

Welcome!



This year the Society of Urology and Engineering has changed its name slightly to Engineering and Urology Society or E&U for short. This was necessary in order to re-register the society as a section of the Endourological Society. The president of the society, Dr. Arthur Smith, and the advisory board have elected a new team of officers: Louis Kavoussi, M.D. and Dan Stoianovici, Ph.D. as Co-Presidents, Margot Damaser, Ph.D. Vice-President, Jack Vitenson, M.D. Secretary, and Gopal Badlani, M.D. as the Treasurer of the Society. Once again we are very thankful to Dr. George Nagamatsu, the founder and first president of the society.

The Engineering and Urology Society is holding its 18th annual meeting on Saturday April 26th 2003 in Chicago, as usual at the beginning of the annual meeting of the American Urological Association. The E&U society is dedicated to providing a forum where the latest surgical tools can be assessed and cutting-edge technology can be presented, as they pertain to either immediate or ambitiously foreseen urologic applications. The meeting is also meant to serve as a vehicle to shape future urologic practice by facilitating interactions among clinicians, academia and industry scientists. With this in mind, several exciting discussions have been planned for this year's meeting. The program will include invited presentations and podium discussions in the morning and two poster scientific sessions in the afternoon on a wide variety of topics related to applied engineering, including advances in endoscopy, urodynamics, ablation techniques, modeling and simulation, robotics, laparoscopy and telemedicine.

We are very happy to announce that this year our colleagues from our "sister" European Society of Urology Technology will be joining us in the meeting. We welcome their presence and are very anxious to learn about their success and experience at their podium presentation and discussion scheduled in the morning. Dr. Manyak's Biotechnology Forum has once again been incorporated into the program together with a new "Actual-Reality" section on Physiologic Modeling and Simulation.

Another exciting event will be the presentation by the 2002-2003 endowed fellow of the E&U, Dr. Koon Rha, and award of the new E&U fellowship for clinicians wishing to study applied engineering. This is a unique program where physicians can have the opportunity to work in an academic or industrial engineering laboratory to gain important insight in shaping the future of urologic practice. It is our hope that this fellowship will inspire participants to create new paradigms in urologic practice allowing for improvement of current surgical methodologies and the discovery of pathways to solve current therapeutic challenges. Details regarding the program can be found on the website of the society at <http://www.endourology.org/sue/>. Information regarding membership can also be found on this site.

The society is looking forward to seeing many new members in Chicago. We welcome all urologists, engineers, scientists from industry and academia to join us for this unique multi / interdisciplinary experience. It is through the sharing of many visions that our future will be shaped.

Thank you for joining us!

Accreditation:

The American Urological Association Education and Research, Inc. is accredited by the Accreditation Council for Continuing Medical Education to offer continuing medical education to physicians.

Credit:

The American Urological Education and Research, Inc. designates this educational activity for a maximum of 8.0 hours of Category 1 credit towards the Physicians Recognition Award. Each Physician should claim only those hours that he/she actually spent in the educational activity.

SCIENTIFIC PROGRAM

ENGINEERING AND UROLOGY SOCIETY



*Saturday, April 26, 2003
Palmer House Hilton, Red Lacquer Room*

7:00am-7:30am	Registration	
7:30am-7:40am	Welcome and awarding of Society Fellow Certificate	
7:40am-8:00am	Fellows Presentation: Video-Assisted Minilaparotomy Surgery	Koon Rha, M.D.
8:00am-9:00am	Physiologic Modeling and Simulation: Techniques and Applications	Margot Damaser, PhD
	Virtual Reality (VR) in Medicine: Current and Future Techniques	Mary Rasmussen Virtual Reality in Medicine Laboratory
	Agent Based Modeling and Simulation (ABMS): Current Techniques and Future Applications	Michael North Argonne National Laboratory
	Anatomical Study of Pelvic Floor Disorders: Future application of VR and ABMS	Lennox Hoyte, M.D.
	Simulation for Improved Neurocontrol Paradigms: Future application of VR and ABMS	Ken Gustafson, PhD
9:00am-10:00am	European Society of Urology Technology	
	Do We Really Need Robotics?	Claude Abbou, M.D.
	Training in Urology-Use of Simulators	Jean de la Rosette, M.D.
	Pelvic Trainers and Organ Perfused Models	Jens Rassweiler, M.D.

SCIENTIFIC PROGRAM

10:00am-10:30am	Hemostasis for Partial Nephrectomy	Jay Bishoff, M.D.
10:30am-11:00am	Flexible Endoscopy	Peter Schulam, M.D., PhD
11:00am-12:15pm	Biotechnology Forum	Michael Manyak, M.D.
	Novel Magnetic Resonance Imaging for Tissue Oxygen Concentration in Prostate Cancer	James B. Mitchell, PhD
	Applications of Hyperthermia and Drug-Containing Liposomes to Treatment of Prostate Cancer	Mark W. Dewhirst, DVM, Ph.D.
	Dosimetry for Real Time Brachytherapy Advances in Radiation Therapy	Nelson N. Stone, M.D.
12:15pm-1:00pm	Lunch Break	

SCIENTIFIC PROGRAM

1:00pm-3:00pm

Poster Session #1

Moderators: Marshall Stoller, M.D., Jihad Kaouk, M.D.

- Poster #1 “Integrated Laparoscopy Ergonomics for Surgeon Safety”
Presented by Assaad El-Hakim
- Poster #2 “Synthetic-Animal Model for Urologic Laparoscopy Training”
Presented by Dan Stoianovici
- Poster #3 “Vattikuti Institute Prostatectomy: Does the Robot Make Learning Easy”
Presented by Alok Shrivastava
- Poster #4 “Visdart and Vistpro: A Novel Application of Technology for Training Robot Assisted Surgery”
Presented by Alok Shrivastava
- Poster #5 “Expert Videotape Analysis and Critique Benefits Laparoscopic Skills Training of Urologist”
Presented by Stephen Y. Nakada
- Poster #6 “Feasibility of Telesurgery Between Baltimore and Rome: Our Experience in Laparoscopic and Percutaneous Procedure”
Presented by Pierluigi Bove
- Poster #7 “Single Surgeon Laparoscopy with a Novel “Scope Holder”
Presented by William C. Collyner
- Poster #8 “In Vitro Comparison of Burst Tension and Puncture Pressure in Commonly Used Organ Retrieval Bags: All Bags Are Not Created Equal”
Presented by Louis Eichel
- Poster #9 “A Comparison of the Opening Strength of Stone Baskets”
Presented by Michael J. Conlin
- Poster #10 “What Happens to Hemostatic Agents in Contact with Urine? An In Vitro Study”
Presented by Louis Eichel
- Poster #11 “Long Term Effects of Biodegradable PEG-based Hydrogel as a Tissue Sealant in a Laparoscopic Partial Nephrectomy Porcine Model”
Presented by Sanjay Ramakumar

SCIENTIFIC PROGRAM

- Poster #12 “Comparison of the Mechanical, Flow and Optical Properties of Contemporary Flexible Ureteroscopes”
Presented by Kun-Yuan Chiu
- Poster #13 “A New Ureterorenoscope with a Semirigid Shaft and 270° Tip Deflection: Comparison with Established Devices”
Presented By Lutz Trojan
- Poster #14 “Percutaneous Endopyeloplasty: Initial Clinical Series”
Presented by Mahesh Desai
- Poster #15 “FoleyGoalie™: A New Device to Prevent Traumatic Foley Catheter Pull Outs in Men”
Presented by Jeffrey Lee Rosenblum
- Poster #16 “Local Tissue Reaction to Different Synthetic Sling Materials: Stereological Analysis in Rodents”
Presented by Cássio Riccetto
- 3:00pm-3:15pm Coffee Break
- 1:00pm-3:00pm **Poster Session #2**
Moderators: Douglas Milam, M.D., Edward Wahl, M.D.
- Poster #17 “The Perception of Need for Academic Engineers in Urology”
Presented by Manoj Monda
- Poster #18 “Transobturator Safyre: A Minimally Invasive Self-Anchoring and Readjustable Sling”
Presented by Cássio Riccetto
- Poster #19 “Injectable Sling for Female Stress Urinary Incontinence”
Presented by Cássio Riccetto
- Poster #20 “The Use of a Balloon for Bladder Autoaugmentation: Experimental Study”
Presented by Carlos Arturo Levi D’Ancona
- Poster #21 “A Concept for Intracavitary, Targeted and Fractionated Bladder Irradiation for Invasive Bladder Tumors”
Presented by Daniel Yachia

SCIENTIFIC PROGRAM

- Poster #22 “Enhanced Objective Quantitative Cystometric Analysis of Compliance and Contractility”
Presented by Edward F. Wahl
- Poster #23 “Revisiting 3D Color CT Scan – A Triumph of Biomedical Engineering”
Presented by Linda Zielinski
- Poster #24 “Automatic Needle Targeting Under X-Ray Fluoroscopic Guidance”
Presented by Alexandru Patriciu
- Poster #25 “Comparison of Seven Holmium: Yag Laser Optical Fibers”
Presented by Bodo E. Knudsen
- Poster #26 “Laser Therapy in Penile Carcinoma: Point of Technique and Outcome”
Presented by Dominic Frimberger
- Poster #27 “Erbium: YAG Laser Incision of the Ureter and Urethra: Optimization of the Laser Parameters”
Presented by Nathaniel M. Fried
- Poster #28 “Micro-Inkjet Device for Rapid, Precise, and Noncontact Surgical Marking of Tissues”
Presented by Nathaniel M. Fried
- Poster #29 “Subsurface Thermal Lesions in Tissue Using an Nd:YAG Laser and Cryogen Spray Cooling”
Presented by Daniel Durand
- Abstract #30 “HIFU and Localized Prostate Cancer”
Presented by Christian Chaussy
- Abstract #31 “A Novel Minimally Invasive Method of Studying the Acute Effects of Double Pigtail Stent on Ureteral Peristalsis in Vivo Using A Magnetic Sensory in a Porcine Model”
Presented by Ramakrishna Venkatesh
- 5:00pm MEETING ADJOURNED

ABSTRACTS

ABSTRACT #1

INTEGRATED LAPAROSCOPY ERGONOMICS FOR SURGEON SAFETY

Assaad El-Hakim, Kun-Yuan Chiu, Arthur D. Smith, Benjamin R. Lee
Long Island Jewish Medical Center, New Hyde Park, NY

