Moderated Poster Session 4: Functional Urology
June 29, 2009, 1630–1730

MP-4.01

Imaging periprostatic tissue architecture with multiphoton microscopy and second-harmonic generation to improve potency outcomes during nerve-sparing radical prostatectomy: a pilot feasibility study

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Introduction and Objective: Multiphoton microscopy is a novel technology that permits acquisition of bioimages using several low-energy photons to induce autofluorescence of cellular components without damaging live tissue. When combined with imaging of a quantum optics phenomenon called second-harmonic generation (SHG), tissue discrimination may be enhanced. We report our results in both rat and fresh human prostatectomy specimen models.

Materials and Methods: The prostate, cavernous nerves, seminal vesicles and periprostatic tissue was excised from 15 euthanized male Sprague Dawley rats and imaged under an Olympus X61WI upright fluorescence microscope. Twenty-five *ex vivo* human prostatectomy specimens were also imaged immediately after robotic-assisted radical prostatectomy. A femtosecond pulsed Titanium/sapphire laser at 780 nm wavelength was used to excite the cellular tissue. Second-harmonic generation signals were collected at 390 (standard deviation 35) nm and autofluorescence registered at 380–530 nm. Bioimages were merged for better tissue differentiation. Tissues were labelled and correlated with H&E images at final histopathology.

Results: High-resolution images of the prostatic capsule, periprostatic vessels, smooth muscle cells, nerves and periprostatic inflammation were documented in rat and human prostatectomy specimens. Histopathological confirmation of these structures with H&E was closely congruent with MPM images.

Conclusion: Multiphoton microscopy with SHG delivers superior real-time high-resolution cellular bioimages. Our pilot feasibility study demonstrates the potential for improving potency and cancer clearance outcomes during radical prostatectomy through augmented real-time visualization/preservation of the periprostatic structures with eventual integration of the technology into laparoscopic and robotic platforms.

MP-4.02

Phosphodiesterase type 5 inhibitors exert an antifibrotic effect against Peyronie disease plaques in man

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Introduction and Objective: Peyronie disease (PD) is a disorder characterized by fibrotic plaques of the tunica albuginea of the penis. Phosphodiesterase type 5 (PDE5) inhibitors have been shown in an in vitro model to exert a potential antifibrotic affect against PD-like scars. To our knowledge, there are no published data examining the impact of PDE5 inhibitors dissolving PD plaques in man. The main objective of this study was to evaluate the efficacy of this novel approach among a cohort of PD patients.

Materials and Methods: Patients diagnosed with PD based on penile duplex ultrasonography and physical examination were started on PDE5 inhibitors as monotherapy were included. Data including demographics, dosage, duration, subjective and objective response were collected in a retrospective manner using outpatient charts at our institute. Assessment of plaque change was determined by ultrasonography, patient report and physical examination.

Results: A total number of 32 patients (mean age 52) met our selection criteria. Among the evaluable population, 57% had a degree of penile curvature. All patients had a stable PD and received tadalafil 5 mg once a day for a mean duration of 7.5 months. Subjectively, more than half (52%) reported positive response described as improved curvature, better erections or decreased palpable induration, whereas 48% had no significant response. Objectively, 7 patients underwent a follow-up duplex ultrasonography to reassess the plaque in which 86% ($n = 6$) had a decrease in plaque size and 14% ($n = 1$) had worsening of the plaque.

Conclusion: While this early report describes our limited initial experience, this analysis supports an antifibrotic role for tadalafil. Further assessments with objectives measures will be needed before widespread adoption of this approach.

MP-4.03

Renal and functional outcomes following cystectomy and neobladder reconstruction

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Introduction and Objective: Orthotopic reconstruction following cystectomy has evolved in an attempt to restore anatomy and function as close as possible to the preoperative state. We review the renal and functional outcomes of patients who underwent cystectomy and neobladder reconstruction at our institution and attempt to define factors that are predictive of renal function outcome.

