

UW Urology News

*The Newsletter of the
University of Washington Department of Urology*



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News from the Chairman

Paul H. Lange, MD, FACS

In thinking about my message for this newsletter, I was struck by the contrast between what is contained herein and what was discussed at our two recent Grandest Rounds in October and November. It seems to me that this mixture speaks volumes about some issues that will challenge the future of Medicine, including Urology and thus this department.

In this newsletter, Dr Ellis relates our experience with robotic prostatectomy. It is reassuring that this department is on the cutting edge and our residents and fellows are learning that edge. It is no secret that everybody and every place seem to be rushing to "be involved" in

robotic prostatectomy, despite its still uncertain cost/benefits ratios. It reminds me of the early competitive frenzy surrounding ESWL, which to my memory was not Urology's "finest hour". Like many my age, I am not becoming involved and thus ironically am doing more of the harder and/or more advanced prostate cancer open cases. Unlike some of my peers, I believe robotics is the future because whatever its current advantages, like the early days of Endourology, the technology will only get better and teaching the procedure will become easier and faster. I am amazed at how fast Dr. Ellis has moved our robotic experi-



ence into equipoise with our excellent open series regarding quality of life and cancer control. I believe this is because Dr Ellis was already very experienced in open radical prostatectomy before he embraced laparoscopic and robotic approaches. This not uncommon phenomenon raises many issues regarding the training and place of urologic oncology in our specialty.

Continued page 6

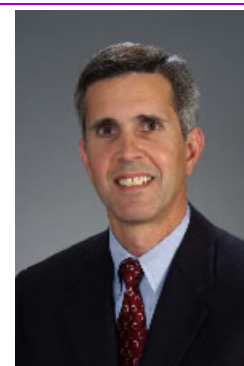
Robotic Prostatectomy

William J. Ellis, MD

The robotic surgery program at UWMC has now completed its third year. Nationwide, the trend towards increasing numbers of robotic procedures continues. We therefore felt this would be an appropriate time to provide an update on robotic surgery, including training, surgical, oncologic, and economic issues surrounding robotic prostatectomy.

The initiation of robotic programs at most teaching institutions is drastically altering the resident experience. At the

UWMC, the majority of prostatectomies now are performed robotically. As such, we have seen a sharp decline in the open radical prostatectomy experience of the residents. For the time being, the robotic procedure is still perceived as an advanced laparoscopic procedure, with the residents spending relatively little time on the console. While all residents will now finish with some robotic experience, our Fellows in Endourology and Urologic Oncol-



ogy will receive more in depth robotic experience. The Institute for Surgical and Interventional Simulation (ISIS) at the University of Washington is actively involved in collaboration with our department to bring off-line training to all surgical procedures. Tom Lendvay

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Image Guided Therapy for Urological Disease

Sangtae Park, MD



As a specialty, we are fortunate to have multiple imaging modalities at our disposal for diagnosing patients' urological conditions. For example, computed tomography (CT) has clearly become the gold standard for the diagnosis of urolithiasis,¹ and modern multislice CT scanners can render detailed 3 dimensional CT images for surgical planning (Figure).

These enhanced imaging techniques have also opened up the possibility of using needle ablative technologies in treating urological neoplasms. For example, a great number of incidental renal tumors are being diagnosed in older patients with

multiple comorbidities, and needle-based renal cryoablation and radiofre-



quency ablation are very well tolerated outpatient procedures for these patients. At the University of Washington Medical Center, the Urology Department is working together with our Interventional Radiology colleagues to treat these masses using such ablative techniques.

It has been shown repeatedly that the success of such needle ablative techniques depends strongly on detailed 3 dimensional imaging during ablation, and with the recent acquisition of the Siemens DynaCT, a breakthrough in 3-D interventional imaging, our team is able to ablate these lesions with even more confidence than before. Reports on the efficacy of needle ablative techniques have been very encouraging, with cancer specific success rates over 95% at three to four year follow-up. We believe teamwork

with the interventional radiologists is critical to keep urologists closely involved in the treatment of patients with small renal masses, because it is not inconceivable that in the future, patients found to have small renal masses could be referred straight from the CT or ultrasound suite to the Interventional Radiology outpatient clinic.