INTRODUCTION: Several studies have described a variety of neuromusculo-skeletal injuries sustained by the laparoscopic surgeon, notably upper extremity, neck and back disorders. Although workplace intervention studies promoting workers safety are widespread in industry, no such study exists addressing the optimal ergonomics for laparoscopic surgeons. **METHODS:** A MEDLINE search was performed from 1966 to 2002 on the topics of laparoscopy and ergonomics. As well, a review of industry workplace interventions specific for back and upper extremities was performed. **RESULTS:** 12 out of 95 publications that met criteria of scientific design and outcome analysis were retained. As well, an analysis of 12 peer-reviewed publications (6 reviews and 6 prospective randomized trials) addressing the effect of ergonomic interventions on back disorders, and three reviews on upper extremity disorders, was performed. A combination of interventions was required, including workplace re-design, organizational modifications, and individual modifications (exercise, physiotherapy, cognitive therapy, functional restoration, light duty). We identified multiple specific significant risk factors for laparoscopy: 1- Static posture of head and neck (AP range, kinetic data, lap. vs open: 9.5 vs 13.1 cm), and decreased anteroposterior weight shifting (Center of pressure, forceplate data: 0.5 vs 0.8 cm); 2- Extreme and frequent upper arm awkward movements (kinetic data: 2 to 4 fold increase in shoulder internal rotation, elbow total flexion, and wrist supination and ulnar and radial deviation); 3- Instruments handle design (non-pistol) and finger vs palm grip (>2 fold increase in EMG nRMS of the Flexor Digitiform Superficialis, Extensor Digitiform Communis, and Thenar compartment muscles); 4- Table height (higher than 0.7 to 0.8 of elbow height, or >77cm above floor level); 5- Improper suturing technique (horizontal vs vertical: up to 2.5 fold increase in work load of forearm flexors, arm flexors and extensors, and deltoid muscle); 6- Surgeon's experience less than 2 years (increased eye strain and finger numbness); 7) Instruments working angle (>45° to surgeon's sagittal plane). Monitor position was not found to be a significant risk factor. **CONCLUSION:** Interventions specific to identified risk factors will reduce morbidity to the laparoscopic surgeon. A prospective multi-institutional randomized trial is warranted with the following outcomes: reported injury rate, recurrence rate, overall physical functioning, job satisfaction, fatigue index and risk behavior rate.

ABSTRACTS

ABSTRACT #2

Synthetic-Animal Model for Urologic Laparoscopy Training

Dumitru Mazilu PhD, Lucian Gruionu, Oscar Fugita MD, Lars Ellison MD, Peter Pinto MD, Alexandru Patriciu,
Louis Kavoussi MD, Dan Stoianovici PhD

URobotics Lab, Brady Urological Institute, Johns Hopkins Medical Institutions, Baltimore, MD.

<http://urology.jhu.edu/urobotics>

We present a new trainer for urologic laparoscopy in the form of a synthetic torso that closely respects human anatomy and allows the placement of animal organs in situs. The torso includes a reusable base on the shape of the human torso and a disposable abdominal wall. The base presents two internal cavities corresponding to the lungs and the abdomen. The abdominal wall part covers and seals the base. A synthetic skeleton is incorporated within the base to provide a realistic structure. The model is pressurized in the thoracic cavity to simulate respiration and appropriate animal organs are placed in the abdomen.

In order to create a realistically shaped torso, we used the cryosection - photographic male model data from the Visible Human Project of the National Library of Medicine. We extracted transverse slices of a male model at an average of five-millimeter intervals from section no. 4155 at sagittal-coronal coordinate $z = 463$ voxel ≈ 154 mm to section no. 2048 at $z = 3190$ voxel ≈ 1063 mm. This region spans the entire torso of the model including the thoracic, abdominal, and pelvic regions. A manual segmentation process was used for each slice to outline the boundaries of the body, pulmonary, and abdominal cavities. The abdominal cavity included all peritoneal and retroperitoneal organs. The segmented geometry from all slices was then reconstructed into three three-dimensional (3D) surfaces outlining the outer body and the shape of the two cavities. For all image manipulation procedures, 3D reconstruction, and manufacturing operations of the torso, we used the Pro/ENGINEER® (Parametric Technology Corporation) design software. These 3D surfaces were used to design and fabricate negative molds for casting the trainer. The torso was cast of Cine Skin Silicone A/B from Burman Industries Inc. over the skeleton model placed in the mold.

Using this simulator the trainee undergoes numerous steps, beginning with the insertion of the Veress needle, insufflating the CO₂, determining the port sites and placing the trocars. The trainee can then perform a variety of laparoscopic procedures that necessitate dissecting and developing tissue planes, excising and reconstructing tissue, suturing, electrocautery, and performing other surgical maneuvers in an anatomically consistent setting. The natural human body configuration allows the trainee to have a correct spatial representation and distribution of trocars as he would normally have in the human abdomen. The possibility of placing an animal kidney in the retroperitoneum allows the trainee to operate on realistic tissues. This mixed synthetic / animal trainer with induced respiratory motion of the organs is expected to render a more realistic model to the real operation compared to the existing “box” laparoscopic trainers. The construction of the simulator and preliminary feasibility tests have been completed and a training study will follow next.

Acknowledgement: This work was supported by grant #PHD0103 from the American Foundation for Urologic Disease.

ABSTRACTS

ABSTRACT #3

Vattikuti Institute Prostatectomy: Does the robot make learning easy?

Alok Shrivastava M.D.

Objective: Laparoscopic prostatectomy is said to have a steep learning curve of 40-60 cases. We compare learning curves of three consecutively trained surgeons in robotic radical prostatectomy.

Methods: At Vattikuti Urology Institute we have performed 400 laparoscopic radical prostatectomies over past 2 years. 350 cases were performed using daVinci Surgical robot. 300 of these were done using our Vattikuti Institute Prostatectomy technique. We analyse the procedure times (Operating time + Setup times) of the three consecutive surgeons using regression analysis and power trend to define learning curve. Surgeon A and C operated 4 or more cases per week each and surgeon B operated less than 4 cases per week.

Results

Power regression equations for procedure times

Surgeon A (225 Cases)

Procedure Time = $356(\text{Chronological order of the case})^{-0.15}$

$R^2 = 0.36$

Surgeon B (50 Cases)

Procedure Time = $219(\text{Chronological order of the case})^{-0.03}$

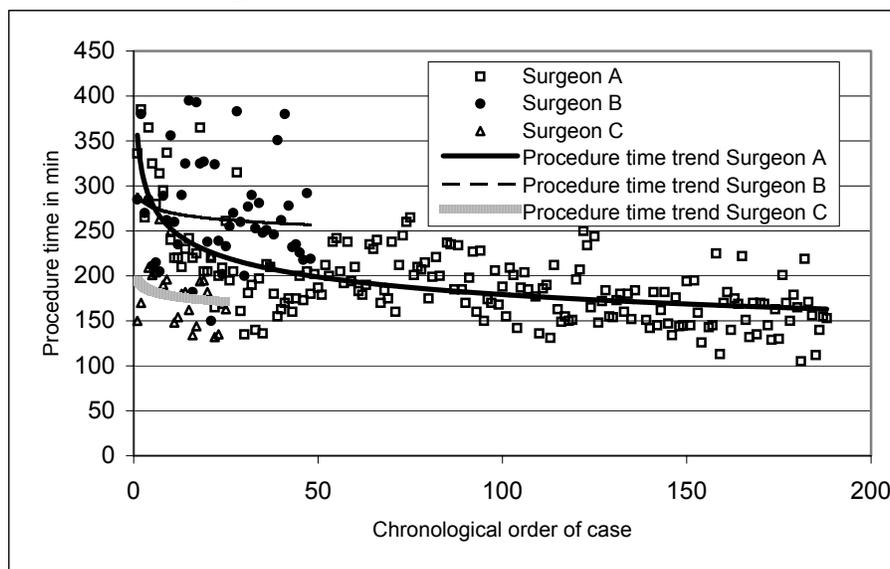
$R^2 = 0.01$

Surgeon C (25 Cases)

Procedure Time = $195(\text{Chronological order of the case})^{-0.04}$

$R^2 = 0.03$

Power trend curves for the three surgeons



Conclusion:

Surgeon A, who developed the procedure, had a rapid improvement in procedure times. Whereas for the two subsequent surgeons started very close to their final procedure times. We conclude that after development of the robotic procedure, subsequent surgeons were trained with a very little learning curve.

ABSTRACTS

ABSTRACT #4

VISDART AND VISTPRO: A NOVEL APPLICATION OF TECHNOLOGY FOR TRAINING ROBOT ASSISTED SURGERY

Alok Shrivastava M.D., James O. Peabody M.D., Mani Menon M.D.

Robotic surgery has ushered a new era in minimally invasive surgery. Vattikuti Urology Institute uses daVinci Surgical System™ for radical prostatectomy for prostate cancer. The robot has a 3-D display for the surgeon and 2D CRT display for assistants and other personnel in the operating room. This limitation made training and mentoring difficult due to the different visual perspective. **VISDART** (Vattikuti Institute Stereoscopic Display for Audience, Recording, and Transmission system) and **VISTPRO** (Vattikuti Institute Stereoscopic-digital video based Training **PRO**gram) were developed locally to overcome this limitation. The learning curves of two consecutive surgeons are analyzed. Surgeon-A was trained without and surgeon-B was trained with VISDART and VISTPRO. First 20 cases of both surgeons are analyzed (n=40). The mean operative time during mentoring for surgeon-B was 45% less than the mean operative time of the surgeon-A, during the same phase of training ($p < 0.0001$). The operative time trend curve was shifted to left for the surgeon-B indicating an easier learning curve. The system was developed at a cost of fourteen thousand dollars. We conclude that the VISDART and VISTPRO are cost effective solutions and help in making the learning curve easier thereby help in training and mentoring of robot-assisted surgery.

ABSTRACT #5

EXPERT VIDEOTAPE ANALYSIS AND CRITIQUE BENEFITS LAPAROSCOPIC SKILLS TRAINING OF UROLOGISTS

Stephen Y. Nakada, Sean P. Hedican, Madison, WI, Jay T. Bishoff, San Antonio, TX,
Steven J. Shichman, Hartford, CT, J. Stuart Wolf, Jr., Ann Arbor, MI

INTRODUCTION. Teaching laparoscopic skills has become the focus of the latest generation hands on laparoscopic courses.

METHODS. Thirty-four practicing urologists ages 31 to 61 years (mean 46.6 years) with laparoscopic experience (range 0-200, mean 27.6 cases), 32 of whom had taken prior AUA laparoscopy courses, participated in an AUA-sponsored hands-on laparoscopic skills course over a 2 day period in August 2002 or March 2003. They all took a knowledge assessment examination and performed standardized tasks (rope passing, ring placement and laparoscopic suturing and knot-tying) at the beginning and the end of the course with videotape analysis and critique. Prior to the repeat skills assessment, each participant received individual critique and instruction based on videotape review of their initial performance. The urologists also participated in a porcine laboratory and a pelvic trainer session totaling 6 hours between skills assessments. None of the participants had performed significant laparoscopic suturing prior to the course. **RESULTS.** Using Wilcoxon' signed rank test, the participants improved from a mean of 119.32 seconds to 98.36 seconds with the rope pass ($p = 0.0001$), and with the ring placement from a mean of 9.70/minute to 12.09/minute ($p = 0.0001$). All participants had significantly fewer false passes (mean 9.35 compared to 5.21) during repeat skills assessments ($p = 0.0001$). Participants improved from 0.54 sutures/minute to 1.22 sutures/minute following video critique and practice ($p = 0.0001$) Degree of laparoscopic experience (number of cases), age of the urologist and pre-course knowledge (exam score) had no significant bearing on results in the initial skills assessment or in the improvement of task time (Spearman correlation coefficients). **CONCLUSION.** Urologists with some laparoscopic experience (mean 27.6 cases) can improve laparoscopic skills using mentored videotape analysis and experience gained from a 2 day hands on course. Prior knowledge, degree of experience and urologist age had no significant bearing on their performance in this setting.

