Welcome! The Engineering and Urology Society (E&U) is holding its 19th annual meeting on Saturday, May 8th 2004 in San Francisco, in conjunction with the annual meeting of the American Urological Association. The E&U is dedicated to providing a forum where the latest tools 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, one on basic science and the other clinical. A wide variety of topics related to applied engineering, advances in endoscopy, urodynamics, ablation techniques, modeling and simulation, robotics, laparoscopy and telemedicine will be addressed.

This year we opened an independent web site for the E&U society at: http://engineering-urology.org/. We also added a new web-based review site to the paper submission system implemented last year. We received an impressive number of reviews (446) of the papers submitted. Each paper received 11 or 12 reviews from 27 reviewers around the world. This formed a well diversified and widely distributed review process. . Reviewers scored each paper with a grade from 1-10, and papers were accepted for presentation based on the average grade

The new "Best Paper Award" has also been created this year, for the paper with the highest review score. We are happy to announce that this year the award goes to Dr. Jeffrey Caddedu's research team from UT Southwestern and UT Arlington for their excellent work on a magnetic positioning system for laparoscopic instruments.

For the next year we hope to introduce a web-based society membership database unified with the Endourological Society. This will allow for easy payments of membership and conference registration fees and will provide convenient automated reminders through your e-mail. The E&U abstracts will continue to be published in the Journal of Endourology. Last year's abstracts can be found in the November 2003 issue of the journal: Vol. 17, No. 9, p823-834.

Dr. Inderbir Gill, the program chair this year, has assembled a well esteemed group of specialists for the podium sessions in the morning, chaired by Drs. Badlani, Manyak, de la Rosette, and Denstedt. We would like to thank our colleagues from the European Society of Urology Technology for joining our meeting again this year. Another exciting event will be the presentation of the 2004-2005 endowed fellowship of the E&U to Dr. Sompol Permpongkosol. 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.

The society welcomes 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. Once again we are very thankful to Dr. George Nagamatsu, the founder and first president of the society for setting the basis on which we meet today.

Thank you for your continued scientific support,

Louis Kavoussi, MD
Dan Stoianovici, PhD

E&U 2004 PROGRAM

ENGINEERING AND UROLOGY SOCIETY

Saturday, May 8th, 2004
Grand Hyatt, Plaza Ballroom West

Program Chair: Inderbir Gill

7:00AM-7:30AM	**Registration**	
7:30AM-7:40AM	**Welcome and Awards**	Louis Kavoussi
	Best Paper Award and E&U 2005 Fellowship	Dan Stoianovici
7:40AM-8:00AM	**2004 Fellows Presentation**	Jennifer Miles-Thomas
	Telerounding	
8:00AM-9:00AM	**Nerve Sparing During Prostatectomy**	Gopal Badlani
	Nerve Regeneration	Thomas Lue
	Cavermap and Nerve Simpulators	James Eastham
	TRUS – Guidance During LRP	Osamu Ukimura
	Thermal Effects of Energy Sources: Implications for NVB Preservation	Chandru Sundaram
9:00AM-10:00AM	**Biotechnology Forum**	Michael Manyak
	Intrarenal Cooling during LPN	Jamie Landman
	Thermal Distribution During Renal RFA	Raymond Leveillee
	Thermal Advances for Lap Renal Procedures	Rodney Davis
	Bioadhesives in Urology	Sanjay Ramakumar
10:00AM-10:30AM	**Coffee Break**	
10:30AM-11:30AM	**ESUT Session**	Jean de la Rosette
	Renal Cryosurgery	Pillar Laguna
	Heat-therapies aiding LPN	Roland van Velthoven
	Intra-arterial Hypothermia for LPN	Gunter Janetschek
11:30PM-12:00PM	**E&U Plenary Session**	
	Bioactive Stents	John Denstedt
	Allogenic Muscle-Derived Progenitor Cell Injection into Urethra for Stress Incontinence	Michael Chancellor
	Incontinence	
12:00AM-1:00PM	**Lunch Break**	

E&U 2004 PROGRAM

1:00PM-3:00PM **Poster Session #1 – BASIC SCIENCE** Peter Schulam
Alex Patriciu

Poster B1 An Inexpensive Customizable Patient Note Generator and Database Program
Presented by Sijo Parekattil

Poster B2 Uroengineering Website Platform
Presented by Sijo Parekattil

Poster B3 Using Two Energy Sources of Shock Waves for Stone Fragmentation by the Duet Lithotripter – An In Vitro Study
Presented by Alexander Greenstein

Poster B4 Magnetic Positioning System for Trocarless Laparoscopic Instruments
Presented by David Duchene

Poster B5 A Simplified Functional Model of the Lower Urinary Tract
Presented by Chandrasekhar Thamire

Poster B6 A Predictor for Optimizing Transurethral Microwave Hyperthemia
Presented by Chandrasekhar Thamire

Poster B7 Laparoscopic Skills Training Using an Expensive, Homemade Webcam Trainer
Presented by Steve Chung

Poster B8 Preliminary Report on the Method of Bladder Microvascular Analysis Using Cystoscopy
Presented by Kyoko Sakamoto

Poster B9 In-Vitro Release of Indomethacin, Dexamethasone and Ciprofloxacin from the Biodegradable Polymeric Coatings of the Braided Poly-Lactic Acid (96L/4D) Stents
Presented by T. Tammela

Poster B10 Extraluminal Evaluation of Ureteral Electrical and Mechanical Physiology with Giant Magneto Resistive and Electromyographic Sensors
Presented by Caroline Ames

Poster B11	Evaluation of a Novel Nickel-Chromium (NiChrome) Based Device for Laparoscopic Renal Parenchymal Transection Presented by Jay Belani
Poster B12	Erbium: YAG Laser Lithotripsy with Hybrid Germanium/Silica Optical Fibers: A Feasibility Study Using Ex Vivo Stone Samples Presented by Nathaniel Fried
Poster B13	Comparison of Sapphire and Germanium Oxide Optical Fibers for Transmission of Q-switched and Long-Pulse Erbium: YSGG and Erbium: YAG Laser Radiation Presented by Nathaniel Fried
Poster B14	Mechanical Properties of Soft Tissue in Extension: Methodology and Preliminary Results Presented by Gunter De Win
Poster B15	The Evaluation of Employing Intuitive Writing Interface in Robot-Aided Laser Presented by Gunter De Win
Poster B16	Are Endoscopic Adjustable Port Seals Associated with Laser Fiber Damage? Presented by Bodo Knudsen
Poster B17	The Camera Phone: A Novel Aid in Urologic Practice Presented by Sanjay Razdan
Poster B18	Comparison of Erbium: YAG (l = 2.94mm) and Holmium: YAG (l = 2.1mm) Lasers for Incision of the Urethra and Bladder Neck: An In Vivo Chronic Study in Pigs Presented by Nathaniel Fried
Poster B19	Robotic Respiratory Tracking Algorithm, Initial Experiences Presented by Alexandru Patriciu
Poster B20	Novel Intraurethral Magnetic Proximity Valves Presented by Homan

3:00PM-:5:00PM **Poster Session #2 – CLINICAL** Jay Bishoff
Jeffrey Caddedu

Poster C1	Point of Technique-Prostate Biopsy – The Method of Collection Presented by Faiyaz Kapasi
Poster C2	A Prospective Randomised Study Between Transurethral Vaporization Using Plasmakinetic Energy and Transurethral Resection of the Prostate-Long Term Follow Up Presented by Faiyaz Kapasi
Poster C3	A New Tool in Laparoscopic Radical Prostatectomy Presented by O.M. Schlarp
Poster C4	Telementored Laparoscopy Between Italian Universities Presented by S. Micali
Poster C5	Tissue-Link Ds 3.0tm Dissecting Sealer Device Assisted Partial Nephrectomy for Renal Masses: A New Surgical Technique Presented by Pedram Ilbeigi
Poster C6	A Comparison of the Three-Arm and Four-Arm DaVinci Surgical System for Extraperitoneal Laparoscopic Robotic Prostatectomies Presented by Mutahar Ahmed
Poster C7	Comparison of Guide Wires in Urology: Which, When and Why? Presented by Louis Eichel
Poster C8	Video-Assisted Minilaparotomy Surgery Using Piercing Abdominal Retractors Presented by KM
Poster C9	True Extraperitoneal Laparoscopic Robotic Prostatectomy (ER-LRP): A Large Series Experience at One Institute Presented by Mutahar Ahmed
Poster C10	Efficacy of HIFU in Prostate Cancer Presented by Ch. Chaussy
Poster C11	The Use of a Sling System for Renal Positioning During Laparoscopic Partial Nephrectomy Presented by Gary Chien

Poster C12	Single Surgeon Laparoscopic Flank Procedures with a Novel "Scope Holder" for Camera Control Presented by William Collyer
Poster C13	Suggested Positioning of the Fourth Arm During Robotic-Assisted Laparoscopic Prostatectomy Presented by David Lee
Poster C14	Reproducibility of Learning Curve for Robotic Prostatectomy: Transference of Technique from Site to Site Presented by David Lee
Poster C15	Novel Peditrol® Irrigation Device Provides Superior Irrigation Flow and Acceptable Pressures for Flexible Ureteroscopy Presented by John Honey
Poster C16	Use of the Waterjet for Laparoscopic Retroperitoneal Lymph Node Dissection in Testis Cancer Patients Presented by Stefan Corvin
Poster C17	Combined Urethral Stricture Lance and Visual Urethrotomy for the Management of Complete Posterior Urethral Strictures Presented by Armelinda Andrada

ABSTRACTS – BASIC SCIENCE

ABSTRACT B1

AN INEXPENSIVE CUSTOMIZABLE PATIENT NOTE GENERATOR AND DATABASE PROGRAM

Sijo J Parekattil, Anthony J Thomas

Cleveland Clinic Foundation

Introduction and Objective: To develop an inexpensive customizable user-friendly patient note generator and database program. The target audience would be urologists in practice.
Methods: Microsoft Access ™ and a Visual Basic™ action button based algorithm were used to create a patient note generator and database program. The program utilizes a user-friendly customizable patient encounter form that the urologist fills during or after a patient visit. This encounter form is used to generate a complete level 5 coding visit note. This note is designed to be easier to read than conventional template notes. The encounter form also generates a letter to the referring physician. The program maintains a complete patient database on all patients seen by the physician. The program is password protected thus limiting access only to the author of the encounter forms. A utility was added to capture, store and sort patient digital imaging. A "To Do" list utility was designed to allow the urologist to make notes/ reminders to enhance delivery of care. An interface to our existing hospital based computer system (Epic™) was created.
Results: A customizable user-friendly patient note generator and database program was created. The program was tested in a clinical practice. The first patient encounter lasted 41 minutes for the complete visit, documentation and printing out of the visit note and referring physician note. By the fifth patient encounter, the entire process was accomplished in 23 minutes. The Figure below illustrates a screen shot from the program. The database structure of the program allowed the user to sort and select patient records based on any criteria for easy review and analysis.
Conclusion: This program illustrates that an inexpensive customizable user-friendly patient note generator and database can be created. Such a program would make it easier for urologists in practice to enter the era of digital charting and patient database management.

ABSTRACTS – BASIC SCIENCE

ABSTRACT B2

UROENGINEERING WEBSITE PLATFORM

Sijo J Parekattil and Anthony J Thomas.

Cleveland Clinic Foundation

Introduction and Objective: To develop a non-commercial website platform for the free exchange, research and development of engineering/mathematical solutions for urological applications.

Methods: HTML and Java ™ programming were utilized to create a website platform for the delivery, distribution and development of urologic software solutions. The website was designed as a springboard for the distribution of Palm™ based and Windows™ PC based software programs. A download system to allow urologists from around the world to access these programs was designed. The website was also designed to provide updates on novel urological surgical products to enhance the delivery of urologic care. A mailing list system with newsletter updates was incorporated. Study feedback sections were also included to allow users to provide their input into the refinement of the distributed software. The site was designed and is maintained by an academic urologist without any external commercial support or endorsements in order to prevent any bias in product development and distribution.

Results: The website address created for the uroengineering platform was: www.uroengineering.com. The Figure below illustrates the home page for the site. Various Palm^{TM} and Windows^{TM} based outcome prediction models , surgical training simulation software and urology utility programs were posted on the website for free distribution and download. Over the last six months, the site has received over 7,200 hits. Four prediction models were posted on the site: (1) a renal/ureteral stone passage and duration predictor, (2) vasovasostomy or vasoepididymostomy predictor, (3) vasoepididymostomy pregnancy and patency outcome predictor and (4) an intrauterine insemination pregnancy outcome predictor. Digital surgical simulation training programs for hypospadias, male reconstructive and male infertility surgery were posted (access was restricted to only urology residents, urologists and medical students by a verification service). A urology calculator for residents to perform routine urology equations was also posted.

