

**S1.S.01: External urethral sphincter injections with botulinumtoxin a in patients with neurogenic detrusor sphincter dyssynergia without spinal cord lesions: a retrospective study**

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**Introduction:** Botulinumtoxin A (BoNT-A) injections into the external ure-thral sphincter (EUS) is an established therapeutic procedure to reduce bladder outlet obstruction in neurogenic patients with detrusor-sphincter-dyssynergia (DSD) due to spinal cord injury (SCI). Given the paucity of data in patients with DSD but without SCI, we aimed to assess the efficacy of transperineal electromyography (EMG) directed EUS injections with BoNT-A in a cohort of patients with suprapontine cerebral lesions.

**Methods:** For this retrospective study, we screened all patients who underwent their first BoNT-A injection into the EUS at the clinic for neurorehabilitation and paraplegiology in Basel between 2015 and 2021. Inclusion criteria were patients aged 18 years or older with neurogenic detrusor overactivity (NDO) and DSD with a maximum detrusor pressure (Pdetmax) during voiding of at least 40 cmH<sub>2</sub>O, confirmed by urodynamic studies (UDS). Of these, patients with SCI were excluded. Primary outcomes were a reduction in Pdetmax during voiding and post-treatment detrusor over-activity leak point pressure (DOLPP). Secondary outcome was a reduction of patients relying on indwelling urinary catheters post-treatment.

**Results:** Our retrospective chart analysis revealed 13 eligible male patients (median age 31 years), with different underlying suprapontine disorders (trau-matic brain injury = 6, hypoxic/septic encephalopathy = 3, other = 4). All patients underwent EMG triggered BoNT-A injections with either 100 (n = 7) or 150 (n = 6) units, respectively. Pdetmax during voiding was significantly lower post-BoNT-A (median 105 vs. 54 cmH<sub>2</sub>O, p=0.006), whereas DOLPP remained unchanged (median 50 vs. 50 cmH<sub>2</sub>O, p = 0.33). While 6 patients relied on an indwelling urinary catheter pre-treatment, no patient required an indwelling urinary catheter post-treatment.

**Conclusions:** Transperineal BoNT-A injections into the external urethral sphincter in male patients with NDO and DSD without underlying SCI is feasible and significantly reduces bladder outlet obstruction in this cohort.



### **S1.S.02: Facilitators and barriers to transitioning to self-catheterization: a patient and caregiver perspective**

**Authors:** Wang, HH, Morhardt D, Warh B, McNamara E, Estrada C, Bauer S

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**Introduction:** Although prenatal myelomeningocele (MMC) closure has benefits, its impact on neuro-urologic function isn't clearly established. Urodynamic study (UDS) serves as indicators of acquired secondary spinal cord tethering requiring surgery to prevent lower urinary tract (LUT) deterioration. We sought to compare risk for neuro-urologic deterioration from spinal cord tethering between prenatally and postnatally repaired children and determine what effect surgery has on LUT function.

**Methods:**

MMC children with prenatal and those with postnatal closure followed at our institution from 1999 to 2019 were included in 1:3 ratio. Birth year, gender, functional neurological level, urodynamic data and reasons for surgery were assessed during follow-up. Primary outcome was defined as time to secondary untethering. Secondary outcome was effect of surgery on neuro-urologic function. Cox proportional hazard model was fitted.

**Results:** 2 (57%) of 21 children with prenatal and 15 (24%) of 62 with postnatal MMC closure underwent secondary spinal surgery. Median surgical age in the prenatal closure group was younger (median 16 (IQR 13-62) months) compared to the postnatal group (median 69 (IQR 35-120) months,  $p=0.02$  and was significantly associated with need for secondary surgery ( $p<0.01$ ). Prenatal MMC closure had a 4.7 times hazard ratio for surgery compared to the postnatal closure cohort ( $HR=4.7(95\%CI=2.5-12.0)$ ,  $p<0.001$ ). 8 of 12 (67%) children with prenatal closure requiring secondary surgery had UDS changes: detrusor overactivity (6), bladder hypertonicity (3), urethral sphincter fibrillation potentials (3), loss of sacral reflexes (2) and conversion from synergy to dyssynergy (3) [some had >1 finding]. Of these 8, 7 improved postoperatively: resolution of detrusor overactivity (5), improved compliance (3), absence of fibrillation potentials (3), return of sacral reflexes (1) and reversion to synergy (1). Similarly, 93% (14/15) of postnatally closed children with acquired tethering had UDS changes with improvements on UDS postoperatively, in 11/15 (74%).

**Conclusions:** Prenatal MMC closure was associated with a significantly higher risk for documented acquired spinal cord tethering. The majority of those undergoing secondary surgery presented with worsening neuro-urologic parameters. Early detection of changes with UDS and secondary untethering resulted in neuro-urologic improvement in most. Periodic and comprehensive monitoring of these children and aggressive intervention are warranted to preserve LUT function.

**S1.S.03: Prenatal closure of myelomeningocele is associated with higher risk for early secondary spinal cord tethering**

**Authors:** Wang, HH, Morhardt D, Warh B, McNamara E, Estrada C, Bauer S

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**Introduction:** Although prenatal myelomeningocele (MMC) closure has benefits, its impact on neuro-urologic function isn't clearly established. Urodynamic study (UDS) serves as indicators of acquired secondary spinal cord tethering requiring surgery to prevent lower urinary tract (LUT) deterioration. We sought to compare risk for neuro-urologic deterioration from spinal cord tethering between prenatally and postnatally repaired children and determine what effect surgery has on LUT function.

**Methods:** MMC children with prenatal and those with postnatal closure followed at our institution from 1999 to 2019 were included in 1:3 ratio. Birth year, gender, functional neurological level, urodynamic data and reasons for surgery were assessed during follow-up. Primary outcome was defined as time to secondary untethering. Secondary outcome was effect of surgery on neuro-urologic function. Cox proportional hazard model was fitted.

**Results:** 2 (57%) of 21 children with prenatal and 15 (24%) of 62 with postnatal MMC closure underwent secondary spinal surgery. Median surgical age in the prenatal closure group was younger (median 16 (IQR 13-62) months) compared to the postnatal group (median 69 (IQR 35-120) months,  $p=0.02$  and was significantly associated with need for secondary surgery ( $p<0.01$ ). Prenatal MMC closure had a 4.7 times hazard ratio for surgery compared to the postnatal closure cohort ( $HR=4.7(95\%CI=2.5-12.0)$ ,  $p<0.001$ ). 8 of 12 (67%) children with prenatal closure requiring secondary surgery had UDS changes: detrusor overactivity (6), bladder hypertonicity (3), urethral sphincter fibrillation potentials (3), loss of sacral reflexes (2) and conversion from synergy to dyssynergy (3) [some had >1 finding]. Of these 8, 7 improved postoperatively: resolution of detrusor overactivity (5), improved compliance (3), absence of fibrillation potentials (3), return of sacral reflexes (1) and reversion to synergy (1). Similarly, 93% (14/15) of postnatally closed children with acquired tethering had UDS changes with improvements on UDS postoperatively, in 11/15 (74%).

**Conclusions:** Prenatal MMC closure was associated with a significantly higher risk for documented acquired spinal cord tethering. The majority of those undergoing secondary surgery presented with worsening neuro-urologic parameters. Early detection of changes with UDS and secondary untethering resulted in neuro-urologic improvement in most. Periodic and comprehensive monitoring of these children and aggressive intervention are warranted to preserve LUT function.

**S1.S.04: Outcomes of urethral sphincter (US) onabotulinum toxin type A (Botox) after failed sacral neuromodulation (SNM) therapy in women with voiding dysfunction (VD)/chronic non-obstructive urinary retention (CNOUR)**

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**Introduction:** Treatment options for VD/CNOUR in female patients are limited. SNM is the only minimally-invasive NICE-approved treatment in the United Kingdom. US-Botox is a promising alternative with minimal risks. We reviewed the outcomes of US Botox administered cystoscopically in female patients who had failed previous SNM for VD/CNOUR.

**Methods:** We retrospectively reviewed all SNM procedures in a single tertiary referral centre between 2011-2021. All female patients with a history of VD/CNOUR and failed previous SNM followed by US-Botox were included in the study. All patients were investigated with video-urodynamics studies preoperatively. Demographic, clinical, urodynamic and patient global impression of improvement (PGI-I) data was collected.

**Results:** Twelve patients were included (mean age  $31.8 \pm 12.9$  years). All of them received 100 IU Botox cystoscopically under sedation/ general anaesthesia. Six (50%) were in complete retention (due to acontractile bladder [n=5] or bladder-outlet-obstruction [BOO; n=1]), requiring intermittent (CISC; n=5) or indwelling-urethral (IDUC; n=1) catheterisation. The other 6 patients were spontaneously voiding with high PVR, emptying to completion via CISC (n=4), suprapubic-catheter (SPC; n=1) or simply not emptying (n=1). Two had acontractile bladder and four non-anatomical BOO in video urodynamics. All patients had raised maximum-urethral-closure-pressure (MUCP; mean  $105 \pm 25$ cmH<sub>2</sub>O, expected  $62 \pm 13$ cmH<sub>2</sub>O). Based on PGI-I, 6 patients (50%) reported no change after US-Botox (PGI-I=4); three continued CISC, two underwent a Mitrofanoff procedure and one is awaiting urinary reconstruction. Six (50%) patients reported improvement (PGI-I=1-3) with less pain on catheterisation (n=1), >50% reduction of PVRs (n=2) or becoming catheter free (n=3). Initial benefit was maintained in 4 of these 6 patients, who continued to repeat injections (range 2-6 injections). One

patient had a postoperative urinary tract infection and one self-limited haematuria. No stress incontinence was reported in this series of patients.

**Conclusions:** Despite a discrete 50% success rate, our data suggests that US-Botox is a good alternative to major reconstructive surgery in VD/CNOUR patients who failed previous SNM. This response rate is consistent with previously published data by our team in a similar patient population without prior surgical intervention.



**S1.S.05: The outcomes of sacral neuromodulation in patients with refractory nocturnal enuresis.**

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**Introduction:** Nocturnal enuresis is difficult to treat with variable response to the NICE recommended treatments of anticholinergics and desmopressin, particularly in the teenage and young adult population. It causes embarrassment and significantly affects quality of life and personal relationships. There is limited data on the effectiveness of Sacral Neuromodulation (SNM) in patients with nocturnal enuresis (NE). We report outcomes for patients in our institution who underwent SNM for medically refractory NE.

**Methods:** We retrospectively reviewed the prospectively obtained SNM database of our hospital to identify patients who complained of nocturnal enuresis and had SNM between 2010 and 2022. Demographic, clinical and urodynamic data were reported. All patients had a first stage tined lead placement (FSTLP) in theatre and were assessed with frequency- volume charts and gender appropriate LUTS questionnaire pre op and during the trial phase. A positive trial phase (>50% improvement) was followed by permanent battery implantation. We used the Mac Nemar’s test to assess if the change in the nocturia post SNM treatment was statistically significant. We considered p values less than 0.05 as significant.

**Results:** Sixteen patients (3 male, 13 female) were identified. Their age ranged between 26 and 72 years. All of them had proven detrusor overactivity in urodynamics studies. Thirteen patients (81%) had at least a 50% improvement in NE episodes with 9 (56%) reporting complete resolution of enuresis. Two patients (11%) reported no improvement and one patient had an early explantation due to infection. This improvement in the nocturia rates post SNM was statistically significant ( $p=0.008$ ).

**Conclusions:** SNM is an effective therapy in the majority of patients with medically refractory nocturnal enuresis with a 56% cure rate and 81% improvement rate/ reduction in pad usage. It is our suggestion that the teenage population in particular may benefit from SNM, where drug and behavioural treatment have failed to improve symptoms due to inefficacy or poor patient engagement and compliance.

**S1.S.06: Transurethral resection of the prostate versus medical treatment for bladder outlet obstruction in non-neurological patients with high storage pressures: a pilot study**

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**Introduction:** Due to potential postoperative risks in male patients with non-neurogenic lower urinary tract symptoms (LUTS) with detrusor overactivity (DO) ( $\geq 40$  cmH<sub>2</sub>O) and bladder outlet obstruction (BOO) we aimed to investigate the effect of transurethral resection of the prostate (TURP) compared to alpha1-adrenoreceptor-antagonists and antimuscarinics/beta-3-agonists.

**Methods:** We retrospectively analyzed 19 patients in two urological centers investigating bladder function by video-urodynamic investigations and patient-reported outcomes by International Prostate Symptom Score (IPSS) before and after treatment. A nonparametric test was employed in the statistical analysis.

**Results:** The IPSS showed a significant improvement in the surgical group ( $p = 0.032$ ) compared to the conservative medical treatment group ( $p = 0.192$ ). Post-interventional quality of life (QoL-IPSS) ameliorated after TURP ( $p = 0.042$ ), but not under medical therapy ( $p = 0.55$ ). Q<sub>max</sub> ( $p = 0.028$ ), post-void residual ( $p = 0.038$ ), and events of incontinence ( $p = 0.034$ ) improved significantly in the surgical group. Maximum detrusor pressure amplitude decreased in both groups significantly after the intervention ( $p = 0.009$  after TURP and  $p = 0.008$  after medical treatment, respectively). Maximum cystometric capacity raised in both groups after treatment ( $p = 0.037$  after TURP and  $p = 0.021$  after medical treatment, respectively). Bladder compliance improved in the medical group ( $p = 0.028$ ).