Materials and Methods: Between December 2003 and October 2007, 31 patients underwent cystectomy with Studer neobladder reconstruction. Follow-up data were obtained regarding renal function (serum creatinine, µmol/L), continence, urinary flow rates and postvoid residual (PVR) at 3, 6 and 12 months after surgery. Day and night incontinence were graded as none, 0–1 "security" pads/d; mild, 2 pads/d; moderate, 3 pads/d; severe, more than 3 pads/d. Change in serum creatinine from baseline was calculated at each follow-up time interval. Regression analysis was performed to determine if neobladder function parameters (continence, flow rate and PVR) and hydronephrosis were associated with change in creatinine.

Results: Daytime incontinence was present in 29.2% at 3 months (mild 16.7%, moderate 4.2%, severe 8.3%) and progressively decreased to 15.8% at 12 months (mild 10.5%, moderate 5.3%, severe 0%). Nighttime incontinence was present in 63.6% of patients at 3 months and decreased to 31.6% at 12 months. Five patients developed hydronephrosis. There was a statistically significant increase in serum creatinine, which progressed during follow-up. The average increase was 15 µmol/L (95% CI 1.7–28.3, $p = 0.03$), 23.7 µmol/L (12.5–34.9, $p = 0.0002$) and 32.4 µmol/L (18.4–46.4, $p = 0.0001$) at 3, 6 and 12 months, respectively. Higher flow rates were inversely associated with increase in creatinine and became statistically significant at 12 months (maximum flow $p = 0.01$, average flow $p = 0.005$). Presence of hydronephrosis was associated with increased creatinine and was statistically significant at 12 months ($p = 0.03$).

Conclusion: Orthotopic neobladders have excellent functional outcomes with low rates of incontinence. Urinary control improves substantially during the first postoperative year. The progressive increase in creatinine was statistically significant, but the clinical relevance is unknown. Higher urinary flow rates were associated with statistically significant

preservation of renal function. This is a novel finding and warrants further investigation.

MP-4.04

Clinical and urodynamic findings in post–radical prostatectomy incontinence

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Introduction and Objective: The study aims were to correlate clinical complaints with urodynamics and to evaluate the effect of postoperative radiotherapy.

Materials and Methods: Clinical records and urodynamics of 680 men with a mean age 65.6 (range 47–92) who underwent video-urodynamic studies (VUDS) for post-RP incontinence (PPI) were reviewed. All patients completed a standardized history and urological symptom questionnaire. Video-urodynamic studies consisted of filling and voiding subtracted pressures and cystourethrography. Data were recorded at the time of encounter and analyzed subsequently. Institutional ethics approval was obtained before the study.

Results: Overall 616 (91%) men complained of stress urinary incontinence (SUI), 340 (50%) had urgency incontinence (UUI) and 286 (42%) had both. On VUDS 494 (72.6%) had SUI demonstrated, 178 (26.2%) had detrusor overactivity (DO) incontinence and 128 (18.8%) had both. The mean Valsalva leak point pressure (VLPP) was 98.3 (range 10–247) cm water. The mean voiding pressure (VP) was 31.7 (range 1–205) cm water and flow rate (Qmax) was 16.31 (range 1–49) mL/s. One hundred and fifty men (22%) had been treated for bladder neck contractures (BNC). The complaint of SUI alone was noted in 330 men and of these SUI was demonstrated on VUDS in 246 (74.5%) with 96 men (29%) exhibiting DO. Only 54 men of the total cohort complained of pure UUI and of those 40 (74%) had DO but 22 (41%) also had SUI noted on UDS. The mean overall number of pads/day was 4.15 (range 1–18) and was similar in the SUI-only and UUI-only groups. One hundred thirty-six men underwent post-RP radiotherapy. Pad use, mean VLPP, presence of DO and the incidence of BNC were similar in this group to those who did not have radiotherapy. However, the Qmax was significantly lower and VP was significantly higher than that seen in the nonradiated group ($p < 0.05$).

Conclusion: In men with PPI, SUI was the most common complaint and finding on VUDS. There was good correlation of symptoms with VUDS findings. However, 41% of those with the complaint of only UUI demonstrated SUI on UDS. Obstruction was more common in patients who underwent radiotherapy. Overall, VUDS was helpful in assessing the cause of PPI.

MP-4.05

Review of complications of suburethral mesh slings requiring urological intervention

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Introduction and Objective: Suburethral mesh slings are widely considered a safe and effective treatment of stress urinary incontinence (SUI); however, complications occur that may necessitate surgical intervention. We herein report our experience in managing such complications.