ABSTRACTS

ABSTRACT #6

FEASIBILITY OF TELESURGERY BETWEEN BALTIMORE AND ROME: OUR EXPERIENCE IN LAPAROSCOPIC AND PERCUTANEOUS PROCEDURES.

Pierluigi Bove,¹ Dan Stoianovici,² Salvatore Micali,¹ Alexandru Patriciu,² Nicola Grassi,¹ Thomas W. Jarrett,² Giuseppe Vespasiani,¹ and Louis R. Kavoussi,^{2,1} Department of Urology, "Tor Vergata" University of Rome, Italy. ² Johns Hopkins Medical Institutions, Baltimore, USA.

INTRODUCTION AND OBJECTIVES: Minimally invasive surgery offers many advantages but its correct practice is associated with a steep learning curve. Telesurgery has been developed to reduce the complications due to inexperienced surgeons. It allows a surgeon at a remote site to guide and teach practicing surgeons in a primary site by utilizing robotic devices, telecommunications and video technology. **METHODS:** From September 1998 to July 2000, 17 telesurgical procedures were telementored between two separate operating sites 9230 Km apart: a primary operating room located at the Policlinico Casilino "Tor Vergata" University of Rome and a remote site located at the Johns Hopkins Medical Institutions of Baltimore. Of these procedures, 14 were laparoscopic cases: 8 spermatic veins ligation, 2 retroperitoneal renal biopsy, 3 simple nephrectomies and 1 pyeloplasty. Three procedures were carried out to obtain a percutaneous renal access. All cases were performed with the use of two robots: the first robot, AESOP, for the orientation of the laparoscope, and the second one, PAKY, to perform the percutaneous renal access. In addition to the robotic device, the system provided 4 ISDN lines, a PC with dedicated software to manage the connection, audio and video connection, an external video-camera with a panoramic view of the operating room, and remote control of the electrocautery and the telestrator. **RESULTS:** All the procedures were accomplished with an uneventful postoperative course. 10 operative cases were successfully telementored. In 5 cases, it was not possible to establish a connection to the remote site, and 2 procedures were converted to open surgery because of intraoperative complications. Time delay of the image transmission was less than one second. **CONCLUSIONS:** This preliminary experience has demonstrated the feasibility of international telementoring. It is a viable method that could potentially provide education to surgeons and decrease the likelihood of complications due to inexperience with new techniques.

ABSTRACTS

ABSTRACT #7

SINGLE SURGEON LAPAROSCOPY WITH A NOVEL “SCOPE HOLDER”

William C. Collyer, Jaime Landman, Ramakrishna Venkatesh, Richard Vanlangendonck, Kevin Morrissey; St Louis, MO, and Ralph V. Clayman; Irvine, CA

INTRODUCTION AND OBJECTIVE: To some extent, the spread of laparoscopy has been limited by the lack of ergonomic and intuitive instrumentation. A major challenge has been the dependence of operating surgeons on a trained camera-person to be their “eyes.” Another major disadvantage of the traditional technique with camera control by an assistant is the common positioning of the camera directly in front of the surgeon when operating in the flank position. This position forces the surgeon and or the assistant to operate in awkward and uncomfortable positions. In this video, we demonstrate the use of an inexpensive, novel “scope holder” that can be worn by the surgeon. With the application of minimal postural adjustments, this device allows the surgeon to coordinate the movement of his or her instruments and the field of laparoscopic vision in a more intuitive fashion. **MATERIALS AND METHODS:** The “scope holder” consists of a metal chest plate fixed to a wide, supportive belt and chest strap and a movable arm that can be fixed to the chest plate outside of a sterile gown by a magnet. The arm can be positioned anywhere on the plate and moved to optimize camera position and minimize the amount of body movement required to visualize the surgical field. The laparoscopic camera is held in a padded sheath suspended from the arm by a modified ball and socket joint. A clip on the arm stabilizes the laparoscope while allowing the scope to be rotated to take advantage of a 30 degree lens. The field of vision is controlled by postural motion. **RESULTS:** In a porcine model, the “scope holder” has allowed us to perform single surgeon laparoscopic nephrectomy and other renal procedures without an assistant for camera control and without prolonging operative times. **CONCLUSIONS:** The “scope holder” is an inexpensive, novel device that allows the surgeon to intuitively control his or her field of laparoscopic vision and coordinate the movement of his or her instruments and the camera. This device may facilitate learning laparoscopy by allowing the surgeon to operate in a more comfortable and intuitive manner. (patent pending)

ABSTRACTS

ABSTRACT #8

In Vitro Comparison Of Burst Tension and Puncture Pressure In Commonly Used Organ Retrieval Bags: All Bags Are Not Created Equal

Louis Eichel, Corollos Abdelsehid, Jay Basillote, Carlos Uribe, Elspeth M. McDougall, and Ralph V. Clayman
University of California, Irvine Department of Urology

Purpose: Organ entrapment sacks are commonly used to retrieve a wide variety of specimens in laparoscopic urologic surgery. Organs can be removed via an extended port site incision whole or in parts via morcellation. We performed an in vitro comparison of commonly used organ entrapment sacks to determine their relative resistance to bursting and instrument puncture. **Methods:** The following sacks were compared with regard to relative bursting tension and resistance to instrument puncture: The 8 X 5 cm LapSac (Cook Urological), Endopouch Retriever (Ethicon Endo-Surgery), Endo-Catch (US Surgical), Endo-Catch II (US Surgical), Endo-Catch Gold (US Surgical), and a one-quart Ziploc Bag (Ziploc Brand). To test bursting tension a 25 mm diameter smooth Teflon ball was placed at the bottom of each pouch. The neck of the pouch was then placed through a 20 mm smooth edged hole in a 3/4 inch Lucite testing plate lined at the bottom with a layer of 1/4 in high density polyether foam to reduce friction and prevent shearing. A testing stand with a strain gauge on a motorized puller was used to pull the bag through the hole at a rate of 12 in/min. The bursting tension for each bag was measured 5 times and averaged. Puncture pressure was also measured on the testing stand by sandwiching a monolayer sheet of the bag material into a stretcher block of Lucite with a 20 mm hole through the middle. A 16.5 mm Kelly clamp and a pair of ring forceps attached to the strain gauge were then individually depressed into the material by the motorized arm at 12 in/min until a puncture pressure for each instrument was obtained. The puncture pressure for each bag and instrument combination was measured 5 times and averaged. For each bag tested, the ease of delivery deployment was also considered. **Results:** The average bursting tensions for the 8 X 5 cm LapSac, Endopouch Retriever, Endo-Catch, Endo-Catch II, Endo-Catch Gold, and the 1-quart Ziploc Bag were 118, 62.9, 31.0, 46.3, 38.3, and 22.9 pounds respectively. All of the sacks specifically marketed for organ retrieval broke in a circular fashion that outlined the junction between the ball and the foam-lined ring. The Ziploc bags uniformly stretched apart just above the ring until the bag tore. For the large Kelly clamp, the average puncture pressures for the sack material were 14.9, 4.5, 4.2, 4.0, 5.0, and 4.6 pounds respectively. For the ring forceps, the average puncture pressures for the sack material were 42.5, 8.8, 14.3, 14.48, 12.2 and 6.36 pounds respectively. The Endopouch Retriever, Endocatch, Endocatch II, and Endocatch Gold can be delivered easily into the peritoneal cavity and are easily deployed by depressing the plunger of the device. The mouth of these sacks stays open without further manipulation. The Lap Sac and Ziploc bag must be rolled by hand prior to insertion into the peritoneal cavity and do not stay open at the mouth without further manipulation. **Conclusion:** The Lap Sac is the most durable sack available for organ entrapment it is literally 3 times more resistant to bursting or puncture than any of the other tested entrapment sacks. When morcellating, the ring forceps is far less likely to puncture the LapSac than use of a Kelly type blunt tipped forceps. However, deployment of the LapSac remains more difficult than the alternative plastic sacks. Among the latter, the Endopouch Retriever is the most resistant to bursting; however, all of the plastic sacks are relatively prone to puncture, even with a blunt morcellator such as a ring forceps. Hence, morcellation within these sacs is ill advised. The Ziploc bag is prone to both bursting and puncture and hence is less suited for organ retrieval than any of the other commercially available entrapment sacks.

ABSTRACTS

ABSTRACT #9

A COMPARISON OF THE OPENING STRENGTH OF STONE BASKETS

Michael J Conlin, MD, Gregory Taylor, MD
Oregon Health & Science University, Portland, OR

Background: Baskets are commonly used to remove ureteral calculi. The removal of imbedded ureteral calculi or calculi in stenotic ureters is a challenge to the urologist. Calculus extraction under these conditions may be facilitated by the use of baskets with strong opening forces. We determined the opening forces of many commonly used baskets. **Methods:** A calibrated digital force gauge was used to measure the opening forces of ten baskets from three manufacturers. The single highest and lowest measurements were discarded, and the mean opening force was determined from the remaining measurements. **Results:** The overall results are presented in the table below. The paired helical basket has the highest opening force of the conventional baskets. Nitinol tiplless baskets had the lowest opening strengths. A new deflectable tiplless basket, also made of nitinol, produced the greatest opening strength of all baskets tested.

Basket Feature	Mean opening force (kg)
Nitinol	0.013
Flat wire	0.056
Stainless Steel	0.072
Paired Helical	0.088
Articulated	0.089

Conclusions: The new deflectable nitinol baskets have the highest opening force of all the types of stone baskets tested. Whether greater opening force facilitates removal of imbedded ureteral calculi or removal of calculi from stenotic ureters remains to be investigated.

ABSTRACTS

ABSTRACT #10

WHAT HAPPENS TO HEMOSTATIC AGENTS IN CONTACT WITH URINE? AN IN VITRO STUDY

Carlos Uribe, Louis Eichel, Sepehr Khonsari, Jay Basillote, Hyung-Keun Park, Ching Chia Li, Corollos Abdelsheid, Ian Cassamiro, David I. Lee, Elspeth M. McDougall, and Ralph V. Clayman, University of California, Irvine, Department of Urology

Significance and Background: As the indications for use of topical hemostatic agents increases in urology, the question arises: what happens to these agents when they enter the urinary collecting system? To answer this question, we performed a series of in vitro experiments mixing three different hemostatic agents into normal and sanguineous urine.

