W2: Lower Urinary Tract Symptoms in Paediatrics and Dysfunctional Voiding: A Functional Approach to Treatment.
Workshop Chair: Giovanni Mosiello, United Arab Emirates
12 September 2017 07:30 - 08:30

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**Speaker Powerpoint Slides**
Please note that the PowerPoint slides presented by the Faculty during the Workshop will be made available after the meeting via the ICS website www.ics.org/2017/programme Please do not film or photograph the slides during the Workshop as this is distracting for the speakers and yourselves from the learning opportunity.

**Aims of Workshop**
During this Workshop, you will receive updated information on the standard terminology and assessment methods and treatment options for Lower Urinary Tract Symptoms Dysfunctional Voiding in Children and Adolescents, including conservative and minimally invasive surgery. There will be 4 lectures from various disciplines, all focusing on a functional approach, to increase the understanding of the pathophysiology, diagnostics and treatment of the above-mentioned conditions from childhood to young adult age. Treatment will not be focused only on medication or surgery but also on non-pharmacological approach, urotherapy and pelvic floor muscle training and rehabilitation.

**Learning Objectives**
Standardisation of terminology for paediatric and transitional LUTS and dysfunctional voiding.
Understanding of the pathophysiology of dysfunctional voiding in children and young adults.
Understanding and indication of the updated methods for pelvic floor training/re-training and pelvic floor muscles rehabilitation.
Learning regarding indication and techniques for “open” or minimally invasive surgery.

**Learning Outcomes**
After this workshop, you will be able to define, assess and indicate appropriate referral or medical, surgical, non-medical/non-surgical treatment for children and adolescents affected by LUTS and dysfunctional voiding.

**Target Audience**
Urologists, Paediatric Urologists, Physiotherapists, Occupational Therapists, Nurses, Other Specialties.

**Advanced/Basic**
Advanced

**Suggested Reading**
ICS Standardisation of Terminology Document
ICCS Standardisation of Terminology Document

**Other Supporting Documents, Teaching Tools, Patient Education etc**
Pre-Workshop Questionnaire distributed at the workshop (will be filled by the attendees before the start of the workshop)
End-of-workshop Questionnaire distributed at the workshop (will be filled by the attendees at the end of the workshop)

**Let's All Talk the Same Language: Standardisation of Definitions and Terminology**
Selcuk Yucel, MD

The standardization of definitions and terminology for lower urinary tract and bowel function is imperative to understand, evaluate, discuss and communicate on symptoms, findings, history taking, diagnosis, diagnostic tools and methods, treatment and success for lower urinary system dysfunction in children and adolescents. Terminology and definitions should be internationally accepted and used to eliminate possible confusion among the urologists and other specialists and subspecialists who are dealing with lower urinary system dysfunction problems in children. Lower urinary system dysfunction in children and adolescents is a very common and heterogeneous broad term across the world and it is imperative to talk the same language by all healthcare providers and associated parties.
One of the tasks of International Continence Society Children and Young Adults’ Committee is to contribute to form a platform for such a common terminology language. For this purpose, we wish to cooperate with other societies and committees who have been publishing and producing on standardization of those definitions and terms. We noted that there is a significant increase in paediatric lower urinary system dysfunction published studies in the last 15 years. Moreover, with no geographical limits, there is approximately four fold increase in the likelihood of usage of recommended terminology by Standardization Committee of the International Children’s Continence Society following their publication on standardization of terminology for lower urinary tract dysfunction. However, one fourth of recent publications, unfortunately fail to follow those recommended terms and definitions.

In this course we aim to transfer the terminology offered by the Standardization Committee of the International Children’s Continence Society revised in 2016. Terminology will consist of manifestations and symptoms such as day time frequency, incontinence and tools of investigation such as voiding diaries, uroflometrics, urodynamics, post voiding residuals, ultrasound measurements, and conditions/diseases with subgroups, and treatments along with objective success rates.

Dysfunctional Voiding in Children and Adolescents

Mario De Gennaro

The lack of coordination between detrusor muscle contraction and relaxation of the urethral sphincter, is the pathogenetic factor at the basis of functional bladder outlet obstruction in children. When this pathologic mechanism occurs in neuropathic patients, it is defined as detrusor-sphincter dyssynergia, (DSD). When occurring in non-neuropathic patients, it is defined as dysfunctional voiding, (DV). The obsolete terms for DV are Hinman Syndrome or non-neurogenic neurogenic bladder, which are both obsolete and not recommended as terminology, by the International Children Continence Society, (ICCS). Children and adolescents, affected by DV, pass urine in spurts with a typical pattern at urinary flowmetry called “staccato void.” They usually come to the attention of a Physician for either difficulty in voiding, recurring urinary infection, suprapubic pain, or accidental ultrasonographic detection of a thickened bladder wall. The majority of these cases have associated bowel disturbances and day-time and/or night time urinary leak, which can be also associated to “reactive” overactive bladder and frequency of micturition.

