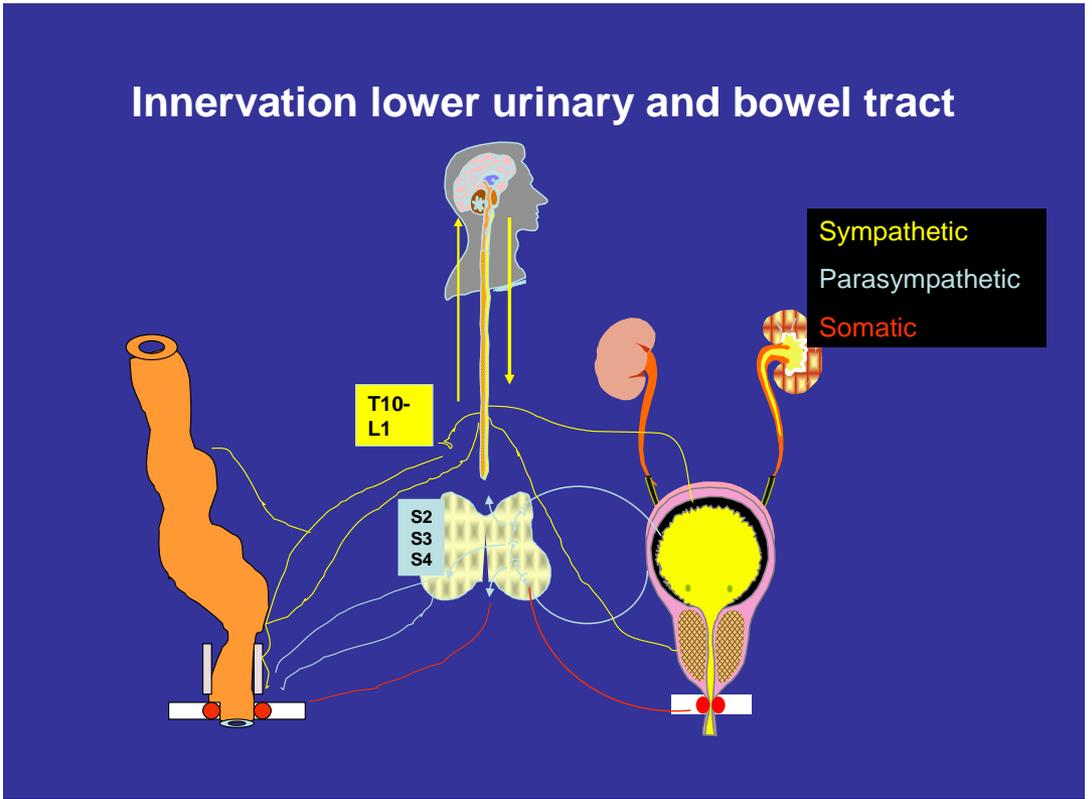
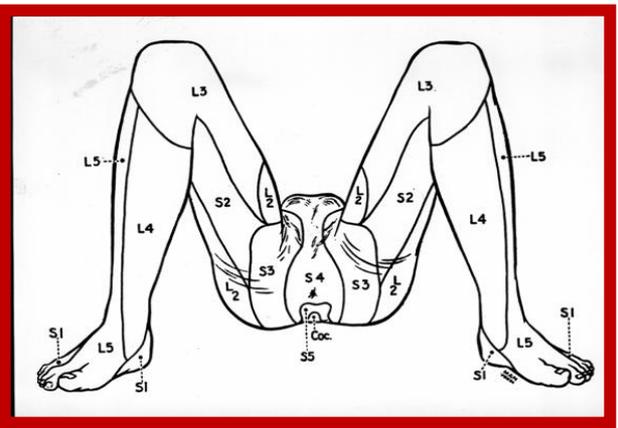
- **Symptoms and signs (questionnaires, voiding diary)**
  - **Sensation of bladder fullness**
  - **Bladder capacity**
  - **Leaking**
  - **Infections, smelly urine**
  - **Bladder emptying technique**
  
  - **Bowel function**
  - **Sexual function**

# Clinical investigation

- **General examination; scars, bulking areas, weight**
- **Perineal area :**
  - **Skin**
  - **External genitalia**