Methods: three commercially available topical hemostatic products: oxidized regenerated cellulose (Surgicel; Ethicon, Somerville, NJ), fibrin glue (Tisseel; Baxter Health Care Corporation, Irvine, CA) and gelatin matrix hemostatic sealant (Flo seal; Fusion Medical Technologies, Mountain View, CA) were studied. Human urine (10 ml) was added to samples of each substance; this was done in triplicate. The 9 sample tubes were then capped and placed onto a test tube shaker at slow speed and 37°C. Observations regarding consistency of the material were made at 6 hr, 12 hr, 24 hr, 48 hr, 72 hr, 96 hr, and 120 hrs (5 days). Gelatin matrix hemostatic sealant was further tested in urine with varying amounts of blood or blood clot; observations were again recorded out to 5 days. **Results:** Oxidized regenerated cellulose maintained its solid form when it initially came in contact with urine but over a period of 5 days it transformed into a mucoid substance with visible free-floating fibers. It did not completely dissolve in urine within 5 days. Gelatin matrix upon coming into contact with urine was immediately transformed into a fine colloidal suspension which did not change over the 5 days of the study. Fibrin glue, after mixing the two components (fibrinogen and thrombin) directly in the urine, immediately formed a solid clot at the bottom of the test tube upon contact with the urine. When the mixture was allowed to form for 15 minutes outside of the urine and then was added, it again maintained a solid form. After 72 hours, the fibrin glue became a semi-solid gelatinous plug. Upon analysis at 5 days, the fibrin glue clot had transformed into a cohesive mucoid gel. The gelatin matrix hemostatic sealant when in contact with blood or blood clot appeared to either become part of a blood clot or to remain in a colloidal suspension. At 5 days, all clots had dissolved to a fine particulate suspension and the gelatin matrix appeared as a fine suspension. **Conclusion:** Fibrin glue and oxidized regenerated cellulose maintain a solid form when initially placed in direct contact with urine and then assume a semi-solid gelatinous state which is present even 5 days following introduction. Only hemostatic gelatin matrix remained as a fine particulate suspension both in normal and sanguineous urine. The implication of these findings with regard to sealing the renal parenchyma or small violations of the collecting system after percutaneous or laparoscopic surgery await further in vivo testing.

ABSTRACTS

ABSTRACT #11

Long term effects of biodegradable PEG-based hydrogel as a tissue sealant in a laparoscopic partial nephrectomy porcine model

ugene Park, Jennifer Linehan, Nathan Ullrich, **Sanjay Ramakumar**

Purpose: Polyethylene-glycol (PEG)-based hydrogel is available as a tissue sealant and an adjunctive hemostatic aid. We sought to determine the long term efficacy and safety of its use as a single agent for laparoscopic partial nephrectomy in a porcine model. **Methods:** Female domestic swine with an initial weight at least 70kg were used. 16 Pigs were cycled between 1 control group and 3 treatment groups. Animals in group 1 received diagnostic laparoscopy and mobilization of the left kidney. Groups 2 to 4 underwent a laparoscopic left lower pole guillotine nephrectomy into the collecting system. Hemostasis and tissue sealing was achieved with application of a PEG-based hydrogel. The animals were closed. Group 1 was survived and euthanized at 12 weeks, group 2 at 2 weeks, group 3 at 6 weeks, and group 4 at 12 weeks. Group 1 underwent relook laparoscopy at weeks 2, 6, and 12 for visual comparison. Blood was drawn for labs at preoperative, 2, 6, and 12 weeks after IM sedation in surviving animals. At the time of euthanasia, all animals underwent an IVP, final laparoscopy, and tissue harvesting. **Results:** All animals underwent the initial procedure without intraoperative or post-operative complications. Hemostasis was satisfactory after hydrogel application. EBL was scant, (<30cc) in all cases. All subject kidneys were visually perfused at the end of the case. All animals behaved clinically normal postoperatively. In all groups, there was no evidence of significant fluid collection, increased adhesion formation, or delayed hemorrhage at final laparoscopy and necropsy. Both kidneys were perfused and functioning on IVP, and BUN and Cr levels were stable in all animals. There was no evidence of urine leak seen on IVP, laparoscopy, or necropsy. Histologically, the hydrogel was starting to lose confluence at 2 weeks; at 6 weeks only trace amounts were seen; no hydrogel was evident at 12 weeks. There was no evidence of necrosis, or significant inflammatory reaction. On necropsy examination at 2 weeks there was consistently a small amount of clot under the hydrogel layer, estimated at less than 3cc. At 6 weeks there was only trace amount of hematoma, and at 12 weeks there was no hematoma seen. **Conclusions:** Biodegradable PEG-based hydrogel is effective for long term use as a single agent for hemostasis, as well as a sealant for the urinary collecting system in this animal model. Even after degradation, there were no complications such as delayed hemorrhage or urinary leakage. This represents promising sealant technology and should be further investigated for human use.

ABSTRACTS

ABSTRACT #12

Comparison of the Mechanical, Flow, and Optical Properties of Contemporary Flexible Ureteroscopes

Kun-Yuan Chiu, M.D., Yi Cai, Robert Marcovich, Assad El-Hakim, Arthur D. Smith, Benjamin R. Lee, Department of Urology, Long Island Jewish Medical Center, New Hyde Park, NY, USA

Introduction: Although flexible ureteroscopes are now used routinely in the treatment of several conditions of the urinary collecting system, limitation of active tip deflection may interfere with treatment of lower pole renal pathology and smaller scope diameter may impair irrigant flow. We compared the newly designed flexible ureteroscopes with prior models to see if design advances have overcome these clinical problems. **Methods:** Two newly released flexible ureteroscopes, the ACMI DUR-8 Elite and Storz 11278AU were compared with four previous models, the Storz 11274AAU, the ACMI DUR-8, the Wolf 9F, and the Olympus URF-P3. Specifications, purchase price, and repair costs were obtained from the individual manufacturers. Active tip deflection, irrigation flow rates, and intraluminal pressures with and without various endoscopic tools (3F Nitinol stone basket, 200 and 365 micron laser fibers, and 3F biopsy forceps) were assessed. Also, the field of view and screen image size of each scope were compared.

Results: The new instruments did have advantage in active tip deflection. The ACMI DUR-8 Elite and the Storz 11278AU had a better upward flexion at 79 degrees and 144 degrees in comparison with their older models, respectively. Although the active tip deflections of all ureteroscopes were compromised by insertion of different endoscopic tools in different ranges, these new instruments were less influenced. With 3F basket inside the working channel, the ACMI DUR-8 Elite and the Storz 11278AU had 0.7% and 2.8% loss of upward tip deflections in comparison to their older models at 9.6% and 5.0%, respectively. However, the advantage of active tip deflection seemed compromised the flow rates in these new instruments. **Conclusion:** The new flexible ureteroscopes have significantly better active tip deflection than previous models, both with and without endoscopic instrumentation in the working channel. However, improved flexibility comes at the expense of decreased irrigant flow rate and greater radius of curvature, as well as higher purchase and maintenance costs.

ABSTRACTS

ABSTRACT #13

A NEW URETERORENOSCOPE WITH A SEMIRIGID SHAFT AND 270° TIP DEFLECTION: COMPARISON WITH ESTABLISHED DEVICES

Lutz Trojan, Thomas Knoll, Kai Uwe Köhrmann, Peter Alken, Maurice Stephan Michel
Department of Urology, University Hospital Mannheim, Germany

Introduction: Flexible ureterorenoscopy is frequently used in minimally invasive endourological procedures for the disintegration and removal of stones. In combination with currently available working devices, modern instruments even enable access to stones in the lower calyx group. Maximum deflection of scopes is inhibited by the probes used. Therefore, steep infundibulopelvic angles can cause access problems and make a direct retrograde approach difficult. Compared to established scopes, the newly developed ureterorenoscope (7.5F, Storz) has a rather rigid shaft that allows a greater angle of deflection. Aim of the study was to compare relevant properties of the new device, such as irrigation and maximum deflection after the insertion of different lithotripsy and stone extraction probes, with other commercially available scopes. **Material and Methods:** The angle of maximum active and passive deflection and maximum irrigation of different flexible ureterorenoscopes (9.0F Wolf, 7.5F Olympus, 7.5F Storz and the new semiflexible 7.5F Storz) were measured after 9 different lithotripsy and stone extraction probes were introduced into the instruments. The degree of deflection that enabled easy insertion of the different probes was also assessed. Maximum irrigation was additionally quantified. **Results:** Compared to other scopes, the new 7.5F Storz ureterorenoscope displayed improved properties with respect to deflection. Without a probe, maximum deflection of up to 270° can be achieved. Maximum deflection is not inhibited by thin probes such as 200µm laser probes or the 2.4F Zerotip basket. A 180° angle of maximum deflection is still upheld with rigid probes such as the 3F Triceps basket. The new scope demonstrated an identical working channel diameter and maximum irrigation when compared to the 7.5F scopes of Storz and Olympus. The best irrigation was achieved by the 9F Wolf scope. **Conclusion:** The flexible scopes tested in this study revealed remarkable differences regarding the active and passive deflection state. For successive flexible ureterorenoscopy, the effect of different probes on the deflection of the scope should be taken into consideration. Although irrigation remains comparable, the newly developed semirigid 7.5F ureterorenoscope displays a significant advantage over the currently available scopes with respect to the maximum deflection with and without the inserted varying working probes.

ABSTRACTS

ABSTRACT #14

PERCUTANEOUS ENDOPYELOPLASTY : INITIAL CLINICAL SERIES.

Mahesh Desai, M.D., Inderbir Gill, M.D., Mihir Desai, M.D.

We present the initial clinical experience of the novel technique – percutaneous endopyeloplasty to correct ureteropelvic junction (UPJ) obstruction. Endopyeloplasty consists of horizontal suturing of an endopyelotomy incision percutaneously in a Heineke-Mikulicz fashion using a 5 mm. suturing device (SewRight SR5, LSI Solutions, Victor, NY). Endopyeloplasty was successfully completed in 23 patients. Mean operating time was 114 ± 25.8 minutes and suturing time was 44.3 ± 11.4 minutes. Mean hospital stay was 4.6 ± 1.8 days. Complications had occurred in 4 patients, 1 intra-operative in the form of cutting through of sutures, post-operatively 3 patients had developed fever and one patient had symptomatic hyponitremia. All complications were treated successfully. Over a mean follow up of 10 months (1-19), all patients remain asymptomatic & show improved drainage. We believe that percutaneous endopyeloplasty has simplicity of endopyelotomy and efficacy of pyeloplasty.