Assessment of these cases is based on a basic urological work-up, urinary flowmetry with EMG of pelvic floor muscles, evaluation of bowel function and pattern of bowel movements as well as consistency of the feces (Bristol Stool Scale). An ultrasound to assess rectal diameter or a plain abdominal x-ray are used in different centres, to assess the possibility of associated fecal load. In some cases with suspect of spina bifida occulta, (SBO), or Tethered cord, (TC), or in case of previous operations for posterior urethral valves, other congenital urological anomalies, an invasive urodynamic evaluation with cystometry and pressure-flow study, may be required. In this case a video-urodynamic evaluation will be the most indicated. Cases diagnosed later on in life (adolescence) may be considered also for nephrologic evaluation and possibly also for nuclear medicine renal scan (DMSA). Current management is based on biofeedback of the pelvic floor muscles and/or medication. New child friendly softwares, make it easy to attract interest from the young patients, who are interested in the interactive work of the PFM’s contraction/relaxation exercises. Usually 4 session of biofeedback succeed in improving symptoms. Should biofeedback be unsuccessful or partially successful, alfa-blockers such as tamsulosine and doxazosine are utilized also in children, with careful monitoring of the blood pressure and of the school performance and attention. Neuromodulation (PTNM) or neuromodulation at the level of S3 with neuromodulation implanted devices, are also a third line of treatment for these patients. As previously mentioned DV is frequently associated to bowel disturbances, with obstinate constipation or intermediate severity of constipation, with periodic episode of fecal impaction. This is called bladder and bowel disorder (BBD) a term recognized by the International Children Continence Society Standardization of Terminology Document, (2015 and 2016). Bowel disorders need always to be tackled ans resolved, before embarking in the management of the urinary issues. Details of Assessment, Management and comorbidities will be discussed.

Pelvic Floor Muscles Re-training and Urotherapy

Nelly Faghani, Physiotherapist, Canada

The treatment of pelvic floor dysfunction in the pediatric population is extremely under-serviced. These dysfunctions contribute to undo stress for the child and family and have significant consequences on quality of life. Also, pediatric bladder (and bowel) dysfunction can persist into adulthood; pelvic rehabilitation providers must direct attention to the pediatric population to improve the current and future health in our patient populations.

Physiotherapists are an important part of a multidisciplinary team in treating urinary tract symptoms and dysfunctional voiding in paediatrics. The assessment begins with a very detailed subjective history to determine the onset of the current problem. Evaluation of basic bladder and bowel habits can be further investigated by looking at a voiding diaries and fibre diaries. This is an extremely important outcome measure that will let us evaluate the fluid intake, contribution of bladder irritants, voiding frequency and habits, urinary or fecal urge and leakage, bowel frequency (note of type, straining or pain) and fibre intake. Appropriate outcome measures should be administered at regular intervals to monitor change throughout the treatment program.

The objective evaluation will include assessment of posture, breathing patterns and clearing of the lumbar spine and sacroiliac joints. Any overall muscle imbalances including over-activity or under-activity must be evaluated and subsequently addressed. The objective evaluation will also include doing a neurologic screen, assessing for scar tissue restriction, diastasis recti, and external visualization of the appropriate sphincter action, anal reflex and sensory testing. Biofeedback may be utilized to help
visualize recruitment and relaxation patterns of the pelvic floor muscles. Can the child activate the pelvic floor muscles without compensation (breath holding, adductors, gluts)? Are they able to effectively maintain this contraction (and for how long) and are they able to get back to their baseline resting tone (and is this a delayed relaxation)?

Once a problem list has been identified and short and long-term goals have been made, treatment strategies can include:

- Education on the anatomy and function of the lower urinary tract
- Behavioral modification including fluid intake, timed or scheduled voiding and avoidance of holding maneuvers
- Diet modification with emphasis on avoidance of bladder irritants, adequate water consumption and fiber intake
- Constipation management programs
- Education on toileting postures and positions, including double voiding
- Skin care and proper wiping
- Deep (diaphragmatic) breathing
- Neuromuscular reeducation of the pelvic floor muscles to improve awareness to ensure proper activation, relaxation, endurance and coordination (biofeedback)
- Global muscular strength and coordination
- Manual therapy to address external muscle over activity
- Postural education
- Mindfulness practice
- Cognitive Behavioral Therapy (CBT)
- Appropriate referral when indicated

Pelvic floor muscle retraining and Urotherapy are an integral part of the multidisciplinary approach to treating lower urinary tract symptoms and dysfunctional voiding in paediatrics. This functional approach can significantly improve symptoms and increase our patients overall quality of life into adulthood.

**Minimally Invasive Treatment and Surgical Options**

**Giovanni Mosiello, Italy**

Some new procedures with, minimvasive can be useful to consider in these patients after the failure of conservative treatment. The management strategies of incontinence in these children will be not defined by urodynamics studies and urinary tract imaging only, and in our experience a multidisciplinary approach is mandatory, with a team involving at minimum an urologist, urotherapist, psychologist. Lower urinary tract dysfunction have to be related to coexisting pathologies too, as well as quality of life. The separate classification of over or underactivity in both the detrusor and the urinary sphincter determines the pattern of bladder dysfunction and directs tailored management.

**Detrusor overactivity or decreased compliance during storage:**
- Detrusor underactivity during emptying:
- Sphincter overactivity during emptying:
- Sphincter underactivity during storage:

The most important urological advancement in NBD treatment in these years remains the use of onabotulinum toxin A that has revolutionized the treatment of overactive detrusor especially in neurogenic conditions. In the recent years onabotulinum toxin A has changed dramatically the treatment of NBD in adults and pediatrics in many centers the indications to bladder augmentation were dramatically reduced, and children have been treated with success and during time, avoiding bladder augmentation. In our experience onabotulinum toxin A confirmed its efficacy and safety as well as in the experiences of other colleagues. No severe complications were observed maybe due to our pre-intra and postoperative protocol treatment and only in 3 cases we observed persistent hematuria 24 hours longer. Botulinum toxina A safety was confirmed regarding the effects on bladder wall after repeated injections While this treatment seems to be more effective in bladders with detrusor muscle overactivity, scant data are reported on low-compliant high pressure bladders The most commonly used dose of botulinum toxin is 10 U/kg with a maximum dose actually still of 300 units, that of course will be reduced as in adults to 200 UI. Of course it is is unclear how many times this treatment can be repeated, although repetitive treatment has been found to be safe in children and in adults Histological studies have not found ultrastructural changes after injection. In the guidelines of the European Urological Association for Neurogenic Lower Urinary Tract Dysfunction the role of onabotulinumtoxin A is presented in a different way respect to ICCS document. Onabotulinum toxin could be a treatment alternativein other pathologies as PUV.