Conclusion: The uroengineering website platform provides a unique forum for the widespread distribution, feedback and development of software solutions for urologic applications.

ABSTRACTS – BASIC SCIENCE

ABSTRACT B3

USING TWO ENERGY SOURCES OF SHOCK WAVES FOR STONE FRAGMENTATION BY THE *DUET* LITHOTRIPTER AN IN-VITRO STUDY

Alexander Greenstein[1], Mario Sofer[1], Haim Matzkin[1], Yehuda Aminetzah[2]
[1]Department of Urology, Tel Aviv Sourasky Medical Center, Tel Aviv, Israel
[2]Direx Medical System Ltd, Israel

Introduction: The novelty of the Duet lithotripter lies in its two independent spark plug generator/reflector systems focused at a common F2. This in-vitro study was performed to evaluate stone fragmentation by the Duet lithotripter in various modes of operation.
Methods: Eighty five phantom gypsum stones were placed in a 2.5-mm sieve mesh net-like basket and immersed in a specially designed water bath coupled to the Duet lithotripter (Direx Medical Systems Ltd., Israel) and a-priori positioned at F2. The Duet is a tubeless electrohydraulic lithotripter, consisting of two separate identical discharge units, shock wave generator (SWG), and co-focal reflectors placed 72* apart. It can be operated in four modes: 1. Bottom reflector only ("B" mode), directed at 36* above the horizon. 2. Top reflector only ("T" mode) directed at 36* below the horizon, 3. Alternate (asynchronous) mode: mode “A” that alternates sequentially between “B” and “T”, 4. Simultaneous (synchronous) mode: mode “S” in which both reflectors operate simulta neously. Each ellipsoid reflector aperture is 180.5 mm in diameter and the focal extent is 142 mm. (focal zone size of 13 mm X 13 mm X 48 mm) It allows up to 120 shocks per minutes (PPM) in all four modes of usage. The voltage setting is up to 24 kV for the “B”, “T”, and “A” modes, but only up to 17 kV for the “S” mode. Shock waves were delivered at rates of 60 or 120 PPM and at voltage levels of 16 or 22.8kV (Note: $2 \times 16^2 =\sim 22.8^2$). Fragmentation was considered complete when all phantom stone fragments fell through the holes of the basket.
Results: Table summarizes data retrieved from each of the four sessions

	High Voltage	**Rate**	Single Reflector Mode **(“B” or “T”)**	Alternating mode **(“A”)**	Simultaneous mode **(“S”)**
Session	**kV**	Shock waves rate (PPM)	number of shocks to complete fragmentation	number of shocks to complete fragmentation	number of shocks to complete fragmentation
1	22.8	120	134 ± 18 (SD)	112 ± 19 (SD)	
2	22.8	60	112 ± 18 (SD)		
3	16	120		223 ± 49 (SD)	114 ± 28 (SD)
4	22.8	120	159 ± 40 (SD)		

Conclusion: The Duet lithotripter is more effective when used in a simultaneous or alternating mode compared to the classical single mode of shock delivery, with the added benefit of shorter treatment time.

ABSTRACTS – BASIC SCIENCE

ABSTRACT B4
Best Paper Award Winner

MAGNETIC POSITIONING SYSTEM FOR TROCARLESS LAPAROSCOPIC INSTRUMENTS

David A. Duchene[1], Robert Eberhart[1], Linda Baker[1],
Raul Fernandez[2], Richard Bergs[2], Jeffrey A. Cadeddu[1]

[1]University of Texas Southwestern Medical Center, Dallas, Texas
[2]Automation & Robotics Research Institute, UT Arlington, Fort Worth, Texas

Introduction: A main limitation of laparoscopy is the fixed working envelope surrounding each trocar, often necessitating the placement of multiple ports to accommodate changes in instrument position and improve visibility and efficiency. Additional ports contribute to post-operative pain and carry a risk of bleeding or organ damage. To provide for greater flexibility of endoscopic viewing and instrument usage and to further reduce morbidity, we have developed a novel laparoscopic system that allows unrestricted intra-abdominal movement of an endoscopic camera and surgical instruments without additional port sites.

Methods: A transabdominal magnetic positioning system (MPS) and tool platform that can be introduced into the abdominal cavity through a single laparoscopic trocar (12 mm) and then secured magnetically to the abdominal wall has been fabricated. Independent movement of the MPS and tool platform about the abdominal cavity is directed by a surgeon-controlled external permanent magnet, anchored to the MPS across the abdomen. The MPS is capable of supporting a custom-designed intra-abdominal laparoscopic camera or tissue retractor independent of any dedicated trocar. In addition, an independent trocar light source has been adapted to the MPS. Functional testing of this system was evaluated in a porcine model.

Results: Functionally adequate permanent magnet lifting forces at 1 and 2 cm spacing from the magnet have been obtained (850 g and 350 g, respectively). Performance does deteriorate across a biologic tissue medium but has not caused any histologically-proven tissue damage with short periods of use. MPS performance using the novel intra-abdominal laparoscopic camera, a liver/spleen retractor attached to the tool platform, and a trocar light source was sufficient to complete 3 porcine laparoscopic nephrectomies using only a 5 mm and 12 mm trocar (left and right hand working instruments only).

Conclusion: We have designed and built a magnetic positioning system capable of securely supporting surgical instruments across a porcine abdomen. This MPS can support prototype tissue retractors or cameras obviating the need for individual laparoscopic trocars. Laparoscopic porcine surgery utilizing only 2 trocars is feasible. Further refinements, including robotic technology, will facilitate the development of an array of clinically relevant laparoscopic instruments that will also not require trocars.

ABSTRACTS – BASIC SCIENCE

ABSTRACT B5

A SIMPLIFIED FUNCTIONAL MODEL OF THE LOWER URINARY TRACT

Chandrasekhar Thamire, Ph.D[1], Bonnie S. Carr[1], Prabhakar Pandey M.D[2].

[1]Collaborative Program in Mechanical Engineering, Frostburg State University, MD, and University of Maryland, College Park
[2]Urology Clinic of Cumberland, MD

Introduction: Urodynamic investigation can be regarded as one of the most useful clinical tools currently available for evaluation of the lower urinary tract dysfunction. Although this tool provides invaluable information fo r assessing the primary function of the system, it may not alone be sufficient for fully understanding the underlying factors causing the dysfunction. The process can be enhanced if stresses in the bladder wall can be assessed from the standard urodynamic test results. This study presents a first-order model that can be used to determine the bladder wall stresses from standard urodynamic curves.

Methods: The bladder is assumed to be axisymmetric, hyperelastic, and isotropic, with the urethra located centrally at the bottom and along the vertical axis. The governing equilibrium equations are solved to obtain the tensile stresses in the bladder during the filling stage, using simplified constitutive relations for the bladder wall material. Boundary conditions for flow during the voiding stage are obtained from the pressure-flow curves of typical healthy males. Volumetric flow rate during this phase is prescribed as time-dependent boundary condition at the bladder neck. Contraction of the bladder and hence detrusor muscle shortening velocities are obtained from conservation laws. Pressure and velocity profiles within the bladder under tension are then computed by solving the Navier-Stokes equations. Stresses within the bladder wall are calculated using simplified constitutive relations and the muscle-shortening velocities. Calculations are performed for healthy and symptomatic individuals.

Results: For healthy males, the detrusor pressures calculated from the study compare well with those from the urodynamic curves. Correlations, which remain to be evaluated experimentally, are proposed from the calculations for predicting the bladder wall stresses and extent of obstruction, when applicable, from the urodynamic data.

Conclusion: A first-order mathematical model is proposed to predict the bladder wall stresses and obstruction, if applicable, from the urodynamic data. From preliminary results, it can be seen that increased wall stresses occur in cases with bladder-outlet obstruction. With further development, prediction of critical parameters from this model may enhance urodynamic interpretation by providing additional information on the lower-urinary tract function.

ABSTRACTS – BASIC SCIENCE

ABSTRACT B6

A PREDICTOR FOR OPTIMIZING TRANSURETHRAL MICROWAVE HYPERTHERMIA

Chandrasekhar Thamire, Ph.D.[1] Prabhakar Pandey M.D.[2]

[1]Collaborative Program in Mechanical Engineering, Frostburg State University, MD, and University of Maryland, College Park
[2]Urology Clinic of Cumberland, MD

Introduction and Objective: Benign prostatic hyperplasia (BPH), one of the most common diseases in aging men, is often treated by open prostatectomy or transurethral resection of the prostate. Among the other therapies that are associated with less morbidity, transurethral microwave thermotherapy (TUMT) has been shown to be an attractive option in partially relieving the symptoms. The present study examines the optimization of TUMT through a first-order heat transfer model from the currently available thermal coagulation data.

Methods: The device examined here is assumed to be a Foley-type catheter, capable of delivering controlled microwave energy at approximately 915 MHz to preferential zones within the prostate. The heat generated by the device inductively increases the temperature of the tissue to well above 40°C to cause necrosis in the tissue when applied for adequate times. The catheter is assumed to consist of a cooling system to prevent thermal damage to the urethral lining. Additionally, the microwave antenna inside the catheter is assumed to be offset, away from the rectum, to minimize overheating there. To analyze the temperature histories that dictate the necrosis process, a transient analysis of the Pennes bio-heat transfer equation was performed for different combinations of the microwave power, coolant flow rate, coolant temperature, location of the device within the prostate, and precooling duration. The resulting temperature histories are associated with the available thermal-necrosis data to determine the extent of coagualtion within the prostate.

Results: For the applicator under consideration, thermal injury data is presented for a variety of parameter settings. Based on the temperature histories and necrosis results calculated from the thermal-injury data for a wide range of parameters, correlations are provided to predict necrosis zones that will result from a given set of parameters. Alternately, if a known target region needs to be thermally coagulated, the proposed correlations can suggest an optimum protocol to cause coagualtion in the desired zone.

Conclusion: In this study, thermal injury extent caused by hyperthermia is examined for benign prostatic hyperplasia. Correlations are proposed to predict the necrosis zones based on the input parameters. With further development, prediction of thermal damage from the proposed correlations may become possible, enhancing the application of microwave thermotherapy for benign prostatic hyperthermia.

ABSTRACTS – BASIC SCIENCE

ABSTRACT B7

LAPAROSCOPIC SKILLS TRAINING USING AN INEXPENSIVE, HOMEMADE WEBCAM TRAINER

Steve Y. Chung, Douglas Landsittel, Chris H. Chon, Christopher S. Ng, Gerhard J. Fuchs

Endourology Institute, Cedars-Sinai Medical Center, Los Angeles, California
Biostatistics, niversity of Pittsburgh, Pittsburgh, Pennsylvania

Objectives: Numerous sophisticated and expensive trainers have been developed to assist surgeons in learning basic laparoscopic skills. We have developed an inexpensive trainer and evaluate its effectiveness.

MATERIALS AND Methods: The webcam laparoscopic training device is composed of a webcam, cardboard box, desk lamp, and home computer. This homemade trainer was evaluated against two commercially available systems: video Pelvitrainer (Karl Storz) and the dual mirror Simuview (Simulab). The Pelvitrainer consists of a fiberglass box, single lens optic laparoscope, fiberoptic light source, endoscopic camera, and video monitor, while the Simuview trainer utilizes two offset, facing mirrors and an uncovered plastic box. Forty-two participants without prior laparoscopic training were enrolled in the study and asked to execute two tasks: object-pick-up and pattern cutting. Participants were randomly assigned to 6 groups, with each group representing a different permutation of trainers to be used. The time required for participants to complete each task was recorded, and differences in performance were calculated. Paired t-tests, Wilcoxon signed-rank test, and analysis of variance test were performed to analyze the statistical difference on the performance times for all conditions.

Results: Statistical analyses for both tasks disclosed no significant difference for the video and webcam trainers. However, the mirror trainer gave significantly higher outcome values when compared to the video ($p=0.01$ for task 1 and $p<0.01$ for task 2) and webcam ($p=0.04$ for task 1 and $p<0.01$ for task 2) trainers**.** An analysis of variance test indicated no overall difference across the orderings ($p=0.36$ for task 1 and $p=0.99$ for task 2). However, by the third attempt, the time required to complete both skill tests decreased significantly for all three trainers ($p<0.01$ for both tasks).

Conclusion: Our relatively simple, homemade webcam system (patent pending) offers an inexpensive alternative for learning basic laparoscopic skills for those without prior experience.