ABSTRACT #15

FoleyGoalie™: A New Device To Prevent Traumatic Foley Catheter Pull Outs In Men

Jeffrey Lee Rosenblum, M.D., The Rosenblum Center for Urologic Care, Exton, PA

This article describes a unique device, FoleyGoalie™, invented by the author to prevent male patients from traumatically pulling out their foley catheter with the balloon inflated. FoleyGoalie™ is a cylindrical device that is back loaded over a patient's indwelling foley catheter and penis. The cylinder is composed of stretch-resistant helical strands of multifilament polyester and urethane-coated nylon braided together. A Velcro strap secures FoleyGoalie™ to the base of the penis, proximally. Distally, tape secures FoleyGoalie™ to the indwelling catheter. When a force is applied to pull the catheter out the cylinder assumes a smaller radius tightening down on the catheter and penis securing the foley in place. When the force is removed the device reverts to its relaxed state. FoleyGoalie™ has prevented foley catheter dislodgement in male patients with mental impairment who have attempted to pull out their foley catheters. FoleyGoalie™ represents a useful and practical modality to prevent traumatic foley catheter pull-outs and their associated complications in men.

ABSTRACTS

ABSTRACT #16

LOCAL TISSUE REACTION TO DIFFERENT SYNTHETIC SLING MATERIALS: STEREOLOGICAL ANALYSIS IN RODENTS

Paulo Palma, Cássio Riccetto, Marcelo Thiel, Miriam Dambros, Rogério Fraga, Amílcar Barreta, Andreza Teixeira, Alexandre R. Paz, Renata M. Triglia, Nelson R. Netto Jr.
Division of Urology Universidade Estadual de Campinas - UNICAMP, SP, Brazil.

Introduction and Objective: The poor quality of pelvic floor tissues is one of the factors involved in stress urinary incontinence (SIU). Minimally invasive slings are presently used for the management of this condition. This experimental study compares local tissue reaction elicited by the four most frequent used materials. **Methods:** Sixty female Wistar rats, eight weeks old were used in the study. They were divided in 4 groups and were submitted to subcutaneous implant in the abdominal area of an 8x4 mm polypropylene mesh (Group 1), polymethylsiloxane (Group 2), swine small intestine submucosa, SIS, (Group 3) and polygalactin co-polymers (Group 4). The rats were sacrificed at 7, 30 and 90 days after the implant, and the abdominal wall was resected for histology and stereological analysis of the local inflammatory reaction and fibrosis. The same pathologist classified the inflammatory reaction as mild, moderate or severe, depending on the intensity of the process. Collagen fibers were identified on paraffin sections using Sirius red staining. The volumetric density of the fibers was determined on paraffin sections using the M-42 test grid system. Differences of the stereological findings of the four groups were tested with the ANOVA test and Newman-Keuls for multiple comparisons. A probability of $p < 0,05$ was taken as the criterion of significance. **Results:** After 7 days of the implant a moderate inflammatory reaction was observed in the four groups, with no significant difference ($p=0.784$). At 30 days, group 4 showed less inflammatory reaction than groups 1 and 2. The more intense inflammatory reaction was found in group 3 ($p<0.001$). In 86% of the rats sacrificed at 30 days, the inflammatory reaction was mild or moderate. At 90 days, the inflammatory reaction less intense in group 4 than groups 1 and 2. The most severe inflammatory reaction was observed again in group 3 and was significant different from the other groups ($p<0.001$). Comparison of the stereological findings of the four groups at 90 days showed significant differences in the volumetric density for collagen fibers. Groups 2 and 3 showed volumetric density of 85 % and 86% respectively. On the other hand, group 1 presented a volumetric density of 65%, that was lower than groups 1 and 2, but higher than group 4 (volumetric density =61%). Polygalactin co-polymers were still present at that time. **Conclusion:** Swine small intestine submucosa and silicone induced greater inflammatory reaction, as well as more collagen fibers deposition than polypropylene. The polygalactin co-polymers were the most biocompatible material, with no significant differences in collagen fibers production when compared to polypropylene. Because polygalactin co-polymers were still present, due to the long absorption time, this material may be a promising alternative for minimally invasive slings.

ABSTRACTS

ABSTRACT #17

THE PERCEPTION OF NEED FOR ACADEMIC ENGINEERS IN UROLOGY.

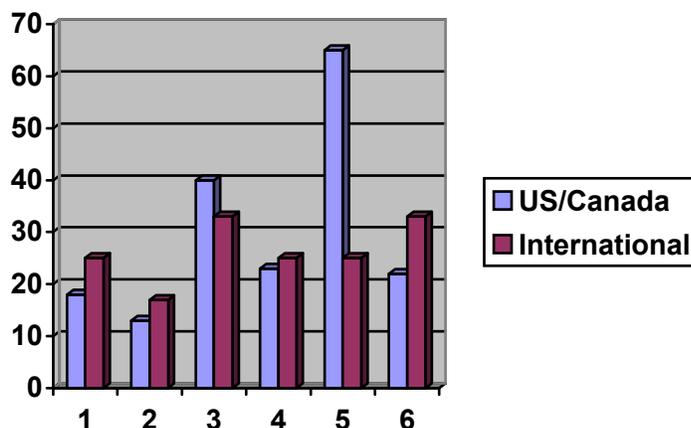
Manoj Monga, Kyle Anderson, Sara Best, Ilene Harris. University of Minnesota, Minneapolis USA

Purpose: The National Institute of Health recently requested proposals to establish a curriculum-driven program aimed to create educational opportunities that would attract students from scientific disciplines underrepresented in disease-oriented biomedical research such as engineering into careers in areas of particular interest to the NIDDK. To establish the need for an increased presence of engineers in urological research an email survey was conducted.

Methods: Sixty American and twelve international academic urologists who are active members of the Endourological Society responded to the email survey. Participants were asked to describe their current collaborative relationships with engineers. **Results:** Current collaborative efforts between academic urologists and engineers are presented in Figure 1. The majority of American respondents (65%) collaborate primarily with engineers in industry as opposed to engineers in academia. As one respondent stated "This is not the purest of interactions in most cases." When asked if they perceived a "need for more academic engineers with a focus on urological research", 98% of endourologists from the USA/Canada and 100% of international endourologists answered 'Yes'. **Conclusions:** There is a perceived need for more engineers in urologic research amongst academic urologists. This perceived need may represent a true need to expose and train engineers in urological research, or it may represent a need for better collaborative networking between existing researchers.

Figure 1: Urologists currently collaborate with:

1. Engineers within their department
2. Engineers with a primary focus on urology in a different department
3. Engineers in other fields at their university
4. Engineers at other universities
5. Engineers in industry
6. No engineers at this time



ABSTRACTS

ABSTRACT #18

TRANSOBTURATOR SAFYRE: A MINIMALLY INVASIVE SELF-ANCHORING AND READJUSTABLE SLING

Paulo Palma, Cássio Riccetto, Miriam Dambros, Marcelo Thiel, Rogério Fraga, Claudio Vilas Boas, Nelson R. Netto Jr. ,Division of Urology, Universidade Estadual de Campinas, UNICAMP, SP, Brazil.

Introduction and objectives: A new concept of a minimally invasive, self-anchoring, re-adjustable horizontal sling for female urinary stress incontinence is described. The aim of this innovative approach is at the same time to provide a urethral backboard support and avoid the Retzius space in cases of previous failed procedures. **Methods:** The Safyre sling is made of a polypropylene mesh for urethral support, held between two self-anchoring columns made of polydimethylsiloxane polymer. With the patient in the lithotomy position, a hook-like needle is introduced medially through the obturator orifice to a previously made vertical vaginal incision. The extremity of the sling is attached to the tip of the needle and brought through the obturator and the puborectalis muscles and fascias. The same maneuvers are repeated on the other side, creating a horizontal sling. **Results:** There were 20 patients, mean age 59 years, that underwent transobturator Safyre. In eighteen patients (90%) incontinence was cured, greatly improved in one (5%) and failed in one patient (5%). One patient underwent a successful later readjustment. **Conclusion:** Transobturator Safyre is a promising technique. This approach may be useful in cases of previous failed anti-incontinence procedures and obese patients, allowing for later readjustment, should it become necessary.

ABSTRACT #19

INJECTABLE SLING FOR FEMALE STRESS URINARY INCONTINENCE

Paulo Palma, Ashvin Desai, Cassio Riccetto, Miriam Dambros, Marcelo Thiel, João Colaço, Viviane Herrmann, Mario Martins, Nelson R. Netto Jr.
Division of Urology Universidade Estadual de Campinas - UNICAMP, SP, Brazil

Introduction and Objective: A innovative concept of an injectable urethral sling design, constructed from biodegradable, thermo sensitive biocompatible co- polymers is described. The objective of this innovative approach is to reinforce the natural urethral ligaments, such as urethropelvic and pubourethral ligaments using biodegradable polymer sling so as to provide necessary backboard support for the urethra. **Materials and Methods:** A thermo sensitive, viscous liquid formulation of biodegradable co-polymers of polylactic acid and polycaprolactone(Prosurg, Inc San Jose CA) was developed for minimally invasive injectable sling treatment. The biodegradable polymer composition is in liquid form at room temperature that solidifies upon contact with body tissue and cellular fluids, resulting in a solid support structure. The injectable sling procedure was performed under spinal anesthesia in a 45 years-old patient with type III stress urinary incontinence that was submitted previously to two unsuccessful anti-incontinence procedures. The biodegradable polymer material was injected into the suburethral area , towards the pubourethral ligament and urethropelvic ligament bilaterally using a 18 ga injection needle. A Foley catheter was left in the patient for overnight, as a precaution. **Results:** No complications were observed in the post-operative period. A mild dyspareunia was reported 2 months after the injection procedure. Presently, the patient remains continent , six months following the injectable sling procedure. **Conclusion:** The concept of an injectable urethral sling design, constructed from biodegradable, thermo sensitive biocompatible co- polymers to reinforce and support the urethra for incontinence treatment is a feasible procedure. Further studies and proper follow-up are needed to validate this novel , minimally invasive office based procedure.