**Conclusions:** In our pilot study of non-neurological patients with high storage pressures and BOO, both TURP and medical treatment improved urodynamic parameters and TURP led to a better quality of life compared to medical treatment. Thus, well-designed prospective randomized controlled trials are highly warranted further exploring this under-researched topic.

**S1.S.07: Pediatric neurogenic bladder and treatment with onabotulinumtoxin a**

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**Introduction:** Intradetrusor Onabotulinumtoxin A is a therapeutic alternative in patients refractory to anticholinergics, but a significant proportion of injected cases do not show significant decreases in endovesical pressures. The objective is to evaluate the effects of repeated intradetrusor Onabotulinumtoxin A injections in neurogenic bladder resistant to the first line.

**Methods:** Patients with neurogenic bladder dysfunction, refractory to oral oxybutynin, received Onabotulinumtoxin A endoscopically. Patients were evaluated with a CIC chart, urinary tract ultrasound, and urodynamics at third month. Those with clinical and / or urodynamic improvement were reinjected within 12 months. Those without changes were for cystoplasty. Continuous data were reported as median and mean  $\pm$  SD. The paired t test was applied to compare the parametric values, and the Wilcoxon signed rank test was used to compare nonparametric variables. A p value  $<$  0.05 was considered statistically significant.

**Results:** 82 cases were recruited with a mean age of 11.3 years. 29 of these were excluded from the analysis on incontinence due to therapeutic procedures due to sphincter incompetence (n: 14) and irregular charts (n: 15). In 54 cases the statistical criteria of urodynamic analysis could be applied. The patients were reinjecting with onabotulinumtoxin A, two, three, four and five times: 20 cases, 7, 4 and 1 case, respectively. About 50% on average achieved total urinary continence. In the first and second injection there was a significant increase in the mean cystometric capacity (p1: 0.007 and p2: 0.014), respectively. Mean intravesical pressure at the end of filling decreased on average from 47 to 44 cmH<sub>2</sub>O (not significant). We performed cystoplasty in 28 cases (34%).

**Conclusions:** The use of onabotulinumtoxinA in neurogenic bladder with hypertonia as a second line increased cystometric capacity, improving compliance in a large proportion of pre teens. Cystoplasty was necessary in more than a third of patients.

**S1.S.08: Transurethral injection of autologous muscle precursor cells for the treatment of female stress urinary incontinence – a prospective and randomized phase I clinical trial**

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**Introduction:** To investigate the safety and feasibility of transurethral injections of autologous muscle precursor cells (MPCs) into the external urinary sphincter (EUS) to treat stress urinary incontinence (SUI) in female patients.

**Methods:** Prospective and randomized clinical trial. Standardized 1h pad test, ICIQ-UI-SF questionnaire, urodynamic study, and MRI of the pelvis were performed at baseline and follow-up 6 months after treatment. MPCs were gained through an open muscle biopsy of the lower limb. Specimens were transported to a GMP facility for processing and cell expansion. The final product was implanted through transurethral ultrasound-guided injections into the EUS. Primary outcome were defined as any adverse events (AEs) during follow-up. Secondary outcomes were functional, questionnaire and radiological results.

**Results:** Ten female patients were included in the study, of which 9 received treatment. Patients had clinical SUI grade  $\geq 1$  with median age of 45 years (32-58y) and median BMI of 24 kg/m<sup>2</sup> (21.0-29.4kg/m<sup>2</sup>). Out of 8 AEs, 3 (37.5%) were potentially related to treatment: One urinary tract infection healed with antibiotic treatment, one dysuria and one discomfort at biopsy site were treated conservatively. Maximal urethral closure pressure under stress decreased from 79 cmH<sub>2</sub>O at baseline compared to 71 cmH<sub>2</sub>O ( $p=0.859$ ), whereas functional urethral length under stress was 25 mm at baseline compared to 30mm at 6 months follow-up ( $p=0.009$ ). ICIQ-UI-SF scores improved from 7 points at baseline to 4 points at follow-up ( $p=0.035$ ). MRI of the pelvis revealed no evidence of tumor or necrosis, while diameter of EUS muscle increased from 1.8 mm at baseline to 1.9 mm at follow-up ( $p=0.009$ )

**Conclusions:** Transurethral injections of autologous MPCs into the EUS for treatment of SUI in female patients can be regarded as safe and feasible. Only a minimal number of expected and well-treatable AEs were documented. Promising functional, QoL and anatomical outcomes were found.

**S1.S.09: Comparison of the treatment efficacy of selective bladder denervation of trigone with radiofrequency ablation method in refractory overactive bladder patients with patients who underwent bladder intramuscular botulinum toxin injection**

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**Introduction:** To compare the clinical experience with selective bladder denervation (SBD) of trigone in women with refractory overactive bladder (OAB) with patients who underwent bladder intramuscular botulinum toxin injection (IBTI).

**Methods:** In this prospective and randomized study, one group of women with refractory OAB underwent a single temperature controlled 60 seconds radiofrequency and 100 units of IBTI was applied to the second group. It is planned to follow up with the patients for up to 12 weeks. Since it is a preliminary report 6 patients in both groups are evaluated for 4 weeks, evaluated for adverse events and changes in OAB symptoms.

**Results:** This is a preliminary report with 1 monthly follow-up result of 6 patients with both groups. It is planned to evaluate 60 patients in 2 groups, 30 patients with SBD and 30 patients with IBTI with 3 months follow-up. Median symptom reduction based on a 3-day bladder diary in the SBD group is 50%(n:3) for urinary incontinence, urgency episodes 33.2%(n:2), and treatment benefit was reported in 66.8% (n:4) patients depending. Median symptom reduction based on a 3-day bladder diary in the IBTI group is 66.8%(n:4) for urinary incontinence, urgency episodes 66.8% (n:4), and treatment benefit was reported in 83.4% (n:5) of patients. Procedure-related adverse events were reported in %33.2 (n:2) of patients in the SBD group and %33.2 (n:2) of patients in the IBTI group.

**Conclusions:** This study demonstrates the comparison of selective bladder denervation of trigone in relieving symptoms of refractory OAB with bladder intramuscular botulinum toxin injection. A 60-second RF algorithm using ablations of the sub-trigonal tissues could be durable and effective as intramuscular botulinum toxin injection but further follow-up period and number of patients needed to present.

### **S2.C.01: Construct validity of the irritable bowel syndrome - quality of life (IBS-QoL) questionnaire in spinal cord injury (SCI) patients**

**Authors:** Priya Kohli, Aidin Abedi, Nhi Ha, Veronica Stefania Montera Arcila, Luis Alejandro Morales Ojeda, David Ginsberg, Evgeniy Kreydin

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**Introduction:** Patients with spinal cord injury (SCI) have a high prevalence of neurogenic bowel dysfunction. The Irritable Bowel Syndrome-Quality of Life (IBS-QOL) is a comprehensive 34-question instrument evaluating the impact of bowel dysfunction on various domains of QOL. We sought to assess the construct validity of the IBS-QOL questionnaire for use in the SCI population as no such comprehensive measure exists.

**Methods:** Patients with SCI were recruited from a national medical rehabilitation hospital. Cognitively intact, adult SCI patients with >3 months elapsed from their injury were considered for inclusion. Patients completed the IBS-QOL and Neurogenic Bowel Dysfunction Score (NBDS) via either telephone interview or paper survey in the clinic. Patient demographics and medical history were obtained by chart review. Select items of the NBDS were dichotomized to identify subgroups of patients with severe bowel-related dysfunction. This instrument measures the severity of bowel dysfunction in patients with SCI, with answers weighted to predict QOL. Construct validity was assessed using the hypothesis testing method. To this end, the IBS-QOL was hypothesized to differentiate the sub-groups of patients stratified based on the severity of bowel dysfunction (i.e., known-group/discriminative validity), with patients with severe dysfunction expected to have significantly worse QOL scores.

**Results:** One hundred and six patients responded. Eighty-two (77%) were male and mean age was  $45.3 \pm 13.6$  years. Majority of the patients had injuries at thoracolumbar levels ( $n = 74, 71.2\%$ ). The IBS-QOL demonstrated sufficient construct validity to discriminate the sub-groups of patients with severe bowel dysfunction in terms of uneasiness, sweating or headaches during bowel emptying ( $p = .0003$ ), time spent on bowel emptying ( $p = 0.0065$ ), flatus incontinence ( $p = 0.0076$ ), and overall satisfaction with bowel function, although the differences related to the frequency of bowel accidents and perianal issues were not significant.



**Conclusions:** We demonstrated the construct validity of IBS-QOL for assessment of bowel-related QOL in SCI. This measure provides a comprehensive and domain-specific understanding of bowel-related QOL following SCI, although further studies are needed to assess its reliability, responsiveness, and generalizability across different patient populations.

## **S2.C.02: Face validity of the irritable bowel syndrome - quality of life (IBS-QoL) questionnaire in spinal cord injury (SCI) population**

**Authors:** Priya Kohli, Aidin Abedi, Nhi Ha, Veronica Stefania Montera Arcila, Luis Alejandro Morales Ojeda, David Ginsberg, Evgeniy Kreydin

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**Introduction:** Neurogenic bowel dysfunction affects the majority of persons with spinal cord injuries (SCIs). Yet, validated measures of bowel-related quality of life (QOL) are lacking for this population. To address the current gap, we sought to validate the Irritable Bowel Syndrome-QOL (IBS-QOL) questionnaire by assessing its content and face validity in SCI population.

**Methods:** English and Spanish-speaking patients with chronic SCIs, as well as care providers at a large safety net hospital were enrolled. Using semi-structured one-on-one interviews, the participants were asked to review the IBS-QOL survey and express their opinion about this measure (all items together) in terms of comprehensiveness and relevance to the construct of bowel-related QOL in SCI population. In addition, the experts rated the relevance of each item, and the patients were asked about the comprehensibility of the questionnaire. Interviews were conducted via telecommunication and transcribed to extrapolate common themes.

**Results:** Six experts (five physicians and one nurse practitioner) and twelve patients participated in the study. Item-level analysis of expert responses showed that for 97% (33/34) of questions, at least 4/6, agreed that questions were relevant for the construct and population of interest. During the patient interviews, the participants overwhelmingly agreed that the survey was comprehensive, relevant to bowel related QOL following SCI, and easy to comprehend. As a common theme, the patients expressed that detailed assessment of bowel-QOL as part of their routine care was of great interest. Some experts highlighted body image items that were less frequently encountered in their practice, suggesting that such items were likely more appropriate for IBS patients.

**Conclusions:** Using both patient and expert interviews, we demonstrated that the IBS-QOL has sufficient content and face validity for assessment of bowel-related QOL after SCI. Additional studies are needed to assess the reliability of this measure, while longitudinal designs can be utilized to assess its ability in

capturing the meaningful changes in QOL in response to bowel rehabilitation.

### **S2.C.03: Role of bladder sensations and detrusor overactivity in overactive bladder symptoms in patients with multiple sclerosis**

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**Introduction:** The study aimed to assess the relationship between bladder sensations, detrusor overactivity, and severity of overactive bladder symptoms in patients with multiple sclerosis (PwMS).

**Methods:** Consecutive PwMS assessed with a standardized urodynamic test including 3 consecutive cystometries (20 ml/min, 100 ml/min and 100 ml/min with 4°C fluid (Ice water test (IWT))) between June 2020 and October 2022 were included in this retrospective study. Data collected were bladder diaries including an assessment of desire to void for each micturition, symptoms assessed with Urinary Symptoms Profile (USP), bladder sensations with first desire to void (FDV) and strong desire to void (SDV) during the 20ml/min cystometry, and presence of detrusor overactivity (DO) during at least one of the three cystometries. Volume between FDV and SDV was calculated for each patient (FDV-SDV).

**Results:** Two hundred and two patients were included (mean age  $47.4 \pm 11.8$  years, median EDSS 3 IQR[2-5], 74.3% of women). DO was found in 104 (51.5%) patients. Reduced FDV-SDV volume (<50 ml) was significantly associated with the occurrence of DO (27% vs 5%;  $p < 0.0001$ ), as well as earlier sensations during cystometries ( $167 \pm 88$ ml vs  $204 \pm 109$ ml for FDV,  $p=0.02$ ;  $285 \pm 131$ ml vs  $353 \pm 116$ ml for SDV,  $p<0.001$ ). The absence of cold perception during IWT was associated with DO (45% vs 23%,  $p<0.01$ ). The proportion of micturitions done at urgent need to void was not different between the two groups (26% for those without DO vs 28% for those with DO,  $p=0.69$ ). In patients without DO, FDV-SDV volume was correlated with voids frequency ( $\rho = -0.30$ ;  $p=0.03$ ), mean voided volume ( $\rho = 0.52$ ;  $p<0.001$ ), and USP OAB sub-score ( $\rho=0.32$ ;  $p<0.01$ ), especially with the item related to the warning time (time from first sensation of urgency to micturition or incontinence) ( $\rho = 0.38$ ;  $p<0.01$ ).

**Conclusions:** Detrusor overactivity has an impact on bladder sensation during cystometries. In patients without DO, afferent bladder sensations may have a significant impact on overactive bladder severity, especially in reducing the warning time.