ABSTRACT B8

PRELIMINARY REPORT ON THE METHOD OF BLADDER MICROVASCULAR ANALYSIS USING CYSTOSCOPY

Kyoko Sakamoto, Paul Zupkas, Peter Chen, Michael Albo

University of California San Diego, CA

Introduction: Many diseases in of the bladder are associated with changes in the bladder vasculature that are mostly evaluated histologically. During cystoscopy bladder wall vasculature is visualized, however there is currently no method to objectively analyse the morphology of the bladder vasculature. In other organs, such as the conjuctiva and nail-beds, changes in their microvascular morphology have been associated with disease states such as sickle cell anemia and diabetes mellitus. We report the preliminary study to evaluate the feasibility of using cystoscopic images to measure the morphological changes in bladder wall vasculature in association with bladder disease. We chose transitional cell carcinoma because we believe that the differences in morphological parameters would be most pronounced between this group and any other group with bladder dysfunction and because of the relative frequency of this disease in our patient population.

Methods: 12 male patients (45-80 years of age) undergoing diagonostic cystoscopy (8 with a history of transitional cell carcinoma and 4 without pathological diagnosis) The bladder images generated by the cystoscope were digitally recorded. A 5 Fr ureteral catheter in the field of view of the cystoscope on the bladder surface provided a reference for measuring vessel diameter and length. The images were enhanced using a custom image analysis system. The vessels were classified into orders to ensure consistent comparison of vessel order between patients. Order #1 vessels were the smallest visible vessels in the recorded images with higher order vessels formed by the convergence of lower order vessels. The blood vessel length (VL), and diameter (VD) and branching density (BD) were measured. BD was measured by averaging the number of branch points in a 2mm square of bladder surface area.

Results:

	non-TCC		TCC	
Diameter (m)		n		N
*Order #1	23.54.2	127	29.53.1	231
*Order #2	42.811.1	167	49.29.8	342
*Order #3	59.413.7	121	64.614.8	239
Order #4	75.89.7	73	77.410.5	167
Length (m)				
Order #1	Unable to view the ends in order #1 vessels			
*Order #2	426109	149	490127	331
*Order #3	640124	111	70491	207
*Order #4	690131	67	680211	159

*$p<0.05$

VD and VL were significantly greater in TCC compared to non-TCC patients in the lower order vessels. For VD this difference disappeared in higher order vessels. There was no significant difference in the BD in TCC versus non-TCC patients.

Conclusion: Morphologic assessment of the bladder vasculature can be performed using standard cystoscopy and an image analysis software. In this small group of patients, differences can be measured between patients with TCC versus patients without TCC, using this method. Research in other organ systems would suggest that the differences in microvasculature are greatest at the capillary level (VD < 10 um). Capillaries were not measurable in the present study due to the limitations of the visualization techniques. Future efforts will focus on the refining imaging and analysis techniques to measure capillary morphometric parameters. This method may be used to evaluate other bladder diseases, such as bladder outlet obstruction and cystitis, that are associated with changes in bladder wall vascularity.

ABSTRACTS – BASIC SCIENCE

ABSTRACT B9

IN-VITRO RELEASE OF INDOMETHACIN, DEXAMETHASONE AND CIPROFLOXACIN FROM THE BIODEGRADABLE POLYMERIC COATINGS OF THE BRAIDED POLY-LACTIC ACID (96L/4D) STENTS

Mikkonen, J.[1], Tammela, T.L.J.[2], Kellomäki, M.[1],

[1]Institute of Biomaterials, Tampere University of Technology
[2]Department of Urology, Tampere University Hospital , Tampere, Finland

Introduction: Despite developments in endoscopic and reconstructive urology, the treatment of urethral strictures is far from ideal. Endoscopic optical urethrotomy remains the primary treatment but 40 – 75 % of strictures recur within 2 years. Because a stent inserted after urethrotomy cannot prevent the recurrence, for the most difficult cases it would be necessary to develop bioactive biodegradable stents which could modulate the formation of the scar tissue or prevent infection. We aimed to investigate the *in-vitro* release profile of three different drugs from the coatings of the biodegradable braided stents.
Methods: Braided stents of self-reinforced poly-lactic acid (96L/4D) fibers were coated by immersing the stents in the solution containing appropriate biodegradable polymer, drug (indomethacin, dexamethasone or ciprofloxacin) and acetone as a solvent. After immersion the excess coating was removed from the stents. The coating procedure was repeated and the acetone was thoroughly evaporated. Two different drug concentrations, the first twice as high as the second, for both non-sterile and gamma sterilized stents were used for dexamethasone and indomethacin. Ciprofloxacin, however, was not as soluble to acetone as the other two drugs and therefore dispersion of only the lower drug-dose was used for both non-sterile and gamma sterilized stents. The stents were placed in phosphate buffer solution in a shaking incubator (+37 °C) and the released drug was measured periodically using UV-spectrometer.
Results: The drugs were differently hydrophobic demonstrated as varying speed in drug release. The most hydrophilic drug, dexamethasone, was released mainly during the first two weeks and the release profile followed the first-order kinetics. The most hydrophobic drug, indomethacin, showed two release peaks, the first in the beginning and the second between 30 and 60 days, when the degradation of the polymer matrix had progressed. The higher drug load in the stent resulted in faster drug release and more hydrophilic release profile, due to disturbance in the crystal structure of the coating polymer and diffusion properties. In the case of dexamethasone and indomethacin, gamma sterilization decreased slightly the drug-release rate and the release profile moved toward hydrophilic due to the changes in the molecular arrangement in the structure of the coating polymer. However, in the case of ciprofloxacin, the gamma sterilization increased slightly the drug-release rate. This may be due to differences in solubility of the drugs in the polymer-acetone-solution.
Conclusion: The sustained release was achieved for all the three drugs. It was also evident, that the concentration and hydrophility of the drug had a great influence on the drug-release profile. The gamma-sterilization modified greatly the drug-release profile of dexamethasone and indomethacin, but had only little effect on the drug-release profile of ciprofloxacin probably due to the different solubility of the drugs in the coating solution. It may be possible to develop bioactive biodegradable stents which can modulate the formation of scar tissue and prevent infection after optical urethrotomy in the future.

ABSTRACTS – BASIC SCIENCE

POSTER B10

EXTRALUMINAL EVALUATION OF URETERAL ELECTRICAL AND MECHANICAL PHYSIOLOGY WITH GIANT MAGNETO RESISTIVE AND ELECTROMYOGRAPHIC SENSORS

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Introduction: The physiology of the ureter has not been well characterized. Previously, techniques for evaluation of ureteral physiology employed intraluminal sensors. Intraluminal evaluation of the ureter is of limited value as intraluminal sensors significantly alter normal physiology. We describe the development of a novel extraluminal method of studying ureteral peristalsis that can be deployed in a minimally invasive manner. Furthermore, we describe our efforts in the development of this technology into a radio frequency ambulatory device.

Methods: Electromyographic (EMG) electrodes were used for recording action potentials of ureteral smooth muscle peristalsis. Two sets of modified bipolar steel wire EMG electrodes were mounted on a 21G ¾" hypodermic needle and then deployed laparoscopically into the serosal surface of the proximal and mid ureter. EMG electrode deployment was achieved by insertion of the needle of the EMG electrode through the adventitia and retracting the needle back over the wires leaving the tips of the wire electrodes (facilitated with 1 mm barbs) on the ureteral surface. The EMG signals were then amplified and displayed on a multichannel oscilloscope.

Giant Magneto Resistive (GMR) technology was then utilized for measurement of mechanical movement of the ureter. The GMR device consists of a small neodymium magnetic disc that creates a magnetic field and a GMR sensor which identifies any change in the magnetic field produced by movement of an object placed within its field. A small 1-cm window was created under the ureter for placement of the magnetic sensor between the EMG leads. A tiny, 1 mm magnetic disc was affixed to the top surface of the ureter using fibrin glue.

The GMR sensor uses a half-Wheatstone bridge circuit and the signals from the sensor were amplified and displayed simultaneously on the same oscilloscope with the EMG signals. The GMR and EMG signals were correlated with laparoscopically visually observed peristalsis.
All evaluations were performed with intraabdominal pneumoperitoneum pressures reduced to 5-6 mm Hg after the equipment was deployed to allow for normal peristaltic activity. Sedatives that diminish smooth muscle contraction were reversed with yohimbine.

Currently in development is a telemetry system that will permit such monitoring in a controlled housing environment. This will allow evaluation of physiological function not observable during laboratory experimentation under anesthesia, throughout the time span during which additional significant physiological events may be occurring. This time period may potentially extend over days or weeks.
The proposed telemetry unit will house two GMR sensor circuits and a minimum of four EMG circuits. Intraabdominal sensors and electrodes will be wired through the abdominal wall to a processing/transmitter pack. The pack, estimated to be 1.5 x 5 x 5 cm, can be placed in a subcutaneous pouch. Telemetry reception will be received and directly input to a personal computer for data storage, reduction, and analysis.

Results: Application of the EMG electrodes and the magnetic sensor device did not result in any alteration of ureteral physiology. After monitoring the baseline physiological response of the ureter, experiments to monitor the response of the ureter to different situations can be performed.

Conclusion: The novel application of the GMR technology allows for minimally invasive *in vivo* extraluminal evaluation of ureteral physiology. Animal movement and quadruped postures may contribute significantly to complete physiological function. Application of GMR sensors and EMG electrodes in an awake, ambulatory animal will provide a fully functional physiological porcine model. Availability of dual GMR sensors and multiple EMG channels will permit generation and analysis of peristaltic wave amplitude and velocity, in addition to current data measuring the occurrence of peristaltic waves only.

ABSTRACTS – BASIC SCIENCE

POSTER B11

EVALUATION OF A NOVEL NICKEL-CHROMIUM (NICHROME) BASED DEVICE FOR LAPAROSCOPIC RENAL PARENCHYMAL TRANSECTION

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Introduction: Laparoscopic nephron sparing surgery for small parenchymal masses is becoming increasingly common. The dissemination of these procedures remains somewhat limited by the technical challenges associated with renal transection and hemostasis. We describe our early experience with a novel device which uses a NiChrome loop electrode to resect tissue and concurrently coagulate.

Materials: NiChrome is an alloy produced by the combination of nickel and chromate. Nichrome alloys are characterized by their ability to remain flexible yet achieve high levels of resistance to current, which is theoretically ideal for parenchymal tissue resection. With the advent of a novel deployment mechanism, the feasibility of parenchymal tissue transection with a Nichrome electrode is possible. The deployment mechanism is based on the NiChrome element which is fixed on the distal tip of the end-effector and is mobile more proximally. When deployed, the NiChrome active element assumes a semicircular shape capable of resecting exophytic small lesions of solid organs such as liver, kidney, or uterus.

Methods: In a porcine model, we evaluated the ability of the NiChrome electrode to resect normal parenchymal tissue. After gaining laparoscopic access, and without renal vascular control, renal and hepatic tissue transaction was performed.

Results: During initial application on renal parenchyma, the electrode resected a 3x2.5x1 cm segment of renal parenchyma using pure cutting electrosurgical current. Complete hemostasis was achieved by subsequent application of coagulation current with the same NiChrome electrode. Subsequently, blend electrosurgical current was used to resect a 2x2x1 cm segment of kidney and a 3x2.5x1 segment of liver with complete hemostasis.

Conclusion: Nichrome is a theoretically ideal material for parenchymal tissue transaction and our initial laboratory experience is promising. The novel deployment mechanism devised for the electrode was functional and versatile allowing transaction of different sized and shaped lesions. Further laboratory work is in progress.

ABSTRACTS – BASIC SCIENCE

POSTER B12

ERBIUM: YAG LASER LITHOTRIPSY WITH HYBRID GERMANIUM / SILICA OPTICAL FIBERS: A FEASIBILITY STUDY USING EX VIVO STONE SAMPLES

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Introduction: Previous reports have shown that Erbium:YAG laser lithotripsy is 2-3 times more efficient than conventional Holmium:YAG laser lithotripsy. The major limitation to endoscopic use of the Er:YAG laser in the upper urinary tract is the lack of a suitable optical fiber delivery system which is robust, flexible, and biocompatible. The design of a hybrid optical fiber delivery system combining the advantages of a germanium oxide "trunk" fiber (e.g. flexibility, high power transmission) with the advantages of a silica fiber tip (e.g. robust, biocompatible) has been previously shown in our laboratory to deliver sufficient Er:YAG laser energy for soft tissue ablation. The goal of this study is to determine the feasibility of using this hybrid fiber for Er:YAG laser ablation of hard tissue (e.g. urinary stones) as well.