When NBD is associated to untreatable severe vesico-ureteral reflux (VUR), surgery is often required. In the past yearswe suggested a combined endoscopic injections of botulinum toxin type A (BoNTA) and dextranomer/hyaluronic acid (DxHA) as an effective minimally invasive treatment of VUR and NBD not responding to CIC and anticholinergics. Another very promising treatment option is Sacral neuromodulation (SNM), that was used extensively in adults. It has been suggested that sacral root stimulation facilitates bladder recovery, we have experienced sacral neuromodulation (SNM) in children with incomplete injury and SNM seems to be a promising therapeutic modality in selected ones. In some cases of severe dysfunction when there is a overactive sphincter patients have to perform CIC. and when patients, or their caregivers, are unable to catheterize the native urethra surgical alternatives have to be considered: urinary continent derivation according to Mitrofanoff’s principle, that can be performed laparoscopically. Recently good results were reported with button cistostomy using mini-invasive endoscopic insertion with a Mic-Key gastrostomy, button (Kimberly-Clark/Ballard,USA) was inserted endoscopically according to original Subramaniam’s technique. The mean overall operative time was 40 minutes, no surgical complications were reported. All the buttons are in situ, well working. No peristomal urine leakage, wound infection, erosion granuloma, were observed. Buttons were changed every 3 months and all relatives and patients are satisfied about urinary drainage, opening the
button and connecting it the feeding tube. Regarding bladder outlet insufficiency treatment, this may be well managed by bulking agents. Of course this a temporary treatment with a short term efficacy useful in pediatric population in order to postpone major surgical procedure. A valid option seems to be the laparoscopic bladder neck reconstruction according to Chrzan.
Lower Urinary Tract Symptoms in Paediatrics and Dysfunctional Voiding: A Functional Approach to Treatment

07:30 Introduction Giovanni Mosiello
07:35 Let’s All Talk the Same Language: Standardisation of Definitions and Terminology Selcuk Yucel
07:45 Dysfunctional Voiding in Children and Adolescents Mario De Gennaro
08:00 Pelvic Floor Muscles Re-training and Urotherapy Nelly Faghani
08:10 Minimally Invasive Treatment and Surgical Options Giovanni Mosiello
08:20 Questions

Affiliations to disclose:
Medtronic: consultant
Wellspect: consultant
Coloplast: consultant
Pfizer: PI in clinical trial
Ipsen: PI in clinical trial
Allergan: PI in clinical trial

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Institution funded
Sponsored by:

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Let's All Talk
The Same Language:
Standardisation
of Definitions and Terminology

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References


Why Standartization is Essential ?

Global Disease
Different Specialities and Subspecialities
Research (for Etiology and Management)
Diagnostic Work-up
Disease Classification
Academic Purposes
Good care of Children

Is Vigorous Work on Standartization Worthed ?

More Publications (Almost 50% every three years)
Widely Accepted Terminology (almost 4 fold)
No Geographical Tendency
Still way to go (25% not using standard terminology)

Bladder and Bowel Dysfunction (BBD)

Discourage Dysfunctional Elimination Syndrome since it points out a particular condition (Bowel and Bladder together).
BBD can be subdivided into LUT Dysfunction and Bowel Dysfunction.
If only both are present, BBD should be used.
Symptomatic Terms

Age:
Only >5 years of age for LUT symptoms
Only >4 years of age Bowel symptoms

However, younger ages could be selectively labelled as well, depending on maturation level.

Symptomatic Terms

Storage Terms:
Incontinence:
Involuntary leakage of urine

Voiding Terms:
Hesitancy:
Difficulty in initiating voiding
Straining:
Need for intense effort to increase intraabdominal pressure to initiate and maintain voiding
Weak Stream:
Observed stream or uroflow is weak
Intermittency:
Not continuous voiding but several stop and start spurts
Dysuria:
Burning or discomfort during voiding

Symptomatic Terms

Others:
Holding Maneuver:
Observable moves to postpone voiding or urgency

Feeling of incomplete emptying:
Not feeling empty after voiding and may return voiding again

Urinary Retention:
Inability to void despite distended bladder

Postmicturation dribble:
Involuntary leakage of urine right after voiding

Spraying of the urinary stream:
Spray/split of urine stream instead of single stream

Symptomatic Terms

Storage Terms:
Increased or Decreased Voiding Frequency:
8 or more times voiding daily
3 or less times voiding daily documented with a formal chart or diary

Urgency:
Sudden and unexpected compelling to urinate
Only after bladder control

Nocturia:
Has to wake up at night to urinate only

Symptomatic Terms

Genital and LUT Pain:
Bladder Pain:
Suprapubic discomfort, pain or pressure

Urethral Pain:
Pain felt in urethra

Genital Pain:

Pain in vagina or penis:
Vaginal irritation related to incontinence, Penile pair or episodic priapism related to full bladder, constipation or phimosis
Tools of Investigation

**Bladder Diary:**
- Complete bladder diary: 7 day incontinence episodes and night time urine volume measurement
- Frequency and volume chart: 48 hours (not necessarily consecutive 2 days)