# Clinical neurological examination



**Voluntary control of anal sphincter and perineal muscles**

# Correlation clinical neurologic examination and LUT function

- **NOT GOOD** in children with **lumbosacral myelodysplasia:**

Wyndaele and De Sy J Urol, 133: 638, 1985; Marshall and Boston Eur J Pediatr Surg, 11 Suppl 1: S21, 200135

- **Fairly GOOD** in individuals with **spinal cord lesion but with restrictions**

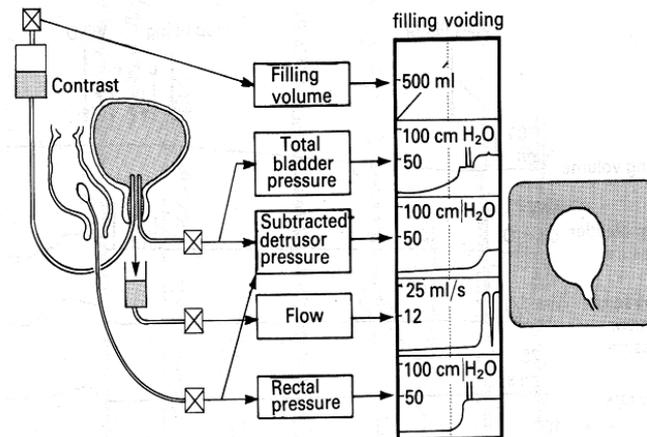
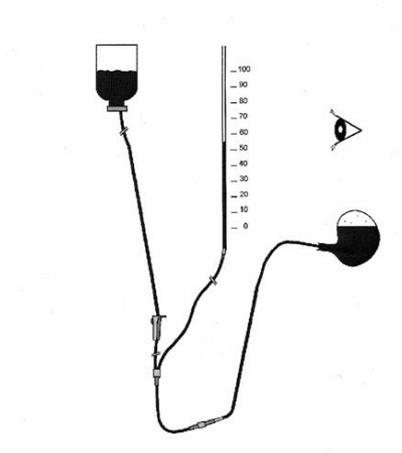
– between thoracic 10 and lumbar 2

# Laboratory tests

- **Urine test + culture**
- **Blood test**
  - kidney function
  - chronic inflammation
  - ---

# Urodynamic tests

- enough evidence that these tests are valuable in neurologic urinary problems



# Urodynamic tests

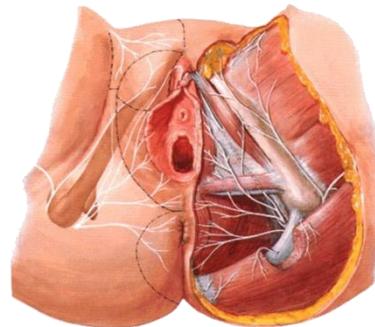
- **Pressure is the key**
- **Do testing dynamically**
  - **Try to get an answer why there is incontinence, recurrent infection, diverticula formation..**
  - **Evaluate if emptying technique is accurate**

# Cystometry filling

- ***Slow***
- **Natural fill cystometry (NFC)**
  - **Less filling speed in hyperreflexic neurologic bladders corresponds with lower MPdet and increase in compliance.**
  - **No significant differences in hyporeflexic or areflexic neurologic bladders**
    - **De Gennaro et al 1996, Zermann et al 1997, Ko et al 2002.**

# + EMG ?

- **Dyssynergia** Sundin, Petersen 1975
- **Types dyssynergia** Blaivas et al 1981
- **Differentiate between pelvic nerve injury, distal autonomic neuropathy, progressive autonomic failure - multiple system atrophy, and idiopathic Parkinson's disease.** Aoki et al 1985



- **Pressure-flow study: obstructive pattern (high pressure voiding) also in neurologic patients**
  
- **Video urodynamics**
  - **clear image of bladder neck and urethral sphincter activity during filling and voiding**
  - **Anatomy of LUT, reflux, calculi,...**

# Filling sensation

- **Important for voluntary bladder control**
  - impaired perception of bladder filling during CMG is a sign of neuropathy
  - Complete AIS A SC lesion: sensation of bladder filling during cystometry in 26 %.
  - Myelodysplasia the perception of bladder filling present in a majority of patients

Wyndaele 1992,1993
- **Bladder-filling sensation investigations reproducible** Ersoz and Akyuz 2004