Image guided therapy such as needle ablation and percutaneous renal stone surgery rely on both cognitive skills and excellent hand-eye coordination of the surgeon. With the advent of the 80 hour workweek for housestaff, surgical simula-

tion in the laboratory has emerged as a potentially valuable adjunct to surgical training because residents may be getting less exposure to operative urology. Simulators also have a great deal of potential to minimize surgical complications by allowing the trainee to become exposed to myriad possible intraoperative complications.

In endourology and minimally invasive urology, we have validated the use of virtual reality surgical simulators such as the PERCMentor (Simbionix, Cleveland OH). In this simulator, fluoroscopic guided percutaneous renal puncture can be practiced, with placement of a wire in an antegrade fashion into the collecting system. The virtual reality simulator provides detailed three dimensional images to the trainee, without exposure to real ionizing radiation. The simulator is able to record operative time, fluoroscopy time and intraoperative complications, thereby providing immediate feedback on the trainee's per-

formance. We showed that training residents on this machine improves their percutaneous renal access abilities and enhances their understanding of the intricate intrarenal anatomy. In the future, virtual reality simulators may play a central role in surgical training, by providing an opportunity for residents to perfect their surgical skills before operating on a patient. With the expertise of Dr. Tom Lendvay in the pediatric urology division, we are also working to develop other simulators for urologic procedures to enhance resident surgical skills and improve patient safety. An integral part of this simulator training program is ISIS, the University of Washington's interdisciplinary surgical simulation lab to develop and implement curricula for housestaff. Dr. Lange and Dr. Joyner, residency coordinator, strongly support the development of curricula integrating surgical simulation for U.W. urology residents.

In the laboratory, we are working on studying the basic science of sound waves in medical applications. SWL are sound waves familiar to all urologists, and here at the University of Washington, the Advanced Physics Laboratory and the Urology Department have joined forces to study shockwave physics to improve clinical SWL outcomes. Unbeknownst to most clinicians, dual head SWL technology and prefocal localization of stones were developed right here on our campus. With collaborators at the California Institute of Technology, Boston University and Indiana University, we are working on porcine renal stone models to study the effect of various intravenous agents on soft tissue damage and developing mathematical models on supercomput-

Robotic Surgery in Pediatric Urology

Thomas Lendvay, MD

In April 2005, Children's became one of only a handful of pediatric institutions nationwide to incorporate the da Vinci® robotic system into minimally invasive surgery. Robotic-assisted laparoscopic (RAL) surgery has penetrated adult urology, general surgery, cardiac surgery, and gynecology. Many people, however, have reported that robotic surgery is not applicable to children before adolescence due to the smaller working spaces and the robot's size. At Children's Hospital and Regional Medical Center, we are using the robot to assist in performing urinary tract reconstruction formerly difficult with pure laparoscopy. We have performed over 20 robotic surgeries including extravesical ureteral reimplantation, pyeloplasty, ureteropyelostomy, nephrectomy, and Mitrofanoff and ACE procedures. We have operated on children less than 10 kg and under one year of age. Our goal is to determine if patient outcomes can be improved with the use of RAL. Laparoscopy has been shown to reduce post-operative pain and lessen hospital stays in adults, but little literature has focused on these advantages in children. Few surgeons perform complex urinary tract reconstructions on infants and toddlers because fine suture material is required for delicate anastomoses and smaller working spaces overstep the limitations of pure laparoscopic equipment and techniques. The robot, however, allows for increased precision and articulation required for complex reconstructions in small children.

This Fall we begin our first prospective study with the robot comparing RAL extravesical ureteral reimplants with open extravesical reimplants. Our primary study end-point will analyze post-operative pediatric pain scores. In addition, we will compare narcotic requirements, operative times, length of hospital stays, and surgery outcomes. We will also collaborate with pediatric urologists from the University of Connecticut to assess RAL pyeloplasty outcomes in children less than 4

years of age, an age group of patients thought by some not to be candidates for RAL due to patient size.

In addition to my clinical research endeavors, I will be focusing on advancing robotics in the realm of surgical simulation. CPR, PALS, ATLS, and ACLS are all examples of medical simulation training modules which focus on first teaching disease didactics and subsequently recognizing and applying appropriate interventions. Historically, surgical training has been based on the doctrine, "See one, do one, teach one." Although current and past surgical training has remained relatively unchanged, demands from clinicians, the public, and the government to improve patient outcomes have encouraged us to re-evaluate our training techniques. Airline pilots spend hundreds of hours in flight simulators before they ever get into a cockpit. This type of training will be applied to surgical residencies in the future. The models for surgical simulation have become evident in teaching basic laparoscopy but the techniques in pure laparoscopy, especially suturing, are associated with a slow learning curve. We are working with a surgical simulation company in Seattle to validate a virtual reality da Vinci® robot simulator. In addition, I am collaborating with the University of Washington Biorobotics and Engineering department in their goal to create a dual trainer-trainee robot consul to teach robotic techniques with immediate trainer oversight, much like in a cockpit.