**Bowel Diary:**
- 7 day bowel diary Bristol Stool Form Scale
- Constipation: Rome III criteria

**Questionnaires:**
- LUT Function Quest:
  - DVSS and PIN-Q
- Psychol Screening:
  - Child Behavior Checklist (CBL)
  - Strengths and Difficulties Quest of Behavior Assemt for Children (SDQ of BASC)
  - Short Screening Inst for Psychol Problems in Enuresis (SSPIE)

**Urine Flow Measurement**
- Toilet trained and >50% of EBC voiding and multipl With or without EMG
- Flow rate: Qmax over 2 sec and (Qmax)^2 > voided vol
- Curve Shapes:
  - Bell (Normal)
  - Tower (OAB)
  - Staccato (Dysfunctional)
  - Interrupted (Underactive)
  - Plateau (BOO)

**Curve Shapes:**
- Bell
- Tower
- Staccato
- Interrupted
- Plateau

**Pelvic Ultrasound** (EBC: (age+1)x30)

- VV+PVR:BC
  - PVR:
    - 4-6 y-o: Single PVR>30 ml or >21% BC
    - rePVR>20 ml or >10% BC
    - 7-12 y-o: Single PVR>20 ml or >15% BC
    - rePVR:>10 ml or >6% BC
  - Bladder should be btw %50-115% of EBC
  - PVR should be obtained <5 min of voiding

**Bladder Wall Thickness:**
- Normal values do not exist and differ with filling

**Rectal Distention:**
- >3 cm suggestive of fecal impaction

**Invasive Urodynamics:**

- **Cystometry (Filling Phase):**
  - Complete emptying of bladder
  - Filling rate 5-10% of EBC per min
  - Temp btw 25-37°C
  - Not prolonged instill if pain or pdet >40 cmH₂O

**Documentation of**
- Bladder sensation
- Detrusor activity
- Bladder compliance
- Bladder capacity

**Invasive Urodynamics:**

- **Cystometry (Filling Phase):**
  - Bladder sensation
  - Reduced or Absent

- **Detrusor activity:**
  - Any detrusor activity before voiding is abn
  - Detrusor overactivity is involuntary det contr

- **Spont or provoked**
- **Phasic or terminal**
- **Sympt or none**
- **Neurog or Idiopath**
Invasive Urodynamics:

Cystometry (Filling Phase)
Bladder capacity:
Cystometric capacity is bladder volume where normal desire to void
Maximum cystometric capacity is the volume where no longer to delay micturation
Bladder compliance:
Change of volume by Change of Pdet C: dV/dPdet
Note the curve of compliance
Should be linear until bladder is full

Invasive Urodynamics:
Voiding Cystometry (Pressure Flow Studies)
Detrusor Function during Voiding
Detrusor Underactivity
Reduced contr of det during voiding with incomplete emptying. Acontractile is no contr whatsoever. PFS is good a differ of BOO vs underactive bladder
Urethral Function during Voiding:
Dysfunctional voiding
Intermitent or fluctuating flow due to intermitent contract of muscles during voiding in neurol normal children. EMG or videoUD is required to differentiate from underactive detrusor with abdominal voiding
Detrusor Sphincter Dyssynergia (DSD)
Incoordination of det and urethral sphincter due to neurol disorder characterized by active EMG during detr contr. Spinning top urethra can be seen in both conditions.

Conditions/Diagnosis
Incontinence:
minimum age of 5y-o
minimum 1 episode in 1 month
minimum duration of 3 months
Significant if >1 episode in 1 month and 3 episodes in 3 months
Enuresis is frequent if >4 per week and infrequent <4 per week
Enuresis: a symptom or condition of intermittent incontinence during sleep.
Subgroups:
Monosymptomatic No LUT symptom
Non-monosymptomatic LUT symptoms
Secondary >6 months of dry period
Primary Less dry periods

Daytime Conditions/Diagnosis
BBD
Combination of bowel and bladder disturbances in neurol normal. If upper tract deformation occurs severe BBD called Hinman's syndrome
Overactive Bladder
Urgency frequency or nocturia with or without incontinence in absence of UTI. Detrusor overactivity is a UD term.
Voiding Postponement
Habitually postponing moves. Low frequency, urgency and incontinence from full bladder. Oppositional Defiant Disorder
Underactive Bladder
Children who raise abd pressure to void. Low frequency with interrupted flow and detrusor underactivity in UD

Dysfunctional voiding
Habitual contrac of sphincter or pelvic floor during voiding with staccato or interrupted flow where EMG is noted in neurol normal child
Bladder Outlet Obstruction
Impediment of urine flow by increased Pdet and low flow rate.
Stress Incontinence
Involuntary leakage of urine during exertion
Vaginal Reflux
Toilet trained girls complain about only day time incontinence right after voiding with no other LUT symptom related to urine entrapment in introitus
Daytime Conditions/Diagnosis

Giggle incontinence
extensive emptying or leakage only during laughter

Extraordinary daytime only urinary frequency
At least one time voiding per hour with <50% EBC (typically 10-15%) only during day. Exclude polydipsia, DMD, DI, polyuria, UTI or viral infection

Bladder Neck Dysfunction
Impaired or delayed opening of bladder neck resulting in low flow and normal to high Pdet. Prolonged opening time can be noted with UF with EMG. EMG lag time remains to be validated

Treatment
Definitions of Treatment Methods

No Standard/Maintenance Therapy but Define Them

Pharmacological Therapy or Surgical Therapy
Use of Drugs or Surgery

Neuromodulation
Alteration and Modulation of Nerve Activity through central and peripheral electrical stim or chemical agents to target sites