ABSTRACTS

ABSTRACT #20

THE USE OF A BALLOON FOR BLADDER AUTOAUGMENTATION: EXPERIMENTAL STUDY

Carlos Arturo Levi D'Ancona, Jean Ikonomidis, Iara de Luca, Nelson Rodrigues Netto Jr.
Division of Urology, University of Campinas Medical Center, São Paulo, Brazil

Purpose: The aim of the present study is to compare the results of bladder autoaugmentation with and without intravesical balloon. **Material and Methods:** A total of 10 mongrel dogs (15 to 20 Kg.) were divided into two groups: Group I (standard procedure) was treated by vesicomyotomy, and Group II (balloon) was treated with vesicomyotomy and an intravesical balloon for seven days. All animals were maintained with a urethral catheter for seven days. Cistometry was performed on all the animals, prior to surgery and in the immediate postoperative, seventh, fifteenth and thirtieth postoperative days. Cistometry was performed on the thirtieth day and then the dogs were sacrificed and the bladder was removed for histological analysis. **Results:** Preoperative urodynamic evaluation showed mean bladder capacity of 250 ml and compliance of 8ml/cmH₂O in the standard procedure group and 280ml of capacity and 10cm/H₂O of compliance in the balloon group. In the standard procedure there was a progressive decrease of bladder capacity and compliance from the seventh to the thirtieth postoperative days. This was not observed in the other group. In both groups histological evaluation showed extensive fibrosis in the area where the vesicomyotomy was performed. In addition, shrinkage of the surgical area was observed in the standard group. **Conclusions:** The major concern about the autoaugmentation technique is the development of fibrosis and consequent contraction of the diverticulum. This study shows that the use of an intravesical balloon can prevent the shrinkage by holding the diverticulum distended.

ABSTRACTS

ABSTRACT #21

A CONCEPT FOR INTRACAVITARY, TARGETED AND FRACTIONATED BLADDER IRRADIATION FOR INVASIVE BLADDER TUMORS

Daniel Yachia* & **Eran Hirschowitz****, (*)Hillel Yaffe Medical Centre. Hadera – Israel and
B. Rappaport Faculty of Medicine, Technion. Institute of Technology of Israel. Haifa, Israel
(**) Innoventions Ltd. Cesarea – Israel

INTRODUCTION AND BACKGROUND: Current therapy for bladder cancer is adequate only if the disease is diagnosed during its early stage to be treated curatively. Of these, more than 70% will recur after the first transurethral resection. Therapies which could significantly reduce this high recurrence rates or prevent or even delay radical cystectomy would be a benefit to patients and global health care systems by reducing costs. Radical cystectomy's implications on quality of life are well known. A treatment allowing bladder preservation without compromising tumor control could maintain quality of life these patients. Interstitial and intracavitary irradiation for invasive bladder cancer have been developed and tried mainly in Europe and Japan. Specially designed Iridium-192 wire afterloading applicators have been used for vaginal and rectal wall, as well as endobronchial and brain brachytherapy. Also a special 3-way catheter for high rate intracavitary bladder radiotherapy was developed in Japan. Through this catheter the bladder was irradiated with 5 Gy per fraction to a total dose of 40-50 Gy in 8 to 10 fractions (⁶⁰Co). Other groups tried transcystoscopic intracavitary irradiation in the treatment of noninvasive papillary transitional cell carcinoma and carcinoma in situ of the bladder. **METHOD:** A concept for an afterloading system for remote-control, focal intracavitary irradiation using a specially designed balloon (BrachySphere™) for bladder cancer is presented. This balloon which is lighter than urine is inserted transurethraly and floats in the bladder. It has a lead shielded core where the radioactive source is located, and a slit in the shield for focal radiation exposure when it is opened. An external remote control device commands the position of the balloon and timing of the irradiation. This system will allow fractionated, intracavitary and well targeted irradiation by steering the balloon to the desired site/s and reduce the unnecessary radiation damage to the surrounding tissues and organs. Following delivery of the prescribed dose, the radioactive source with the balloon will be removed transurethraly. **CONCLUSIONS:** Successful intracavitary brachytherapy is likely to provide a good control of the tumor by resulting in long-term complete tumor remission in patients that conventionally are candidates for radical cystectomy. This approach may allow a good quality of life in these patients. The BrachySphere™ may make the bladder brachytherapy technology an accepted and accessible treatment alternative in patients who are candidates for radical cystectomy; however the effectiveness of this mode of treatment for bladder tumors needs to be clearly demonstrated.

ABSTRACTS

ABSTRACT #22

Enhanced Objective Quantitative Cystometric Analysis of Compliance and Contractility

Edward F. Wahl, Blaine Kristo, Stephen R. Shapiro*, and Bernard M. Churchill

University of California, Los Angeles

Department of Urology, Division of Pediatric Urology, *Pediatric Urologist, Sacramento, CA

Introduction: High intravesicle storage pressure can lead to urinary incontinence, inefficient ureteral transport, a predisposition to vesicoureteral reflux, and poor perfusion of the bladder wall. High intravesicle pressure is the result of inadequate bladder compliance and/or inappropriate detrusor contractions. While detrusor instability is amenable to pharmacological therapy, severe reductions in compliance due to changes in the amount and type of bladder wall connective tissue require surgical solutions. Use of a method to reliably and economically separate, identify, measure, display, and analyze bladder wall contractility and compliance (C&C) with potential for resolving these problems is described. **Methods:** Filling cystometry data from a system with sufficient accuracy to separately quantify and determine C&C, as previously reported, was analyzed with a new methodology. This computerized analysis system automatically removes artifacts from filling phase cystometrograms and, using nine urodynamic fundamentals, analyses the detrusor pressure-time data to determine the C&C. Calculations are repeated (iterative analysis) until there is no change in the relaxed state detrusor curve and no more contractions greater than 2cmH₂O are identified. The contractility and compliance are displayed graphically and numerically. This has been validated retrospectively by i.) application to 50+ difficult-to-analyses cases, ii.) detailed comparison contraction-by-contraction with the raw pressure-time data, and iii.) verifying separation from background artifact. **Results.** The separate identification and display of C&C is currently being applied reliably and economically in clinical practice. **Compliance Character.** The relaxed state detrusor pressure that increases as the bladder fills is quantified by a graphical template. **Contractility character.** The greater the amplitude of the inappropriate pressure contractions the longer the duration (from 4 seconds to as much as 5 minutes) of the contraction. They are of four types. "H": A few (typically 2) large contractions of amplitude greater than 25 cmH₂O and time duration greater than 30 seconds. "M": Contractions of short duration, about 5 to 15 seconds in length of sufficient amplitude to cause a leakage event. "L": Contractions in the range of 4 to 15 cmH₂O, generally present in both of the above two cases and superimposed on the larger longer duration contractive pulses. "F": Groups of frequent contractions of 1 to 4 cmH₂O amplitude that are present in all urodynamic data. Generally these occur in the few minutes preceding a normal void, urgent need to void, or substantial contractions (type H). Cases with poor compliance will sometimes also have poor contractility. **Discussion.** Compliance is quantified by a dimensionless number and by the related template. The seriousness of the contractility is quantified by the normalized power factor. **Conclusions:** Because the treatment of bladders with poor contractility differs greatly from those with detrusor instability, the ability to reliably differentiate between these two etiologies is important. We have shown that it is feasible to perform C&C analysis and identify frequent small-amplitude detrusor contractions. We hope that this previously unrecorded information as well as the more explicit enhanced quantitative C&C will permit more appropriate diagnosis and treatment of those with intrinsic bladder dysfunction.

We gratefully acknowledge the financial support of the Wendy and Ken Ruby Fund for Research Excellence in Pediatric Urology.

ABSTRACTS

ABSTRACT #23

Revisiting 3D Color CT scan- A Triumph of Biomedical Engineering

Dr. Ecanow, Irving Garlovsky, Linda Zielinski, Roland Williby, Gennady Demin, Igor Sukhov, Irving Bush,
St. Joseph's Hospital, Elgin, IL 60123

Color 3D CT scans have been investigated in our hospital over the past 15 years. Initially thought to be too cumbersome, time consuming and fraught with seeming inaccuracies, 3D CT scans have been improved and revised over the past several years. This presentation will demonstrate that this technique is useful in delineating 1) prostatitis, seminal vesicle infection; 2) urinary reflux; 3) the extent of prostatic bladder, testis, kidney and urethral cancer; 4) localization of abdominal testis; 5) urachal conditions and renal vascular abnormalities (including tumor involvement in the renal veins and inferior vena cava). Prostate cancer spread into the seminal vesicles and pelvis and penetration of bladder cancer into or through the deep bladder muscle can be evaluated before and after chemotherapy and/or radiation.

This technique has finally found a place in the everyday armamentarium of the urologist and is a demonstration of the useful blending of medicine and engineering.

ABSTRACTS

ABSTRACT #24

Automatic Needle Targeting under X-Ray Fluoroscopy Guidance

Alexandru Patriciu, Dumitru Mazilu PhD, Doru Petrisor PhD, Albert Ong MD,

Louis Kavoussi MD, Dan Stoianovici PhD

URobotics Lab, Brady Urological Institute, Johns Hopkins Medical Institutions, Baltimore, MD.

<http://urology.jhu.edu/urobotics>

Abstract: We present a method for automatic needle targeting in robotic percutaneous access under x-ray fluoroscopy. The method is insensitive to image distortion and C-Arm geometric characteristics. The proposed method is derived from the common needle superimposing technique used by surgeons in manual procedures.

Methods: The system includes our AcuBot robot connected to a C-Arm fluoroscopy unit. AcuBot is a 6DOF needle manipulator comprising a 3DOF Cartesian stage, a passive global positioning arm, 2DOF needle orientation module (RCM) and a 1DOF needle driver (PAKY). The passive arm and the Cartesian stage allow for the initial positioning of the robot with the tip of the needle is at the skin entry point. The RCM is then involved for orienting the needle about its tip and PAKY inserts the needle after proper targeting is achieved. AcuBot is controlled by an industrial PC equipped with a “Motion Engineering Inc.” (MEI) motion control card. The PC is equipped with a Matrox Meteor II frame grabber for image acquisition and the Matrox Imaging Library is used for image processing.

The C-Arm is initially placed AP as in the manual procedure and an appropriate entry point is selected. The needle is loaded and the Cartesian stage is maneuvered until the tip of the needle reaches the entry point, so that in the image the tip of the needle is superimposed over the target. In order to facilitate the automatic detection of the needle in the x-ray a 5mm steel ball is mounted at the end of the needle. Fluoroscopic images are used by the algorithm to superimpose the ball over the tip of the needle by continuously adjusting and correcting the orientation of the needle with the RCM module. Once proper orientation of the needle is confirmed by the urologist, the C-Arm is rotated into a lateral view and needle insertion is performed.

Results: The algorithm was implemented and initially tested with a CCD camera in place of the C-Arm. The maximum needle placement error in 50 experiments, measured as the distance between the point of the needle and the desired target was 1mm. Next, a series of 25 trials were performed on a kidney phantom (Percutaneous kidney slab by Limbs and Things Inc) using a GE OEC-9800 fluoroscope (Figure 1). These experiments revealed an average needle placement accuracy of 0.9mm and an average radiation time of 5.54s.

Conclusion: The method gives an automatic, precise, and fast solution for needle placement under C-Arm fluoroscopy. The method does not require preliminary C-Arm calibration or initial positioning estimation. Compared to the manual approach, the method provides increased accuracy and reduced radiation exposure.