Through collaboration with the ISIS (Institute for Surgical and Interventional Simulation) Center at the University of Washington, Dr. Sangtae Park and I will be developing surgical simulation curricula to help instruct residents on safe and efficient practices for bedside procedures. The first simulation module we plan to develop is a percutaneous suprapubic tube (SPT) place-



ment module for the management of acute urinary retention. When surveyed, residents reported that a simulation module to train SPT placement would have benefited them and most respondents reported knowing of patients who suffered morbidity from inadequate placement or positioning of these tubes. We plan to develop a prototype virtual reality suprapubic tube placement module with haptic feedback to help urology residents learn how to minimize morbidity and understand the indications for such tubes. Once designed, this module could be adapted to training Emergency Medicine and Pediatrics residents on how to safely perform suprapubic bladder aspiration for pediatric fever work-ups, as well as be adapted for other percutaneous needle insertion/catheter placement techniques such as thoracentesis. Hospitals around the country are moving towards individual procedure credentialing and will require that residents have completed appropriate didactics and simulation before performing procedures on actual patients. Similar to general surgery and anesthesiology who have designed mannequin-based central venous line placement simulators incorporating ultrasound (US) guidance, our simulator will use US to mitigate patient morbidity. The University of Washington's ISIS Center has a cooperative relationship with the University of British Columbia and McGill University in Canada to share simulation modules and residents/medical students for validation studies. Through additional collaborations with faculty at Emory University and the University of Minnesota, we will have a robust resident population to evaluate and ensure statistical power for any validation studies.

Robotic prostatectomy, cont. from page 1

describes some of this work in more detail in his article. The robotic prostatectomy procedure is ideally suited to simulation.

While I do think there are certain advantages to the robotic approach, they are often overstated. For example, I believe continence and potency preservation are similar in well performed laparoscopic and open procedures. The running anastomosis of the robotic procedure is touted as being superior to the interrupted procedure of an open procedure. In my experience, both anastomoses are usually watertight. I don't believe there is any reason the catheter can or should be removed earlier after one procedure than the other. The limiting factor for catheter removal is generally edema of the anastomosis. Removal of the catheter too early will lead to an unacceptably high urinary retention rate, regardless of the procedure performed. I have not noticed a difference in time to urinary continence between the procedures. Similarly, it is unclear why there should be significant differences in potency between a well-performed open or laparoscopic approach. The skill of the surgeon in preserving the cavernosal nerves is probably the most important factor for potency preservation in both approaches.

There are, however, some notable differences between the techniques. Vision and magnification with the robotic technique are improved over the open procedure. There is no debate that there is less blood loss with the laparoscopic procedure, as the pneumoperitoneum slows venous bleeding. This, combined with the magnification of laparoscopy, allows bleeding to be accurately visualized and controlled. The lower blood loss combined with the minimally invasive incisions provide for a quicker return to normal activity following the laparoscopic procedure, often by several weeks. Despite this, there are a few downsides to the laparoscopic approach. The robotic instruments lack tactile sensation, which can be an issue when nerve sparing is being considered in higher risk tumors or when mild induration is present. A thorough lymph node dissection is somewhat more difficult to accomplish due to the angle of the instruments. This, combined with the lack of tactile sensation causes me to lean towards an open approach in locally advanced disease. I have also found that I feel more comfortable

with the open approach in obese men or in men with prostates over 100 grams in size. In summary, and given the important caveat of equivalent surgical skill, robotic surgery has an advantage for most patients, mainly in the form of a quicker recovery.

The final part of the equation is cost, which can be evaluated from multiple perspectives. From a hospital perspective, robotic prostatectomy is probably a loss leader. The amortized cost of the robotic machine, maintenance contracts, disposables, and added OR time may amount to several thousand dollars per case, even in high volume centers. For low volume centers, the cost per case could be significantly higher. To the insurer, depending on payment contracts, the robotic procedure is either equivalent to, or more expensive than, standard open prostatectomy. Furthermore, the insurer doesn't benefit from decreasing the patient's time off work. To the physician, the slight increase in reimbursement for the robotic procedure is more than offset by the increased time to perform the procedure. This is particularly evident early in the learning curve of one's experience.