Alarm Treatment
A device giving a strong sensory signal immediately after an incontinence episode and can be used day or night

Treatment
Definitions of Treatment Outcome

Initial Success

No Response: <50% reduction
Partial Response: 50-99% reduction
Complete Response: 100% reduction

Long term Success
Relapse: More than one symptom recurrence per month
Continued Success: No relapse in 6 months after stopping treatment
Complete Success: No relapse in 2 years after stopping treatment
W2. Lower Urinary Tract Symptoms in Paediatrics and Dysfunctional Voiding: A Functional Approach to Treatment

Dysfunctional Voiding in Children and Adolescents

Mario De Gennaro

Affiliations to disclose:
No disclosure

Funding for speaker to attend:
☑ Self-funded
☑ Institution (non-industry) funded
☒ Sponsored by: Wellspect

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ICCS - Paediatric Continence Care
In collaboration with Continence Foundation of Australia

Urinary Incontinence: from Childhood to Adulthood

Participants: 2109 women aged 40 to 69 yrs
Results:
- Frequent nocturia in childhood was strongly associated with adult nocturia (OR 2.3; p < 0.001)
- Childhood daytime incontinence was associated with adult urge incontinence (OR 2.6; p < 0.05), as was childhood nocturnal enuresis (OR 2.7; p < 0.01)
- A history of more than 1 childhood UTI was associated with adult UTIs (OR 2.8; p < 0.001)

L 701 – Transitional Care

Effect of Childhood Dysfunctional Voiding on Urinary Incontinence in Adult Women

Participants: 84 women urogynae outpatient clinic and 86 controls
Results: Higher prevalence of a history of childhood dysfunctional voiding in women with current
- frequency (OR 2.48, P = 0.004)
- urgency (OR 2.02, P = 0.03)
- SUI (OR 2.21, P = 0.01)
- and UUI (OR 2.48, P = 0.009)
L 105 – Bladder/Bowel Dysfunction

Conditions – LUT Symptoms
- OAB / urge incontinence
- Voiding postponement
- Dysfunctional voiding
- Underactive bladder
- Obstruction

Definition
- “The child with dysfunctional voiding (this phrasing is preferred instead of voiding dysfunction) habitually contracts the urethral sphincter during voiding. The term cannot be applied unless repeat uroflow measurements show curves with a staccato pattern, or unless verified by invasive urodynamic investigation”

Normal Lower Urinary Tract Function

Dysfunctional Voiding at Uroflowmetry/EMG

Staccato
- Synergic sphincter relaxation
- Not getting to 0

Interrupted
- EMG overactivity
- Getting to 0
Assessment
• Diaries
• Uroflow – EMG – PVR

– Phys. Exam – normal genital, perineum, back, lower extremities
(exclude neurogenic bladder)

Charts/questionnaires
Frequency volume chart
Voiding diary
Bowel diary
Scoring systems for childhood LUTS
To be repeated

Uroflow
Non-invasive
To be done according to ICCs guidelines with adequate filling
Describes voided volume, post void residual, flow rate and pattern
Measures Qmax, Qave
Helps identify voiding disorders, cannot diagnose on one flow study
Simultaneous EMG of PFM
Used a measure of success of intervention

Normal bladder function

Overactive bladder

Dysfunctional voiding
Dysfunctional voiding

- Definition
  - disorder of emptying, NOT a disturbance of LUT function
  - ext. sphincter contraction during voiding → ↓ detrusor reflex & slow uroflow
  - May coexist with storage disorders

Non pharmacologic treatment

- Urotherapy measures
  - Education, bowel management, drinking, voiding regimes, diaries, outcome measures
  - Toilet posture/relaxed voiding techniques
  - Comprehensive BFB programs – EMG, flowrate
  - Neuromodulation
  - CIC
  - Antibiotics if recurrent UTI
  - Behavioural or psychiatric co-morbidities addressed concurrently

Dysfunctional voiding → Severe Dysfunctional Voiding (underactive detrusor)

- Consequences
  - high bladder fill pressure → reflux, renal damage
  - post void residual → recurrent UTI

- Symptoms & Signs indicating further testing
  - Straining to void +/− overflow incontinence
  - Prolonged, unsustained detrusor contraction
  - Intermittent, staccato uroflow
  - Large bladder (sensation disturbed)

Detrusor Underactivity:
- associated with altered perception of bladder volume
- not necessarily diminish detrusor contrattility

Severe Dysfunctional Voiding
Underactive detrusor

ICCS Standardization & Definitions

Educational Committee Chair
(Mario De Gennaro)

- Beer, 1915: Apathetic children
- Laidley, 1942: Achalasia
- Paquin, 1963: Megacystis Syndrome
- Williams, 1969: Occult Neuropathic Bladder
- Hinman, 1970-73: Non Neurogenic Neurogenic Bladder
- Hanna, 1981: Pseudo Neurogenic Bladder
- Hinman, 1986: Hinman’s Syndrome

P Smith, 2014

First Sensation: something in your bladder
First Desire: first thought to empty
Strong Desire: would interrupt what are doing
Dysfunctional voiding and detrusor underactivity

- CIC
- Bowel management and UTI prevention
- Voiding regime and fluid management
- Prevention of nocturnal bladder distension – high Volume
- Little evidence for management
- From experience

Pressure Bladder Volume (PVR)

Dependent Obstruction

Little pressure + high volume can damage kidneys
... thus, drain urinary tract

Underactive Bladder - Treatments

- Urotherapy (II level)
  - FKT – pelvic floor
  - Double voiding regimes
  - BFB
  - Neuromodulation (peripheral)
- Drugs
  - Alpha blockers
  - Botulin toxin
- Neuromodulation – sacral implant