## **S2.C.04: Fatigue, depression, and symptoms of neurogenic lower urinary tract dysfunction in persons with multiple sclerosis**

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**Introduction:** Fatigue, depression, and lower urinary tract neurogenic dysfunction (NLUTS) symptoms are common in individuals with multiple sclerosis (MS). Bladder diaries (BD) are used to objectify NLUTS. The aim of this study was to investigate the associations between fatigue, depression, and NLUTS from BD in individuals with MS.

**Methods:** NLUTS were recorded in 256 subjects using BD: voided volume (VV), standardized voiding frequency (SVF), imperative desire to void (IDV), nocturia (NU), and urinary incontinence (UI). Fatigue was assessed with the Fatigue Scale for Motor and Cognitive Functions (FSMC). Depression was assessed with the General Depression Scale (GDS). We compared the severity of fatigue and depression between subjects with and without NLUTS. The severity of fatigue and depression correlated with the severity of NLUTS, and the association between the severity of fatigue and depression and the number of each NLUTS was determined.

**Results:** UI and IDV show significantly higher scores of FSMC total, VV shows significantly higher scores of FSMC motor. NU shows significantly higher values of ADS. The severity of IDV and VV has the greatest impact on the severity of fatigue and depression. The more individual NLUTS present, the higher scores for FSMC and GDS occur.

**Conclusions:** The relationship between fatigue, depression, and NLUTS has been demonstrated in a variety of ways. IHD and VV have the most influence.

A prospective longitudinal study on the correlation of successful therapy of NLUTS and improvement of fatigue/depression must follow, as this may represent a crucial influence on the quality of life of persons with MS.

**S2.C.05: A nationwide assessment of the incidence and survey on the management of lower urinary tract symptoms of multiple sclerosis patients – how much do we know? How much do we care?**

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**Introduction:** Impairment of bladder function with multiple sclerosis (MS) is frequent and may affect up to 90 percent of patients during MS. Storage and voiding symptoms are both common and, in most cases, require medical attention. However, GPs, neurologists and other MS specialists often lack the competence to focus on lower urinary tract symptoms (LUTS), thus their management is often suboptimal. This can potentially lead to irreversible damage in the upper urinary tract or even kidney failure and significantly decrease the quality of life. Our aim was to investigate the incidence and assess the level and scope of treatment of LUTS in MS patients in Hungary.

**Methods:** We have organized a multicentric cross-sectional study to assess the incidence and severity of LUTS among MS patients. We also enquired about and the treatment they received and the rate of medical indifference among MS patients in Hungary. A questionnaire consisting of 22 questions - including the Qualiveen-SF and King's Health Questionnaire - was sent to 18 neurology departments between November of 2021 and November of 2022.

**Results:** After analysing more than 26'000 answers from 475 patients whom 67,7% (322) experienced some kind of LUTS, but 75% (210) received no urological attention, and only 10% had urodynamic examination, we can honestly qualify this population overlooked. Barely 30% (96) have been prescribed oral aids and only 1% (4) percent received invasive treatment, while 25% (72) needed some form of pad or diaper daily. In 88% (283) the ineffective therapy has not been revised by urologists. (The detailed results of statistical analyses shall be presented at INUS-2023.)

**Conclusions:** Although the urinary symptoms of MS are quite common and well known (to the MS specialist MDs and nurses), their management is not nearly satisfactory. The majority of patients are without proper examination and care for their urinary complaints. Our duty is to shine a light on this

population aid them to battle MS related voiding symptoms and assist the necessary education of neurologists and care providers.



## **S2.C.06: Adult occult spina bifida with the sole manifestation of lower urinary tract symptoms**

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**Introduction:** Occult spinal bifida (OSB) is observed even in modern times with good nutritional status and advanced prenatal diagnosis technology. In OSB, lower urinary tract symptoms (LUTS) can be the sole manifestation preceding other neurological signs. However, it is not easy to diagnose spina bifida in patients with only LUTS, especially when the bony defect is small. In some cases, with X-ray imaging, it may be difficult to identify small bony defect by artifacts such as bowel gas. We conducted an exploratory pilot study of OSB cases observed in patients with LUTS using computed tomography (CT) images.

**Methods:** Patients with atypical LUTS but had never been diagnosed with neurological disease and had no neurological symptoms were evaluated when CT scan images were available. The axial views of the spine in the CT scan were analyzed by comparison with the X-ray images. OSB was defined as incomplete closure of the posterior vertebral arch, including a cleft in the vertebral arch and a high-level sacral hiatus above the sacral vertebra (S)-3.

**Results:** Thirty-five patients (male 51.4%) were found to have failure of closure at the posterior vertebral arch. The median age at initial visit to urology clinic was 47.8 (range 17.6~78.7) years. Based on the highest level of bony defects in each patient, 28% had defects below lumbar vertebra (L)-5, 57.1% had defects below S-1, 5.7% had defects below S-2, and 8.6% had defects below S-3. Fifteen (42.9%) patients had an underactive bladder, another 15 patients (42.9%) had an overactive bladder, and 5 (14.3%) patients showed functional bladder outlet obstruction.

**Conclusions:** OSB are observed in a non-negligible number of adult LUTS patients without neurological symptoms. The possibility of OSB should be considered when the cause of bladder and urethral dysfunction is unclear. An axial view of the spine in a CT scan may be useful for detecting incomplete closure of the posterior arch. The mechanisms by which spinal bony defects affect bladder function should be clarified. Research on preventing the progression of LUTS by reconstructing the defect area at an early stage should be conducted in the future.

**S2.C.07: A multi-centre randomised controlled study confirming the improved performance with a new micro-hole zone catheter in a population of adult male intermittent catheter users**

**Authors:** M.H. Landauro, L. Jacobsen, O.F. Nascimento, R. Vaabengaard, N. Thiruchelvam and P. Bagi

**Presenting Author (name and affiliation):** Rikke Vaabengaard, Medical Affairs, Coloplast A/S

**Introduction:** Residual urine is seen as a risk factor for acquiring urinary tract infections (UTIs) and most users dependent on clean intermittent catheter (CIC) are uncertain if they empty their bladder completely. With conventional eyelet catheters (CEC), users can experience urinary flow-stops during catheterisation, caused by mucosal suction, giving a false impression that the bladder is empty. Removing the catheter prematurely may leave residual urine behind. This study investigated the performance of a new micro-hole zone catheter (MHZC) designed to improve bladder emptying as a result of a free urinary flow without premature flow-stops.

**Methods:** The investigation was a multi-centre, randomised, controlled crossover study including 73 male IC users (ClinicalTrials.gov NCT05485935). The study consisted of four study visits and two 4-week test periods at home. The MHZC was compared to a CEC with a sleeve (SpeediCath® Flex, Coloplast A/S or Vapro™, Hollister, Inc).

Flow-stop episodes and residual volume at 1st flow-stop after healthcare professional (HCP)-led catheterisation were included as primary endpoints, and after self-catheterisation as supportive endpoints. Pressure inside the catheter was included as exploratory endpoints.

**Results:** Mean number of flow-stop episodes [95% CI] was close to zero for the MHZC at both HCP-led catheterisation 0.20 [0.09; 0.43] and self-catheterisation 0.13 [0.04; 0.37] as opposed to CEC with mean flow-stop episodes of 1.32 [0.96; 1.80] and 0.96 [0.65; 1.43] at HCP-led catheterisation and self-catheterisation (both  $p < 0.001$ ).

Mean RV1 was significantly less for the MHZC with mean values [95%CI] of 18.00 mL [7.05; 28.94] and 8.23 mL [0; 22.09] for HCP-led and self-catheterisation, respectively, as opposed to the CEC with mean values [95%CI] of 63.93 mL [37.86; 90.01] and 36.80 mL [23.10; 50.51] for HCP-led and self-catheterisation, respectively (both  $p \leq 0.004$ ).

The results of the primary endpoints were substantiated by a significantly smaller pressure peak at 1st flow-stop, equivalent to minimized mucosal suction, for the MHZC.

**Conclusions:** The superior performance of the MHZC over the CEC, in terms of significantly reduced number of flow-stops and residual urine at 1st flow-stop (RV1), indicate a clinical benefit of the MHZC in CIC dependent users with improved bladder emptying and potentially reduced microtrauma during CISC.

### **S2.C.08: Dependence on urinary catheterisation elicits considerable worry about urinary tract infections**

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**Presenting Author (name and affiliation):** Rikke Vaabenggaard, Medical Affairs, Coloplast A/S

**Introduction:** Urinary tract infections (UTIs) are among the most common complication in relation to bladder dysfunction and often linked to the use of catheters. Apart from enduring unpleasant experiences with UTIs, most catheter users also sustain practical obstacles to avoid UTIs. The aim of this study was to explore mental and practical challenges among intermittent catheter (IC) users, to better understand their worries and knowledge about UTIs and preventive strategies.

**Methods:** This was a multinational, cross-sectional study among IC users with bladder dysfunction. A questionnaire consisting of close-ended or rating questions was developed by Coloplast and focused on concerns, perceptions, and preventive strategies regarding UTIs and IC use.

**Results:** In total, 2,942 participants completed the questionnaire; 48% were between the age of 50-69 years, 57% male, 97% had used IC for more than 6 months, 56% used IC due to neurogenic causes, 20% due to non-neurogenic causes, while the rest used it due to other causes than the listed or reasons unknown to the participants. On average, participants reported 2.7 incidents of UTIs within the last year; 25% had not experienced any UTIs while 14% experienced it 6 times or more. In total, 84% of participants worried about UTIs occasionally and 53% daily or weekly, 45% rated UTIs as their greatest concern in life, and 81% perceived a good bladder health as free of UTIs. Incomplete bladder emptying was perceived as the main cause of UTIs by 27% of participants and 49% worried about not emptying their bladder completely. Furthermore, 80% found it important to know if their bladder was completely empty after IC use, but only 30% felt that they always knew if it was completely empty. Participants indicated uncertainty about cause of UTIs, primarily attributing it to drinking insufficient amounts of water (41%), incomplete bladder emptying (27%), and bacteria around genitals (25%).

**Conclusions:** This study showed that IC users spent much time worrying about UTIs and preventive strategies like complete bladder emptying to avoid it. More support to prevent UTIs is warranted for IC users to improve their wellbeing.

**S2.C.09: Association between the neurogenic bladder symptom score, functional status and quality of life in multiple sclerosis patients**

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**Introduction:** Multiple Sclerosis (MS) is the most common demyelinating disease of the nervous system. Approximately 75% of patients with MS will present low urinary tract symptoms during the course of the disease impacting their quality of life. The Neurogenic Bladder Symptom Score (NBSS) has been validated to assess urinary symptoms in three domains and quality of life in these patients. The objective of this study was to evaluate the impact of urinary symptoms in this group of patients on their quality of life, as well as their association with functional status using the Expanded Disability Status Scale (EDSS).

**Methods:** With the approval of the ethics committee, the Spanish version of the NBSS was applied to patients diagnosed with MS from the Neurology clinic. The EDSS score was also obtained.

The NBSS total score and by domains were compared with the EDSS <5 or >5, and with the quality of life question. The cut-off point of the NBSS total score with better sensitivity and specificity was calculated and its association with the EDSS, quality of life, type of multiple sclerosis and time of diagnosis of the disease was analyzed. For all statistical comparisons significance was considered as  $p < 0.05$ .

**Results:** We enrolled 116 consecutive patients with MS in remission, 78 women and 38 men, to answer the NBSS. A significant association was found for the EDSS < or >5 with the NBSS total score ( $p=0.003$ ), continence domain ( $p=0.01$ ), storage and voiding domain ( $p=0.02$ ), but not for the consequences domain ( $p=0.94$ ). In the multivariate analysis, the question of quality of life and the time of diagnosis of the disease are the best predictors for the total score ( $p < 0.05$ ). The NBSS cut-off point that is best associated with an EDSS < or > 5 was 19 points.

**Conclusions:** The severity of urinary symptoms assessed by the NBSS in patients with MS is associated with the severity of the disease assessed by the EDSS and with their quality of life, making it an appropriate tool for the assessment and follow-up of patients in neurourological clinical practice.

### **S2.C.10: Gastrointestinal microbiome and urinary tract among individuals with chronic spinal cord injury: results from an exploratory, feasibility study**

**Authors:** Matthias Walter (Basel | CH) Lorenz Leitner (Zurich | CH) Miriam Koschorke (Zurich | CH) Martina D. Liechti (Zurich | CH) Thomas M Kessler (Zurich | CH) Adam Stein (Manhasset | US) Ona Bloom (Manhasset | US) Susan Brophy (Fredericton | CA) Shane McCullum

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**Introduction:** Alterations of the urine (UT) and gut (GI) microbiota are associated with many seemingly diverse disorders, affecting the immune system and correspondingly influence the composition of the microbiome (i.e. reciprocal signaling). Individuals with spinal cord injury (SCI) are prone to infections and this could be reflected by changes in the microbiome. Given the paucity in the current literature, there is a need to evaluate UTt and GI microbiota in individuals with chronic SCI.

**Methods:** The aim of this exploratory, feasibility study was to investigate UT and GI microbiota in order to identify differences between those with recurrent / chronic infections (YES) and those without (NO). The study was registered (NCT02903472) and approved by all local ethics boards. Main inclusion criterion: Individuals with a chronic SCI with either recurrent (YES) / chronic infections (NO). All samples were obtained approximately 1, 6, and 12 months after enrollment. 16Sv4 amplicons generated from the samples were sequenced, quality-filtered and clustered into 97% similarity operational taxonomic unit (OTUs). OTUs were aggregated into each taxonomic rank, and plotted the relative abundance of the most abundant ones. Alpha diversity (Shannon index) was computed and compared between both groups (i.e. infection YES or NO) using analysis of variance (ANOVA). Microbiome composition similarity among samples (Beta diversity) was assessed using permutational ANOVA (Permanova). Differential abundance testing was used to identify differentially abundant taxa between both groups.

