

Time	Topic	Speakers
10	Care of sacral area dysfunctions: From survival to quality of life	Michele Spinelli
15	Neurogenic bladder and bowel: Knowledge of the urologist about bowel	Julien Renard
15	Neurogenic bladder and bowel: Knowledge of the coloproctologist about bladder	Anton Emmanuel
15	Relationship between UTI and bowel function	Michele Spinelli
10	Neuromodulation and neurostimulation treatments: Timing and expected results	Julien Renard
10	Neuromodulation and neurostimulation treatments: Emerging new approaches	Gianluca Sampogna

Aims of Workshop

The aim of the course is to explore and discuss the interactions between lower urinary tract and gastrointestinal tract under both physiological and pathological conditions. Diseases in one of the organs may provoke alterations in bladder-bowel cross-talk, underlying clinical co-morbidity of bladder and bowel dysfunctions. Patients with neurological disorders may present altered cross-reflexes, which represent potential targets to plan and perform effective treatments, ranging from transanal irrigation to sacral neuromodulation.

At the conclusion of this activity, participants will be able to recognize alterations in bladder-bowel interactions, assess them appropriately, and re-establish physiological bladder-bowel communication.

Learning Objectives

1. To outline and discuss interactions between bladder and bowel under both physiological and pathological conditions.
2. To plan and organize an appropriate diagnostic work-up in patients affected by neurogenic bladder and bowel dysfunction.
3. To criticize and perform clinical decisions to re-establish physiological bladder-colon cross-talk, reducing fecal and/or urinary incontinence, urinary tract infections, and abdominal hyperalgesia, thus improving quality of life in neurogenic patients

Target Audience

Urology, Urogynaecology and Female & Functional Urology, Bowel Dysfunction, Basic Science, Conservative Management

Advanced/Basic

Advanced

Suggested Learning before Workshop Attendance

- 1) Malykhina AP, Wyndaele JJ, Andersson KE, De Wachter S, Dmochowski RR. Do the urinary bladder and large bowel interact, in sickness or in health? ICI-RS 2011. *Neurourol Urodyn*. 2012 Mar;31(3):352-8. doi: 10.1002/nau.21228.
- 2) Spinelli M., Rizzato L., Renard J., Frediani L. A simple morpho-functional evaluation leads to a high transanal irrigation success rate in neurogenic bowel management. *Pelviperrineology*. 2016;34(4):124–128.
- 3) Thaha MA, Abukar AA, Thin NN, Ramsanahie A, Knowles CH. Sacral nerve stimulation for faecal incontinence and constipation in adults. *Cochrane Database Syst Rev*. 2015 Aug 24;(8):CD004464. doi: 10.1002/14651858.CD004464.pub3.

1. Bliss, D.Z. (Ed.). (2018). *Management of Fecal Incontinence for the Advanced Practice Nurse*. Paris, FR. Springer.
2. Krames, E., Peckham, P.H., Rezai, A.R. (Eds.). (2018). *Neuromodulation: Comprehensive Textbook of Principles, Technologies, and Therapies*. Elsevier: Academic Press.
3. Nair, K., González-Fernández, M., Panicker, J. (Eds.). (2018). *Neurorehabilitation Therapy and Therapeutics*. Cambridge: Cambridge University Press.

Care of sacral area dysfunctions: From survival to quality of life - Michele Spinelli

Pelvic physiological function depends on the coordinated communication between lower urinary tract (LUT) and distal gut. Indeed, bladder and bowel share embryological origin (they both arise from the cloaca), are anatomically adjacent to each other, share the pelvic floor structures, have common autonomic and somatic innervation from the spinal cord, present a similar function of storage/evacuation of, respectively, urine and feces. The pelvic cross-sensitization is conveyed by neural, endocrine, paracrine and immune mechanisms. Pathological changes in one of the organs may provoke alterations in bladder-bowel cross-talk, underlying clinical co-morbidity of bladder and bowel dysfunctions. Experimental data coming from both human and animal studies identified different specific cause-and-effect links. The comprehension of these altered cross-reflexes helps to identify potential targets to plan and perform effective treatments in patients with concomitant bladder and bowel disorders.