Dysfunctional voiding

→ Severe Dysfunctional Voiding
(underactive detrusor)

- Consequences
  - if high bladder fill pressure → reflux, renal damage
  - if post void residual → recurrent UTI
The bladder and the bowel - partners in crime -

Dysfunctional voiding / (Elimination Syndrome)

- Dysfunctional Elimination
  - Coexistence of urinary & fecal retention
- Consequences
  - Rectal & abdominal distension with pain
  - Disorders of filling

Thank you
Grazie
Arrivederci a Roma

Topics
- LUTS
- Enuresis
- Urodynamics
- Neurourology
- Urotherapy
- Neuromodulation
- Drugs for Continence
- Surgery for Continence
- Urinary Tract Infections (UTI)
- Bowel and Bladder Dysfunction
- Neurogenic Bladder & Bowel in Children & Adolescents

ICCS 2018
26-29 September
Meeting Chair
Maria De Simone

Workshops & Educational Courses
Workshops on Urodynamics & on Urotherapy | 26 Sep 2018
Bladder & Bowel Dysfunction in Children toward Adults | 27 Sep 2018
Call for Abstracts: Panels & Lectures

www.iccs2018.info
CNS Control over Lower Urinary Tract Function

Background

- Overlooked
- True epidemiology unknown
- 4.2%–32% children with wetting problems
- Multi-factorial aetiology
- Learned unconscious behaviour, maturational delay, perpetuation of infantile patterns, congenital
- Co-exist OAB –compensating EUS/PFM
- Assoc >PVR, UTI, detrusor hypertrophy, trabeculated bladder, VUR, upper tract damage
- Bladder decompenstion and hypocontractility – CIC
- Associated bowel dysfunction

Daytime urgent UI – 2.5y boy Toilet training at age of 2y – Large bladder

Dry in the night. Uroflowmetry: normal bell shape PVR <5ml.

Q1: What is your interpretation for voiding diary? Q2: what is your treatment plan?

Interpretation of Voiding Diary:

Q1: Polyuria and Large VV
Q2: Treatment plan
  → Fluid restriction and timed voiding
  → Stop beating the child when he wetted the pants.

Clinical Outcomes

- Quickly became dry in one week and persistent dry thereafter.
- Lessons: Large bladder capacity may be related to Urgent UI in children
Pelvic Floor Muscles Re-training and Urotherapy

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• Paediatric population extremely under-serviced

• As children grow older, UI is seen as seen as more of a burden Schulpen 1997 and levels of parental intolerance increase Butler et al 2002

• Significant consequence on quality of life Fan et al 2008

• Paediatric bladder (bowel) dysfunction can persist into adulthood

Questionnaires
(The Standardization of Terminology of LUT Function in Children and Adolescents: Update Report From the Standardisation Committee of the International Children’s Continence Society 2015)

• LUT
  – Dysfunctional Voiding Symptoms Score (DVSS) Farhat et al 2000
  – Pediatric Urinary Incontinence Quality of Life Score (PIN-Q) Bower et al 2006

• Psychological
  – Short Screening Instrument for Psychological Problems in Enuresis (SSIPPE) Van Hooeck et al 2007

Effects of Urinary Incontinence (UI)


• Children who experience anxiety causing event may have a higher risk of developing UI, and in turn having incontinence causes significant stress and anxiety in children Thibodeau et al 2013

• Adolescents with UI reported a range of psychosocial problems and clinicians should be aware that they might require support from psychological services Grzeda et al 2017
**Constipation**

- Constipation accounts for 3% visits to paediatrician and 25% to paediatric gastroenterologist (Bharucha et al 2006, Drossman 1999)

- Urinary incontinence (and faecal incontinence) are significantly more common in children with constipation (Loening-Bauke 2007)

- Treatment of constipation can resolve UI (Erikson et al 2003, Loening-Bauke et al 2007, 1997)

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**Physiotherapy Objective Assessment**

- **Central Nervous System**
- **Respiratory Function**
- **Pelvic Floor Function**
- **Global Contributors**

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**Urotherapy**

(The Standardization of Terminology of LUT Function in Children and Adolescents: Update Report From the Standardization Committee of the International Children’s Continence Society 2015)

- Information and demystification
- Instruction on how to resolve LUT dysfunction
- Life-style advice
- Registration of symptoms and voiding habits
- Support and encouragement
- Specific intervention

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**Bladder and Bowel Diaries**

- **Diaphragmatic Breathing Exercises and Pelvic Floor Training with Dysfunctional Voiding (DV) (Zivkovic 2012)**

  - **Aim**: to investigate the role of abdominal and pelvic floor muscle training in children with DV
  - **Conclusions**: In combination with standard urotherapy, abdominal and pelvic muscle training is beneficial for curing UI, nocturnal enuresis and UTI’s in children with DV as well as normalizing urinary function
Physiotherapy Treatment

• Re-education of the PFM
  — Biofeedback Chase et al 2010
  • Contraction
  • Relaxation
  • Coordination
• Manual therapy
  — External muscle over activity
  — ILU massage
• Parasacral TENS Lordelo et al 2010, PTNS Capitanucci et al 2009
• Global muscular strength and coordination

Combined Functional Pelvic Floor Muscle (PFM) Exercises with Swiss Ball & Urotherapy for Management of Dysfunctional Voiding in Children Ladi Seyedian et al 2014

• Conclusion: Functional PFM exercises with Swiss ball combined with behavioral urotherapy proved as safe and effective therapeutic modality, reducing the frequency of urinary incontinence, post void residual and the severity of constipation in children with dysfunctional

Summary

• Multidisciplinary approach
• Motivate to improve compliance
• Education on treatment options
• Pelvic floor training and urotherapy are effective
• Be creative, use incentives and rewards
• Increase confidence
• Give hope and self-efficacy

Thanks you
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Acknowledgements:
Dawn Sandalcidi DSD PT
Minimally invasive treatment and surgical options in dysfunctional Voiding.