**Results:** Overall 19 individuals (5 women, 26%, median age 44 years [Q1: 36; Q3: 52] and time post injury 7 years [Q1: 2.5; Q3: 17.5]) were enrolled and provided at least one urine and stool sample (i.e., a read count >1000) for taxonomic analysis. Alpha diversity (shown as mean [SD]): No significant between-group differences for UT ( $p = 0.396$ ) or GI microbiome ( $p = 0.854$ ). Beta diversity: No significant between-group differences for UT ( $p = 0.708$ ) or GI



microbiome ( $p = 0.63$ ). Further, no differentially abundant OTUs were identified.

**Conclusions:** Preliminary analysis revealed no significant between-group differences. We are currently analyzing all remaining samples as well as short-chain fatty acids (SCFA) which are known to play an important role in the maintenance of health.

### **S3.C.01: Urodynamics are essential for predicting the risk for upper urinary tract damage after acute spinal cord injury**

**Authors:** Veronika Birkhäuser, Collene E. Anderson, Marko Kozomara, Mirjam Bywater, Oliver Gross, Stephan Kiss, Stephanie C. Knüpfer, Miriam Koschorke, Lorenz Leitner, Ulrich Mehnert, Helen Sadri, Ulla Sammer, Lara Stächele, Jure Tornic, Martina D. Liechti, Martin

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**Introduction:** Urodynamic investigation (UDI) is the gold standard to assess LUT symptoms, and to identify urodynamic risk factors for upper urinary tract damage (detrusor overactivity combined with detrusor sphincter dyssynergia, maximum storage detrusor pressure  $\geq 40$  cmH<sub>2</sub>O, bladder compliance  $< 20$  mL/ cmH<sub>2</sub>O, vesicoureteral reflux). However, UDI availability is limited in some settings. Prognostic models for urological outcomes could support clinical decision-making, thereby promoting stratified management, and potentially reducing the dependence on UDI. Therefore, we aimed to develop a prediction model based on clinical parameters for the occurrence of urodynamic risk factors for upper urinary tract damage during the first year after acute spinal cord injury (SCI).

**Methods:** 97 patients underwent urodynamic investigation at 1, 3, 6 and 12 months after acute SCI in the framework of a population-based longitudinal study at a single university SCI centre. Candidate predictors were identified from the literature and included demographic characteristics, neurological and functional status 1 month after SCI. The occurrence of urodynamic risk factors for upper urinary tract damage were evaluated in univariable analysis. Multivariable logistic regression was used for prediction model development and internal validation. The impact of missing data in 24 patients (24/97, 25%) who did not return for a 12-month urodynamic follow up was investigated using sensitivity analyses.

**Results:** Two models showed fair discrimination for maximum storage detrusor pressure  $\geq 40$  cmH<sub>2</sub>O: i.) upper extremity motor score and sex, area under the receiver operating curve (aROC) 0.77 (95% CI: 0.66-0.88), C-statistic 0.76 (95% CI: 0.65-0.87), ii.) neurological level, American Spinal Injury Association Impairment Scale grade, and sex, aROC 0.79 (95% CI: 0.68-0.90), C-statistic 0.74 (95% CI: 0.63-0.85). In-depth analysis of all other outcomes was precluded by very low or high outcome prevalence in the population.

**Conclusions:** We identified two models that provided fair predictive value for urodynamic risk factors for upper urinary tract damage during the first year after SCI. Pending external validation, these models may be useful for clinical trial planning, but less so for individual-level patient management. Therefore, urodynamics remain essential for reliably identifying patients at risk for upper urinary tract damage.

### **S3.C.02: Feasibility of using a urinary condom to measure pressure-flow in males in supine and sitting position**

**Authors:** Katharina Böhler, Hubert John, Jure Tornic

**Presenting Author (name and affiliation):** Katharina Böhler,

**Introduction:** Pressure-flow studies have become the gold standard to assess bladder emptying phase as a part of the urodynamic investigation. The set-up consists of a regular uroflowmetry combined with the continuous measurement of the intravesical bladder pressure during bladder emptying phase in a sitting or standing position. However, under certain circumstances (e.g. neurologic condition) the investigation has to be performed in a supine position so that the recording of the urinary flow is omitted. In this study, we aimed to assess the feasibility of a novel solution for the measurement of a pressure-flow study in male patients in supine position.

**Methods:** In this ongoing study, male patients (between 18 and 95 years) requiring urodynamics are being included. The investigations are performed, according to the good urodynamic practice standards of the International Continence Society (ICS) and consist of three measurements: 1. in sitting position with a regular free uroflowmetry, 2. in sitting position with a urinary condom connected to a drainage tube (length 50cm, diameter 0.7cm) to drain the urine into the flowmeter, 3. In supine position with urinary condom connected to the drainage tube.

Urodynamic parameters are recorded and differences between measurements and illustrated in table form.

**Results:** Two patients have been included so far. Maximum cystometric capacity was 640, 580 and 550 mL and 165, 180 and 190 mL in the first and the second patient, respectively. Spontaneous voiding was possible in all measurements with a voiding efficiency (voided volume: max. cystometric capacity) of 22, 62 and 82% in the first and 48, 39 and 58% in the second patient.

Maximum flowrate (Q<sub>max</sub>) and detrusor pressure (P<sub>Det</sub>) at Q<sub>max</sub> were in the first patient (5, 12, 22 mL/s and 53, 46 and 31 cmH<sub>2</sub>O) and in the second patient (6, 4, 5 mL/s and 72, 64 and 38 cmH<sub>2</sub>O).

**Conclusions:** Preliminary results of our study indicate that using a urinary condom connected to a tube might be used to evaluate pressure-flow parameters in supine position. However, more data is needed to make final conclusions and to validate this method.

### **S3.C.03: Feasibility of lumbosacral spinal cord imaging for patients with neurogenic lower urinary tract dysfunction**

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**Introduction:** The lumbosacral spinal cord (SC) contains nuclei that innervate the lower urinary tract. Therefore, pathological changes in the lumbosacral gray matter (GM) or white matter (WM) may lead to neurogenic lower urinary tract dysfunction (NLUTD). Assessments of the conus medullaris (CM) by magnetic resonance imaging (MRI), particularly diffusion MRI opens the possibility to examine the structural underpinnings of NLUTD. The aim of the study is to investigate the feasibility of lumbosacral MRI in healthy subjects and a patient cohort representative for the challenging imaging conditions typical for patients with NLUTD.

**Methods:** Ten healthy subjects and 10 acute SCI patients (1-month after injury, with radiologically normal appearing lumbosacral cord and varying types and severity of NLUTD) underwent 3T imaging (Siemens Prisma Scanner). Twenty axial T2\*-weighted (5 mm thickness, FLASH sequence) and 15 diffusion-weighted slices (5 mm thickness, reduced FOV single-shot spin-echo echo planar imaging sequence) were acquired in the lumbosacral cord. SC and GM were segmented manually, providing tissue-specific cross-sectional area (CSA) measurements and diffusion tensor imaging (DTI) maps (fractional anisotropy (FA), axial diffusivity (AD), and radial diffusivity (RD)). DTI metrics were extracted within the WM using the PAM50 WM atlas. Accounting for the varying length of the CM between subjects, outcomes were calculated for interpolated equidistant slices (normalized for the individual length of the CM) representing the same neurological levels across subjects. Scan-rescan reliability was assessed by computing coefficient of variation (COV). A linear mixed effect model was used to assess group differences ( $p < 0.05$ ).

**Results:** The scan-rescan reliability showed COVs below 8% for all CSA and total WM DTI outcomes for all normalized levels in the CM. Patients showed smaller CSA and FA values ( $p < 0.05$ ) in the upper part of the CM.

**Conclusions:** CSA and DTI measurements were feasible in the lumbosacral cord in individuals with NLUTD and subtle neurodegenerative CM changes. Reduced CSA and DTI outcomes indicate secondary tissue atrophy and impaired tissue integrity of WM early after SCI. The presented methods providing structural imaging correlates may be used in neurological diseases affecting the lower SC. This may help to increase our understanding of the underlying pathophysiological processes of NLUTD.

### **S3.C.04: Single subject fMRI mapping at 7T during stimulation of the urogenital region: a pilot study**

**Authors:** D. Frings, W. van der Zwaag, B.F.M. Blok

**Presenting Author (name and affiliation):** Dennis Frings, Erasmus MC Rotterdam

**Introduction:** The central representation of the sensation of urogenital organs is still not fully understood. In this study we aim to investigate their sensory representation by functional MRI at 7T during electrical stimulation of the anus, left areola, clitoris, perineum, and left medial foot. We hypothesize that we will find consistent central representation of all target areas, and that the areas associated with affective sensation show significantly different activation patterns than areas associated with strictly tactile sensation.

**Methods:** For this preliminary analysis, eight healthy female participants were scanned in a 7T-MRI scanner. Stimulation regions of interest were the clitoris, perineum, anus, left areola, and left medial foot as control (tibial nerve region). Two electrodes were placed on or directly adjacent to each investigated region. For each region, a strength for the electrical stimulation was determined such that the subject clearly felt the stimulation without it being perceived as painful.

**Results:** For this preliminary analysis, functional responses in the brain regions S1, insula, and cerebellum were chosen to be investigated. In S1, we found consistent activation in all subjects for nearly all regions, with activation for clitoris, anus and nipple regions showing activation in either the medial wall of S1 or the dorsolateral wall. On average, clitoris, anus and nipple stimulation resulted in larger areas of cortical activation. Insula activation was seen in all subjects for nearly all regions. Anterior insula activation was much more common, while posterior insula activation was only seen in areolar stimulation in three subjects. We see significant activation in the cerebellum in all subjects, however no patterns in this activation can be recognized.

**Conclusions:** These preliminary results show successful identification of four urogenital areas in single subjects at 7T. We found significant activation in nearly all subjects for all regions in S1, insula and cerebellum, in concordance with previous 1.5T and 3T group studies. We also found that areas associated with affective sensation (nipple, clitoris and anus) on average showed much larger areas of activation than areas with pure tactile sensation. This is the



first study aiming to somatotopically map the female clitoris, perineum, anus and areola at 7T.

**S3.C.05: The effect of transcutaneous spinal cord stimulation on lower urinary tract symptoms and brain activity in stroke survivors: a neuromodulation-functional magnetic resonance imaging study**

**Authors:** Veronica Stefania Montero Arcila, Luis Alejandro Morales Ojeda, Rita Jen, Priya Kohli, Sarah Ponce, Nhi Ha, David W. Chapman, Parag Gad, V. Reggie Edgerton, Kay Jann, David Ginsberg, Evgeniy Kreydin, Aidin Abedi.

**Presenting Author (name and affiliation):** David Ginsberg, University of Southern California, Institute of Urology, Keck School of Medicine, Los Angeles, CA.

**Introduction:** Stroke survivors often develop lower urinary tract symptoms (LUTS) that can be difficult to treat and profoundly impacts their quality of life. By its nature, a stroke could change the activity of the brain due to impairment of brain centers responsible for controlling micturition, which give rise to less cortical activation. Transcutaneous Spinal Cord Stimulation (TSCS), a novel technique in neuromodulation, is emerging as a powerful tool with growing clinical evidence in neuro-restoration potential. The objective was to evaluate changes in brain activity using functional MRI (fMRI) and patient reported outcome measures (PROM) following twelve weeks of bi-weekly TSCS.

**Methods:** Twelve patients with de novo lower urinary tract symptoms following a stroke prospectively underwent TSCS for 24 sessions. Patients completed a voiding diary, ICIQ-OAB questionnaire, MRI safety Form, and underwent fMRI + UDS before and after TSCS therapy. Blood oxygen level dependent (BOLD) signal intensity was detected and synchronized during the maximum urgency period, measured 10 seconds prior to detrusor contraction. Descriptive statistics and paired t-test were used when appropriate.

**Results:** Twelve patients (5 males, 7 females) with a mean age of  $52.8 \pm 9.8$  years old completed the study. After completion of TSCS, patients reported a decreased perception of urge per void ( $1.83 \pm 0.34$  vs  $0.92 \pm 0.21$ ;  $p < 0.05$ ), number of urge incontinence episodes ( $6.96 \pm 2.12$  vs  $4.15 \pm 1.58$ ;  $p < 0.05$ ), and an increased number of urge-free voids per 24 hours ( $0.27 \pm 0.09$  vs  $2.29 \pm 0.91$ ;  $p < 0.05$ ). ICIQ-OAB scores were significantly lower post stimulation ( $9.6$  vs  $4.1$ ;  $p = 0.001$ ). Functional MRI detected an increase in BOLD signal in the cerebellum, cuneus, and multiple frontal areas including the inferior, medial, and middle frontal gyri following TSCS.

**Conclusions:** Patients that completed twelve weeks of TSCS experienced a significant reduction in perceived urge per void and urgency incontinence episodes and an increase in urge-free voids per 24 hours. ICIQ-OAB scores were significantly lower in patient's post-spinal neuromodulation. TSCS resulted in a restoration of activation of several cortical brain regions.

