Minimally Invasive Surgery Week

MINIMALLY INVASIVE SURGERY WEEK 2013
ANNUAL MEETING & ENDO EXPO
HYATT REGENCY RESTON
RESTON, VA (WASHINGTON DC)

State of the Art Lectures in Robotic Surgery

Alphabetical by presenter

Wednesday 7:30am-3:30pm

Robot-Assisted Bladder Surgery: Update

Piyush K. Agarwal, MD

Head, Bladder Cancer Section, Urologic Oncology Branch

National Cancer Institute at the National Institutes of Health

Radical cystectomy (RC) is the first-line therapy for the treatment of muscle-invasive bladder cancer as well as refractory cases of high grade, non-muscle-invasive disease. Current surveys indicate that more surgeons are performing the procedure laparoscopically with robot-assistance. Although most surgeons perform the extirpative portion of the case with robot-assistance, many will still use open techniques for the urinary diversion and reconstruction. Recent techniques, however, facilitate intracorporeal urinary diversion and reconstruction done laparoscopically with robot-assistance. I will highlight these techniques along with other exciting advances in robot-assisted bladder surgery.

State Of The Art in Robotic Plastic and Reconstructive Surgery

Taiba Alrasheed, MD

Over the last 10 years, robotic surgery has grown to dominate minimally invasive applications in urology, gynecology, general surgery, and otorhinolaryngology. Although only recently introduced to plastic surgery, the superb precision and high-resolution, three-dimensional optics make the surgical robot a valuable and versatile plastic surgical tool.

Three general applications of robotics in plastic surgery have been develop which include: (1) transoral robotic surgery (TORS) for head and neck reconstruction, allowing complex oropharyngeal reconstruction without dividing the lip or mandible, (2) robotic microvascular anastomoses, extending the capabilities of the human hand, and (3) minimal access muscle harvest for an "incisionless" harvest of both the latissimus dorsi and rectus muscles. Indications, advantages and disadvantages of each application will be discussed.

State of the Art in Robotic Telesurgery & the Future of Robotics

Mehran Anvari, MD, PhD

Robotic surgery is rapidly evolving and widely driven by technological advances. Surgical robotics has proven to enhance the surgeon's senses, motor performance and diagnosis capability to perform more accurately and precisely. Recent advances in Image Guided Surgery and Fluorescence Navigation are paving the way for the integration of robotics into diagnostic and

interventional procedures. This presentation will focus on the past, current, and future applications of telesurgery and the challenges which need to be overcome to allow telesurgery to become a routine application of surgical robots. It will also focus on how the future of robotic surgery will undoubtedly see a shift towards automatic and programmable platforms, integrated surgical systems, non-invasive surgery, and the removal of the surgeon from the confines of the operating room.

Robotics in Male Infertility & Chronic Orchialgia

Jamin Brahmbhatt, MD

Since its inception in early 2000, robotic assistance with urologic procedures continues to expand. The magnification, three-dimensional visualization, and surgical control offered by the surgical robotic system has led to its integration into microsurgical procedures for male infertility and chronic orchialgia. The addition of robotic assistance may allow an improvement in outcomes similar to when the operating microscope was introduced in microsurgery. Though the use of robotics in microsurgery is still in its early phases, initial findings are encouraging. This presentation will cover robotic microsurgical procedures and tools for infertility and chronic orchialgia/testicular pain such as vasovasostomy, vasoepididymostomy, varicocelectomy, testicular sperm extraction and targeted denervation of the spermatic cord. Preliminary clinical studies appear to show improved operative efficiency and comparable outcomes. The use of robotic assistance during robotic microsurgical vasovasostomy appears to decrease operative duration and improve the rate of return of postoperative sperm counts compared to the pure microsurgical technique. Long-term prospective controlled trials are necessary to assess the true benefit for robotic-assisted microsurgery. The preliminary findings are promising, but further evaluation is warranted.

Next Generation Medical Robotics: Concepts for the Future

Kevin Cleary, PhD

In this presentation, I will first give a brief review of the history of medical robotics, starting in 1985 with the first recorded use of a robot to help position a needle for brain biopsy. I will then discuss how robots have been used in many clinical applications, including orthopedics, urology, radiosurgery, cardiac surgery, and general surgery. Current medical robotics systems including the da Vinci, CyberKnife, Magellan, SpineAssist, and RIO will be discussed. With this as background, I will then describe the needs for the next generation of robotics as well as some potential clinical applications that are the subject of current research efforts.

Robotic Esophagectomy

Farid Gharagozloo, MD

Over the last 35 years Esophageal Cancer has increased by 500% in the United States. Multimodality therapy of esophageal cancer combining chemotherapy, radiation therapy, and surgery has emerged as the treatment of choice in the majority of patients. Due to the high morbidity and mortality associated with conventional surgery, minimally invasive approaches have been advocated.