Giovanni Mosiello

### Severe Dysfunctional Voiding

<table>
<thead>
<tr>
<th>AUTHOR, YEAR</th>
<th>PTs</th>
<th>Mean age yrs</th>
<th>F-UP yrs</th>
<th>ICC n.</th>
<th>Vesicotomy</th>
<th>Bladder Augm</th>
<th>Renal failure</th>
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<tr>
<td>Hinman, 1973</td>
<td>14</td>
<td>9.7</td>
<td>ND</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>ND</td>
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<td>Allen, 1977</td>
<td>21</td>
<td>ND</td>
<td>ND</td>
<td>0</td>
<td>ND</td>
<td>4</td>
<td>5 (24%)</td>
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<td>Jayanthi, 1997</td>
<td>7</td>
<td>&lt;1</td>
<td>ND</td>
<td>6</td>
<td>7</td>
<td>3</td>
<td>2 (28%)</td>
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<td>Yang, 1997</td>
<td>27</td>
<td>12</td>
<td>4.1</td>
<td>8</td>
<td>1</td>
<td>5</td>
<td>5 (18%)</td>
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<tr>
<td>Handel, 2003</td>
<td>4</td>
<td>14.5</td>
<td>5.0</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>0</td>
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<tr>
<td>Kari, 2006</td>
<td>4</td>
<td>4.3</td>
<td>ND</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4 (100%)</td>
</tr>
<tr>
<td>Al Mosawi, 2007</td>
<td>7</td>
<td>6</td>
<td>ND</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>2 (28%)</td>
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<tr>
<td>Silag, 2011</td>
<td>22</td>
<td>9.1</td>
<td>6.7</td>
<td>22</td>
<td>0</td>
<td>8</td>
<td>1 (4%)</td>
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### Treatment:

- Onabotulinum toxin A
- Sacral Neumodulation
- Surgery

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**Onabotulinum Toxin A targets both the afferent and efferent pathways**

- **Efferent pathway**
  - Blocks parasympathetic neurotransmission at prejunctional nerve terminals
  - Reduced parasympathetic nervous system activity
  - Blunting reflex vasomotor and detrusor hyperreflexia

- **Afferent pathway**
  - Blocks release of neurotransmitters associated with sensoryafferent pathways
  - CGRP
  - Substance P

**Treatment benefit:**
- Detrusor muscle relaxation
- Reduced urgency

**Onabotulinum Toxin A** is an innovative treatment for OAB with a dual mechanism of action.

**Blocks**
- Peripheral sensitization
- Sensory hyperalgesia maintained as bladder distends

**Treatment benefit:**
- Reduced urgency
Botox External sphincter injection

- Steinhardt, J Urol, 158: 190, 1997
- Mokhless et al, J Urol, 176: 1767, 2006

Onabotulinum toxin A is effective

Botox injection PEDIATRICS OAB

The Effect of Botulinum-A Toxin In Incontinent Children With Therapy Resistant Overactive Detrusor

Hoebeke et al, J Urol, 176: 328-331, 2006

Recommendations on the Use of Botulinum Toxin in the Treatment of Lower Urinary Tract Disorders and Pelvic Floor Dysfunctions: A European Consensus Report

Children

OAB LoE 3
Dosage determined by body weight:
5 – 10 UI/kg up to 300 U Botox *
Older than 3 years
Effective and safe

Sphincter LoE 3

Long-Term Efficacy and Durability of Botulinum-A Toxin for Refractory Dysfunctional Voiding in Children


- 12 with dysfunctional voiding who underwent botulinum toxin A injection to the external urinary sphincter.
- Mean patient age at surgery was 10.5 years (range 4 to 19).
- Average follow-up was 45 months (range 20 to 71).
- Eight of the 12 children (67%) experienced significant improvement.
- Half of the cohort required a second injection an average of 15 months later.
- Three of the 4 patients who failed to show improvement had neuropsychiatric problems and 1 had evidence of bladder underactivity.
- Conclusions reasonable efficacy and durability of intrasphincteric botulinum toxin A injection in children with refractory dysfunctional voiding.
OnabotulinumtoxinA
PEDiatric IDO

- Few studies in pediatrics
- Side effects: CIC risk
- ANAESTHESIA
- UTI?
- Phase III clinical trial in Pediatrics is on the road
- A future RADICAL CHANGE IN THE TREATMENT OF IDO IN PEDIATRICS AS FOR NDO?

Specialised Management of Urinary Incontinence in Children

**CONCEPT:** NM, applied in urology to chronic diseases, modules the reflexes pathways which control the activity of:

- Detrusor
- Rectum
- Pelvic floor
- sphincters

- Overactive bladder
- Dysfunctional voiding
- Underactive bladder (lazy bladder)
- Neurogenic bladder dysfunction
- Foecal incontinence
- Chronic constipation

Current State of Nerve Stimulation Technique for Lower Urinary Tract Dysfunction in Children

Mario De Girolamo, Maria Luise Capriotti, Giuseppe Mosello, and Antonio Zanara

**Table 1 - Included studies.**

A pooled success rate of 68% for the test phase and of 92% for permanent SNM as well as a pooled adverse event rate of 0% for the test phase and of 24% for permanent SNM
Preliminary results of sacral neuromodulation in 23 children
Journal of Urology 2006

- 23 patients tested (6 to 15 years of age), 21 pts with definitive implant, mean FU 13.3 months
- symptoms of dysfunctional voiding, enuresis, incontinence, UTIs, bladder pain, urinary retention, urgency, frequency, constipation and/or fecal soiling.
- Of the 19 patients with UI 16% had complete resolution, 68% had improvement, 11% had no change, 5% noted worsening of their UI.
- Preoperatively, 6 patients with urinary retention (NOUR) required treatment with CIC 3 to 4 times daily. Of these patients 2 (33%) no longer required CIC, while 4 remained on self-catheterization.