### **S3.C.06: Urodynamics: imposition or not as bad as it seems? Secondary analyses from a randomized controlled trial**

**Authors:** Gross Oliver, Kasten Madlen, Wettstein Marian S., Anderson Collene E., Birkhäuser Veronika, Borer Joëlle, Koschorke Miriam, Liechti Martina D., McCallin Shawna, Mehnert Ulrich, Sadri Helen, Stächele Lara, van der Lely Stephanie, Kessler Thomas M., Leitner

**Presenting Author (name and affiliation):** Oliver Gross, Department of Neuro-Urology, Balgrist University Hospital, University of Zürich, Zürich, Switzerland

**Introduction:** Urodynamic investigation (UDI) is the gold standard for evaluating refractory lower urinary tract symptoms. However, its invasive nature, involving bladder and rectal catheterization, can cause emotional and physical discomfort and side effects. The aim of these secondary analyses from a randomized controlled trial (RCT) assessing artifact susceptibility of water- and air-filled urodynamic systems was to assess discomfort and adverse events (e.g. urinary tract infections (UTI)) of UDI.

**Methods:** From 04/2021-01/2022, 490 patients (40% females) participated in the RCT and underwent UDI. In case of asymptomatic bacteriuria, no antibiotic prophylaxis was given. After removal of the catheters, patients were asked to rate their emotional perception and pain on a numerical rating scale from 0-10, with lower values indicating less discomfort/pain. A follow-up telephone interview was conducted 7-14 days later to assess examination-related adverse events. Chi-square test and logistic regression were used to evaluate associations.

**Results:** Median overall emotional discomfort and pain were 2 (Q1-Q3: 0-5) and 2 (Q1-Q3: 0-4). Female patients reported stronger emotional discomfort ( $p=0.004$ ). Pain ratings did not differ significantly between sex ( $p=0.112$ ). In the follow-up interview, 30% (146/490) reported self-limiting pain with a median intensity of 5 (Q1-Q3: 3.5-6) and a duration of  $\leq 72$ h in 81% (118/146) and  $> 72$ h in 19% (28/146) of cases. Increased urgency was found in 18% (90/490) ( $\leq 72$ h: 70% (63/90);  $> 72$ h: 30% (27/90)). 6% (28/490) of patients developed a UTI. UTI was significantly associated with UTI within the past 12 months (odds ratio (OR) 3.01 95% confidence interval (CI) 1.38-6.58,  $p=0.006$ ), asymptomatic bacteriuria at UDI (OR 4.54, 95% CI 1.54-13.41,  $p=0.006$ ) and higher Charlson-Comorbidity-Index (OR 1.22, 95% CI 1.06-1.4,  $p=0.005$ ). However, the number of positive urine cultures needed to treat to prevent one UTI was 16 (95% CI 9.6-38.6). Gross hematuria was present in 8% of patients, with 34% of these patients taking anticoagulants or platelet aggregation inhibitors. Severe adverse events requiring

hospitalization were seen in 1% (5/490) with 3 of them being examination related (UTIs) and 2 not examination related.

**Conclusions:** UDI is a well-tolerated examination with an acceptable rate of short- and medium-term adverse events. Prophylactic antibiotics to reduce post-UDI UTIs do not seem justified.

**S3.C.07: Static average maximal urethral closure pressure (aveMUCP) as an outcome predictor of urethral sphincter electromyography (USEMG) in a contemporary series of patients with suspected Fowler's Syndrome (FS).**

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**Introduction:** USEMG remains the cornerstone in the diagnosis of FS, although it is only available in highly specialised units. The role of MUCP is currently considered in the diagnostic pathway of FS as patients frequently present with a high MUCP (> 100 cm H<sub>2</sub>O) and abnormal USEMG. There is conflicting evidence regarding MUCP values in patients with normal (n) and abnormal (ab) USEMG and whether MUCP can predict a certain USEMG outcome and therefore be used as an alternative in the diagnosis of FS. We aimed to investigate the predictive value of static aveMUCP for an abUSEMG in a contemporary series of patients with suspected FS.

**Methods:** Retrospective review of urethral pressure profile (UPP) and USEMG studies performed in a single tertiary referral centre for patients with suspected FS between 2015-2022. Age, aveMUCP and USEMG outcome (normal/abnormal) were collected. Expected MCUP (expMUCP) was calculated with Edwards-Malvern formula (expMUCP= 92-age). Average MUCP was calculated by three consecutive MUCP values as per the standard departmental protocol. All UPP and USEMG were performed following the standard departmental protocols published previously. Statistical analyses were performed with Stata 17.0 with p values <0.05 being considered statistically significant.

**Results:** A total of 201 patients with suspected FS were included in the study. Sixty-four (64) patients had a normal USEMG (nUSEMG) and 137 an abnormal USEMG (abUSEMG). Median (IQR) age (years) was similar between groups (nUSEMG=34.5 [24-44.5] vs abUSEMG=29 [25-37], p=0.146). Mean (+/-SD) aveMUCP was significantly higher in abUSEMG group (90.1 +/- 27.7 vs 78.82 +/- 30.65 cmH<sub>2</sub>O; p=0.005). Logistic regression and ROC curve analyses suggested a modest capacity for aveMUCP to predict abUSEMG (AUC=0.61), not improved when aveMUCP-expMUCP difference (AUC=0.58) or ratio (AUC=0.59) were used. An aveMUCP >100cmH<sub>2</sub>O (a value commonly used

in diagnostic pathways) correctly classified only 47.76% of patients (sensitivity=35.77%; specificity=73.44%; positive predictive value 74.24%; negative predictive value 34.81%).

**Conclusions:** Although, MUCP tends to be higher in patients with abUSEMG, it has a rather modest predictive capacity for an abnormal USEMG in patients suspected Fowler's syndrome. MUCP >100 cmH<sub>2</sub>O is likely to be related with an abnormal USEMG. However, values between the expMUCP and MUCP = 100 cmH<sub>2</sub>O cannot exclude an abnormal USEMG and thus, patients with suspicious clinical picture should be investigated further with USEMG in specialist neuro-urology units.

### **S3.C.08: Similar artefact susceptibility for water- and air-filled urodynamic systems: results from a randomized controlled non-inferiority trial**

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**Introduction:** Urodynamic investigation (UDI) is the gold standard to assess refractory lower

urinary tract symptoms. Water-filled systems (WFS) are the method of choice for

UDI pressure measurements according to the International Continence Society

(ICS). However, air-filled systems (AFS) are widely used as convenient alternative to WFS, although it is unclear whether these systems produce comparable measurements.

**Methods:** In this randomized controlled non-inferiority trial patients (n=490) scheduled for

UDI were allocated by block randomization in a 1:1 ratio to undergo UDI using a

WFS (n=244) or an AFS (n=246). UDI consisted of same session repeat filling

cystometry and pressure flow study. The primary endpoint was artefact

susceptibility evaluated by a modified Bristol UTraQ quality scoring scale (Gammie

A. et al., 02/2022, Neurourol Urodyn.) ranging from 0-18, with higher scores indicating a better quality. Urodynamic traces were assessed by an expert in

functional urology blinded to the measurement system used. A clinically meaningful non-inferiority margin was pre-specified as -2 points on the quality scoring scale (AFS-WFS). Non-binary data presented as median and Q1-Q3.

**Results:** The median overall quality score was 14.5 points (13.5-15.5) for the WFS and 15.5 (14.5-16.5) for the AFS. Inferiority of AFS could be rejected at the pre-specified non-inferiority margin (0.96, 95%-confidence-interval 0.68-1.25,  $p < 0.001$ ). Typical artefacts consisted of repeated relevant rectal



contractions (WFS vs AFS: 57% (138/244) vs 68% (166/246),  $p=0.015$ ), poor pressure transmission during cough test at empty bladder (WFS vs AFS: 38% (93/244) vs 4% (10/246),  $p<0,001$ ), and detrusor resting pressure outside of the physiological range at empty bladder (i.e.,  $>5\text{cmH}_2\text{O}$  or  $<-5\text{cmH}_2\text{O}$ ) (WFS vs AFS 16% (40/244) vs 42% (104/246),  $p<0.001$ ). Overall, AFS revealed higher resting pressures at start of UDI (vesical pressure WFS vs AFS: 18.5 (14.5-24) vs 27 (22-30)  $\text{cmH}_2\text{O}$ ; abdominal pressure 20 (15.5-25) vs 30.25 (25.5-35.5)  $\text{cmH}_2\text{O}$ ,  $p<0.001$ ). Median UDI installation time was similar between groups (WFS vs AFS: 26 (20-32) vs 26 (20-32) min,  $p=0.913$ ).

**Conclusions:** Our results demonstrate that AFS are non-inferior to WFS regarding overall quality

of urodynamic traces. However, both measurement systems have particular pitfalls that need to be known for problem solving during UDI and require awareness for accurate interpretation of UDI.

### **S3.C.09: Altered white matter integrity in female patients with overactive bladder**

**Authors:** Michels L, Surbeck W, Stämpfli P, Freund P, Kessler TM, Leitner L, Liechti MD, Luechinger R, Walter M, Mehnert U

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**Introduction:** Overactive bladder (OAB) is associated with elevated urgency and urinary incontinence. These lower urinary tract symptoms (LUTS) seems to be paralleled by structural white matter (WM) hypointensities, such as WM lesions (Sakakibara et al. 2012) in the brain. We aimed to investigate the role of global and local WM tract function in women with OAB using traditional and novel structural imaging markers.

**Methods:** 12 female OAB patients (40 years, range 32-42; no signs of depression, anxiety, or mild cognitive impairment) and 12 healthy female controls (HC, 34 years, range 28-44) were included in this study. All participants were assessed using the female LUTS (FLUTS) questionnaire. Diffusion Tensor Imaging (DTI) was recorded on a 3-Tesla Philips Ingenia scanner. To analyze DTI data in a voxel-wise fashion, Tract-Based Spatial Statistics was used to minimize multi-subject registration errors (FSL, <http://www.fmrib.ox.ac.uk/fsl>). Primary quantitative DTI metrics were fractional anisotropy (FA) as well as the novel metric fiber density (FD), using a multiple-comparison correction with  $p < 0.05$ . Correlations with urological scores within the OAB group were explored in 20 major tracts.

**Results:** Using a whole brain (voxel-to-voxel) approach, FA and FD was reduced in patients with OAB compared to HC in several regions, including callosal fibers, supplementary motor area, and precentral gyrus. OAB showed positive associations (Spearman correlations) of FA and FD with the incontinence episodes in the left and right arcuate fasciculus (all  $p < 0.045$ , all  $r > 0.58$ ).

**Conclusions:** We conclude that the observed WM alterations in OAB patients contribute to their diminished capability of LUT control, as those affected regions (e.g. callosal fibers, supplementary motor area, and precentral gyrus) are associated with the control of the pelvic floor. These neuroimaging findings help to improve our understanding of OAB etiology and the involved supraspinal centers.

**S3.C.10: Prevalence of pathological urodynamic findings and subsequent clinical implications in patients with minimally conscious state / unresponsive wakefulness syndrome: a retrospective exploratory study**

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**Introduction:** The aim of this study was to investigate the prevalence of pathological findings during early urodynamic studies (UDS) in patients with minimally conscious state (MCS) / unresponsive wakefulness syndrome (UWS) and whether management of the lower urinary tract (LUT) was influenced.

**Methods:** This retrospective cohort study was approved by our local ethics committee (EKNZ 2019–02394) and is reported in accordance with the STROBE statement guideline for cohort studies.

Patients were eligible when meeting the following inclusion criteria: diagnosis of MCS or UWS at our rehabilitation centre between January 2011 and December 2019 and documented baseline urodynamic studies (UDS) for assessment of LUT function.

Patients were included if aged 18 years or older and underwent baseline UDS after being diagnosed with MCS/UWS. We analyzed urodynamic parameters and subsequent management of the LUT in this cohort.

The primary outcome was to obtain the prevalence of pathological findings during early urodynamic studies (UDS) in patients with MCS/UWS. The secondary outcome was whether LUT management was changed with respect to the baseline UDS findings.

**Results:** In total, 32 patients (7 females, median age 37 years) with MCS/UWS were included for analysis.

Prior to baseline UDS, the minority of patients had at least one pharmaceutical LUT treatment (21.9%) and have utilized one method of assisted urinary bladder emptying (78.1%).

Furthermore, 46.9% of all patient had experiences at least one LUT complication since admission, comprising: UTI/CA-UTI 31.3%, catheter occlusion 21.9%, etc. While 90.6% of patient demonstrated at least one pathological parameter, neurogenic detrusor overactivity (NDO, 81% (26/32)) and detrusor-sphincter-dyssynergia (DSD, 69% (22/32)) were the two most frequent pathological UDS findings.

Following baseline UDS, new LUT treatment options were established in 56% (18/32) of all patients. In addition, bladder-emptying methods were changed in 47% (15/32) of all patients, i.e. mainly fewer patients relying on indwelling catheters.

**Conclusions:** This retrospective cohort study revealed a high prevalence of NDO and DSD in patients with MCS/UWS, illustrating the importance of early UDS to adapt LUT management in this cohort accordingly.

#### **S4.C.01: Validation of a questionnaire on pelvic organ function for Russian patients with neurological diseases**

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**Introduction:** Bladder, bowel, and erectile dysfunctions are common among post-stroke patients and patients with Parkinson's disease and multiple sclerosis. For many people, questionnaires reduce embarrassment. Since no questionnaire in Russia would evaluate all three pelvic organ systems in patients with different neurological diseases, we validated the Japanese pelvic organ function questionnaire on a Russian group of patients.