Acknowledgement and Disclaimer: This work was partially supported by grant No. 1R21CA088232-01A1 from the National Cancer Institute (NCI). Under licensing agreements between ImageGuide (iG) and the Johns Hopkins University (JHU), the authors are entitled to a share of royalty received by JHU on iG sales of the AcuBot robot used in this study. Under a private license agreement between D.S., L.R.K and iG, DS and L.R.K are entitled to royalties on iG sales of products embodying the AcuBot technology.



Figure 1: AcuBot in C-Arm guided needle insertion experiments

ABSTRACTS

ABSTRACT #25

COMPARISON OF SEVEN HOLMIUM:YAG LASER OPTICAL FIBERS

Bodo E. Knudsen, London, ON, Randolph D. Glickman, San Antonio, TX, Kenneth J. Stallman, San Antonio, TX, Saher Maswadi, San Antonio, TX, Darren T. Beiko, London, ON, John D. Denstedt, London, ON, Joel M. Teichman, San Antonio, TX, St. Joseph's Health Care London, University of Western Ontario; University of Texas Health Science Center at San Antonio

INTRODUCTION AND OBJECTIVES: The emergence of flexible ureteronephroscopy has necessitated the need for holmium:YAG optical fibers than can bend and transmit laser energy in a deflected position. It is unknown whether optical fibers among manufacturers have equivalent transmission and safety. In this study, we test the hypothesis that optical fiber performance differs among manufacturers.

METHODS: Holmium:YAG optical fibers were tested on a Lumenis 60 W holmium:YAG laser. All fibers were original and verified to have polished tips by microscopy. Small (200-272 μm diameter) and medium (300-400 μm) fibers were tested from Lumenis, Innova, Dornier, and Optical Integrity. Fibers were tested in straight configuration and deflected to 180° with a bending radius to duplicate that achieved in an ACMI DUR-8 Elite ureteroscope. The optical output was measured by energy detector with the laser set at 500 mJ pulse energy at 10 Hz. Pyroelectric imaging was done. The fibers were run at 500-2800 mJ pulse energy to determine the minimum energy required to fracture the fiber at the site of bending. Each fiber was placed through the working channel on the ACMI DUR-8 Elite ureteroscope and flow rates (mL/min) were calculated. The maximum deflection of the DUR-8 Elite with each fiber in the working channel was recorded. **RESULTS:** All small fibers had greater optical output in straight vs. 180° configurations. The Dornier fiber had the lowest optical output in either configuration. Some medium fibers had greater optical output in straight vs. 180° configurations. The Dornier 200 μm fiber fractured repeatedly in 180° configuration with pulse energy as low as 0.6 J. The Lumenis 365 μm fiber fractured repeatedly in 180° configuration with pulse energy as low as 1.0 J. Pyroelectric images confirmed near Gaussian optical output for all fibers. Flow rates (mL/min) were calculated with each fiber inserted into the DUR-8 Elite working channel.

	500 mJ pulse energy (50 pulses, 3 runs) Fiber Straight	500 mJ pulse energy (50 pulses, 3 runs) Fiber 180°	Minimum pulse energy (mJ) required to fracture fiber Fiber 180°	Fiber Diameter in microns	Mean flow rate through DUR-8 Elite Ureteroscope (mL/min)	Maximum angle of deflection achieved with fiber with DUR-8 Elite Ureteroscope (°)
Lumenis 272	476 \pm 1	408 \pm 0	*	407.5	27.7	242
InnovaQuartz 200	408 \pm 0	402 \pm 1	2800	384	30.0	272
Dornier 200	250 \pm 2	243 \pm 1	600	354.5	34.2	263
Optical Integ 300	485 \pm 1	485 \pm 1	*	693	8.8	210
Lumenis 365	501 \pm 0	503 \pm 0	2000	520	17.2	205
InnovaQuartz 400	498 \pm 2	496 \pm 0	*	718.5	7.7	210
Dornier 400	506 \pm 1	448 \pm 1	*	716.5	8.0	206.5

* did not fracture with pulse energy setting up to 2.8J

CONCLUSIONS: Optical performance differs among manufacturers. For small fibers, the Lumenis 272 μm and Innova 200 μm fibers are best. For medium fibers, the Innova 400 μm and Optical Integrity 300 μm fibers are best. The Dornier 200 μm fiber does not couple well with the Lumenis laser.

ABSTRACTS

ABSTRACT #26

Laser therapy in penile carcinoma: Point of technique and outcome

Dominic Frimberger, Edwin Hungerhuber, Alfons Hofstetter and Peter Schneede

Department of Urology, Ludwig- Maximilians
University of Munich- Grosshadern, Marchioninstr. 15, 81377 Munich, Germany

Summary: The most important issues in penile cancer remain adequate tumor control and the prevention of recurrent disease. The outcome data from a single institution of the last 13 years for patients with penile carcinoma treated with Nd: YAG laser coagulation was reviewed to evaluate the safety of laser treatment in comparison to local excision and amputation techniques respectively. A retrospective analysis of 29 patients with penile carcinoma treated with Nd: YAG laser coagulation between 1987 and 2000 was performed. Two patient groups were formed, group 1 consisting of patients with carcinoma in situ only and group 2 including all other tumor stages. Group 1 consisted of 17 patients of which 2 had recurrent disease. Two patients underwent inguinal lymphadenectomy of which one was positive. Group 2 consisted of 12 patients, 10 with T1 disease and 2 with a T2 tumor. One patient developed recurrent disease and 2 patients had metastatic spread to their lymph nodes. Two patients, one of each group required partial amputation for recurrent disease. The cosmetic results and patient satisfaction are excellent. Modern laser surgery of the outer genital allows oncologically, functionally and cosmetically convincing results in the hand of the experienced surgeon. While superficial lesions up to T1 can safely be treated with Nd: YAG laser coagulation, the treatment of choice for stage T2 or higher lesions remains partial amputation.

ABSTRACT #27

Erbium:YAG Laser Incision of the Ureter and Urethra: Optimization of the Laser Parameters

Nathaniel M. Fried, Ph.D.¹, Albert M. Ong, M.D.¹, Koon H. Rha, M.D., Ph.D.¹, Zelalem Tesfaye, M.S.¹, and Pooya Hejazi, M.S.² Departments of Urology¹ and Electrical Engineering², Johns Hopkins University, Baltimore, MD

Introduction: The most frequent complication associated with endourologic treatment of ureteral and urethral strictures is stricture recurrence. The Erbium:YAG laser is capable of incision of soft tissues with minimal peripheral thermal damage and therefore may be a promising alternative to the cold knife and Holmium:YAG laser for incision of ureteral and urethral strictures. **Methods:** Optimization of the Er:YAG laser was conducted using fresh samples of porcine ureters and canine urethras, ex vivo. Preliminary in vivo studies were also performed in a laparoscopic porcine ureteral model with exposed ureter. Laser radiation with a wavelength of 2.94 μm , pulse lengths of 8, 70, and 220 μs , output energies of 2-35 mJ, fluences of 1-25 J/cm^2 , and pulse repetition rates of 5-30 Hz, was delivered through 250- μm and 425- μm core germanium oxide optical fibers in direct contact with ureteral tissue. **Results:** Ex vivo perforation thresholds measured 2-4 J/cm^2 , with ablation rates of 50 $\mu\text{m}/\text{pulse}$ at fluences of 6-11 J/cm^2 . In vivo perforation thresholds were approximately 1.8 J/cm^2 , with the ureter perforated in less than 20 pulses at fluences greater than 3.6 J/cm^2 . Thermal damage zones ranged from a minimum of 20 μm at 8 μs laser pulse lengths to a maximum of 60 μm with 220 μs pulses. Mechanical damage (tissue tearing) was observed with the Er:YAG laser at the 8 μs pulse duration, and operation was limited to low pulse repetition rates. **Conclusions:** The Er:YAG laser, operating at a pulse duration of approximately 70 μs , a fluence of 4 J/cm^2 , and a pulse repetition rate of 20 Hz, is capable of rapidly incising urethral and ureteral tissues, in vivo, with minimal thermal and mechanical side-effects. The Er:YAG laser is more efficient than the Ho:YAG laser for cutting tissue, with perforation thresholds measuring $\sim 2 \text{ J}/\text{cm}^2$ versus $\sim 34 \text{ J}/\text{cm}^2$, respectively. The Er:YAG laser is also more precise than the Ho:YAG laser, with peripheral thermal damage zones measuring 10-20 μm versus 300 μm , respectively. Chronic animal wound healing studies are planned to quantify scarring induced during Er:YAG laser incision, and optimization of fiber optic delivery systems for endoscopic delivery of mid-infrared laser energy has begun.

ABSTRACTS

ABSTRACT #28

Micro-inkjet Device for Rapid, Precise, and Noncontact Surgical Marking of Tissues

Rahayu Ramli¹ and Nathaniel M. Fried, Ph.D.²
Departments of Biomedical Engineering¹ and Urology²
Johns Hopkins University, Baltimore, MD

Introduction: There is a need for improved methods of tissue marking as the applications for laparoscopic surgery increase. The use of a micro-inkjet system for noncontact, rapid, and precise marking of surgical margins prior to excision or morcellation of tissue may provide improved correlation with histologic analysis. The purpose of this study was to optimize the micro-inkjet parameters for noncontact marking of tissue and compare its performance with a syringe-pump used for contact marking of tissue. **Methods:** India ink was used as a sample permanent dye for marking of poster board, kidney, and ureter, during the optimization of micro-inkjet and syringe pump systems. Noncontact dye delivery was studied using a micro-inkjet head (4-mm-diameter x 20-mm-length) connected to a high-voltage power supply and operated by laptop computer. The inkjet orifice consisted of a glass capillary tube with an 80 μ m opening, capable of delivering dye volumes of 20 pL – 1 nL at pulse repetition rates of 1 Hz – 20 kHz. Contact dye delivery was studied for comparison using a syringe-pump connected to tubing with inner diameters of 0.25, 0.5, and 1.0 mm. **Results:** The optimal ink jetting parameters were observed to be voltages of 30-50 Hz, pulse repetition rates of 750-1000 Hz, and a distance of approximately 5 mm from the tissue surface. Precision marking with ink spots as small as 200-400 μ m was achieved by delivering a burst of 50 pulses over a duration of 50-65 ms. Ink spots increased with operation time, and large 1-mm-diameter spots could be deposited on urological tissues over periods of 250 ms - 3 s. The syringe pump system was less precise, with minimum spot diameters of approximately 1 mm created in 1 s using the 250- μ m-diameter tubing. **Conclusions:** The micro-inkjet system is capable of rapidly and precisely marking tissue in a noncontact mode. Further improvements in the inkjet head need to be made to prevent clogging during extended operation and to eliminate divergent particles, or satellites. Potential laparoscopic applications of the inkjet system include precision tissue marking, dye-enhanced laser tissue welding, and dye-enhanced laser ablation.