Materials and Methods: We performed a retrospective chart review of 26 patients with complications of suburethral sling insertion managed in our centre between 2001 and 2008.

Results: A total of 26 patients were included in the review, 19 with obstruction only and 7 with urinary tract erosion. The median age at presentation was 56 (range 29–81) years. Mean time of follow-up was 16.6 months. Mean time from sling insertion to presentation was 8.2 months. All patients presented with voiding dysfunction (obstructive and/or overactive bladder symptoms). Additional findings included recurrent UTI ($n = 14$) and pelvic pain/dyspareunia ($n = 10$). Two patients developed bilateral upper tract obstruction and 1 patient developed metastatic squamous cell urethral carcinoma. Transvaginal urethrolysis was necessary in all 26 patients. An initial attempt at endoscopic urethrolysis was made in 6 patients with uncomplicated sling erosion, but all 6 eventually required transvaginal excision. One patient required laparotomy and partial cystectomy to facilitate sling clearance, as well as ureteric reimplantation. The patient who developed squamous cell carcinoma of the urethra required radical cystourethrectomy, and later died of metastatic disease. The remaining patients experienced relief of their obstructive voiding symptoms, whereas overactive bladder symptoms persisted in 10 patients. Stress urinary incontinence recurred in 11 patients.

Conclusion: Lower urinary tract obstruction and/or erosion are the most common urological complications of suburethral sling surgery requiring surgical intervention. Cystoscopy and urodynamics are mandatory in the investigation of such cases. Upper tracts should be evaluated in cases of complex erosions. Most patients will require prompt urethrolysis. Although endoscopic urethrolysis for simple erosions is feasable, it does not provide satisfactory outcome; therefore, formal excision and urethral closure is recommended. While urethrolysis is very effective at relieving obstruction, OAB symptoms often persist, and SUI may recur in one-half of the cases. Finally, we report for the first time a case of complex sling erosion associated with invasive urethral squamous cell carcinoma.

MP-4.06

Urethral diverticulae in women: discrepancies between magnetic resonance imaging and surgical findings

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Introduction and Objective: Magnetic resonance imaging (MRI) is considered the gold standard for diagnosing urethral diverticulum (UD), with near 100% accuracy. Our aim was to describe instances that contradict this paradigm and identify reasons for discrepancies.

Materials and Methods: A database was searched for women who had UD surgery from 1998 to 2008. A panel of all authors reviewed MRI scans. Selective patients underwent preoperative MRI. Multiplanar, multisequence imaging included T_1 and T_2-weighted sequences, with and without fat saturation, pre– and post–gadolinium contrast. Images were stored as DICOM images and reviewed on GE PACS workstation by a radiologist with 7 years' experience in interpreting pelvic MRI. All but 1 author (surgeon) was blinded to surgical findings. The panel came to consensus about presence or absence of UD or cancer, and position and anatomy of UD. Discrepancies were classified as failure to detect UD or cancer and errors in anatomy/position of UD.

Results: We identified 76 patients. Within 1 month of surgery, 40 patients underwent MRI. Of these, 10 (25%) had discrepancy between MRI and surgical findings. In 4, MRI failed to diagnose UD. In 3 of these, UD was not seen at all. One was misdiagnosed as a Bartholin cyst. In these patients preoperative diagnosis was made by palpation of UD. In 2 patients with cancer of the UD there were no suspicious MRI findings. In 4 patients there was major discrepancy in position/anatomy of the UD that made intraoperative decision-making difficult.

Conclusion: In this series, MRI had a 25% diagnostic error rate. The most serious was failure to detect cancer. This was probably due to the fact that the cancers were in the wall of the UD, did not project into the lumen and did not enhance with gadolinium. Other potential reasons for discrepancies include size too small for MRI sensitivity and loss of fluid from UD. High accuracy rates of MRIs in other series may be partly due to the fact that in the absence of radiological confirmation, especially for small diverticulae, some surgeons may choose not to perform surgery. Magnetic resonance imaging is very useful in evaluation of UD but we believe diagnostic accuracy is not as high as reported.

MP-4.07

The natural history of small incidental testicular masses in infertile men: Is surveillance the new standard of care?