Several studies assessed the impact of bladder, bowel and sexual impairments, highlighting these sacral dysfunctions as really invalidating ones. Snoek et al. (2014) delivered a specific survey to assess the percentage of subjects who expected an important or very important improvement in quality of life (QoL) related to a possible improvement in different impairments and disabilities. They included four groups, made up of Dutch paraplegics (n=269) and tetraplegics (n=134), together with UK paraplegics (n=641) and tetraplegics (n=431). All respondents defined bladder and bowel management as impairments having a major impact on QoL. The symptoms related to sacral area dysfunctions proved to have a substantial negative impact on QoL, social integration, and personal independence, resulting in embarrassment, anxiety, loss of independence and dignity, depression, social isolation, and loss of sexual relationships.

Finally, the mechanisms underlying the cross-talk between bladder and bowel under physiological and pathological conditions are complex and partially known. The care of all sacral area dysfunctions is more effective than the treatment of a single pelvic organ disorder in terms of comorbidities, complications, survival rate, and QoL.

Relationship between UTI and bowel function - Michele Spinelli

Urinary tract infections (UTIs) represent one of the most pressing medical problems in the world. There is a global crisis of antibiotic resistance, and resistant UTIs are on the rise. In this scenario, clinicians play a pivotal role in reducing unmotivated antibiotic administration and removing the predisposing conditions which favour UTIs.

One of the most important risk factors for recurrent UTIs is represented by bowel dysfunction. All clinicians should be aware of this relationship to investigate properly bowel function in each case of recurrent UTIs, especially when urine cultures reveal microorganisms being part of the intestinal microflora, i.e. E. coli. In these cases, the re-establishment of a physiological bowel function may determine the definitive treatment of recurrent UTIs.

As for patients with LUT dysfunctions, UTIs are quite common. The indication for antibiotic therapy is represented by the presence of symptoms, like fever, pyuria, autonomic dysreflexia etc. Indeed, the UTI treatment with antibiotics may cause bowel problems, which favour UTIs, establishing a vicious circle. Individuals with spinal cord injury proved to develop life-threatening complications related to antibiotic administration, like the pseudomembranous colitis caused by the Clostridium difficile toxin.

Take home message: The cross-talk between bladder and bowel should always be considered during routine clinical practice to assess, diagnose, treat, and follow people with neurogenic LUT and bowel dysfunctions.

Neurogenic bladder and bowel: Knowledge of the coloproctologist about bladder - Anton Emmanuel

Neurogenic bladder and bowel: Knowledge of the urologist about bowel - Julien Renard

The bowel function is a key part of urological consultation for LUT symptoms. Indeed, urological problems may be the expression of concomitant bowel dysfunctions (i.e. overactive bladder [OAB] may be the result of ab extrinseco bowel compression due to significant chronic constipation).

Therapeutic actions in one system may improve, but also worsen symptoms in the other. In children, it is common to solve urinary incontinence by treating constipation and, in this way, prevent recurrent UTIs.

Conversely, the OAB treatment with bladder relaxing drugs may solve urinary incontinence, and cause/worsen chronic constipation with associated fecal incontinence. Proper risk-benefit issues should always be discussed with patients, and urologists should consider alternative therapies for OAB, like intravesical injections of botulinum toxin.

Similarly, the bladder enlargement/replacement with bowel segments has the risk of severe side effects in both (neo)bladder and bowel.

De Wachter et al. (2003) assessed the sensation of bladder filling during two consecutive cystometric studies, including one with an empty rectum and one with a full rectum, in 15 healthy female volunteers. They highlighted sensations of bladder filling were reported at smaller volumes when the rectum was distended, and electrical perception thresholds in the bladder were higher when the rectum was full.

Since urologists are usually the principle providers in the clinical setting to address bowel concerns, urologists should master the bowel function assessment and administer first-line treatments: lifestyle advice, diet, establishment of a routine for bowel care, adjuvant techniques (e.g. abdominal massage), medications, suppositories, and enemas. In case of failure, urologists should promptly address patients to specialized coloproctologists for second-line treatments.