Robotics offers greater visibility and greater instrument maneuverability when compared to conventional videoendoscopic techniques. Robotics has been used for minimally invasive esophagectomy in a variety of manners. This presentation summarizes the experience with Robotic Esophagectomy culminating with Completely Robotic Endoscopic Ivor Lewis Esophagogastrectomy.

Robotic Lobectomy for Early Stage Lung Cancer: Results Following the Learning Curve

Farid Gharagozloo, MD

BACKGROUND: Robotic lobectomy has been evolving over the past decade and has been shown to be feasible.

METHODS: From January 2009 until November 2012, we performed a retrospective review of prospectively accrued patients at our institution that underwent robotic lobectomy.

RESULTS: 174 patients underwent robotic lobectomy. There were 71 men and 103 women with a mean age of 65+/-10.3 years of age. Lobectomies were right upper (47), right middle (14), right lower (30), left upper (46), and left lower (27), lingulectomies (8), and bilobectomies (2). Mean operating room time was 198 +/-50 minutes. Pathologic upstaging was noted in 31/174 (18%) patients. There were 2 /172 (1.2 %) emergent conversions to a thoracotomy for bleeding from the pulmonary artery. There were no intraoperative deaths. Postoperative mortality was 1.7%. There were no deaths among the last 154 patients. Minor complications were seen in 34/174 (19.5%) patients. Median hospitalization was 5 days. At a median follow up of 41 months, 4/174 (2.3%) patients died from their lung cancer, 8/174 (4.6%) patients had metastatic disease, and 2/174 (1.1%) patients had a second lung primary cancer. There was no local recurrence.

CONCLUSION: Robotic lobectomy is feasible and safe with comparable morbidity to thoracotomy and VATS approaches. The results improve after twenty cases. The oncologic advantage of robotic lobectomy in upstaging early stage lung cancer may be due to enhanced bronchovascular as well as mediastinal node dissection.

The End of the Era of Laparotomy for Obese Patients Undergoing Benign Hysterectomy

Anthony Gyang MD1, Nadia Gomez MD1, Jose Carugno MD1, Cem Iyibozkurt MD2, Georgine Lamvu MD, MPH1

1. Advanced Gynecology and Minimally Invasive Surgery

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Objective: To re-define minimally invasive surgery (MIS)-vaginal, laparoscopic or robotic surgery as the standard of care and preferred method of surgery for obese patients undergoing hysterectomy for benign indications.

Data Sources: We searched PUBMED using the MESH terms of Hysterectomy, Obese, Obesity, surgical procedures, minimally invasive or laparoscopy or robotics identified one hundred and twenty five articles from December 1967 to December 2012.

Methods of Study Selection: We included all abstracts with MeSH terms of hysterectomy, obese and obesity as a minimum requirement.

Results: A total of 41 selected articles were reviewed, 2 RCTs, 10 prospective cohort studies and 29 retrospective cohort studies. Outcomes observed included operative time (OT), estimated blood loss (EBL), postoperative complications and length of stay (LOS) in the obese patients who underwent minimally invasive hysterectomy versus laparotomy. Overall, there was not an increased risk in intra- or post-operative complications in obese patients who underwent MIS versus laparotomy.

Conclusion: Benign gynecologic surgery in the obese patient has been problematic in the era of laparotomy with technically difficult surgeries and especially increased rates of wound complications. After the introduction of MIS, conventional and robotic assisted laparoscopy has quickly become the standard of care in non-obese, but not in the obese women. After advancement of MIS techniques and in the hands of experienced surgeons, a growing amount of data now supports less or similar complication rates, shortened length of hospital stay and an acceptable risk of conversion to laparotomy without changing the result or overall success of the surgery in obese women.

Robotic Kidney Surgery

Jacques Hubert, Prof Dr Med

Thanks to its now well-known advantages, robotics allows the surgeon to enhance his laparoscopic skills and to perform meticulously different kinds of operation.

The robotic minimal-invasive approach can be proposed for most surgical renal procedures:

simple nephrectomies, radical nephrectomies as well as more challenging ones such as some T2 tumors or ureteronephrectomies; delicate steps of nephron-sparing surgery are widely facilitated and large series have now proven the interest of the high-quality vision and endowristed instruments.

Living donors, healthy patients who undergo surgery without benefit for themselves, can be offered a technique which allows the most meticulous dissection.

UPJ syndrome treatment also takes high advantage from robotics. This approach can be indicated even if crossing vessel, redundant pelvis, associated calculi, recurrent stenosis, and horseshoe kidney.

Other procedures such as pyelolithotomy, calyceal diverticulectomy, surgery of duplex or ectopic kidneys… are also facilitated by robotics.