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Introduction and Objective: With the widespread use of scrotal ultrasonography in the evaluation of male infertility, the incidence of small, incidentally detected testicular masses is increasing. Traditionally, treatment has been surgical removal owing to concerns about malignancy. Ultrasonography follow-up has been proposed as an alternative to surgery.

We present the largest series to date of small, nonpalpable, incidentally detected testes masses, and document the natural history of these lesions.
Materials and Methods: We reviewed the records of patients seen at the Mount Sinai Hospital Fertility Clinic from 2001 to 2008. Patients with 1 or more testicular lesions fitting all of the following criteria were included in the study: intratesticular, hypoechoic, diameter less than 1 cm, nonpalpable. We assessed patient age and semen parameters, the size and growth of the lesion(s) on serial ultrasonography, need for surgery and pathological diagnosis.
Results: Of 4418 patients evaluated, 46 (1% of total) met the inclusion criteria. Mean age was 35. Semen analysis showed azoospermia, oligospermia and normospermia in 15, 18 and 7 patients, respectively, and was unavailable in 6 patients. Mean follow-up interval was 253 days, and mean number of ultrasounds was 2.8 (range 1–7). Mean lesion diameter was 4.4 (range 1–10) mm and there was no significant change in mean diameter over time. Of the 46 patients, 38 had serial ultrasonography follow-up only, 3 had immediate surgery and 5 had surgery following a period of ultrasonography follow-up. Indications for surgery were interval growth in 2 (1 partial, 1 radical orchiectomy) and patient choice in 6 cases (partial orchiectomy). One patient had radical orchiectomy for pure seminoma identified owing to interval growth from 3 mm to 6 mm at the 3-month ultrasonography. The other 7 lesions excised by partial orchiectomy were benign (Leydig cell tumour in 5, unspecified in 2).
Conclusion: In this large series of infertile men, the vast majority of small, nonpalpable testicular masses were safely followed with serial ultrasonography and did not show significant growth or require surgical removal. One patient underwent radical orchiectomy for pure seminoma and remains recurrence-free. Serial ultrasongraphy follow-up of small, nonpalpable, hypoechoic testicular masses detected incidentally during work-up for infertility appears to be a safe alternative to immediate surgical removal.

MP-4.08

Near infrared spectroscopy to assess penile blood flow: a novel technique

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Introduction and Objective: Near infrared spectroscopy (NIRS) uses photons of light in the near infrared spectrum to assess concentration changes of oxygenated hemoglobin (O_2Hb) and deoxygenated hemoglobin (HHb) in tissues. Near infrared spectroscopy has been used to assess muscle blood flow. We examined the use of NIRS to detect penile blood flow to see if changes in O_2Hb and HHb concentrations correlate with erections.
Materials and Methods: Two groups of men were examined. Group 1, 10 men with no erectile difficulties, mean age 19 (range 18–22) years, were used to determine the technical aspects of penile NIRS monitoring (i.e., position and securing the probe) and the feasibility of assessing penile blood flow with visual sexual stimulation (VSS). Group 2 consisted of 12 men with prostate cancer undergoing a bilateral nerve-sparing radical prostatectomy. Mean age of the patients was 55 (range 44–66) years. These men underwent NIRS with VSS preoperatively and at 3 months postoperatively with and without 20 mg of vardenafil. Each completed an IIEF questionnaire pre- and postoperatively. During NIRS testing each man was asked to assess if an erection occurred during the VSS.
Results: With Group 1, we created a reusable NIRS probe which was taped to the penis. In 7/10 of the men an erection occurred with VSS, and with NIRS testing O_2Hb concentration increased in all 7 men. In Group 2 the mean IIEF preoperative score was 25 (range 5–30) and the postoperative score was 11.1 (range 1–26). With NIRS testing preoperatively without vardenafil, 8/12 men felt they had some erection with VSS and in 7/8 of these men there was an increase in O_2Hb concentration. In this same group, 9/12 men with NIRS showed increases in O_2Hb concentration with VSS, 2 of which felt they had no erection. When vardenafil was given preoperatively with NIRS testing, 12/12 men felt they had some erection and 10/12 of these men had an increase in O_2Hb concentration. Postoperatively, without vardenafil on NIRS, 2/12 men felt they had some erection and 7/12 men were found to have increases in O_2Hb concentration including the 2 men that had some erection. When vardenafil was added postoperatively 7/12 men felt they had some erection and 7/12 men had increases in O_2Hb concentrations on NIRS.
Conclusion: These preliminary studies show that NIRS can be used to assess penile blood flow with sexual stimulation. A rise in O_2Hb concentration on NIRS testing can assess penile blood flow and correlates well to patient perceived erections. Near infrared spectroscopy is easy to use, safe and requires no special training to interpret the results. More studies are needed to correlate NIRS with Doppler studies.