For those looking to start a robotic program, experience with the open surgical procedure speeds the learning curve, due to an intimate familiarity with the anatomy and surgical approaches to the gland. Most of the principles for the performing the procedure with optimal results have been well described in the open surgical literature. In fact, I believe that a big reason for the rapid progression of this robotic surgery in the past few years is the move of many experienced open surgeons to the technique.

What do I see as the future of robotic surgery? I envision this as a technique that will become more prevalent due to multiple forces. First and foremost, the popularity is patient driven. Patients believe this is a better procedure based on their perception of a minimally invasive procedure and the new technology involved. There has also been a huge Internet "buzz" associated with the procedure including relatively biased websites and "infomercials". For the time being, I believe the technical challenges and costs associated with robotic programs will limit robotic surgery to high volume centers. Most large groups who

migrate toward robotic surgery will have one or two surgeons performing the robotic procedures for the group.

Ultimately, there is a greater future with robotic surgery than with open surgery. Open prostatectomy has approached its limits, and any future improvements are likely be small. There is greater potential for technological advances pushing robotic surgery to the next level. Robotic instrumentation will improve. Force feedback and tactile sensation will be integrated in to the devices. There is great potential for combining the robotic technology with imaging techniques. Imagine a heads up display which could overlay maps of the tumor and cavernosal nerves on top of the live prostate image. With this future ahead of us, I can foresee the day when I will be the seasoned urologist at conference telling the residents about my experience "back in the day" with open radical prostatectomy.

Robotics in children, cont. from page 3

Medical training is now based on learners achieving goals laid out within the Clinical Core Competencies. Each resident must reach these goals before advancement and we have been tasked with ensuring that the public has confidence in our surgical skills. Training our future clinicians through discrete curriculum-based surgical simulation modules demonstrates our unending pursuit to improve patient outcomes.

Plan to attend the UW Urology Alumni Reunion at the 2007 AUA in Anaheim
Details coming soon

2006 Graduation Banquet

In June we proudly graduated another class of residents, fellows, and post-doctoral trainees. Graduates included Chief residents Marc Dall'Era and Thomas Walsh, Pediatric Urology Fellow Thomas Lendvay, Trauma and Reconstruction Fellow James Kuan, and Post Doctoral Fellow Janice Lai. We also said our initial goodbyes to Dr. Michael Mitchell. Several awards were also presented at the banquet: Fildes Award for outstanding patient care, Drs. Marc Dall'Era and Thomas Walsh; Inservice Award, Dr. Jonathan Wright, Resident Research Award, Dr. Stephen Culp; Julian S. Ansell Teaching Award, Dr. Michael Porter, Staff Member of the Year, Donna Mackenzie. Below are a few pictures from the event



Dr. Lange and his Chief Residents, Tom Walsh and Marc Dall'Era



Dr. Mitchell with some farewell words



Dr. Lendvay proudly displays his certificate



Dr. Wessells presenting Dr. Kuan with his certificate



2005-2006 Class of Urology Residents

News from the Chairman cont. from page 1

Dr. Lendvay shows us that robotics is quickly moving to other urological disciplines such as pediatrics and informs us that this technology, with its precise suturing capacities, may open up new areas of intervention for the newborn. Also, robotics may not be limited to the abdominal cases, but very well might be used to advantage in surgical areas that now are easily accessed, such as hypospadias repair. With a little imagination the applications seem limitless.

As was Dr Sweet, before he left us for the University of Minnesota and his original home, Drs Lendvay and Park are becoming increasingly involved in UW's Institute for Surgical and Interventional Simulation, or ISIS. This now nationally prominent organization is leading the crescendoing effort to radically change and streamline surgical education (as flight simulators did for pilot training), and together with some world-class bioengineering groups here, will be very involved in greatly changing the way in which surgeons manipulate and see. I have no doubt that as virtual reality technology advances, soon the TV camera will be replaced by something that will portray a "cartoon" incorporating image information from many wave-lengths besides that which the eye can see including x-ray, ultrasound, and even magnetic resonance. And the residents will then say, "Would you believe surgeons used to cut things not knowing for sure if they were blood vessels or what the backside looked like?"