Neuromodulation and neurostimulation treatments: Timing and expected results - Julien Renard

Sacral neuromodulation (SNM) consists of placing an electrode – usually – through the S3 sacral foramen to deliver regular impulses. Indications for SNM include non-obstructive urinary retention, idiopathic overactive bladder, and chronic fecal incontinence. SNM may re-establish physiological bladder-bowel communication, so it is commonly performed by urologists in case of dysfunctions affecting both bladder and bowel.

Valid success rates are observed in idiopathic LUT and/or bowel dysfunctions. In case of progressive neurogenic conditions, a risk-benefit analysis should be performed prior to proceed with surgery. The exact timing is a matter of debate, even if a delayed indication may be irretrievably detrimental for pelvic organs. Therefore, all clinicians involved in the treatment of neurogenic LUT and/or bowel dysfunctions should promptly recognize patients who can benefit from this treatment.

Take home message: A patient-tailored approach considering bladder and bowel as a unicum is mandatory for urologists to treat neurogenic LUT dysfunctions.

Neuromodulation and neurostimulation treatments: Emerging new approaches - Gianluca Sampogna

Several treatments based on neuromodulation and neurostimulation have been developed over the years to improve both bladder and bowel functions.

To start with, SNM is currently the most used solution. The definitive implant may be preceded by a peripheral nerve evaluation (PNE), placing a temporary lead through a sacral foramen between S2 and S4 (preferably S3) for 1-2 weeks. This is performed because the definitive implant is expensive, and current predictive indices may fail to evaluate the final patients' responses. In case of $\geq 50\%$ improvement in symptoms, the patient undergoes the final implant, which is usually achieved by two procedures: in the first stage, a permanent quadripolar tined lead is placed approaching the temporary electrode position; in the second stage, the implantable pulse generator is attached to the electrode and placed in a subcutaneous pocket at the buttock level. SNM is successfully used to restore bladder-bowel cross-talk predominantly by a neural mechanism. Leroi et al. (2011) reported 30- 100% of patients with double incontinence experienced improvement in both urinary and faecal incontinence at medium-term follow up. However, SNM has been partly investigated in neurogenic sacral dysfunctions for several reasons over the years. The common devices for SNM are approved for 1.5 Tesla MRI head scans. Therefore, SNM was poorly implanted in patients who require a regular monitoring with spinal MRI (i.e. in case of multiple sclerosis). However, novel platforms overcome this limit. Another problem related to SNM is represented by significant variations and anomalies of sacral nerves in patients with myelomeningocele or after pelvic trauma. In these cases, standard S3 stimulation may be challenging. Sievert et al. (2010) performed a pilot study to evaluate the early implantation of bilateral sacral nerve modulators during the acute bladder areflexia phase in complete spinal cord injury (SCI). They observed improved urinary and bowel outcomes in 10 patients undergoing this treatment compared to 6 controls.

In the 1970s, Brindley introduced the sacral anterior root stimulation (SARS) in people with SCI. The first surgical step is represented by a laminectomy of L4-S2. After opening of the dura, the nerve roots from S2 to S4/S5 are isolated and divided into dorsal and anterior roots. The anterior roots are placed within the stimulator, while the dorsal roots are sacrificed. The sacral deafferentation avoids detrusor overactivity and detrusor sphincter dyssynergia. Cables are tunnelled through to the anterior part of the thorax or abdomen and connected to the receiver, which is controlled by patients through a wireless device. The SARS enables micturition, and distal colon peristalsis due to common innervation. However, it may be associated with a simultaneous anal sphincter contraction, which will block direct emptying during stimulation. In addition, novel approaches should avoid the irreversibility of sacral deafferentation.

As for posterior tibial nerve stimulation (PTNS), there is limited evidence for its effectiveness in neurogenic sacral dysfunctions. Non-invasive methods, like peripheral electrical stimulation and magnetic stimulation, can be applied as outpatient procedures or home stimulations without requiring surgery, and are currently attractive considering potential treatments with neuroregeneration or nerve transplantation.

Take home message: Novel emerging solutions, based on neuromodulation and neurostimulation, should overcome the limits of standard SNM, and be associated with safe, efficient, easy-to-implant, durable, MRI-safe, and cost-effective devices.