# Repeat urodynamic testing

- **if treatment evaluation is needed (pressure!!!)**
- **if treatment outcome is not good (incontinence)**

# Specific tests

- **Ice water test**
- **Bethanechol supersensitivity test**

**EMG, Dynamic Bulbocavernosus reflex (BCR), Nerve conduction studies, Somatosensory evoked potentials (SSEP), Electrosensitivity in the LUT and Sympathetic skin response**

- **can be of value. The indications, limitations need to be understood. A proper application is mandatory to get good diagnostic value.**

# Imaging -endoscopy

- **Ultrasonography : image of kidneys and LUT (also follow up)**
- **Isotopes**
- **Xrays –MRI**
- **Endoscopy: when previous diagnosis did not explain symptoms and signs**

# Diagnosis => Management

- WHO ?
- WHAT ?
- HOW ?



# Diagnosis

**Woman 39 years old, married, two children, teacher, Multiple sclerosis since 4 years, general condition acceptable, urinary urgency incontinence, no infection, clinical investigation normal, detrusor overactive, urgency, leaking, hypocontractile, incomplete emptying, no complications**

# Up to treatment



Thanks for listening

**Title:**

The conservative management of neurogenic lower urinary tract dysfunction

**Abstract:**

Most patients with neurogenic lower urinary tract dysfunction (NLUTD) need life-long care to keep the quality of life. The principal aim of treatment NLUTD is to protect the upper urinary tract and to improve continence. The conservative treatment is almost the primary intervention for majority of patients with NLUTD. In this class, different conservative management measures(except pharmacological treatments) for NLUTD patients will be discussed:

1. Behavioral interventions: including a) Timed voiding, b) Promoted voiding, c) Bladder training, d) pelvic floor muscle exercises, e) Triggered reflex voiding, and e)Bladder expression.
2. External appliances: including condom catheter or pads.
3. Catheterization: including a) Intermittent catheterization, and b) Indwelling urethral catheters.
4. Electrostimulation: including a) Peripheral temporary electrostimulation, b)Chronic peripheral pudendal stimulation, c) Intravesical electrostimulation, d)Magnetic stimulation.

The management of neurogenic lower tract dysfunction (NLUTD) is primarily a conservative approach, but it should not be viewed as an isolated event rather as an integral part of a patient's overall management program. Obviously, the type of approach is based on different patterns of NLUTD. **The primary goals of management in patients with NLUTD are to:**

- a) protect the upper urinary tract;
- b) prevent recurrent UTIs;
- c) avoid bladder stretch injury from repeated over-distension;
- d) Improve urinary continence; and
- e) improve the patient's quality of life.

The conservative management except pharmacological treatments will be discussed in this course.

## **1. Behavioral interventions**

The behavioral approach would seem beneficial for most neurological patients.

### **1.1. Timed voiding**

Trying to train the patient voiding their bladder at a fixed time aim to avoid incontinence. Establish right habit of the frequent urination, can improve the ability to control bladder urgency, prolonging voiding intervals, increasing bladder capacity, reducing incontinent episodes, and building patient's confidence. Maybe 3 hours during daytime and none at night. A passive toileting assistance program need to be initiated and maintained by caregivers suitable for patients cognitive and/or motor deficits.

### **1.2 Promoted voiding**

It means that the caregiver should teach the patients that they can require for help with positive reinforcement when they want to go to the toilets. Prompted voiding refers to a caregiver education program in combination with a scheduled voiding regimen, typically every two hours; it is indicated in patients with good cognitive function but at a high-level dependent on the caregivers.

### **1.3 Bladder training**

Bladder training(BT) is used for cognitively and physically able adults to regain

continence by increasing the time interval between voids. Teach the patients to try to prolong their voiding intervals gradually until they can void every 2-3 hours during the day. This technique can help to improve the ability to control bladder urgency, and increasing bladder capacity.

#### **1.4 Pelvic floor muscle exercises**

Pelvic floor muscle exercises (PFME) has been reported to have some value in the treatment of NLUTS, and is indicated in selected NLUTD: cerebral lesions with no cognitive deficit, incomplete spinal cord lesions, incomplete cauda equina, or sacral nerve lesions. PFME can improve urinary continence by inhibiting bladder overactivity and reinforcing urethral closure mechanisms. PFME combine with functional electrical stimulation (FES) may help to improve the effect of pelvic floor muscle training, and may also teach the patient how to contract the pelvic floor muscles.