ABSTRACTS

ABSTRACT #29

Subsurface Thermal Lesions in Tissue using an Nd:YAG Laser and Cryogen Spray Cooling

Daniel Durand, B.S., and Nathaniel Fried, Ph.D., Department of Urology
Johns Hopkins Medical School, Baltimore, MD

Introduction: Surface cooling methods are currently being used clinically in dermatology to superficially protect upper skin layers during laser treatment of vascular birthmarks. This study investigates the ability of laser heating in conjunction with cryogen spray cooling of the skin surface to produce deep subsurface tissue lesions without skin damage, for potential application in noninvasive male sterilization.

Methods: Porcine liver and skin samples were immersed in a saline bath, placed on a heating plate, and maintained at 37 °C with monitoring by embedded thermocouples. Nd:YAG laser radiation with a wavelength of 1.06 μm was coupled into a standard 600- μm -core silica optical fiber. The laser was operated with output powers of 30-40 Watts in a long-pulse mode with pulse durations of 1 s. The laser spot size at the skin surface was fixed at 7.5-mm-diameter ($1/e^2$) and was concentric with the 2-cm-diameter cryogen spot. The cryogen cooling system consisted of a cryogen reservoir, electronic display, and solenoid valve. The cooling system was triggered by a function generator, and an oscilloscope was used to view the pulse characteristics. The cryogen spray was delivered intermittently between laser pulses, with a pulse duration of 60 ms and a repetition rate of 0.333 Hz. A series of cryogen pulses were used to pre-cool the tissue prior to irradiation, and pre-cooling times ranged from 15-75 s. Air was flowed over the tissue surface during the procedure to maintain the surface temperature above 0 °C and prevent ice formation. Operation times ranged from 60-105 s. After the procedure, gross and histologic pathology were used to measure the lesion characteristics in the liver and skin. **Results:** Thermal lesions of 3-mm-diameter were produced in liver tissue below a preserved 2-mm-thick surface layer. Thermal lesions in the dermis appeared 1 mm below the skin surface and measured \sim 2-mm-diameter. **Conclusions:** Initial ex vivo tissue studies demonstrate that it is possible to target and thermally alter subsurface tissue structures without damage to the tissue surface. The ability to preserve 1-2 mm of the skin surface using this method may lead to the successful thermal occlusion of subsurface anatomical structures in the male reproductive tract (e.g. vas deferens, epididymis) for noninvasive male sterilization. In vivo experiments will be necessary to further optimize the laser heating and cryogen cooling parameters.

ABSTRACTS

ABSTRACT #30

HIFU AND LOCALIZED PROSTATE CANCER

C. Chaussy, S. Thüroff

Klinikum München-Harlaching, Department of Urology, Munich, Germany

INTRODUCTION AND OBJECTIVES: After the clinical development phase, the safety and the efficacy of High Intensity Focused Ultrasound (HIFU) as a primary care for localized prostate cancer using the standard treatment parameters was assessed. **METHODS:** Patients presenting with localized prostate cancer, with an initial PSA level ≤ 15 ng/ml, and treated with the standard technical parameters (3 MHz frequency, 5 seconds shot duration) were considered for analysis. All patients were treated with HIFU under general or spinal anesthesia, using the Ablatherm[®] device (EDAP SA, Lyon, France). During the follow-up, random sextant biopsies and PSA level measurements were regularly performed. **RESULTS:** n=271 patients with localized prostate cancer (stage T1-2 N0-x M0) were included and were treated with HIFU as a primary care. Main patients baseline characteristics were (mean \pm SD): age 67.5 ± 7.2 years, prostate volume 20.9 ± 8.8 cc, initial PSA 8.2 ± 3.3 ng/ml. Gleason scores were 2 to 6 for 72.7% of the patients, 7 for 23.2%, and 8 to 10 for 4.1%. The HIFU retreatment rate was 11.4%. The mean follow-up duration was 14.8 months, ranging from 3 to 46.3 months. The mean nadir PSA observed in this population was 0.3 ± 0.8 ng/ml (median=0.0 ng/ml), and the negative biopsy rate was 85.2%. The treatment related morbidity was low: 10.0% of the patients presented intermediate incontinence symptoms, without any total incontinence, and 24.4% presented with UTI easily managed with antibiotics. No chronic toxicity was observed. Only 11/271 patients (4.1%) received an adjuvant PCa (hormonal ablation in 8 patients, radical surgery in 3 patients). **CONCLUSION:** Efficient treatments with a highly favorable risk-benefit ratio are delivered using the HIFU technology. Longer follow-up will confirm its curative potential, and its place among the available treatment options.

ABSTRACTS

ABSTRACT #31

A NOVEL MINIMALLY INVASIVE METHOD OF STUDYING THE ACUTE EFFECTS OF DOUBLE PIGTAIL STENT ON URETERAL PERISTALSIS *IN VIVO* USING A MAGNETIC SENSOR IN A PORCINE MODEL

Ramakrishna Venkatesh¹, Jaime Landman¹, Scott D. Minor², David I Lee³,
 Richard Vanlangendonck¹, William Collyer¹, Chandru P. Sundaram¹, and Ralph V. Clayman³,
¹Division of Urology, Washington University School of Medicine, St. Louis, MO, USA
² Department of Physical Therapy, Washington University School of Medicine, St. Louis, MO, USA
³Department of Urology, University of California, Irvine, CA, USA

Introduction: The optimal clinical application of ureteral stenting remains controversial. This is partly due to lack of understanding regarding the physiologic effects of ureteral stents on the urinary tract. We have developed an accurate and reliable method of studying ureteral pathophysiology in a stented system. Using a novel minimally invasive extraluminal method of studying ureteral peristalsis and is laparoscopically deployed, we evaluated ureteral physiological activity in the stented and unstented porcine ureter. **Materials and Method:** The Giant Magneto Resistive (GMR) technology uses a magnet to create a magnetic field and a sensor to detect small movements of an object within the magnetic field. Bipolar electromyographic (EMG) wire electrodes were used for recording ureteral action potentials. EMG electrodes were placed laparoscopically on the proximal and mid ureter, the GMR device was positioned on the ureteral surface between the EMG leads. Pneumoperitoneum pressure was maintained between 6-8mmHg. Ureteral electro-mechanical activity signals displayed on an oscilloscope were correlated with laparoscopic visually observed ureteral peristalsis. After establishing the consistency of the magnetic sensor to detect ureteral motility, the acute effects of double pigtail ureteral stents were studied. Ureteral peristalsis was studied in a randomized manner using 4.8Fr and 7Fr double pigtail stents. Stent composition (silicone and polyurethane) was also evaluated as half the 4.8Fr stents and half of the 7Fr stents were silicone and polyurethane respectively. Peristalsis was studied in 6 porcine ureters with no stent, 6 pigs after unilateral insertion of 4.8Fr double pigtail stent, and in another 6 after insertion of 7Fr stent. Peristaltic activity was continuously monitored for 8 hours and was re-evaluated 1 week later. **Results:** There was no change in the baseline peristalsis before and after deployment of the EMG electrodes and the magnetic sensor device. A consistent correlation was found between laparoscopically observed ureteral peristalsis and the peristalsis detected by the magnetic sensor. Electrical potentials were shown as multiphasic bipolar and the mechanical contractions as unipolar deflections on the oscilloscope. The acute effect of 4.8Fr and 7Fr ureteral stents on peristalsis is shown in Table 1. At 1-week, the stented ureters were grossly dilated with marked inflammation. There was no difference in peristaltic activity of ureters with silicone or polyurethane based stents. **Conclusions:** The GMR technology allows for minimally invasive *in vivo* extraluminal evaluation of the ureter for studying both the stented and the unstented systems. During the first 2 hours following 4.8Fr or 7Fr stent placement, there was increase in peristaltic activity. During the next 6 hours, 4.8Fr stent had minimal impact on ureteral peristalsis, whereas 7Fr stent produced aperistalsis or decreased peristalsis. At 1-week, the majority of stented ureters showed aperistalsis. Better understanding of ureteral physiologic response may yield improved endoscopic technique, and more expeditious evaluation of ureteral response to different stent prototypes or pharmacological agents.

Table 1: Ureteral peristalsis with no stent, with 4.8Fr and 7Fr ureteral stents

Stent	Baseline Peristalsis (/min.)	Peristalsis 0-2 H (/min)	Peristalsis 4-6 H (/min)	Peristalsis 8 H (/min)	Peristalsis 1-week (/min)
None n=6	2(1-4)	2(1-3)	2(1-6)	2(1-4)	2(1-4)
4.8Fr n=6	2(1-5) <i>p</i> =1.00	4(3-8) <i>p</i> =0.04	3(2-6) <i>p</i> =0.01	2(1-6) <i>p</i> =0.81	0.013 <i>p</i> <0.0001
7Fr n=6	2(1-3) <i>p</i> =0.79	4(3-6) <i>p</i> =0.06	0.018 <i>p</i> =0.003	0.01 <i>p</i> =0.007	0.005 <i>p</i> <0.0001

p values shown represent peristaltic activity in ureters with stents (4.8Fr or 7Fr) compared to those without stents.

OFFICERS

Louis Kavoussi, M.D.

Co-President

Dan Stoianovici, Ph.D.

Co-President

Margot Damaser, Ph.D.

Vice-President

Jack Vitenson, M.D.

Secretary

Gopal Badlani, M.D.

Treasurer

ADVISORY BOARD

Michael Manyak, M.D.

Director, Biotechnology Forum

John Denstedt, M.D.

Jean de la Rossette, M.D.

Peter Schulam, M.D., Ph.D.

Jeffrey Cadeddu, M.D.

Ralph Clayman, M.D.

Douglas Milam, M.D.

Arthur Smith, M.D.

Benjamin Lee, M.D.

INVITED FACULTY

Clement-Claude Abbou, M.D.
Creteil, France

Jay T. Bishoff, M.D.
Lackland, Texas

Margot Damaser, Ph.D.
Hines, Illinois

Jean de la Rosette, M.D.
Amsterdam, The Netherlands

Mark W. Dewhirst, DVM, Ph.D.
Durham, North Carolina

Kenneth J. Gustafson, Ph.D.
Cleveland, Ohio

Lennox Hoyte, M.D.
Boston, Massachusetts

Michael Manyak, M.D.

Washington, D.C.

James B. Mitchell, M.D.
Bethesda, Maryland

Michael North, Software Engineer
Argonne, Illinois

Mary Rasmussen, MFA
Chicago, Illinois

Jens Rassweiler, M.D.
Heilbronn, Germany

Koon Ho Rha, M.D.
Baltimore, Maryland

Peter G. Schulam, M.D.
Los Angeles, California

Nelson N. Stone, M.D.
New York, New York

NOTES

NOTES

NOTES