Methods: Erbium:YAG laser radiation with a wavelength of 2.94 microns, a peak output energy of 500 mJ, a pulse length of 220 microseconds, and a pulse repetition rate of 3-10 Hz, was coupled into hybrid optical fibers with core diameters of 250-, 350-, and 450-microns. Fiber transmission tests were conducted under rigorous bending conditions simulating clinical use in a ureteroscope. The stone ablation thresholds and fiber tip damage thresholds were also determined for uric acid and calcium oxalate monohydrate stone samples. These results were compared with the ablation and fiber damage thresholds for the bare germanium trunk fiber without silica tip and sapphire fiber.

Results: Percent transmission through the germanium trunk fiber and silica tip measured 68% and 37%, respectively. Maximum fiber transmission pulse energies measured 180 $\pm$ 30 mJ and 82 $\pm$ 20 mJ in straight and bent configurations, respectively. The stone ablation thresholds were measured to be approximately 20 mJ, and the hybrid fiber damage thresholds were significantly higher, averaging 55-114 mJ, depending on fiber size and stone type. However, the maximum energy transmitted through the hybrid germanium/silica fibers during Er:YAG laser lithotripsy without fiber tip damage averaged 157 $\pm$ 46 mJ (n = 8) at 10 Hz. One of the fibers exceeded 233 mJ / pulse without damage. By comparison, the fiber damage thresholds for 425-micron germanium and sapphire fibers measured only 18 $\pm$ 1 mJ and 73 $\pm$ 25 mJ, respectively.

Conclusion: The hybrid germanium/silica optical fiber is capable of delivering sufficient Er:YAG laser energy for ablation of urinary stones. The germanium trunk fiber provides increased flexibility over other mid-infrared fibers such as sapphire. However, the hybrid germanium / silica fiber will need further improvement (e.g. transmission of higher pulse energies) before it can be used for rapid Er:YAG laser lithotripsy in a clinical setting.

Acknowledgments: This study was funded by the A. Ward Ford Memorial Institute of the American Society for Laser Medicine and Surgery.

ABSTRACTS – BASIC SCIENCE

POSTER B13

COMPARISON OF SAPPHIRE AND GERMANIUM OXIDE OPTICAL FIBERS FOR TRANSMISSION OF Q-SWITCHED AND LONG-PULSE ERBIUM:YSGG AND ERBIUM:YAG LASER RADIATION

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Introduction: Sapphire and germanium oxide optical fibers are capable of endoscopic delivery of Erbium:YSGG (λ = 2.79 μm) and Erbium:YAG (λ = 2.94 μm) mid-infrared laser radiation for precision hard and soft tissue ablation applications in urology. The sapphire fibers are adequate for use in contact mode with tissue inside rigid endoscopes. The germanium oxide fibers can be used in flexible endoscopes, but not in contact mode. Additionally, previous reports have demonstrated that peripheral thermal damage caused in tissue during Er:YSGG and Er:YAG laser ablation may be reduced from 10-50 microns during conventional long-pulse, free-running mode to only 5-10 microns in short-pulse, Q-switched mode. The goal of this study is to compare the attenuation of Er:YSGG and Er:YAG laser radiation during transmission through sapphire and germanium fibers for both short- and long-pulse laser operation.

Methods: Fiber transmission studies were conducted using both free-running (300 microseconds) and Q-switched (500 nanoseconds) Er:YSGG and Er:YAG laser pulses delivered at 3 Hz through 1-meter-length, 450-micron germanium oxide and 425-micron sapphire optical fibers.
Results: Transmission of free-running Er:YSGG energy averaged 76% and 88% for the germanium and sapphire fibers (n = 7). Er:YAG transmission was 68% and 77%, respectively. Q-switched Er:YSGG laser transmission averaged 57% and 65% for the germanium and sapphire fibers (n = 7). Q-switched Er:YAG transmission was 64% and 74%, respectively. Q-switched Er:YSGG pulse energies up to 42 mJ were transmitted through some fibers. However, fiber tip damage was observed at input/output energies exceeding 40 mJ / 25 mJ (n = 2). Q-switched Er:YAG pulse energies greater than 15 mJ were transmitted through the fibers without any evidence of fiber tip damage.

Conclusion: Both germanium oxide and sapphire optical fibers are capable of transmitting sufficient free-running and Q-switched Er:YSGG and Er:YAG laser radiation for use in both hard and soft tissue ablation. The percent transmission through the sapphire fibers was higher than through the germanium fibers. The percent transmission was also higher for long-pulse operation of the laser than in Q-switched mode. These results demonstrate that fiber optic delivery of Q-switched Erbium laser energy for potential use in ultra-precise tissue ablation applications is feasible.

Acknowledgment: This study was funded by an NIH Phase I SBIR grant awarded to Infrared Fiber Systems (Silver Spring, MD), Grant #1R43 EY13889-01.

ABSTRACTS – BASIC SCIENCE

POSTER B14

MECHANICAL PROPERTIES OF SOFT TISSUE IN EXTENSION METHODOLOGY AND PRELIMINARY RESULTS

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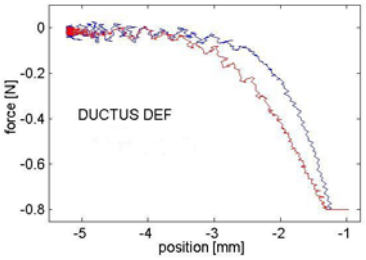
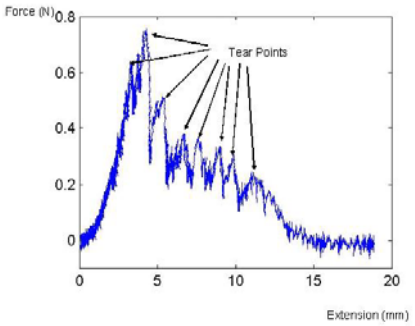
Introduction: With the increasing role of minimally invasive surgery in most surgical specialties, endoscopic skill training is a crucial part in the learning process. Virtual simulators offer a more ethical and financially interesting alternative for skill training on animal models. At this moment however, virtual simulators lack high-quality force feedback and realistic simulation of soft tissue dynamic behaviour during surgery. To improve these shortcomings, precise knowledge of biomechanical soft tissue behaviour is essential. This paper presents a technique to measure mechanical properties of soft tissues and to determine breaking points of different organs under different circumstances, combined with histological examination. Information about the traumatizing effect of tissue extension might allow for the implementation of safety guards within robot assisted surgery.

Material And Methods: Test samples are dissected from 20 adult white star rats (spleen, bowel, kidney, arteries, fat, liver and stomach). The time between removal of the tissue and measurement is kept as short as possible. The tested tissue is clamped between a fixed and a moving laparoscopic grasper. Position and force data is recorded at a 1kHz sampling frequency. The device can be position or force controlled, using a dSpace board. A sinusoidal position trajectory is imposed to measure dynamical tissue properties in extension. A force ramp or position ramp is used to extend the tissue to the breaking point. Offline, histological tissue damage is evaluated with standard H&E slides. Mitochondrial stainings control the viability of the cells post testing.

Results: Position-force curves of different organs yield similar curves. Energy loss due to internal damping and friction in the tissue causes the clear hysteresis visible in every curve. *(figure, ductus deferens, rat, sinusoidal position trajectory : hysteresis between extension (red) and compression (blue) curves))* Repeated extension of tissue to a fixed position requires decreasing force. During the extension of a tissue sample, the force first raises to a maximum *(figure, aorta abdominalis, rat, position ramp)*. Then, the extension force drops, though the sample is further stretched. Macroscopically, the extended tissue seems to be intact at this first tear point. Histological examination on the other hand shows real tissue damage with bleeding. Every tearpoint on the curve corresponds with a supplementary histological damage . The last tearpoint on the curve corresponds with the complete rupture of the tissue.





Conclusion: The presented technique enables reproducible extension tests with accurate measurement of interaction forces. Using a position-force curve, the traumatizing effect of tissue extension can be suggested. Results after repeated extension suggest microscopic trauma or functional alterations of the tissue after extension. Further research focuses on comparing these in vitro results with comparable experiments in vivo, to use these results to simulate mechanical soft tissue behaviour during surgery and to enhance safety in surgical robots.

ABSTRACTS – BASIC SCIENCE

POSTER B15

THE EVALUATION OF EMPLOYING INTUITIVE WRITING INTERFACE IN ROBOT-AIDED LASER LAPAROSCOPIC SURGERY

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Introduction: Laser laparoscopic surgery is the potential procedure that could apply in urology. With the CO_2 laser coupled on the laparoscope, surgeons manually handle laparoscope movement and trigger laser. It simultaneously provides surveillance, diagnosis and ablation to treat patients through laparoscopic procedures. However, controlling traditional laser laparoscopic ablation requires dedicated handling of laparoscope. There are two problems: hand-eye coordination is inversed and the motions of the hand and of the laser tip are scaled with respect to each other. To cope with these problems, we have developed an intuitive writing interface for use in robot-aided laser laparoscopic surgery. By employing writing skill possessed by everyone, the laser ablation is steered by surgeon to ablate ill tissues at his will [1]. However, the improvements and advantages of using the intuitive interface need to be identified. In this paper, three tasks are proposed by us to test the subjects by conventional and robot-aided intuitive writing interface manipulations. The completion time and errors are recorded in each task. The results will be processed and evaluated by statistics.

Methods: There are 34 subjects participating in these examinations. All of them are volunteers from faculty of medicine and biomedical science. All participants have normal or rectified vision and normal hand-eye coordination. All of them have no difficulties in writing/drawing.
The subjects are required to perform three tasks by two different manipulations: conventional manipulation (CM) and intuitive interface manipulation (IIM). CM mimics manual laparoscopic manipulation while IIM uses the intuitive interface and robot system to execute the tasks. In the CM setup, the subjects hold and manipulate the endoscope manually to perform desired tasks. He/She stands beside the phantom with one foot on the pedal to trigger the laser like in conventional procedures. In the IIM setup, the robot holds the laparoscope. The subject uses the intuitive interface to control the movement of the laser.

Every subject makes use of both CM and IIM to perform six trials in each task sequentially. Laser energy in the trials is adjusted to cut through the paper used for the task.
Three tasks are to be performed by each subject. Task 1 consists of shooting 15 dots of 1 mm diameter inside an area of 200mm by 100mm on the task paper. The completion time is registered. A shot is considered successful when the burn marked by the laser contacts the dot on the task paper. For both CM and IIM, six trials were sequentially performed and recorded. The results of task 1 will reveal the differences between the two setups in surveying and the aiming skills of the user.

Tasks 2 and Task 3 consist of tracing and cutting two different figures on the task paper. The figure of Task 2 is a 20 mm by 20mm perpendicular triangle and for Task 3 is a circle of 10 mm diameter. The subjects are advised to trace and cut the figures by activating the laser with CM and IIM setups. An error margin of 1mm with respect to the figure lines is acceptable. The length exceeding this tolerance margin is considered as error. Six sequential trials are performed for each task, with both setups, CM and IIM. Task 2 is aiming at evaluating the performance of tracing a straight line, while in Task 3 examines the subjects' skills for tracing curved lines. Completion time and error area are taken as benchmarks.
The paired-t test, with a significance level of 5 %, is used to examine the mean values of in each task of every subject. These Index of time and error (ITE) are evaluated. ITE is calculated by ITE= completion time + (the longest time to successfully make one shot \ complete the figure per length)*(missed shots/error length).

Preliminary Results: In task 1, 25 out of 34 has significant shorter time by employing Intuitive interface, 2 out of 34 on the contrary. In task 2, 19 out of 34 has significant shorter time by employing Intuitive interface, 1 out of 34 on the contrary. In task 3, 21 out of 34 has significant shorter time by employing Intuitive interface, 2 out of 34 on the contrary.

Conclusion: Three tasks are designed to test the difference between employing conventional manipulation and robot aided intuitive interface manipulation in laser laparoscopic surgery. The results examined by ITE shows greater rate to use shorter time in applying intuitive writing interface and laparoscopic robot.

ABSTRACTS – BASIC SCIENCE

POSTER B16

ARE ENDOSCOPIC ADJUSTABLE PORT SEALS ASSOCIATED WITH LASER FIBER DAMAGE?

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Introduction and Objectives: During flexible ureteroscopy using the holmium:YAG laser, the authors have observed several laser fibers fracture at the point of entry through the adjustable port seals. Damage to the laser fiber by the adjustable port seal was a concern. In this study, the hypothesis that the port seals were damaging the laser fibers was tested.