#### **1.5 Triggered reflex voiding**

Triggered reflex voiding is a method that elicit the reflex detrusor contractions by exteroceptive stimuli on the sacral reflex arc. Suprapubic tapping, thigh scratching, and anal manipulation are the most commonly used maneuvers. Only after the bladder outlet obstruction was managed, the triggered reflex voiding is available. Frequency of use, intervals and duration have to be specified for each patient.

#### **1.6 Bladder expression (Crede and Valsalva)**

When patients have difficulties of emptying bladder because of a inability of opening the bladder neck or functional obstruction at the level of the striated external sphincter by the downward movement. Bladder expression is recommended. The most commonly treatment are the Valsalva (abdominal straining) and the Crede (manual compression of the lower abdomen) maneuvers.

Summary:

The first aim of any therapy is the protection of the upper urinary tract

Lower urinary tract rehabilitation may be effective in selected cases (patients that do not suffer from a complete spinal cord lesion)

Any method of assisted bladder emptying should be used with the greatest caution

Bladder training focus on the restoration of continence, while promoted voiding and

timed voiding focus on the avoidance of incontinence.

## 2. External appliances

If the above-mentioned approaches are unsuccessful, social continence may be achieved by collecting involuntary losses of urine. The term “social continence” is used to describe the condition in which urine losses are contained to ensure the dignity and hygiene of the patient and the living environment by using aid applied to the individual. The devices used may be external (e.g., absorbent products and external catheters). Absorbent products (e.g., body-worn products and bed pads) may offer a reliable solution. Male patients with neurogenic bladder and chronic urinary incontinence can be candidates for a condom catheter connected to a urine or leg bag to collect the urine. These devices must be closely observed to avoid the risk of infection. Long-term use may cause bacteriuria but it does not increase the risk of UTI when compared to other methods of bladder management. Complications may be less with good hygiene, frequent change and maintenance of low bladder pressures. Some patients may be allergic with the latex, and the silicon is available to alter. The penile clamp, previously largely used, is absolutely contraindicated, because of the risk of developing high intravesical pressure with possible vesico-ureteral reflux (Stohrer, Blok et al. 2009).

Summary:

A condom catheter or pads may reduce urinary incontinence to a socially acceptable situation.

## 3. Catheterization

### 3.1 Intermittent catheterization(IC)

The aim of intermittent catheterization(IC) is to empty the bladder and rebuild normal bladder storage, regularly complete urine evacuation, and avoid complications of indwelling catheterization(ID).

Two main techniques have been adopted: sterile or clean intermittent catheterization(CIC) and clean intermittent self-catheterization(CISC). Sterile intermittent catheterization, significantly reduces the risk of UTIs compared with the clean intermittent catheterization, however, it should be done by the professionals or

trained caregiver. For the patients who has self-care ability, nurses could teach them do the CISC. Usually women need to be taught how to use a mirror to find the right urinary meatus. A comparative study shows that CSIC could cause a lower rate of complications especially infection than indwelling urethral catheters (ID)(Turi, Hanif et al. 2006).

Frequency of catheterization will depend on bladder volume, fluid intake, postvoid residual, urodynamic parameters such as compliance, detrusor pressure. Four to six times per day is recommended during the acute stage after spinal cord lesion, and the catheter size should be 12 to 14 Fr. Less frequent catheterization could result in higher catheterization volumes and a higher risk of UTI; more frequent catheterization increases the risk of cross-infections and other complications(Wyndaele 2002). Bladder volume at catheterization should be lower than 400 ml.

### **3.2. Indwelling Catheterization (IDC)**

IDC allows for complete emptying of the bladder, but research evidence has demonstrated that this type of long-term bladder drainage is associated with a significant morbidity (urethral trauma and bleeding, urethritis, urethral fistula caused by improper technique of securing the catheter, bladder stones, cancer, and urethral sphincter erosion) The complication rate has been shown to be higher than with IC (Turi, Hanif et al. 2006). However, ID is still useful in selected patients with difficulty in performing IC or persistent leakage between catheterizations. In developing countries ID is still the method of choice for those with urinary retention or incontinence.