MP-4.09

Reconstruction of an autologous ureteral model by a self-assembly approach

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Introduction and Objective: Several diseases, like stenosis or narrowing, cause ureteral disorders and lead to kidney damage. To correct these anomalies, acellular biomaterials or nonurological tissues are used, but this often leads to postsurgical complications. Our objective is to reconstruct, by tissue engineering and self-assembly method, an autologous ureteral model that can be grafted and is viable. A porcine model was used because of its similarity to the human urinary tract, but the biggest challenge of the model is the production of a porcine fibroblasts sheet, because no research teams were able to produce one.
Materials and Methods: To realize our ureteral model, fibroblasts are extracted from the dermal layer of the skin and urothelial cells from the porcine bladder. The fibroblasts are cultured 4 weeks to allow secretion of their extracellular matrix and to obtain an easy to handle sheet. Fibroblasts sheet are rolled around a mandrel to obtain a tubular form, then it matures for 3 weeks to gain superior adhesion between the fibroblasts layers. Urothelial cells are then seeded inside the tubular model that is placed under perfusion in a bioreactor for 1 week to promote proliferation and maturation of the urothelial cells. To compare the ureteral equivalent with a native ureter, we characterized our model by histology, immunofluorescence (IF) and Western blot (WB). Other tests such as viability and permeability have been performed.
Results: Macroscopically, the model was uniformly assembled, provided suture resistance and was easily handled. Histologically, we obtained a thick layer of fibroblasts in an abundant extracellular matrix and the urothelium was similar to a native ureter. The ureteral model characterization with IF and WB confirmed the presence of a well-differentiated and pseudostratified urothelium. Also we have been able to produce a complete porcine autologous model that will allow us to begin in a near future in vivo test on the pig.
Conclusion: Our porcine autologous ureteral equivalent is a world first in tissue engineering that will help us to go further with human urological research. Furthermore, the great advantage of our model will be the use of the patient's cells which would decrease the inflammatory reaction postsurgically.

MP-4.10

Early sacral neuromodulation prevents urinary incontinence in complete spinal cord injury

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Introduction and Objective: We investigated the influence of noninvasive sacral nerve modulators (SNM) to the pelvic floor and internal organs in the spinal shock phase to avoid chronic irreversible spinal cord injury (SCI) effects on the lower urinary tract and colon.
Materials and Methods: Nine patients with neurologically confirmed complete spinal cord lesions of the upper neuron and atonic detrusor muscle overactivity received bilateral SNMs. Six patients who denied became the controls. The mean follow-up was 23.6 (13.1–36) months. In prone position participants received 2 tined leads connected to an Interstim-I

or II generator into each S3-foramen after best motor response verification of the intact lower motor neuron (contraction of the anal sphincter).
Results: Detrusor acontractility was attained resulting in urinary continence and a significant reduction in symptomatic urinary infections. Videourodynamics confirmed acontractility and absence of neurogenic detrusor overactivity (NDO). Bowel movements did not require oral laxatives; programming achieved an erection for satisfactory intercourse.
Conclusion: Early implantation of SNMs in SCI patients may revolutionize neurogenic lower urinary tract dysfunction management and urogenital disorders; it prevented detrusor overactivity and urinary incontinence, ensured normal bladder capacity and significantly reduced urinary tract infection rates without nerve-root damage. Even bowel function improved and erectile function was achieved. Future investigations will evaluate the potential benefits of earlier sacral neuromodulation in SCI patients for more progressive functioning and better quality of life. This new approach may provide the important clue required for assessing if certain neuronal information is passed through the sympathetic trunk ganglion to the brain after complete SCI.