Methods: Port seals from Cook (TBA-6 Tuohy-Borst adapter), ACMI (ABP Adjustable Biopsy Port Seal), and Applied Medical (Sureseal II) were tested. The Cook and ACMI port seals were adjustable; the Applied Medical product was not. The port seals were applied to three representative holmium:YAG laser fibers: a Dornier Lightguide Super 200, and a Lumenis Slimline 200 and 365. The fibers were placed through a flexible ureteroscope and irrigation was run using a hand-pump mechanism (Cornwall Syringe System, Becton Dickinson). The Cook and ACMI port seals were tightened to the point that no leakage around the laser fiber occurred. The laser fiber was marked. The port seal was released and re-tightened with maximal hand applied force on a clean section of fiber and marked. The Applied Medical port seal cannot be tightened, therefore it was placed on the fiber and the position marked. All fibers were examined with a field emission scanning electron microscope (Hitachi S-4500).

Results: The Applied Medical and ACMI port seals did no visible damage to any fiber **(Figure 1)**. The Cook port seal, when tightened with maximum hand applied force, created several surface markings on a Lumenis Slimline 365 fiber **(Figure 2)**. No other fiber sustained visible damage.

Conclusion: All three port seals do not appear to damage the holmium:YAG laser fibers when tightened to the threshold to prevent leakage of irrigation fluid. Care should be taken not to over tighten the port seals as surface damage may occur.

POSTER B17

THE CAMERA PHONE: A NOVEL AID IN UROLOGIC PRACTICE

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Purpose: With increasing use of digital technology for communication the camera phone was an obvious offshoot. We describe a novel use of the camera phone for efficient, reliable, and cost-effective collection and transmission of medical data in the urologic setting.

Materials and Methods: We used a camera phone (Verizon VGA/Sanyo-Sprint PCS) with a resolution of 640 X 480 pixels to capture images in the operating room as well as in the outpatient clinic. Images were obtained directly from the TV monitor or the X-ray viewing box. These were then immediately transmitted from the camera phone to the office computer via a secure internet connection. The images were then incorporated into operative and office notes as needed.

Results: The quality of the images obtained by this method were at least similar to that of traditional photos with the added advantage of prompt and secure transmission and storage. The images obtained from the LCD monitors were of high quality while those from the CRT monitor occasionally had scanning lines which interfered with image clarity. However , the images could be edited and labels added with the aid of the software which came with the camera phone.

Conclusion: This method allows acquisition of high quality digital images of surgical procedures (endoscopic and open) and radiographic studies with simultaneous data transmission and storage for clinical documentation. The technology reduced costs and increased the efficiency of our practice considerably.

ABSTRACTS – BASIC SCIENCE

POSTER B18

COMPARISON OF ERBIUM: YAG (λ = 2.94 μM) AND HOLMIUM: YAG (λ = 2.1 μM) LASERS FOR INCISION OF THE URETHRA AND BLADDER NECK: AN IN VIVO CHRONIC STUDY IN PIGS

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Introduction: Previous work has shown that the Erbium:YAG laser is approximately 15-30 times more precise than the conventional Holmium:YAG laser for incision of soft urological tissues. The Er:YAG laser produces a peripheral thermal damage zone of only 10-20 microns in comparison with 300-400 microns for the Ho:YAG laser. The goal of this study is to determine whether decreased peripheral thermal damage to adjacent healthy tissue will translate into reduced scarring after laser incision of the urethra and bladder neck.

Methods: A total of 18 domestic pigs underwent laser incision of the urethra and bladder neck. Incisions made with each of the lasers tested were of equal depth (approximately 2.5 mm). The pigs were divided into two arms depending on the type of laser used. In the first arm, incisions were made using the Er:YAG laser (wavelength of 2.94 microns, a pulse length of 70 microseconds, a fiber output energy of 20 mJ, and a pulse repetition rate of 10 Hz, coupled into a 250-micron-core sapphire optical fiber), while the second arm used the Ho:YAG laser (wavelength of 2.12 microns, a pulse duration of 300 microseconds, a fiber output energy of 500 mJ, and a pulse repetition rate of 3 Hz, coupled into a standard 300-micron-core silica optical fiber). A total of three, 1-cm incisions were made in each pig, two at the bladder neck and one in the mid-urethra. Three pigs in each arm were sacrificed on each of the following days: day of surgery, POD 6, and POD 14, and each laser group. Tissue was harvested and processed using standard histopathological techniques and H&E staining. Wound healing markers including incision depth, immediate therma l and mechanical damage, and width of granulation tissue were quantified during analysis of the tissue sections under light microscopy.

Results: At day 0, no observable evidence of significant thermal damage was seen in the incisions created with the Er:YAG laser, while a lateral zone of damage measuring 660 $\pm$ 110 microns, characterized by tissue tearing and coagulation, was observable in the incisions made with the Ho:YAG laser. After 14 Days, the width of granulation tissue measured 430 $\pm$ 100 microns and 1580 $\pm$ 250 microns for the Er:YAG and Ho:YAG incisions, respectively ($P < 0.05$). The depth of healed incisions measured 665 $\pm$ 135 microns and 1237 $\pm$ 144 microns for the Er:YAG and Ho:YAG laser incisions, respectively ($P < 0.05$).

Conclusion: Incisions created using the Er:YAG laser healed and closed more rapidly and with less residual scar tissue at the wound site than incisions made with the Ho:YAG laser. The Er:YAG laser represents a promising tool for precise tissue incision and ablation, and warrants further study for potential clinical use in treating urethral and bladder neck strictures.

Acknowledgement: This study was funded by the Department of Defense Prostate Cancer Research Program, Grant # DAMD17-03-0087.

ABSTRACTS – BASIC SCIENCE

POSTER B19

ROBOTIC RESPIRATORY TRACKING ALGORITHM, INITIAL EXPERIMENTS

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Introduction: In the recent years robots became a new tool in performing image guided procedures. Robots can perform precise, automatic instrument delivery to a static target using a wide variety of medical images. However, it is well known that upper abdominal cavity organs can move significantly during the respiratory cycle. While a breath hold technique was successfully employed in CT-guided interventions, the procedure time and accuracy can be further improved by dynamically adjusting the robot position with the respiratory cycle. Typically, surgical robots allow needle manipulation while maintaining its point location at the desired skin entry point. Once the desired orientation is achieved the needle is inserted. The robot is initially placed such that the fulcrum point is at the desired entry position. Thus, the respiratory tracking problem can be divided in two subtasks. First, the robot needs to maintain the fulcrum point at the entry site using only translational motion; then, the targeting angles are continuously adjusted to compensate for the internal organ motion. In this paper we propose a method for the dynamic adjustment of the robot fulcrum point with the entry site during the respiratory motion. The proposed method underwent an initial validation using a torso phantom.

Method Description: The method was developed for RCM (Remote Center of Motion) based robots and implemented on our AcuBot robot. The AcuBot comprises an XYZ Cartesian stage allowing the tracking of the procedure entry point and an RCM robot used for the alignment of the instrument with respect to the target.

The method is based on a model of the respiratory motion. The model approximates the thorax section with an ellipse with a variable AP diameter (APD) and constant lateral diameter (LD). The variable AP diameter is computed using the thoracic circumference (TC) and the LD measure. LD is estimated using an initial calibration procedure. After the calibration, APD is computed in real time and used to control the robots translational stage such that the fulcrum point moves together with the skin of the patient.

Results: The algorithm was validated using a respiratory phantom developed in our lab. The vertical displacement of the robot was compared with the position of an optical tracker active probe placed on the back of the phantom. The average tracking error was less than 1mm as it can be observed in the error graph plotted over one respiration cycle.

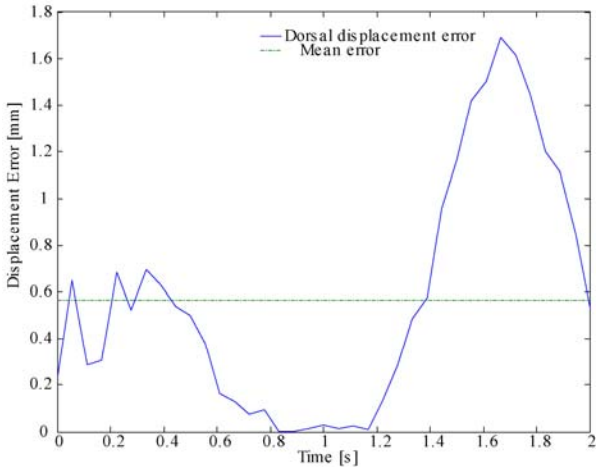

Figure 1 Tracking Error

Conclusion: We present a method to track the skin entry point during respiration. This method does not directly measure-and-follow the displacement of the skin, but uses a model to derive it. Even though more complex, this will allow us in the next step of research to track internal targets by adjusting the orientation of the needle.

ABSTRACTS – BASIC SCIENCE

POSTER B20

NOVEL INTRAURETHRAL MAGNETIC PROXIMITY VALVES

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Urovalve, Inc.

Background: Over the last 3 decades, 25 or more U.S Patents have been issued for proximity valves intended to be placed in urethral stents or catheters and used to treat chronic urinary retention. These are generally valves that can be operated at a distance by a hand held magnet. Previously, human clinical trials have been initiated for at least three devices. However, only tests of a single device, a remote-controlled valve-pump mechanism in a soft silicone housing, designed for women have been reported. The goal of Urovalve, Inc. has been to design a valved catheter that ends just distal to the external sphincter and leaves as much empty, natural urethra as possible. We believe that maintaining a significant length of empty urethra will provide a barrier against bacterial migration and urinary tract infection. Additionally, cycling the bladder from empty to full will mimic natural processes and maintain bladder health. The Urovalve device has been designed to be implanted and explanted without surgery and replaced monthly.
One of the authors, Phillip Davis, is the inventor named on two US patents for the device that is being developed by Urovalve. Study of the designs of earlier devices resulted in an understanding of the apparent disjuncture between the extensive engineering and patent effort and the dearth of human trial success. In general, valve designers appear to have assumed that internal friction and induced magnetic torque were second order mechanical effects. These erroneous assumptions resulted in valves having very short operating ranges from their hand held switching magnets and unreliable opening and closing. This necessitated placing the valves in the penile urethra rather than adjacent to the external sphincter to enable the switch magnet to be placed close to the valve and manipulated at short range. Direct attractive forces available from practical hand held magnets (e.g. neodymium boron iron 1 cm diameter by 4 cm long), and acting on ferromagnetic elements fitting within a typical 18 French valve peak at about 0.03 Newton. These very low forces intended to draw the valve open are always part of a magnetic couple which induces torque on the valve element. This torque plus the unavoidable misalignment of switch magnet and valve induce friction forces comparable to or greater than the useful opening force and severely limit operating range.

Valve Design: The authors will present two valve designs operated by the magnetic couple and tolerant of gross misalignment between valve and switch magnet. These valves can open against intravesical pressures as high as 120 cm H2O at ranges up to 3 cm, enabling placement just distal to the external sphincter. Valve closure is spontaneous on removal of the switch magnet and flow rates for the designs are 4 and 9 ml per second at 50 cm H2O. The valves are 18 French by12 mm long and can be made as small as 12 French by 10 mm at sacrifice of flow rate.

Catheter design: Critical to successful operation is stable catheter
placement in the urethra. The authors believe that valved catheter migration is principally due to over building and excessive rigidity which causes the catheter to be pushed upstream by normal activities. A highly flexible, completely internal catheter that ends in the bulbous urethra will be presented. The initial human feasibility trial is planned to begin third quarter 2004.

ABSTRACTS - CLINICAL

POSTER C1

POINT OF TECHNIQUE-PROSTATE BIOPSY-THE METHOD OF COLLECTION

Faiyaz M. Kapasi, Jaspal Virdi, Ponnambalam Chandrasekar, Chris Barber, J. Mackenzie

Princess Alexandra Hospital, Harlow, UK

Methods: We collect the specimen using b-k panther ultrasound scan machine with bard trucut biopsy needle. 6 cores of the biopsy is taken from each lobe, these specimens are then mounted on to a formalin soaked sponge. (Figures 1 and 2).

Fig. 1

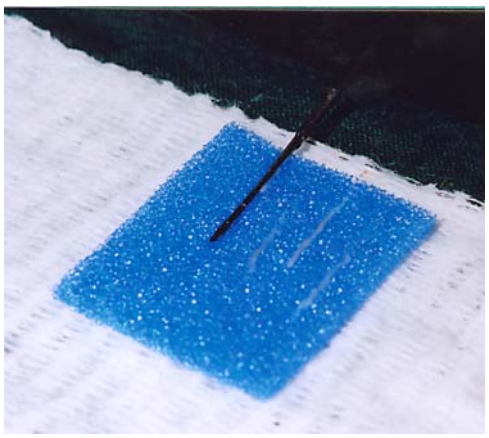

Fig. 2

The sponge is then secured in a small cartridge (Figure 3) which is locked and deposited into the formalin pot (Figures 3 and 4).