Roth TJ, Vandersteen DR, Hollatz P et al., J Urol 2008
Sacral neuromodulation for the dysfunctional elimination syndrome: a single center experience with 20 children

- SNM in 20 children with urinary retention
- Less invasive, innovative technique using limited fluoroscopy and surgical incisions with a low complication rate.
- At 1 to 2 years’ follow up the resolution/improvement rate ranged from 40% to 50% (constipation and nocturnal enuresis) to 80% to 90% (frequency, UI).
- Urinary retention was resolved in 1 of 4 children.

In conclusion: The short term improvement in symptoms and QoL study suggest that the SNS may be a promising therapy in pediatric patients with both gastrointestinal and urinary dysfunction that has been refractory to standard medical management.
Sacral Neuromodulation in Children

- sacral abnormalities: sacral roots and foramen?
- future need for MRI
- dislocation for traumas (children / adolescents)
- statural growth

CIC

Level of evidence 4
Grade of Recommendations C
CONCERN

Introduction

Gastrostomy button is a continent catheterizable LATEX FREE device used to deliver enteral nutrition.

In 1996 De Badiola at al., firstly used a Bart Gastrostomy kit for temporary closure of vesicostomy in children after urodynamic evaluations.

PATIENTS & METHODS

35 pts
- 19 males
- 16 females
- Mean age: 8.84 ± 5.1 yrs

Previously bladder drainage
- CIC 45.7% (16/35)
- Suprapubic cystostomy indwelling tube 42.9% (15/35)
- Nephrostomy 2.9% 1/35

Mosiello G, J Urology 2017

RESULTS

<table>
<thead>
<tr>
<th>Author</th>
<th>N (Pts)</th>
<th>Technique</th>
<th>Complications</th>
<th>Mean follow-up</th>
<th>Satisfaction</th>
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<tbody>
<tr>
<td>De Bruijn (1990)</td>
<td>12</td>
<td>Open</td>
<td>None</td>
<td>30 days</td>
<td>Not Evaluated</td>
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<tr>
<td>Waleed (2007)</td>
<td>17</td>
<td>Laparotomy</td>
<td>1 wound infection, 4 leakage after the inlay period</td>
<td>16 months</td>
<td>Yes</td>
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<td>Brockenbrough (2008)</td>
<td>30</td>
<td>Open</td>
<td>2 U, 1 T and leak, 2 Bladder infection, 1 Bladder fistula, 1 Leakage</td>
<td>12 months</td>
<td>Yes</td>
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<tr>
<td>Mohan (2008)</td>
<td>14</td>
<td>Percutaneous</td>
<td>None</td>
<td>11 months</td>
<td>Yes</td>
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<tr>
<td>Lameen (2015)</td>
<td>21</td>
<td>Percutaneous</td>
<td>1 Bladder fistula and peritonitis, 1 UTI</td>
<td>12 months</td>
<td>Yes</td>
</tr>
<tr>
<td>Mohan (2012)</td>
<td>21</td>
<td>Open</td>
<td>1 U, 2 bladder fistula, 3 leakage</td>
<td>27 months</td>
<td>Not Evaluated</td>
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</table>

Our Series
- Open and percutaneous
  - 1 Bladder abscess, 1 U, 1 T, 1 UTI
  - Minor complications: 1 bladder leakage and 1 UTI
  - Difficulty in bladder opening and 1 UTI

Diagnoses
- 91.4% (32/35) presented neurogenic bladder
- 8.6% (3/35) presented NOUR

Discussion

Several papers in literature demonstrated the safety and efficacy of button cystostomy. Button cystostomy has demonstrated to present mostly minor long term complications represented by UTI, leakage, button decubitus, button side infections.

Mitrofanoff’s Principle: Appendico-cutaneo-stomy

- Careful identification of vascular pedicle
- Deconnect from caecum
- Reimplant distal end in the bladder
- Reimplantation of appendix in bladder
- Lich Gregoir technique
- Minimal 2 cm length
- Stoma through rectus muscle!!

Letter to the Editor

For laparoscopic Mitrofanoff procedure in children, surgery seems to be effective for myelomeningocele dysraphism

In conclusion we agree with Authors suggestion to develop the use of LN in the future, anyway we suggest to remember that surgery (open, laparoscopy or robotic) is only one part of the treatment of NBD.

G Mosiello, 2015
CONCLUSIONS

• A wide therapeutic choice available to clinicians.
• Many of the commonly used treatments are of dubious value and have not been rigoursly evaluated in careful clinical trial.
• Children who suffer of these distressing condition and their familieis need clear guidance in order to have protection by treatments which do not work.

CONCLUSIONS

• Targeted approach optimizes treatment
• In presence of no-responders consider other treatment but first of all re-consider your diagnosis
• Onabotulinumtoxin and SNM are effective in selected cases: treatments with Level of evidence 3, Grade of recommendations C
• Surgery must be the last step