**Methods:** Following international standards, validation of the questionnaire included linguistic and cultural adaptation and assessment of its psychometric properties. Approval of the Russian-language questionnaire version was obtained directly from the developer, Ryuji Sakakibara. The questionnaire was tested twice - before and after treatment. There were 48 patients over 18 years old (18 with Parkinson's disease, 15 with multiple sclerosis, and 15 post-stroke). Statistical analysis of the data was performed using IBM SPSS Statistics 22 software.

**Results:** The Median (IQR) age of patients was 56.5 years (42-70.5). A Russian-language version of the questionnaire was developed during linguistic and cultural adaptation. At the 2nd stage of validation, it was shown that the mean score in the sample was  $2.03 \pm 0.52$  per question upon admission to the hospital and decreased significantly to  $1.91 \pm 0.51$  per question on discharge (Wilcoxon test,  $p < 0.0001$ ). It confirms the questionnaire's high sensitivity to changes in the clinical picture. Cronbach's alpha coefficient was  $\alpha = 0.82$  ( $p < 0.001$ ). It indicates the high level of internal consistency of the questionnaire. Significant Spearman correlation coefficients between the Russian-language version of the questionnaire and the other scores were obtained in the criterion validity assessment ( $\rho = 0.77$  with the International Prostate Symptom Score and  $\rho = 0.62$  with the Overactive Bladder Symptom Score ( $p < 0.0001$ )).

**Conclusions:** This Russian-language version of the pelvic organ function questionnaire is a useful assessment tool for patients' complaints and disease dynamics. This work is valuable as an example of adapting a foreign scale or questionnaire to the local health care system.

#### **S4.C.02: Sex differences and frequency effects in pudendal nerve somatosensory evoked potentials**

**Authors:** Marina Rüfli, Stéphanie van der Lely, Collene E. Anderson, Nadja Furlan, Stephanie A. Stalder, Ulrich Mehnert, Thomas M. Kessler, Martina D. Liechti

**Presenting Author (name and affiliation):** Marina Ruefli, Department of Neuro-Urology, Balgrist University Hospital, University of Zürich, Zürich, Switzerland

**Introduction:** Pudendal long-latency somatosensory evoked potentials (SSEPs) may provide insights into mechanisms involved in neurogenic lower urinary tract dysfunction (NLUTD) and modifications of brain activity induced by neuromodulation treatment. While SSEPs are routinely assessed in clinics using a stimulation frequency around 3 Hz, slower stimulation frequencies are needed to assess long-latency SSEPs. With the general goal to investigate pudendal nerve long-latency SSEPs for application in NLUTD, this study aimed as a first step to investigate the effect of stimulation frequency and sex on the clinically established W-shaped pudendal nerve SSEPs (P40, N50, P65, N85).

**Methods:** In 20 healthy subjects (age: 21-71, 9 females), SSEPs were evoked using rectangular stimuli of 0.2ms applied at the pudendal and tibial nerve using a stimulation frequency of 3.1Hz and 1.1Hz. Signals were recorded from Cz'-Fz using scalp electrodes. On a single-subject level, P40, N50, P65, N85 components were analysed regarding responder rates (criteria: identifiable and replicating components across odd and even SSEP averages), P40 latency, and P40N85 amplitudes. Linear mixed-effects models were calculated using frequency, sex, sex\*frequency, body height, and age as predictors.

**Results:** Considering the presence of the four SSEP components, responder rates were over 85% for both stimulation frequencies, except for pudendal N50, P65 using 1.1 Hz stimulation in males (55%). Regarding P40N85 amplitudes, linear mixed effect analyses revealed significant frequency effects (increased amplitudes using 1.1Hz) for tibial and pudendal stimulation. Longer P40 latencies were found with increasing body height for pudendal and tibial SSEPs. In addition to age effects, there was also a frequency effect for tibial P40 latencies. For pudendal stimulation, only an interaction between frequency and sex was found.

**Conclusions:** The study showed that pudendal SSEP waveforms and amplitudes are sensitive to changes in stimulation frequency. All components could be reliably detected using clinically established stimulation parameters (3.1 Hz stimulation). However, slower stimulation frequencies affected the classical W-shaped SEP waveform, reflected in decreasing responder rates for N50 and P65 components, in particular in males. This was in contrast to tibial nerve SSEPs and needs to be considered when using slower stimulation frequencies, as needed for studies investigating long-latency SSEPs in healthy subjects and patients with NLUTD.



### **S4.C.03: Evaluation of the urological care process in patients with myelomeningocele in Argentina**

**Authors:** Sager C, Gomez Y, Burek C, Weller S, Ruiz J, Lopez Imizcoz F, Rosier N, Diaz Zabala L, Blain O, Corbetta J, Naccache S, Campmany L, de Castro Pérez F, Agrimbau J, Bernardez L.

**Presenting Author (name and affiliation):** Cristian Sager, Garrahan Pediatric Hospital

**Introduction:** Myelomeningocele (MMC) is one of the most severe congenital malformations compatible with life. Of all the patients, 90% presents with a neurogenic bladder requiring early evaluation and treatment. Objectives: To describe the urological evaluation and treatment received by patients with MMC up to the first consultation at Garrahan Hospital (pre-follow-up period). To describe the urological evaluation and treatment implemented from referral to Garrahan Hospital (follow-up period). To evaluate the prevalence of chronic kidney disease (CKD).

**Methods:** A retrospective, longitudinal study with a clinical, analytical design was conducted in patients with MMC between 1 months and 18 years of age referred to Garrahan Hospital for outpatient care for a period of 12 months.

**Results:** 115 patients were included. At the time of referral to the hospital ("pre-follow-up") 7% of the patients had undergone complete urological evaluation (kidney-bladder ultrasonography, urodynamic studies, cystourethrography, renal scintigraphy, and creatinemia levels). Treatment: 33% emptied their bladder by CIC or vesicostomy and 21% received oxybutynin. From follow-up initiation at Garrahan Hospital, 83% underwent complete evaluation, and based on the results CIC was indicated in 87% and oxybutynin in 66% of the patients. On admission, prevalence of CKD was 43%; with stage I in the majority of the patients. The maternal level of education, the distance to the care center and/or the type of coverage did not affect compliance with the proposed study plan.

**Conclusions:** The majority of the patients with MMC were referred to a third-level hospital with incomplete urological studies without full treatment of the neurogenic bladder and with more than 40% renal involvement. Initiation on time of interdisciplinary follow-up and connection with a tertiary hospital allowed for the necessary studies and implementation of adequate treatment.

#### **S4.C.04: Evolution of neurogenic bladder by myelomeningocele with proactive approach**

**Authors:** Sager C, Gomez Y, Burek C, Weller S, Ruiz J, Lopez Imizcoz F, Rosier N, Diaz Zabala L, Blain O, Corbetta J.

**Presenting Author (name and affiliation):** Cristian Sager, Garrahan Pediatric Hospital

**Introduction:** The proactive management of myelomeningocele (MMC) has contributed to decreasing their progression to end-stage renal disease (ESRD). But some patients will continue to show unresolved bladder changes and renal involvement.

Objective: to demonstrate that early urological evaluation shows alterations in the majority of patients with MMC and that some alterations will continue to be evident, despite our proactive intervention.

**Methods:** A retrospective study including 60 patients with MMC. All of them underwent renal/bladder ultrasound, videourodynamic (VUD), renal DMSA and laboratory test when they were less 1 year old. The cases were followed by 5 and 10 years. High risk VUD were defined as: 1) pressure >40 cmH<sub>2</sub>O at expected cystometric capacity (ECC) or DLPP >40 cmH<sub>2</sub>O; 2) high pressure in detrusor overactivity >65 cmH<sub>2</sub>O for girls and >80 cmH<sub>2</sub>O for boys and 3) VUR. The statistical analysis was performed with logistic regression analysis.

**Results:** In the initial evaluation all the patients showed inefficient voiding: 98.3% and high-risk VUD were observed in 28 cases (46.6%). 77% of the cases with abnormal DMSA presented high risk VUD. Although there was high percentages of urodynamic alterations, VUR and UTI in abnormal DMSA, only the Pdet >20 cmH<sub>2</sub>O at ECC was statistically significant (p: > 0.0436). The cases followed until 5 years presented pathological DMSA: 36% (from the initial 30 %); Reduced cystometric capacity: 42% (from the initial 22%); intravesical pressure >20 cmH<sub>2</sub>O a ECC: 62% (from the initial 43%). The cases followed until 10 years (n: 30) presented ESRD about 40%. All patients were with CIC and oxybutynin. Anticholinergic resistance was around 40%.

**Conclusions:** In the initial urological evaluation of patients with MMC, almost all had inefficient voiding, the half of them had high-risk VUD and almost one-third showed abnormal DMSA. After 5 and 10 years of follow-up in half of the cases, the abnormal endovesical pressures and the ESRD (with pathological DMSA) had increased, despite the proactive approach showing that time is another influential factor.



#### **S4.C.05: Neurogenic bladder due to lipomas and lipomenigoceles in children**

**Authors:** Sager C, Gomez Y, Burek C, Weller S, Ruiz J, Lopez Imizcoz F, Rosier N, Diaz Zabala L, Blain O, Corbetta J.

**Presenting Author (name and affiliation):** Cristian Sager, Garrahan Pediatric Hospital

**Introduction:** Since lumbosacral lipomas (LSL) and lipomenigoceles (LMC) are a common cause of spinal cord tethering that can lead to progressive neurological deficits, neurosurgery for LSL and LMC, including untethering of the spinal cord, is recommended. Lipomas can cause bladder dysfunctions, as one of the first signs of neurological deterioration. Objective: To analyze the urological commitment, mainly urodynamic pre and postoperative (POP) of the neurosurgery.

**Methods:** This retrospective, observational study recruited 94 cases with LSL and LMC with average follow-up was 12 years. Clinical-Urological presentation was described; urodynamic status pre-and postsurgical. Excision of lipomatous mass and release of filum terminale were performed as the main neurosurgical procedures. Categorical data were reported as frequencies and percentages (chi-squared test).

**Results:** Population: girls: 69%. Average age of consultation: 2.1 years old (r: 0,1-16). The most frequent sign of presentation were: Tumor: 80% and UTI: 23%. Asymptomatic urological was 42.5% and asymptomatic neurological was 33%. By MRI and surgery, 48 cases of LSL and 46 cases of LMC were identified. Pre and postoperative urodynamics showed: improvement in bladder capacity, compliance, overactivity and postvoid residual in 5, 4, 10 and 19 cases; respectively. Worsening in bladder capacity, compliance, overactivity and postvoid residual in other 3, 2, 8 and 27 cases; respectively. In dysynergy (n: 2), arreflexia (n: 6) and ineffective voiding (n: 3), there were no statistically significant changes. It was required in POP to incorporate de novo: oxybutynin in 27 cases and intermittent catheterization clean in 25 cases.

**Conclusions:** Urodynamic have defined the type of dysfunction, preoperative and POP. The overactivity of the detrusor and the post-void residue were the variables that have suffered most modifications. On the other hand, cystometric capacity and bladder wall accommodation were the variables that did not change in 70% of the cases.

#### **S4.C.06: Sensory assessments in patients with neurogenic lower urinary tract dysfunction undergoing sacral neuromodulation testing**

**Authors:** Stephanie A. Stalder, Martina D. Liechti, Stéphanie van der Lely, Stephanie Knüpfer, Collene E. Anderson, Lorenz Leitner, Ulrich Mehnert, Jure Tornic, Thomas M. Kessler

**Presenting Author (name and affiliation):** Stephanie A. Stalder, Department of Neuro-Urology, Balgrist University Hospital, University of Zürich, Zürich, Switzerland

**Introduction:** Sacral neuromodulation (SNM) is a well-established therapy for non-neurogenic lower urinary tract dysfunction with increasing evidence in patients with neurogenic lower urinary tract dysfunction (NLUTD). Neuromodulation seems to affect afferent signal processing (e.g. increased current perception thresholds (CPTs) after SNM, increased amplitudes in long-latency sensory evoked potentials (SEPs) after tibial nerve stimulation), however, the exact mechanism of action remains unclear. Therefore, we aimed to investigate the relevance of sensory assessments in the context of SNM in patients with NLUTD.

**Methods:** CPTs and SEPs during tibial, pudendal and lower urinary tract (LUT) (bladder dome, trigone, proximal and distal urethra) electrical stimulation (3Hz: tibial, pudendal / 0.5Hz: LUT stimulation) were assessed in 40 patients with refractory NLUTD before and after SNM testing. CPTs, SEP trajectories (Cz-Fz) and the presence of components (tibial and pudendal SEPs: P40,N50,P65,N85; LUTSEPs: P1,N1,P2) were analysed on group level, stratified per location. In patients with all components present, peak markers were individually set for latency and amplitude analyses.

**Results:** For tibial and pudendal SEPs, all components were visible on group level, and marker analyses (n=18) revealed no changes in latencies and amplitudes between visits. This allowed fixed time-point analysis, revealing amplitude changes in late (>85ms) components after SNM testing.

Regarding LUTSEP, predefined components were present on group level for all stimulation locations, without any changes in amplitudes over time. For trajectories, there were trends with consistent changes over time, especially increased amplitudes after SNM in the N1-P2 transition. Overall (n=40), CPTs did not change after SNM testing for all stimulation locations.