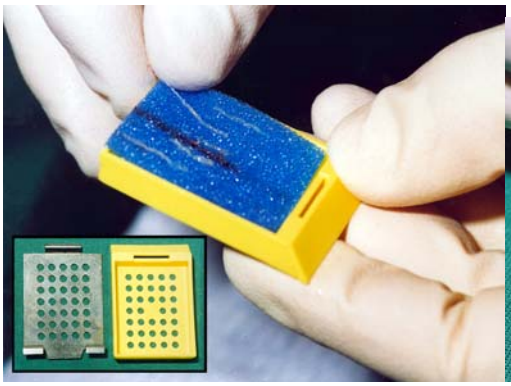

Fig. 3

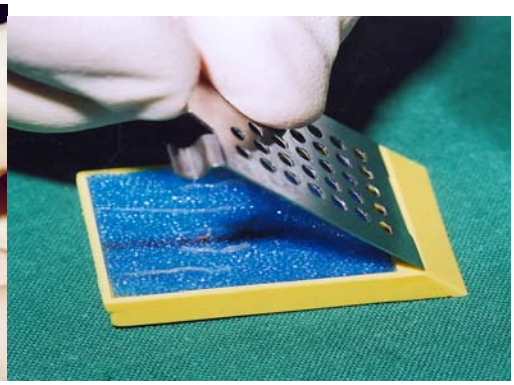

Fig. 4

Comparison with other methods: We present a technique, which gives the best histopathological results. The usual method of collection of the prostatic biopsy is depositing it into a formalin pot directly from the biopsy needle; this leads to fragmentation of the specimen giving unsatisfactory histology results.

Advantages and disadvantages: by this method the entire specimen is kept intact and delivered safely to the pathology department. These are then processed for histopathological examinations. This gives pathologist accurate number of cores, which are easy to process, and gives the best diagnostic results. There are no disadvantages with this method.

Difficulties and complications: There are no difficulties or complication in this procedure. We have used this procedure in over 1000 cases of consecutive prostatic biopsies over 3 years with excellent results.

Conclusion: Our method of prostatic biopsy collection gives the best diagnostic accuracy. We advocate a wider use.

POSTER C2

A PROSPECTIVE RANDOMISED STUDY BETWEEN TRANSURETHRAL VAPORISATION USING PLASMAKINETIC ENERGY AND TRANSURETHRAL RESECTION OF THE PROSTATE LONG TERMFOLLOW UP

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Princess Alexandra Hospital, Harlow, UK

Introduction and Objective: A prospective study was conducted to evaluate efficacy and safety of Plasmakinetic energy (Gyrus electro surgical system), which produces vaporisation of tissue immersed in isotonic saline against standard Transurethral resection of the prostate.

Methods: Randomisation commenced in October 1998 with ratio of 2: 1 '(Plasmakinetic TURP). Seventy six patients (24 with retention of urine) so far have been enrolled in this study with ages ranging between 50 and 81 (mean 69.2 +8 year.) and prostatic weight 20-105 (mean 45.9+22 gs.) Fifty one patients underwent vaporisation and 25 were treated by Transurethral resection. Intraoperative parameters were operating time, blood loss (Haemocue B haemoglobin system) fluid absorption during TURP by using ethanol Glycine by alcoholmeter (saline was used during vaporisation), serum sodium and Haemoglobin. No postoperative irrigation and catheter was removed at 36h.

Results:

TUVP	**IPPS**	**QOL**	**Q-Max**	**PVR**
Pre-op	19.9+7	4.2+1	8.4+2	172+92
6-week (N=51)	8.5+6	2.2+2	20.4+10	44+70
6-mths (N=51)	4.9+5	1.1+1	21.3+11	34+42
12-mths (N=38)	4.9+5	1.0+1	21.7+11	35+66
24-mths (N=26)	3.9+4	1.0+1	20.6+9	20+31
TURP				
Pre-op	19.6+7	3.7+1	8.0+3	172+141
6-week (N=25)	8.6+7	1.4+1	20.4+10	37+44
6-mths (N=23)	5.5+5	1.0+1	19.9+10	47+10
12-mths (N=19)	4.7+4	0.8+1	21.8+14	25+29
24mths- (N=13)	3.8+3	0.7+1	25.0+12	7+11

Results are expected in mean +SD

Operative duration was similar in both groups. There was no significant in pre and post operative creatinine and sodium. Mean blood loss in plasmakinetic group was 251 mL (range 40-1000) and TURP group 497mL (range 50-1750) P-valve <0.001. Fluid absorption in TURP group was <500 mL. One patient in plasmakinetic group had prolonged catheterisation for five days and 3 patients had mild stress incontinence lasting three months. No complications were recorded in the TURP group.

Conclusion: Plasmakinetic produced reduced intraoperative bleeding and had no risk of TUR syndrome due to saline irrigant. This technique is simple to learn, offers safety with no added morbidity.

ABSTRACTS - CLINICAL

POSTER C3

A NEW TOOL IN LAPAROSCOPIC RADICAL PROSTATECTOMY

O.M.Schlarp, W.A.Hübner

Introduction: Laparoscopic radical prostatectomy has gained more and more interest in the past years. However, LSK RPE is still considered a difficult procedure. One challenging part of the surgery is the identification of the bladderneck, especially in obese patients. Another difficult step of the procedure is the establishment of the anastomosis, which has to be carried out at the end of a lengthy and exhausting operation. Especially in extraperitoneal prostatectomy there often is a gap between bladder and urethral stump. We have found a technique to be useful, that involves stenting of the urethra and manipulating the bladder and prostate with a Lowsley retractor. We tested efficacy and safety of this new method.

Technique: When the bladder neck is to be identified, the lowsley retractor is inserted into the bladder. Opening of the wings helps to identify the incision line between prostate and bladder. Once the bladder is cut away from the prostate, the lowsley retractor helps to manipulate and develop the prostate like working through an additional sixth port. Preparation of the seminal structures is facilitated by lifting up the prostate with the help of the Lowsely. We also feel stenting of the urethra with a lowsley retractor rather than a foley catheter to be helpful in dissecting apex and proximal urethra.
Once the prostate is developed and parked in the inguinal region and the anastomosis is initiated, the lowsley retractor is advanced into the bladder and the wings are opened. In this position sutures can easily be placed through the bladder neck (outside-in), which is secured by the lowsley retractor. The retractor may be held by the assistant or nurse, while the surgeon drives the needle holder. In the next step the suture is placed through the urethral stump (inside-out), with the lowsley retractor serving as a counter part to achieve good bites of the urethral wall. We then pass the suture extracorporaly through one of the five ports and secure it with a mosquito clamp. Four to six sutures are placed in this manner. At this point the bladder may be pulled caudally with the lowsley retractor and the sutures are tied one after the other without any tension being at the anastomosis during this procedure.

Results: We have used this technique in the last 10 cases very successfully. The use of the Lowsely helped us in speeding up the surgical learning curve and was a usefull tool in several steps of the surgery.

Discussion: LSK RPE has been gaining increasing popularity within the last five years. One of the major challenges in this procedure is the identification of the bladderneck. Managing the anastomosis, which, as a matter of fact, has to be done after some hours of concentrated surgical work is another difficult step during surgery. Especially when a larger prostate was removed, there could be a significant gap between urethral stump and the bladder neck resulting in difficulties bringing down the bladder neck. In consequence there is a strong tension on the anastomosis often leading to postoperative complications like prolonged intracorporal urine leakage. Using the lowsley retractor to move the bladder caudally takes the tension away from the sutures and allows safe knot tying. We believe this technique to be safe and easy to perform.

POSTER C4

TELEMENTORED LAPAROSCOPY BETWEEN ITALIAN UNIVERSITIES

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[3]University of Turin

Introduction: Minimally invasive surgery offers many advantages, but unfortunately it is associated with a steep learning curve. Telesurgery has been developed to reduce the complications due to unexperienced surgeons. In fact it allows a surgeon at remote site to guide and teach practicing surgeons in a primary site utilizing robotic devices, telecommunications and video technology.

Objective: We report our preliminary experience on 10 laparoscopic telesurgical procedures performed between Italian Universities.

Methods: From June 2001 to April 2003 were telementored 10 telesurgical procedures between three Italian University (Rome, Modena and Turin). Five cases: 1 varicocelectomy, 2 nephrectomy, 1 divertucolectomy and 1 renal tumorectomy were performed in Rome from a less experienced surgeon telementored by an expert surgeon in Modena. Moreover, five laparoscopic adrenalectomy were perfommed from an expert open surgeon, with a limited experience on laparoscopy, telementored from an expert laparoscopist in Turin.

Results: Nine of ten procedures were performed with success, laparoscopic diverticolectomy were difficult and abandoned for an endoscopic treatment. All the procedures were accomplished with an uneventful postoperative course. All cases were succesful telementored. Time delay of image trasmission was insignificant.

Conclusion: This preliminary experience has demonstrated the feasibility of only italian telementoring. Compared to international telesurgery we identified three important difference: delay of immage were minimal, the connections were stable during all operations and procedures schedule were easy plan without difference in time like internarional telesurgery. We belive that telesurgery is a viable method that could potentially provide to surgeon education and decrease the likelihood of complications due to inexperience with new techniques.

ABSTRACTS - CLINICAL

POSTER C5

TISSUE-LINK DS 3.0™ DISSECTING SEALER DEVICE ASSISTED PARTIAL NEPHRECTOMY FOR RENAL MASSES: A NEW SURGICAL TECHNIQUE

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Introduction and Objective: Nephron-sparing surgery (NSS) has emerged as the preferred surgical management of renal masses ≤ 4cm in size in patients with normal contralateral renal function [1,2]. Advancements in hemostatic techniques with lower amounts of blood loss and post-operative morbidity coupled with long-term follow-up data on cancer-free survival have lead to greater utilization of these surgeries [1,3]. During the previous 18 months, we have utilized the Tissue-Link DS 3.0™ Dissecting Sealer device (TissueLink Medical, Dover, NH) for hemostasis and dissection in patients undergoing open partial nephrectomies for renal masses. The Tissue-Link device pre-coagulates renal parenchyma by coupling radio frequency waves with a low-volume cool saline irrigation. The coupling of radio frequency and the conductive fluid avoids tissue charring and desiccation resulting in an easier dissection and improved vascular coagulation. We report our experience with this dissecting/coagulating device during open partial nephrectomy and compare blood loss with conventional method of electrocautery.

Methods: The charts of 32 consecutive patients, in an 18-month period, who underwent open NSS using both techniques, were reviewed.

Results: The mean tumor size excised in the TissueLink™ group was 3.1 cm (range 1.2-7.0 cm), while the tumor size for the conventional group was 2.5 cm (range 0.8-6.0 cm) ($p=0.17$). The mean operative blood loss for the TissueLink™ group was significantly lower than the conventional electrocautery group (126ml versus 194ml, $p<0.027$). Operative times were comparable between the two groups (2.3 hours versus 2.2 hours). There was no difference in hospital stay (2.1 days vs. 2.1 days). Hilar vessels were clamped in 11 patients who underwent the new technique (mean clamp time 13.5 minutes) and in 11 patients who underwent the conventional technique (mean clamp time 10.7 minutes). Occlusion times were not different, hence differences in blood loss are not accounted for by differing clamp times ($p=0.38$). Intra-operative frozen section showed margins were negative in all patients.

Conclusion: TissueLink™ assisted open partial nephrectomy is a promising new technique for excising renal masses while providing superior hemostasis relative to conventional electrocautery dissection.

ABSTRACTS - CLINICAL

POSTER C6

A COMPARISON OF THE THREE-ARM AND FOUR-ARM DAVINCI SURGICAL SYSTEM FOR EXTRAPERITONEAL LAPAROSCOPIC ROBOTIC PROSTATECTOMIES

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Introduction and Objective: The laparoscopic prostatectomy is a relatively new approach for the treatment of localized prostate cancer . Since its introduction, there have been many different advances in its technique and in its technology. For, example, it has been discovered by our experience that an extraperitoneal approach is superior to the original intraperitoneal one. One of the more recent advances in this technology includes the introduction of a four-arm robot as opposed to the classic three-arm. We discuss the advantages and disadvantages of each type of robot in an extraperitoneal laparoscopic robotic prostatectomy (EP-LRP).

Methods: In a 9 month period, 42 patients with localized prostate cancer underwent an EP-LRP using the 4-arm DaVinci robot. The mean age of the patients was 55.6 years with an average PSA of 5.9 and a Gleason score of 6.2. The setup of the EP-LRP requires 5 ports, four of which are operated by the surgeon at the console; the last port is operated manually by an assistant. The setup of the 3-arm ER-LRP also requires 5 ports, 3 of which are operated by the surgeon, and two by the assistant. The role of the assistant in both 3-arm and 4-arm procedures include aligning and exchanging robotic instruments as well as using conventional laparoscopic equipment for suctioning, retraction and suture passing. A comparison of the two types of robots was performed as well as peri-operative, postoperative and pathologic result analysis.