In this issue, Dr Park also talks about

his efforts in collaboration with interventional radiology and bioengineering to percutaneously or extracorporeally treat neoplasms, particularly renal cancer. He alludes to a major challenge for Urology which is, who will eventually play the prominent role in these new approaches. Intervention radiologists have been making great strides in technology and skill in many areas formerly the domain of surgery, and they quite rightly expect to be involved. I believe that the physician taking care of the patient who knows the disease and the organ should play the prominent role for optimal progress and patient care, and offer as support for that position the examples of coronary angiography and, more closer to home, prostatic ultrasound biopsy and ESWL. But others who are well intentioned think about the future differently.

What a contrast this information is with what was discussed at our two Saturday Grandest Rounds. In October, we broke out the historical urological instruments from our Urology museum and our emeritus, retired colleagues (i.e., Bob Gibbons, John Wettlaufer, Julian Ansell, Warren Chapman, Mike Mayo) reminisced over how Urology was practiced in the mid-20th century, when urologists were solidly the primary care giver for many of our diseases, and open and endoscopic surgery and their instruments were so different. There were great lessons here about how Urology should face the future.

At our Grandest Rounds in November we heard about our department's efforts in global medicine and about how our residents who have been to Cameroon learned to func-

tion in a resource-limited environment and with relatively primitive instruments. The leader of our global program, George Brannen, talked about his month-long experiences at the Urinary Fistula Clinic in Ethiopia. We are greatly moved by the stories of tragedy, bravery and triumph involving young almost pubescent girls and their advanced urinary fistulae from childbirth. We were mesmerized by the complicated and yet highly successful surgeries done there, and we were in awe that some of these cured women then became surgical assistants for this clinic and taught the visiting surgeons how to do the operations!

This juxtaposition of the cutting edge with history and the 3rd World raises so many issues about our future. How will we train for the future? Will urologists continue to be the primary care doctors for our diseases or, on the one hand mostly "proceduralists" or, on the other hand, mostly engaged in triage? Now that pediatrics has become a certified subspecialty, should other disciplines (e.g., urologic oncology) follow to ensure our future and the welfare of the patient?

These are topics for another time. For now I hope you all will be proud that this department is very involved locally and nationally in these important issues, and reassured that our staff and trainees are well positioned for this exciting but challenging time. Of course, as always, I end by reminding you all that these efforts cannot reliably occur without your support.

Image guided therapy, cont. from page 2

ers to predict stone breakage. Our hope is that further understanding of the basic physics of stone breakage will improve the stone-free rates using future generations of SWL machines.

Another very exciting focus of the research at the Advanced Physics Laboratory is high-intensity focused ultrasound (HIFU).² This energy source relies on a piezoelectric generator to produce ultrasonic waves at 1 to 5 MHz, and a power amplifier and transducer serve to intensify the waves. These waves are focused onto small F2 focal spots (as small as 0.5mm), generating intensities of 1000 to 10000

Watts per cm². At this intensity, temperatures > 60°C are reached in as little as 3 seconds and maximum temperatures of 100°C can be achieved. Researchers at the University of Washington have demonstrated noninvasive intracorporeal hemostasis of traumatic solid organ injury and secured hemostasis of femoral arteriotomies after aortic angiography procedures using HIFU. The next step is to perform HIFU on renal neoplasms in animal models in order to study its isotherms and its reliability in inducing irreversible cellular injury.

In summary, image guided therapies are being studied intensely for urological applications. The University of Washington's Department of Urology aims to be at the forefront of this active field, and we have incorporated many of these modalities in clinical practice, in resident training and in the laboratory.

1.Park, S., Pearle, M. S.: Imaging for percutaneous renal access and management of renal calculi. *Urol Clin North Am*, **33**: 353, 2006

2.Hacker, A., Michel, M. S., Marlinghaus, E. et al.: Extracorporeally induced ablation of renal tissue by high-intensity focused ultrasound. *BJU Int*, **97**: 779, 2006

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Upcoming Events

Northwest Urological Society Spokane, WA	December 8-9, 2006
4th Annual UW Urology Alumni Reunion At the AUA in Anaheim, CA	May 2007 Time and place TBA
UW Urology Graduation Banquet	June 2, 2007 (tentative)

**Change of Address? Feedback?
Updates? Story ideas?
Questions?**

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