Considering clinical success, analyses revealed differential effects between SNM responders and non-responders in CPTs for tibial stimulation only (decreased in responders, no change in non-responders). However, non-responders generally showed higher LUTCPTs (both visits). Preliminary

analysis of SEP trajectories pointed towards differential effects which needs further analyses.

**Conclusions:** This is the first study combining tibial, pudendal and LUTSEPs with CPT assessments in patients with NLUTD undergoing SNM. CPT and SEP assessments indicate changes after SNM testing and may be useful to predict SNM success. Considering the heterogenous neuro-urological patient population, our findings are promising, however, further investigations with larger groups are warranted.

#### **S4.C.07: Effects of age and sex on lower urinary tract current perception thresholds**

**Authors:** Stéphanie van der Lely, Collene E. Anderson, Flavia Gregorini, Stephanie C. Knüpfer, Lorenz Leitner, Marina Rüfli, Melanie R. Schmidhalter, Stephanie A. Stalder, Jens Wöllner, Thomas M. Kessler, Ulrich Mehnert, Martina D. Liechti

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**Introduction:** The extent to which lower urinary tract (LUT) current perception thresholds (CPTs) (LUTCPTs) change with age and sex is not well understood. Meta-analyses in a recent review on LUT electrical sensory assessment showed that CPTs increase with age, while CPTs did not differ between females and males. However, these findings are not always consistent in single studies, with the type of stimulus being a major source of variability. In order to reliably assess afferent nerve function, we aimed to evaluate the presence and magnitude of age and sex effects on LUTCPTs in our single-center normative data from healthy subjects from the last twelve years.

**Methods:** We pooled all in-house LUTCPT data of healthy subjects (2011–2022: N=132 (age: 18-59 years, 67 females)), where electrical square wave stimulation with a frequency of 0.5Hz and 1ms pulse width was applied in the LUT (bladder dome; trigone; proximal, distal urethra). CPTs were defined 2-4 times according to the method of limits and mean thresholds were calculated. Statistical analyses were performed using mixed-effects generalized linear models (complete-case analysis; predictors: age, sex, catheter type, stimulation location).

**Results:** Overall, median CPT value was 3.3mA (interquartile range: 2.0mA-6.0mA). After accounting for technical aspects (4 catheter types) and stimulation location, age had a clear effect on CPTs. For every 10-year increase in age, mean CPT increased by 25% (95% CI: 12%-40%). Regarding sex, CPT mean point estimate for females was 15% lower (95% CI: -31% to +5%) compared to males, however, did not reach significance ( $p=0.13$ ).

**Conclusions:** In line with findings from our recent meta-analysis, this study shows that CPTs vary with demographic characteristics, in particular increasing 25% with every 10-year age increase. The finding of decreasing LUT sensation may be associated with an age-related reduction of sensory nerve function in the LUT similar to findings from the somatosensory and visceral systems such as the gastrointestinal tract. Hence, it is highly recommended to take age and sex into account for the interpretation of LUTCPT assessments. This

in particular has to be considered for clinical applications and when designing studies and comparing different cohorts.



#### **S4.C.08: Long-term beneficial effects of mirabegron in pediatric patients with therapy-refractory neurogenic lower urinary tract dysfunction**

**Authors:** Klicken oder tippen Sie hier, um Text einzugeben. F.E.E. van Veen<sup>1</sup>, M. Schotman<sup>1</sup>, L.A. t Hoen<sup>1</sup>, B.F.M. Blok<sup>1</sup>, J.R. Scheepe<sup>1</sup>

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**Introduction:** In children, neurogenic lower urinary tract dysfunction (NLUTD) is often caused by congenital anomalies such as myelomeningocele or caudal regression syndrome. Generally used treatment options for NLUTD are clean intermittent catheterization (CIC) with antimuscarinics (AM) and intradetrusor OnabotulinumtoxinA (BoNT-A). However, therapy compliance of AM is poor due to undesirable side effects, and a considerable number of patients become refractory to AM and BoNT-A. This study aimed to evaluate the efficacy and long-term outcomes of mirabegron in children with NLUTD as add-on and stand-alone treatment.

**Methods:** Patients < 18 years with NLUTD who were refractory to AM and/or BoNT-A and were treated with mirabegron 50mg were retrospectively studied. Mirabegron was used as monotherapy or in addition to AM and/or BoNT-A. Video-urodynamic studies were performed before and after mirabegron treatment. Changes in video-urodynamic parameters, need for other NLUTD therapy during follow-up, patient-reported side effects and urinary incontinence were outcomes of interest.

**Results:** A total of 35 patients with NLUTD were included. All patients performed CIC and the median age was 12.9 years (IQR 15.0 – 10.3). Median follow-up was 29.2 months (IQR 56.8 – 10.6). Maximum cystometric capacity increased by 30.8%, from 298.3 (SD 136.3) to 390.3 ml (SD 153.7) ( $p < 0.001$ ), bladder compliance improved by 89.7%, from 14.6 (SD 12.2) to 27.7 ml/cm H<sub>2</sub>O (SD 17.3) ( $p < 0.001$ ) and end-filling detrusor pressure decreased by 29.1%, from 30.6 (SD 16.8) to 21.7 cm H<sub>2</sub>O (SD 13.8) ( $p = 0.001$ ). VUR incidence decreased from 20.0% to 2.9% ( $p = 0.031$ ) and incontinence improved after mirabegron ( $p < 0.001$ ). Volume at first DO showed significant improvement, whereas peak pressure DO did not. Moreover, mirabegron add-on therapy resulted in more significant improvements in video-urodynamic outcomes compared to monotherapy. The median time of requiring additional NLUTD

therapy was 24.8 months (IQR 38.4 – 11.0). None of the patients reported side effects.

**Conclusions:** Mirabegron is an effective treatment for children with therapy-refractory NLUTD with an average efficacy of 2 years after which additional therapy is required. Despite the retrospective character of this study our results confirm the beneficial effect of mirabegron in children with therapy-refractory NLUTD, in particular when mirabegron is used as add-on therapy in those with low-compliance bladders.

#### **S4.C.09: New pelvic floor physiotherapy pathways in a uro-neurology clinic**

**Authors:** Klicken oder tippen Sie hier, um Text einzugeben. Sarah Wright, Natalia Vasquez, Sara Simeoni, Jalesh Panicker

**Presenting Author (name and affiliation):** Natalia Vazquez,

**Introduction:** NICE guidelines recommend pelvic floor muscle training to manage incontinence in neurological conditions, yet the implementation of specialist physiotherapy clinics for such population is lacking. Furthermore, COVID-related disruptions have impacted care pathways in the Uro-neurology department, and the service is hard-pressed in delivering pelvic floor physiotherapy effectively.

**Methods:** We collected data from 13 patients from the Uro-Neurology clinic that completed QoL questionnaires regarding bladder, bowel and sexual health dysfunction (USP, NBD and ASEX) before and after being offered one of two pelvic floor physiotherapy pathways. They also completed a patient global impression of Improvement score after either intervention. In the self-management (SM) pathway, patients predominantly had storage symptoms, mixed incontinence, and/or had mild disability. In the face to face pathway (F2F), patients presented with voiding dysfunction, severe bladder, bowel and sexual symptoms, had chronic pain and/or a complex neurology and clinical history. Eight patients were allocated to the SM pathway and five to the F2F pathway.

**Results:** All patients showed improvement in the USP subgroup scores (SUI, OAB and voiding). All patients showed lower ASEX scores post intervention. The NBD score slightly increased in all patients post intervention. All patients in the F2F group described symptoms as 'a little better' or 'much better' after intervention. Five patients (63%) described their symptoms as 'a little better' or 'much better' and three patients (37%) reported no change in their symptoms after intervention in the SM group. The patients receiving F2F intervention did report increased satisfaction.

**Conclusions:** We developed two pathways for conservative management for pelvic dysfunction that maximise the delivery of pelvic floor physiotherapy. We created a series of videos with information on self-management for pelvic dysfunction that can be shared by clinicians. Results from this project showed a positive outcome from both interventions and results demonstrated the need for a physiotherapy led clinic within our Uro-neurology department. This has now been successfully established and we



continue to provide clinical support and specialist physiotherapy treatment to the patients that come through our department.

#### **S4.C.10: Isolated genital numbness – a clinical and pelvic neurophysiology profile**

**Authors:** Klicken oder tippen Sie hier, um Text einzugeben. Sarah Wright, Natalia Vasquez, Sara Simeoni, Jalesh Panicker

**Presenting Author (name and affiliation):** Sara Wright,

**Introduction:** Genital numbness is an uncommon neurological symptom and identifying the cause can be challenging. Pelvic motor, sensory and autonomic potentials are conveyed by the pudendal nerve. Neurological causes of genital numbness include a conus medullaris or cauda equina lesion or damage to the pudendal nerve. The neurological basis of genital numbness has not been defined and requires further investigation. We describe a cohort of neurological and non-neurological individuals referred with genital numbness assessed clinically and with pelvic neurophysiology.

**Methods:** Individuals were referred to a tertiary referral centre with genital numbness for pelvic neurological assessment from 2018 to 2022. Individuals underwent clinical evaluation for pelvic organ complaints and targeted pelvic sensory examination (Neurotip and Von Frey hair examination). Pelvic neurophysiology studies were performed and included sensory (pudendal, tibial, S2 and S3 dermatomal sensory evoked potentials).

**Results:** 37 individuals were identified with genital numbness (13 female, 35.1%). The median age was 40.3 years (IQR 17.8). 27 individuals (73%) were referred with no pre-existing neurological or neurosurgical diagnosis. Sexual dysfunction was common (73%, n=27) in male and female individuals. Bladder storage symptoms were reported in 40.1%. There were seven individuals with abnormal pelvic neurophysiology, and 71.4% (n=5) had concurrent abnormal clinical examination (both modalities). There were 23 individuals (70% male) with normal pelvic neurophysiology who reported abnormal clinical examination of either sensory modality, though only 5 (21.7%) had an abnormal clinical examination involving both modalities. Sexual dysfunction was reported to be more common in individuals with normal pelvic neurophysiology (76.7% compared with 57.1%). 8 (21.6%).

**Conclusions:** A pelvic neurological assessment is warranted in individuals reporting isolated genital numbness. A lesion of the somatic innervation to the external genitalia is not common. An abnormal pelvic sensory examination involving both tested modalities was associated with abnormal pelvic neurophysiology. Higher rates of reported sexual dysfunction and impaired

erogenous sensation in individuals with isolated genital numbness without evidence for nerve injury may suggest an abnormality of central sensory processing.

### **S5.B.01: Intraneural pudendal nerve recording and stimulation in animal models for the closed-loop control of lower urinary tract dysfunction**

**Authors:** Klicken oder tippen Sie hier, um Text einzugeben. Alice Giannotti, Sara Lo Vecchio, Laura Salatino, Fabio Bernini, Khatia Gabisonia, Lucia Carlucci, Stefania Musco, Fabio Anastasio Recchia, Giulio Del Popolo, Silvestro Micera

**Presenting Author (name and affiliation):** Alice Giannotti, The Biorobotics Institute, Scuola Superiore Sant'Anna, Pisa, Italy

**Introduction:** Pudendal neuromodulation is a promising alternative in patients with lower urinary tract dysfunction unresponsive to sacral neuromodulation. Continuous stimulation may cause neuronal adaptation. Since adaptive pudendal neuromodulation showed increased bladder capacity and voiding effectiveness, a closed-loop (CL) stimulation system based on bladder fullness may improve long-term efficacy. A preliminary study on pig pudendal nerve (PN) recording to predict bladder distension and selective stimulation for bladder control is presented.

**Methods:** Three farm pigs, under general anesthesia, underwent transgluteal surgery for unilateral PN access and intraneural electrode implantation. PN activity was recorded at empty and full bladder conditions. A k-NN classifier based on feature extraction was built to decode bladder filling. Electromyographic (EMG) activity of the external urethral sphincter (EUS), external anal sphincter (EAS), and perineal muscles was recorded during PN intraneural stimulation. Intraneural stimulation was performed by delivering current stimuli with 10-600  $\mu\text{A}$  amplitude and 3 Hz frequency to each active site (AS) of the intraneural electrode. Recruitment curves for each muscle and AS were derived by filtering EMG data within 10-250 Hz and normalizing the filtered EMG values by the maximum contraction obtained. The selectivity index (SI) was computed as the ratio of muscle recruitment to the sum of all muscle recruitments. An AS was considered muscle-selective if both normalized EMG activity and the SI were greater than 0.3.

**Results:** Empty and full bladder states were classified with an accuracy of  $87\pm 3\%$  and  $82\pm 1\%$ , respectively. The stimulation current required to achieve 30% muscle activation from the recruitment curve was 50  $\mu\text{A}$  for perineal muscle and EAS, while 110  $\mu\text{A}$  for the EUS. SI was higher than 0.3 in 2 of 19 ASs for EUS, 4 of 19 ASs for EAS, and 6 of 19 ASs.

**Conclusions:** PN signals showed to provide information on bladder fullness. Intraneural electrodes proved to selectively activate monitored muscles. EUS activation required a higher stimulation current than EAS and fewer ASs were selective for it. These findings support the need for EUS selective stimulation avoiding EAS side activation. Our outcomes may lead to intraneural PN CL device implementation for bladder function restoration.