Results: Particular attention to trocar position was necessary to avoid collision of the arms. The fourth arm emanated from the central column on the surgical cart. This arm was routinely docked as an accessory right-sided robotic arm and was brought in below the patient's right lower extremity, which was placed in a boot-stirrup. The four-arm system allowed for functional transition between three instrumented arms, allowing two arms for operative maneuvering and one for exposure, leaving only suctioning to the assistant. The additional arm was generally equipped with a grasper-dissector. The total mean operative time for the 42 cases was 233 minutes. Mean blood loss was 125 cc. No blood transfusions were needed. The mean hospital stay was 1.3 days. Foley catheter removal averaged 5.2 days. Positive margin rate was 22%. No complications were encountered.

Conclusion: We have found from our experience with both the 3 arm and 4 arm DaVinci robots that the fourth arm provides the primary surgeon with an added degree of independence, which helped to facilitate all aspects of the prostatectomy. The increased amount of control, which the surgeon has during the case, allowed for better tissue plane exposure and dissection. The fourth arm was found to be particularly useful during the neurovascular bundle sparing, pedicle dissection and for the urethro-vesical anastomosis. Lastly, the addition of the fourth arm eliminates the necessity of a highly trained laparoscopic assistant.

ABSTRACTS - CLINICAL

POSTER C7

COMPARISON OF GUIDE WIRES IN UROLOGY: WHICH, WHEN, AND WHY?

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Elspeth M. McDougall, Ralph V. Clayman

University of California, Irvine Department of Urology

Objective: The purpose of this study was to compare and contrast various guide wires with regard to their physical properties as they apply to their use either for obtaining access or co-axial passage of other catheters.

Materials and Methods: The following 0.035 inch diameter guide wires were tested with regard to tip bending force, shaft bending force, pull force, and tip puncture force: Roadrunner PC and PTFE wire guide (Cook Urological, Spencer, Indiana), Glidewire, Bentson Type: 15 cm Flexible Tip PTFE coated guide wire, Amplatz super stiff (Boston Scientific Microvasive, Miami, FL) Urowire XF with SL-6 hydrophilic coating, Bentson guide wire, Amplatz guide wire, (Applied Medical, Rancho Santa Margarita, CA) and Bard guide wire PTFE coated (Bard Urological Division, Covington, GA).

Results: Regarding guide wires used for access, the Boston Scientific PTFE guide wire, with 15 cm flexible tip, required the least amount of force to deflect the tip. Among the 3-cm flexible tip guide wires, the Applied Bentson guide wire had the most flexible tip and the Bard Guide wire had the stiffest flexible tip. The Boston Scientific Terumo Glide-wire required the least amount of force to pull from a tortuous pathway; also this guide wire required the greatest force, four times as much force as the other guide wires, in order to puncture an aluminum foil barrier ($p<0.001$) indicating the safety of its tip. Regarding axial rigidity for the coaxial passage of other catheters over a guide wire, the Boston Scientific Amplatz super stiff was significantly more resistant to bending than all other guide wires ($p<0.05$).

Conclusion: Brand name guide wires designed for the same purpose appear to differ markedly with regard to flexibility, lubricity, and shaft stiffness. In general, long floppy tip and nitinol based guide wires appear to be best used for access, with emphasis on tip flexibility and a low friction coating, while the stiffer shaft guide wires are selected for coaxial passage of catheters, stents, and sheaths. Knowledge regarding the characteristics of each type of guide wire available may help the urologist select the best equipment for the job at hand.

Disclosure: Dr. Clayman is a consultant, receives research funding and is a shareholder in Applied Medical Resources and receives royalties from Boston Scientific and Cook Urological.

POSTER C8

VIDEO-ASSISTED MINILAPAROTOMY SURGERY USING PIERCING ABDOMINAL RETRACTORS

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Introduction: Even with the improvements in laparoscopic instrumentation, the procedures which require solid organ removal (liver, spleen, liver), delicate suture placement (vascular, liver), and insertion of prosthesis (anterior spinal fusion, artificial disc insertion) still may need abdominal incision.

We have devised a modified surgical technique of video-assisted surgery through minilaparotomy. It is a hybridized form of conventional open and laparoscopic surgery using a novel concept of piercing abdominal retractors introduced through the abdominal cavity via minilaparotomy. Piercing retractors 3-dimensionally increase the operative space, and with conventional retractor blades, the minilaparotomy wound can be moved about thus maximizing the area of surgical procedure performed. Since the minilaparotomy is made through the rectus fascia, the postoperative pain and scar/bulging are minimized as in laparoscopic surgery, yet maintaining the techniques and safety of conventional open surgery.

Material and Methods: We retrospectively reviewed procedures performed using video-assisted surgery though minilaparotomy from January 1992 to May 2002. With the use of specially designed retractors and readily available blades, all procedures were performed with a minilaparotomy 5-8 cm long. Abdominal muscles were not cut but rather stretched to avoid unnecessary nerve damage.

Results: There were 363 patients with mean age of 40.2 years(range 16-70). The procedure performed were, 3 partial nephrectomies, 157 live donor nephrectomies (*J Urol 165: 1099, 2001*), 64 radical nephrectomies; 20 ureterolithomies, 19 pyeloplasties. The operative time for laparoscopy-assisted surgery through minilaparotomy ranged from 79 to 290 minutes (mean 125). There was no conversion to open surgery, no peri- or postoperative complications, and only 3 patients needed a blood transfusion at any stage. Pain was significant on the first day but resolved quickly. All patients resumed consistent oral intake on the second day. All patients commenced ambulation by the second postoperative day and were able to resume full ambulatory activity by the 4th postoperative day.

Conclusion: Video-assisted minilaparotomy surgery is a minimally invasive technique maintaining the advantages of both laparoscopic and conventional open surgery. Our method may be used as a first-line approach for procedures requiring incision for solid organ removal (eg. donor nephrectomy, hepatic lobectomy)/device insertion (eg. anterior spinal fusion) or delicate suture repairs (eg. vascular surgery).

ABSTRACTS - CLINICAL

POSTER C9

TRUE EXTRAPERITONEAL LAPAROSCOPIC ROBOTIC PROSTATECTOMY (EP-LRP): A LARGE SERIES EXPERIENCE AT ONE INSTITUTE

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Introduction and Objective: The Laparoscopic Robotic Prostatectomy is a relatively new procedure. Since its introduction by the Montsouris group, it has undergone several modifications. Our experience with the LRP began with the traditional intraperitoneal approach, but since has evolved to a true extraperitoneal approach. We present our experience with the true extraperitoneal approach.

Methods: In a 14 month period, 70 patients with localized prostate cancer underwent a true EP-LRP by a single group. The mean age of the patients was 56.1 years with an average PSA of 5.9 and Gleason score of 6.3. Extraperitoneal Space is developed using the balloon pump expander, avoiding the violation of the peritoneal space. After the placement of five ports in the extraperitoneal space, the surgeon performs the prostatectomy from the Da Vinci consol. The assistant aligns and exchanges robotic instruments in addition to using conventional laparoscopic instruments to facilitate in retracting and in suctioning. Perioperative, and postoperative results were analyzed.

Results: No difficulty was encountered in developing the extraperitoneal space. The intact peritoneum acted as a natural retractor to the abdominal content. In 10 cases, BPLND was performed and in 4 cases, a bilateral laparoscopic hernia repair was performed. The mean operative time was 215 minutes (180-300). Mean blood loss was 135cc (95-200). No blood transfusions were required. The mean hospital stay was 1.3 days. All patients received one time dose of toradol pos-operatively, and demerol/visteril as needed; average use 2.5 times. None were converted to open. Mean foley catheter removal was 5.3 days. Positive margin rate was 19%. No major complications were encountered. Given the short follow up period, 60 (86%) patients were using no pads, 7 (10%) patients dry with only a safety pad, 3 (4%) patients were using 1-2 pads. Of the patients who underwent a bilateral nerve sparing procedure, 79 % obtained a SHIM score of 15 or greater with or without sildenafil.

Conclusion: From our experience, we find that the true extraperitoneal approach is feasible, easier to perform, and has more favorable profile when compared to the transperitoneal counterpart. The EP-LRP eliminated the need for violation of the peritoneal space, thus mimicking the anatomic open retropubic prostatectomy. Our preliminary data indicates that the true EP-LRP has a better peri-operative outcome in term of blood loss, hospital stay and equivalent long term outcome in relatively short follow up period when compared to the contemporary open retropubic series.

POSTER C10

EFFICACY OF HIFU IN PROSTATE CANCER

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Objectives: There are two general strategies for local HIFU application: palliative and curative coagulation of the prostate. The two major tools for efficacy assessment are PSA evaluation and histology (biopsies, TURP chips), which indicate the local effect. All palliative tumor stages are expected to profit from the local tumor debulking. They are compared to the results of the curative HIFU treatment.

Materials and Methods: All treatments were performed with the Ablatherm®-HIFU device (EDAP SA, France). Three patient groups were defined: Group A:curative approach in T1-2 low and intermediate risk patients; Group B:palliative approach in T1-2 high risk patients and patients with locally advanced prostate cancer T3-4; and Group C: palliative approach in patients presenting with systemic disease, (N+/M+). Median baseline PSA, nadir PSA, PSA at last follow-up, time to nadir, and negative biopsy rate (Kaplan-Meier method) were analyzed.

Results:

	Group A	**Group B**	**Group C**
Median/Max follow-up (weeks)	45/342	26/56	7/45
Median initial PSA (ng/ml)	8.1	23.0	45.0
Median nadir PSA ng/ml)	0.0	0.0	0.1*
Median PSA at last (ng/ml)	0.08	1.6	10.0
Median time to nadir (weeks)	9.9	10.4	1.7*
Median PSA stability	81.7%	74.1%	n.a.
Median PSA velocity (ng/ml/y)	0.13	0.99	2.81
Positive biopsies before (med/mean)	2/3.37	3/6.96	6/11.93
Positive biopsies after (med/mean)	0/0.39	0/0.98	0/3.11
5-year actuarial negative biopsy rate	90%	78%	60%

*due to adjuvant hormone ablation

Conclusion: Transrectal HIFU at 3 MHz proved a high local efficacy resulting in a 90% 5-year negative biopsy rate for patients with localized low- and intermediate-risk prostate cancer. Tumor stage related, the 5-year negative biopsy rates at 78% and 60% in locally advanced and systemic disease cases underlined the local coagulative potency of this technique.

ABSTRACTS - CLINICAL

POSTER C11

THE USE OF A SLING SYSTEM FOR RENAL POSITIONING DURING LAPAROSCOPIC PARTIAL NEPHRECTOMY

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Introduction and Objective: Laparoscopic partial nephrectomy (LPN) is one of the most technically challenging operations in minimally invasive urology. In cases where hilar clamping is necessary, warm ischemia time (WIT) must be minimized while tumor is excised and the defect is repaired. Optimal neutral positioning of the kidney is critical so that the tumor may be managed swiftly and precisely. We hereby present a sling system for positioning of the kidney such that the tumor is facing the camera port during LPN.

Methods: 33 patients underwent LPN between October 2002-December 2003. 8 had a renal sling placed intraoperatively due to difficult access to the tumor.

Technique: The renal tumor is exposed and the kidney is mobilized within Gerota's fascia. The renal hilum is dissected and is ready to be clamped. To keep the tumor oriented perfectly towards the camera and the working ports, a traction suture of 2-O vicryl on a CT-1 needle is passed through Gerota's fascia, attempting to catch th e capsule of the kidney. The suture is then brought out through the abdominal wall using a Carter-Thomason suture closure device and secured to the skin level with a clamp.

Results: Six had right sided and two had left sided tumors. All procedures were performed using a transperitoneal approach. Mean size of the tumor was 2.5cm, all surgical margins were negative. Estimated blood loss was 204ml. WIT was 30.8min. We devised a renal sling traction system through the analysis of our current series of patients:

Anterior Tumor

Location of tumor on Anterior Kidney	Placement of sling on renal capsule
Upper	Mid-lateral
Mid	None
Lower	None

Posterior Tumor

Location of tumor on Posterior Kidney	Placement of sling
Upper	Lower lateral
mid	mid lateral
Lower	Mid lateral

Lateral Tumor

Location of tumor on Lateral Kidney	Placement of sling on renal capsule
Upper	Lower lateral
mid	Mid lateral
Lower	Mid lateral

Polar Tumor

Location of tumor on Lateral Kidney	Placement of sling on renal capsule
Upper	Lower lateral
Lower	None

Conclusion:

The most critical steps in LPN are performed during WIT after the renal hilum is occluded. The use of a sling system allows for optimal visualization and positioning of the renal tumor. Hence, the excision of the renal tumor and reconstruction of the tumor bed are performed swiftly and precisely.