An alternative to IDC is an large-bore indwelling catheter placed through the lower abdomen in the dome of the bladder, called suprapubic catheter(SC), SC minimizes the risk of urethral trauma, urethral destruction and the urethral pain. The key disadvantage is that it requires a minor 'surgical' act to insert catheter with potential to injury adjacent structures as the intestine or paravesical blood vessels.

Better materials, smaller size catheters and a proper technique of securing the catheter can reduce the rate of the complication. Silicone catheters are preferred because they are less susceptible to encrustation and because of the high incidence of latex allergy

in the NLUTD population(Stöhrer, Blok et al. 2009). Silicone catheters should be changed every 2-4 weeks, while (coated) latex catheters need to be changed every 1-2weeks has been shown to be of benefit in patients with recurrent symptomatic UTI (Biering-Sorensen 2002).

#### 4. Electriostimulation

Bladder rehabilitation is mainly based on electrical or magnetic stimulation. Over the last two decades, functional electrical stimulation(FES) has been confirmed as a valuable treatment option for patients with symptoms of overactive bladder, but evidence about using electrical stimulation in neurogenic patients is lacking and mainly based on pilot studies with small patient numbers.

##### 4.1 Peripheral temporary electrostimulation

Posterior tibial nerve stimulation and external temporary electrical stimulation (e.g. penile/clitoral or intracavitary) suppress neurogenic detrusor overactivity during acute stimulation (Opisso, Borau et al. 2008). Both techniques have also demonstrated sustained prolonged effects (3 months and 1 year, respectively) in patients with neurogenic bladder dysfunction due to multiple sclerosis (MS) (Kabay, Kabay et al. 2009). In MS patients, combining active neuromuscular electrical stimulation with pelvic floor muscle training and electromyography biofeedback achieved a substantial reduction of lower urinary tract dysfunction symptoms(McClurg, Ashe et al. 2008).

##### 4.2 Intravesical electrostimulation (IVES)

IVES is an option to induce/improve bladder sensation and to enhance the micturition reflex in incomplete central or peripheral nerve damage. Many studies proved that the IVES has positive effect on improving the function of the bladder and urinary tract and on decreasing the possibility of urinary infection. In patients with neurogenic detrusor hypocontractility, intravesical electrostimulation may also improve voiding and reduce residual urine volume(Hagerty, Richards et al. 2007).

##### 4.3 Chronic peripheral pudendal stimulation

The results of a pilot study showed that chronic peripheral pudendal stimulation (chronic, defined as a period of 2 weeks) in patients with incomplete spinal cord injury produced significant neuromodulatory effects in the brain which led to changes

in urodynamic parameters(Zempleni, Michels et al. 2010).

#### 4.4 Magnetic stimulation

A longitudinal observation in Beijing, China shows that functional magnetic stimulation (FMS) on the S3 root region and the bladder region could decrease the frequency of the urination, the daily amount of the urination, and could improve the quality of life for patients with autonomous neurogenic bladder(Zhou, X.Huang et al. 2005). Repetitive transcranial magnetic stimulation can improve voiding symptoms in patients with Parkinson disease or MS, but the duration of the effect, stimulation parameters and the appropriate patient selection are still under investigation(Brusa, Finazzi Agro et al. 2009).

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**ICS 2012 WORKSHOP 17**

**Spinal Cord Injuries and Neurogenic Bladder. A Continence Promotion  
Committee Initiative**

**PHARMACOLOGICAL AND SURGICAL TREATMENTS OF NEUROGENIC  
LOWER URINARY TRACT DYSFUNCTION IN PATIENTS WITH SPINAL  
CORD INJURIES**

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URL: <http://cont-med.umin.jp/>

**Table 1. The primary aims for the treatment of neurogenic lower urinary tract dysfunction (NLUTD) associated with spinal cord injury (SCI)**

1. Protection of the upper urinary tract;
2. Improvement of urinary continence;
3. Restoration of (parts of) the LUT function;
4. Improvement of the patient's QoL.

**Table 2. Treatment strategy of NLUTD in SCI patients**

1. Conservative treatment is the first-line choice.
2. Drug therapy can be combined with conservative treatment to maximize outcome.
3. If non-invasive treatments including drug treatment are failed, surgical interventions can be applied to selected cases refractory to those non-invasive treatments.