### **S5.B.02: Does early montelukast therapy improve bladder function and spinal cord regeneration after sci?**

**Authors:** Klicken oder tippen Sie hier, um Text einzugeben. Michael Kleindorfer, Karin Roider, Behnaz Afrashteh, Sophina Bauer, Evelyn Beyerer, Akshay Akshay, Katia Monastyrskaya, Lukas Lusuardi, Ludwig Aigner and Elena E. Keller

**Presenting Author (name and affiliation):** Michael Kleindorfer, Institute of Molecular Regenerative Medicine, Spinal Cord Injury and Tissue Regeneration Center Salzburg, Paracelsus Medical University, Salzburg, Austria 2 University Clinics of Urology and Andrology, Salzburg General Hospital, Salzburg, Austria

**Introduction:** Spinal cord injury (SCI) is one of the few medical conditions with a high unmet clinical need for emerging therapies that do not only treat the symptoms but the underlying pathology. Our research is directed towards the overshooting neuroinflammation cascade of the secondary injury which is believed to be even more destructive than the primary insult itself. With Montelukast, a licensed leukotriene receptor 1 antagonist, we hope to target one of the main elevated molecules present at the lesion site and in peripheral organs. Montelukast therapy improved non-neurogenic bladder dysfunction in patients and structural bladder integrity in SCI rats.

**Methods:** Our aim was to analyze the potential of Montelukast on bladder function and spinal cord tissue after a severe T9 contusion in rats in a randomized, blinded, sham-controlled study. All animals received a permanent bladder catheter. Oral daily Montelukast therapy started on day 1 after SCI. Primary outcome parameter was the weekly functional bladder analysis, secondary outcome parameter the locomotor function. After 2 months follow up period (FUP), both spinal cord and bladder tissue, was harvested and analyzed by histology, bladder tissue additionally by transcriptomic and proteomic methods.

**Results:** Due to still ongoing analyses, results are shown in a blinded manner.

For all SCI rats, irrespective of group, Locomotor rating showed complete loss of function with no regain of coordinated walking.  $\mu$ CTs of the spinal cord confirmed consistent severe injuries. A first urodynamic pattern analysis highlighted an initial loss of bladder control with partial recovery of bladder function during week 2 and plateauing out in the second FUP month. Transcriptomics highlighted changes in proliferation, contractility and inflammation between SCI and their respective sham animals at 2 months. Animals of group A experienced more collagenisation/fibrosis, while group B had increased mitochondrial activity. Proteomic analysis

found further differences between groups A and B, with B clustering closer to the healthy sham collective.

**Conclusions:** The potential of Montelukast will unravel once data sets are completed and de-blinded.

### **S5.B.03: Rapid detection of bacterial UTIs using a reporter phage-based bioluminescence assay**

**Authors:** Klicken oder tippen Sie hier, um Text einzugeben. Jiemin Du<sup>1</sup>, Susanne Meile<sup>1</sup>, Sonja Milek<sup>2</sup>, Lorenz Leitner<sup>2</sup>, Shawna McCallin<sup>2</sup>, Vera Neumeier<sup>2</sup>, Thomas M. Kessler<sup>2</sup>, Martin J. Loessner<sup>1</sup>, Samuel Kilcher<sup>1</sup>, Matthew Dunne<sup>1</sup> <sup>1</sup> Institute for Food, Nutrition and Health, ETHZ, Zürich, Switzerland <sup>2</sup> Department of Ne

**Presenting Author (name and affiliation):** Lorenz Leitner, Department of Neuro-Urology, Balgrist University Hospital, University of Zürich, Zürich, Switzerland

**Introduction:** Urinary tract infections (UTIs) are among the most common microbial diseases in all age groups and major contributors to the injudicious use of antibiotics. Rapid and accurate pathogen identification directly from urine samples can drastically improve the clinical management of UTIs, alleviating their socio-economic impacts, and facilitating antibiotic stewardship.

Bacteriophages (phages) are viruses that solely infect and kill bacteria by injecting their genome into a bacterial cell to create new virions. The typically narrow and species-specific host ranges of phages make them ideal candidates for the development into pathogen-specific, precision antimicrobials, or as bio-probes for bacterial diagnostics.

**Methods:** Luciferase reporter phages are genetically engineered viruses capable of rapidly detecting their target bacterial hosts with exquisite specificity and sensitivity. Upon infection of their target bacteria, these phages express a luciferase reporter protein that can be easily detected by the production of bioluminescence after substrate addition. Importantly, as phage infection and subsequent luciferase production requires active bacterial metabolism, this diagnostic method does not produce false-positive results in the presence of dead target bacteria (unlike nucleic acid-based diagnostics). Here, using a set of six individual luciferase reporter phages, we report the development and evaluation of a novel phage-based bioluminescence assay for rapid detection of the three predominant UTI pathogens, *Escherichia coli*, *Klebsiella* spp. and *Enterococcus* spp..

**Results:** In vitro, the assay positively identified 83-96% of 154 clinically relevant isolates, showing the highest inclusivity for *Enterococcus* spp. (50/52), followed by *Klebsiella* spp. (45/50) and *E. coli* (43/52). The assay performance was assessed alongside routine clinical testing on 206 patient specimens collected from two local hospitals in Zurich over five months. The reporter phage assay led to reliable detection of *E. coli*, *E. faecalis*, and *Klebsiella* spp. with high specificity (97, 98, 98%) and sensitivity (66, 81, 81%)

at a resolution of  $\geq 10^3$  CFU/mL in under 6 hours (including specimen pre-enrichment).

**Conclusions:** This phage-based diagnostic platform offers opportunities for prompt bacterial UTI diagnosis in point-of-care settings and is currently being developed into a companion diagnostic to determine phage viability and patient eligibility for phage therapy to treat UTIs.

#### **S5.B.04: New microhole zone catheter prevents flow-stops and bladder micro-trauma during intermittent catheterization**

**Authors:** Klicken oder tippen Sie hier, um Text einzugeben. Brit Schrøder, Fabio Tentor, Teodora Miclaus, Lars Schertiger, Kristian Stærk, Thomas Emil Andersen, Andreas Willumsen, Lene Feldskov Nielsen

**Presenting Author (name and affiliation):** Brit Schrøder, Coloplast A/S, Humlebaek, Denmark

**Introduction:** Urinary tract infections (UTIs) are the main complication in clean intermittent catheterization. Among others, increased post-void residual urine and bladder microtrauma represent risk factors for UTIs. We measured UTI-related parameters in a catheter with an innovative 80-microhole design of the drainage zone compared to a conventional eyelet catheter.

**Methods:** New micro-hole zone catheters (MHZC) were compared to the SpeediCath® conventional eyelet catheter (CEC) in CH12 size. We assessed the flowrate, residual volume at first flow-stop, intra catheter pressure, and incidence of mucosal suctioning in an ex vivo porcine lower urinary tract (LUT) model. Four different micro-hole diameters were investigated together with various insertion depths to simulate real-life use scenarios, and different "abdominal pressures" mimicking sitting or standing positions. A pressure sensor inside the catheter tracked pressure variations during voiding. Furthermore, we collected endoscopic images from inside and outside of the catheter, both in the ex vivo model and in vivo in pigs to expand the mechanistic understanding of the MHZC functionality.

**Results:** All MHZCs had residual volumes significantly lower and flowrates significantly higher than the CEC. Investigating mucosal suction, only the Ø0.4 mm MHZC showed no mucosal suctioning events in contrast to the CEC. The flow rate was higher for "abdominal pressure" of 50 cmH<sub>2</sub>O than 20 cmH<sub>2</sub>O, but the residual volume at first flow stop was equally low and no mucosal suctioning occurred. The pressure peaks measured inside the MHZC was low, regardless of "abdominal pressure" unlike for CEC, endoscopic studies showed gradual bladder folding around the MHZC during voiding, but without complete blocking of the micro-holes, or bladder suctioning through the holes, thus avoiding flow-stops, improper voiding, and micro-trauma.

**Conclusions:** The MHZC significantly reduces residual urine and bladder mucosal suction during intermittent catheterization, practically eliminating the need for catheter repositioning and potentially decreasing the risk of UTIs.

**S5.B.05: Neuro-urological device biofilms harbor unique microbe-metabolite interaction networks in infection, and in vitro biofilm reconstitution differs by device material type**

**Authors:** Klicken oder tippen Sie hier, um Text einzugeben. Glenn T. Werneburg MD, PhD, Daniel Hettel MD, Howard B. Goldman MD, Sandip P. Vasavada MD, Aaron W. Miller PhD

**Presenting Author (name and affiliation):** Glenn Werneburg, Department of Urology, Cleveland Clinic Foundation, Cleveland, Ohio, United States

**Introduction:** Device-associated infection is a devastating phenomenon that spans medical specialties including neuro-urology. We set out to characterize the microbial biofilms associated with different device types used in neuro-urology including sacral neuromodulation (SNM) devices, artificial urinary sphincters (AUS), penile prostheses (IPP), and ureteral stents.

**Methods:** Patients age 18 and older scheduled for neuro-urological device removal or revision were identified. Devices and controls were swabbed with great care to avoid contamination from the surrounding field. Swabs and controls were analyzed with next generation sequencing (NGS), metabolomics, and culture-based approaches. Device-isolated microbial strains were then co-cultured with a series of medical material types in a CDC continuous flow stir tank bioreactor, designed to mimic human tissue or urinary tract with a device present. Biofilm formation in the bioreactor was quantitated and compared by strain and material type.

**Results:** 115 devices were included. Biofilm microbial counts ( $p < 0.001$ ) and diversity ( $p = 0.024$ ) differed by device type. Microbiota present on each device type was distinct from that of the perineal flora, rectal flora, or urine in diversity and microbial relative abundance ( $p < 0.01$ ). Device biofilms harbored a greater proportion of the Proteobacteria phylum, and the rectal, perineal, and urine flora harbored a greater proportion of Firmicutes. *Escherichia/Shigella* and *Staphylococcus* and *Sphingobium* genera were common to microbe-metabolite interaction networks for all device types. Unique microbe-metabolite interaction networks were identified in the presence and absence of infection. Antibiotic resistance genes *sul2* (sulfonamide resistance), *ampC* (penicillin resistance), and *rpoB* (rifampin resistance) were detected in biofilms from each device type. All 21 isolated strains reconstituted biofilm in the bioreactor, and biofilm deposition differed by strain and material type on plate count assays, and the results were corroborated by scanning electron microscopy.

**Conclusions:** Sacral neuromodulation devices, artificial urinary sphincter, penile prostheses, and ureteral stents, harbor unique microbial and metabolite profiles that differed from those of skin, urine, and rectal flora. Microbe-metabolite interaction networks differed in the presence and absence of device-associated infection. The findings of this study and the methods implemented set the groundwork for investigation of novel materials and coatings, and bacterial competition strategies, designed to reduce device-associated infection risk, within and outside urology.



**S5.B.06: Lower urinary tract dysfunction induced by spinal cord injury can be improved through imidazoline 2 receptor pathways in mice**

**Authors:** Klicken oder tippen Sie hier, um Text einzugeben. Mamoru Hashimoto, Kang Jun Cho, Stephanie L Daugherty, Nobutaka Shimizu, Pradeep Tyagi, Akihide Hirayama, Hirotsugu Uemura, Jonathan M Beckel, Sergei Karnup, Naoki Yoshimura

**Presenting Author (name and affiliation):** Naoki Yoshimura, Department of Urology, University of Pittsburgh School of Medicine, Pittsburgh, USA

**Introduction:** Imidazoline 2 receptors are reportedly involved in antinociception and neuroprotection; however, their role in the control of micturition is not well elucidated. This study examined the effects of an imidazoline 2 receptor agonist, 2BFI, on lower urinary tract dysfunction (LUTD) in mice with spinal cord injury (SCI).

**Methods:** C57BL/6N female mice at 9-10-weeks old were used. SCI mice underwent complete transection of the Th8-9 spinal cord. Mice were divided into three groups (n=5 per group); (1) spinal intact (SI), (2) SCI with vehicle (normal saline), and (3) SCI with 2BFI treatment groups. Treatment with 2BFI (20mg/kg, twice daily, i.p.) was initiated 2 weeks after SCI. Four weeks after SCI, cystometrograms (CMG) and external urethral sphincter (EUS)-electromyography (EMG) were recorded under an awake condition. Thereafter, L6-S1 dorsal root ganglia (DRG) were harvested to evaluate the transcripts of TRPV1 (C-fiber afferent marker), Tnf and iNOS (inflammatory markers) using qPCR.

**Results:** In CMG, vehicle-treated or 2BFI-treated SCI mice showed LUTD including detrusor overactivity (DO) evident as non-voiding contractions (NVCs) and detrusor-sphincter dyssynergia (DSD) with low voiding efficiency compared with SI mice. However, 2BFI-treated SCI mice exhibited a lower number of NVCs than vehicle-treated SCI mice. Also, voiding efficiency was improved along with increased EUS relaxation time during voiding bladder contractions in 2BFI-treated mice vs. vehicle-treated SCI mice. mRNA levels of TRPV1, Tnf and iNOS in L6-S1 DRG were significantly higher in vehicle-treated SCI mice than in SI mice; however, decreased after 2BFI treatment.

**Conclusions:** We demonstrated that imidazoline 2 receptor activation is effective for SCI-induced LUTD such as DO and DSD, possibly through C-fiber afferent suppression and anti-inflammatory effects.