POSTER C12

SINGLE SURGEON LAPAROSCOPIC FLANK PROCEDURES WITH A NOVEL "SCOPE HOLDER" FOR CAMERA CONTROL

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Objectives: To evaluate the feasibility of performing human laparoscopic flank procedures without an assistant for camera control using the "scope holder," a novel device which allows the surgeon to control the laparoscope with minimal postural movements.

Methods: Five patients underwent transperitoneal laparoscopic pyeloplasty or adrenalectomy using the scope holder for camera control through an umbilical or pararectal trocar.

Results: The mean operative time was 132 minutes (range 90-165 minutes). The scope holder was used for an average of 112 minutes per case (range 75-150 minutes). All portions of the procedures could be performed with the scope holder without an assistant with the exception of trocar placement and examination and occasions where the camera was moved to a more lateral trocar. There were no intraoperative complications. The surgeon found the device easy and comfortable to use.

Conclusion: The "scope holder" is an inexpensive device that allows the surgeon to intuitively control and coordinate movement of the field of laparoscopic vision with the movement of his instruments. Use of the "scope holder" has allowed us to perform single surgeon transperitoneal laparoscopic renal and adrenal procedures without a dedicated assistant for camera control without prolonging operative times.

POSTER C13

SUGGESTED POSITIONING OF THE FOURTH ARM DURING ROBOTIC-ASSISTED LAPAROSCOPIC PROSTATECTOMY

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Introduction: The use of the daVinci Surgical System (Intuitive Surgical, Sunnyvale, CA) is increasing for laparoscopic radical prostatectomy. One of the key aspects of effective use of the system is proper port placement. The original robot utilized 3 arms: one to hold the laparoscopic camera and two to hold laparoscopic instruments. As of late, the surgical platform is upgradeable to support a fourth instrument arm. We describe the use of this fourth arm for the laparoscopic radical prostatectomy.

Methods: From September 2003 to February 2004, 70 robotic-assist ed laparoscopic prostatectomies have been performed at our hospital by a single surgeon. The fourth arm was installed into our system after the second case. Originally, the fourth arm was brought over the right leg and docked to a right lower quadrant la teral port. Due to difficulty with robot system errors and limited mobility experienced over the next 8 cases, the positioning of the arm was changed to bring the arm under the right leg while still docking to a port in the identical position.

Results: With an above-the-leg position in 8 cases, there were 12 system faults, two of which required a restart of the system. During one of these failures , the robot would not properly restart for over 2 hours necessitating conversion of the case from the robotic to a standard laparoscopic approach. Analysis of the faults by the Intuitive engineer showed that they were linked to excessive pressure on the fourth arm or adjacent robotic arm. However, once the arm was brought under the leg there has not been a single system fault specifically related to the fourth arm in 66 consecutive cases.

Conclusion: The below-the-leg positioning for the fourth arm alleviates problems related to arm-to-arm collisions while maintaining excellent intraabdominal mobility for use of the fourth arm.

POSTER C14

REPRODUCIBILITY OF LEARNING CURVE FOR ROBOTIC PROSTATECTOMY: TRANSFERENCE OF TECHNIQUE FROM SITE TO SITE

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Introduction: The laparoscopic radical prostatectomy is a very challenging procedure with a steep learning curve. The daVinci Surgical System has been shown to decrease the learning curve for this operation. Excellent results regarding continence and oncologic efficacy have been demonstrated. However due to the difficulty of the learning curve even with robotic prostatectomy, the feasibility of the development of a robotic program without a long-term on-site proctor of cases is debatable.

Methods: From September 2003 to February 2004, 70 robotic-assisted laparoscopic prostatectomies were performed by a single surgeon. This primary surgeon completed a two year laparoscopic fellowship and during this time assisted on over 50 robotic prostatectomies and performing portions of the cases toward the end of the fellowship. A totally new robotic team was formed with 2 table side assistants who alternated. The operating room data, catheter time, hospital stay, pathological data, continence results and complications were recorded prospectively.

Results: All 70 cases were completed laparoscopically. One robot failure was experienced and this case was completed laparoscopically. The OR times are shown on Figure 1. The mean OR time overall measured from the time the Veress needle was inserted until the last skin stitch was placed was 158 minutes. The average time for the last 20 cases is 136 minutes. The estimated blood loss was 134 cc. No transfusions were given. 69 out of 70 patients were discharged in 24 hours or less. No drains were placed. The catheter time averaged 7 days. There were 49 patients with pathologic T2 tumors and 21 with T3. The overall positive margin rate was 21%. For the T2 tumors it was 12.2% and for T3 it was 42.9%. Over the last 30 cases, however, the rate for T2 tumors was 4.2%. Out of the 22 patients who have at least 3 month followup, 50% are using 0 pads, 36% are using 1 pad per day and 14% are using 2 or more pads per day. The overall complication rate was 19% including 2 major complications: a DVT and a rectal injury.

Conclusion: The robotic prostatectomy can indeed be transferred from site to site without the need for an onsite proctor if an adequate initial experience is first obtained. The primary surgeon had the unique benefit of having both sound laparoscopic and robotic training. The experience of assisting 50 robotic prostatectomies can be considered an adequate threshold. As laparoscopy and robotics further permeates urologic training programs the robotic prostatectomy may become as well accepted as laparoscopic nephrectomy.

POSTER C15

NOVEL PEDITROL® IRRIGATION DEVICE PROVIDES SUPERIOR IRRIGATION FLOW AND ACCEPTABLE PRESSURES FOR FLEXIBLE URETEROSCOPY

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Introduction: Ureteroscopy is a common urological procedure which requires good vision to accurately and efficiently deal with calculi. Techniques that improve irrigation flow greatly enhance vision. Peditrol® is a novel, hands-free irrigation device which delivers a bolus of irrigant through the ureteroscope when the foot pedal is deployed. The purpose of this study was to quantify the flow and pressures created by the Peditrol® device versus commonly used methods of irrigation.

Methods: The study was performed in 2 stages. Flows through a flexible 6.9 F Olympus ureteroscope and a 7.5 F semi-rigid ACMI ureteroscope were measured with the working channel empty, and with a 2.2 F nitinol basket or a laser fiber placed in the working port. Irrigation flow was pressurized by the following methods: gravity drainage at100 cm H2O, pressurized irrigation at 300 cm H_2O via a pressurized irrigation bag, fluid bolus through a 60 cc syringe, and the Peditrol® device. The second stage involved measuring pressures in an ex-vivo cadaveric porcine kidney using the same techniques to pressurize the irrigation flow. A 20 gauge angiocathether was placed through the parenchyma into the renal pelvis under ureteroscopic vision and attached to a pressure transducer.

Results: With the Peditrol® device, mean flows were superior in a flexible ureteroscope ranging from 2 to 6 times that of pressurized irrigation at 300 cm H_20 and similar to a handheld-syringe (0.7 to 1.1 times). The benefit was most pronounced with a 2.2 F basket or 200 *m laser fiber in the working port (3.3 & 6.3 times respectively). The Peditrol® device demonstrated intra-pelvic pressures less than 30 cmH_2O when used with a 12/14 F ureteral access sheath. Without a ureteral access sheath the intra-pelvic pressure reached 92 cmH_2O which was similar to the pressures reached with the semi-rigid ureteroscope under various irrigation conditions (74 – 246 cmH_2O) and comparable to the handheld syringe method through the flexible ureteroscope (88 cmH_2O).

Table 1 - Mean Flows (ml/min)

	100cm H_2O (Gravity)	300cm H_2O (Pressure Bag)	Peditrol®
Flexible ureteroscope	29	96	193
Flexible with 2.2 basket	4.5	23.5	148
Flexible with 200*m laser fiber	11	55.5	182

Table 2 -Intrapelvic pressure (cm H_2O)

	100cm H_2O (Gravity)	300cm H_2O (Pressure Bag)	Peditrol®	60cc Syringe
Semi-Rigid	74	170	210	246
Flexible - no sheath	23	51	92	88
Flexible - sheath	1	8	29	33

Conclusion: The Peditrol® irrigation device generates superior irrigation flow through a flexible ureteroscope versus gravity or pressurized irrigation and flow similar to handheld syringe irrigation. This beneficial effect was most pronounced with an instrument in the working port. The intra-renal pressures created by the Peditrol® device when used with a flexible ureteroscope and ureteral access sheath are low. When a ureteral access sheath is not used the intra-renal pressure is similar or lower to pressures obtained when using a semi-rigid ureteroscope with different irrigation modalities. The Peditrol® device appears to be a useful tool to facilitate ureteroscopy and awaits further assessment in clinical studies.

POSTER C16

USE OF THE WATERJET FOR LAPAROSCOPIC RETROPERITONEAL LYMPH NODE DISSECTION IN TESTIS CANCER PATIENTS

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Objectives: The acceptance of open retroperitoneal lymph node dissection (RPLND) for stage I and II nonseminomatous testicular cancer has decreased because of intra- and postoperative morbidity of the procedure. Laparoscopic RPLND is a minimally invasive and safe alternative for low-stage germ cell tumors, it is however technically demanding and should therefore be performed in experienced centers. The purpose of the present study was to evaluate the waterjet technique for laparoscopic RPLND.

Methods: 18 patients with clinical stage I testis cancer (group A) and 7 patients post chemotherapy for stage II disease (group B) underwent laparoscopic RPLND at our institution. The procedure was performed identically to the open approach using the modified template according to Weissbach. The waterjet was used for removal of lymphatic tissue from the aorta and the vena cava as well as from the sympathetic trunk.

Results: The operation was successfully completed in all patients without conversion to open surgery. Mean operating time was 232 48min. The waterjet was able to remove lymphatic tissue easily and atraumatically. At pressures of 20 bar, the lymph node capsule remained completely intact, thus avoiding tumor cell spread. Antegrade ejaculation could be preserved in all patients who, up to date, show no evidence of disease.

Conclusion: The waterjet allows the save and complete removal of lymphatic tissue leaving vulnerable anatomical structures intact. It can decrease the learning curve of laparoscopic RPLND and contribute to a better acceptance of this procedure.

POSTER C17

COMBINED URETHRAL STRICTURE LANCE AND VISUAL URETHROTOMY FOR THE MANAGEMENT OF COMPLETE POSTERIOR URETHRAL STRICTURES

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Introduction: Urethral stricture lancet is a simple and innovative instrument utilized in conjunction with visual urethrotomy to manage complete posterior urethral strictures secondary benign urethral conditions of gunshot wounds and vehicular accident s. The objective of the study is to offer a minimally invasive alternative in the management of complete posterior urethral strictures other than open surgical urethral repair.

Methods: Urethral stricture lancet is a hollow metal urethral sound with a blade/lancet at the tip. Its protrusion and retraction from the tip is controlled manually preventing unnecessary lacerations and false passages during its insertion. The urethral stricture lancet instrument is inserted via the suprapubic tube cystostomy site and passes through the bladder neck unto the proximal end of the completely disrupted urethra. Distally, a visual urethrotome is inserted to locate the distal end of the disrupted urethra.

While both instruments are inserted proximally and distally, alignment of the urethra is confirmed by two parameters. Alignment initially assessed by fluoroscopy. Subsequent alignment verified by urethroscopy. Urethroscopy would show tenting of visualized urethral disrupted tissue when urethral stricture instruments (with withdrawn lancet/blade) is manipulated. Simultaneous urethrotomy using manual control of urethral stricture lancet (proximally) and visual urethrotomy (distally) forms controlled lacerations to form a common meeting point. This, in turn, creates a viable tract to re-establish continuity of the previously disrupted urethra. Once proximal and distal urethral communication is restored, a guide wire is passed and further dilatation is ensued.

Results: 12 patients with complete posterior urethral strictures were enrolled in the study. 6 cases of gunshot wound and 6 cases of vehicular accident. 12 of 12 patients had successful re-establishment of urethral continuity utilizing the urethral stricture lancet technique. 6 months post-operatively, 6 of 12 showed good uroflowmetry of more than15ml/sec; 4 patients showed fair uroflowmetry results of 8-15 ml/sec and 2 patients showed poor and intermittent flow warranting repeat dilatation under local anesthesia using male urethral sounds. No cases of incontinence and impotence were noted.

Conclusion: Urethral stricture lancet is an innovative and viable alternative for complete posterior urethral strictures secondary to gunshot wounds and vehicular accidents. The simplicity and minimal invasive nature of the procedure offers a valid alternative step before subjecting a patient to open surgical repair for complete posterior urethral strictures.

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