**Table 3. Drug treatment for NLUTD in SCI patients**

**1. Drugs for DO/low compliant detrusor**

- 1) Antimuscarinics
- 2) Botulinum toxin injections in the bladder
- 3) Intravesical vanilloids (resiniferatoxin and capsaicin ) instillation

**2. Drugs for neurogenic sphincter deficiency**

- 1) Alpha-adrenergic blockers
- 2) Estrogen
- 3) Beta-adrenergic agonists
- 4) Tricyclic antidepressants

**3. Drugs for facilitating bladder emptying**

- 1) Alpha-adrenergic blockers
- 2) Botulinum toxin injections in the urethral sphincter
- 3) Cholinergics

**Table 4. Characteristics of antimuscarinics for NDO in SCI patients**

- The first-line choice for treating high detrusor pressure during the filling phase (DO, low bladder compliance)
- Reducing storage symptoms, which in turn helps to prevent renal and bladder damage and potentially improve long-term outcomes
- may need a higher dose in SCI patients than patients with idiopathic DO
- Choice of antimuscarinic agent
  - ✓ Oxybutynin, trospium, tolterodine, propiverine are established, effective, medical treatments for NDO.
  - ✓ Darifenacin, solifenacin, fesoterodine and imidafenacin have not been sufficiently evaluated in SCI patients
- Side effects  
dry mouth, constipation, and increasing voiding dysfunction

**Table 5 Botulinum toxin injections in the bladder for NDO**

- The second-line treatment for refractory to antimuscarinics.
- Botulinum toxin A has been proven effective in a randomised placebo-controlled trial in NLUTD
- Botulinum toxin causes a long-lasting but reversible chemical denervation that lasts for about 9 months.
- Repeated injections seem to be possible without loss of efficacy.
- Generalised muscular weakness is an occasional adverse effect.
- Histological studies have not found ultrastructural changes after injection.

## **Table 6. Surgical treatment of NLUTD in SCI patients**

### **1. Surgery for facilitating bladder storage function**

- 1) Bladder augmentation using intestinal segments
- 2) Autaugumentation by detrusor myotomy
- 3) Sacral dorsal rhizotomies (=sacral deafferentation; SDAF) (with sacral anterior root stimulation; SARS)

### **2. Surgery for stress UI due to sphincter incompetence**

- 1) Suburethral sling procedures
- 2) Bulking agent injection
- 3) Artificial urinary sphincter placement
- 4) Bladder neck reconstruction
- 5) Bladder neck closure with continent diversion

### **3. Surgery for DSD**

- 1) Sphincterotomy
- 2) Urethral stents

### **4. Surgery to increase bladder contractility**

- 1) SARS (with SDAF)
- 2) Bladder covering by striated muscle

### **5. Urinary diversions**

- 1) Continent diversion
- 2) Cystostomy
- 3) Ileal conduit
- 4) Cutaneous vesicostomy

## **Table 7 Recommendations for surgical treatment (EAU Guideline for NLUTD, 2011)**

### **Surgery for Overactive Detrusor**

- Detrusor myectomy is an acceptable option for the treatment of overactive bladder when more conservative approaches have failed. It is limited invasive and has minimal morbidity (Grade B)
- Sacral rhizotomy with SARS in complete lesions and sacral neuromodulation in incomplete lesions are effective treatments in selected patients (Grade B)
- Bladder augmentation is an acceptable option for decreasing detrusor pressure whenever less invasive procedures have failed. For the treatment of a severely thick or fibrotic bladder wall, a bladder substitution might be considered (grade B)

### **Surgery for Underactive Detrusor**

- SARS with rhizotomy and sacral neuromodulation are effective in selected patients (Grade B)
- Restoration of a functional bladder by covering with striated muscle is still experimental

### **Surgery for Overactive Urethra (DSD)**

- Sphincterotomy is the standard treatment for DSD (Grade A)
- Bladder neck incision is effective in a fibrotic bladder neck (Grade B)

### **Surgery for Underactive Urethra (urethral sphincter deficiency)**

- The placement of a urethral sling is an established procedure (Grade B)
- The artificial urinary sphincter is very effective (Grade B)

## References

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## Notes

Record your notes from the workshop here