Precise preoperative evaluation is mandatory for best outcome in this kind of surgery with vascular hazard. If well analyzed, multislice CT scan with different image reconstructions (MIP, 3D…) allows anticipating most of the anatomical pitfalls.

From the beginnings of robotic surgery at the end of the 1990's up to now, continuous technical improvements have followed one another (new instruments, 4th arm, HD vision…); numerous others are under development and will continue to modify kidney robotic surgery.

Development of robotic skills requires specific training, and new technologies such as simulators may improve not only developing basic skills but also allow patient specific procedures training in the future.

Enhancing the surgeon's technical capabilities, robotics improves the adaptation of the surgical treatment to the clinical case (and not the technical possibilities), particularly for kidney surgery.

Robot Assistance in Reproductive Urology: The Evolution of Microsurgery in Male Fertility

Parvis K. Kavoussi, MD

For years people have been dreaming of robots. Whether it has been for science fiction or for practical uses, the idea of a robotic system to mechanically assist us with tasks has been sought after. We used to hear people say "someday robots will do surgery for us". That is not necessarily the case, but robots are certainly finding more utility in assisting us with different types of surgery. The Da Vinci system began with uses for gross surgical procedures and has expanded its utility to microsurgery. In urology, this particularly lends itself to fertility surgery. This technology is primarily useful for vasectomy reversal and varicocelectomy in the realm of reproductive urology. Surgery that we initially tried with the naked eye, advanced through multiple technologies including optical loupes, operative microscopes, and now the operative robot. The advantages for using robotics to assist with microsurgery in reproductive urology include the robotic endowrists allowing for seven degrees of freedom allowing for movements that the human hand and wrist cannot make, an ergonomic design for the surgeon which is less fatiguing than an operative microscope which may enhance performance, and high definition 3D optimal visualization of a microsurgical field. The ability to stop operating for a few seconds and to take a breath during challenging microsurgical cases also allows for an unchanged operative field once the surgeon resumes work unlike the operative microscope. Once the learning curve for robotic microsurgery is mastered by microsurgeons it should improve operative times as well. My data on robotic vasectomy reversal shows comparable outcomes with robotic microsurgery, even

in my very early case series, proving the feasibility of transitioning from pure microsurgery to robotic microsurgery for a formally trained microsurgeon.

State of the Art in Robotic Pediatric Urologic Surgery

Chester J. Koh, MD, FACS, FAAP

Pediatric urology patients have benefited from the evolution of technology for the treatment of genitourinary conditions beyond traditional open surgery. Laparoscopic techniques exist for several procedures including nephrectomy / partial nephrectomy, pyeloplasty, ureteral reimplantation, orchiopexy, and lower urinary tract reconstruction, with associated shorter hospital stays, decreased pain medication usage, and improved cosmesis in comparison to open surgery. One of the most significant technological advances has been the introduction of pediatric robot assisted laparoscopic surgery that has provided surgeons with improved dexterity, instrument control, and visualization for reconstructive procedures.

While the use of technology has undoubtedly expanded in pediatric urology, all pediatric fields and especially the pediatric surgical fields are hampered by the slow pace of development for medical devices that are specifically designed for the pediatric population. The FDA has recognized that pediatric medical device development has lagged behind adult medical device development by 5 to 10 years, and it has encouraged pediatric medical device development through initiatives and grant programs. In order to promote innovation in pediatric medical device development, consortia have formed to improve pediatric medical device development, such as the Southern California Center for Technology and Innovation in Pediatrics (SCCTIP.com) to promote intellectual exchange; the sharing of engineering, clinical, and commercialization resources; and interdisciplinary research through collaborative efforts that encompass academic schools and programs as well as industry partners. This may be the best pathway for entrepreneurs and innovators to develop their pediatric medical device ideas into the “Next Big Thing” in pediatric clinical care

Building a National Robotic Urology Program

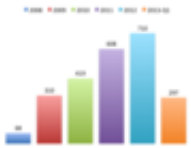
Ali Riza Kural, Prof Dr Med

The first successful robotic urology program was started in Detroit, United States at the beginning of the 21st century. Robot-assisted radical prostatectomy (RARP) is currently widely used, since the estimated blood loss and overall complication rates are less, hospital stay is shorter, and functional and oncological results are at least equivalent to open series performed in the best hands.

We performed the first laparoscopic radical prostatectomy in Turkey in 2003. After gaining experience with standard laparoscopy, the first robotic urology program was initiated in 2005. The first robotic program at our center was launched following a 5 day intensive course in Paris including cadaveric training and case observations. The first robot-assisted radical prostatectomy cases were performed under mentorship of international experts. Initially, we selected mid-size glands and low tumor volume patients, and tried to convince them to undergo robotic surgery. We had to convince the urologists as well, since they were against robotic surgery.

The 2nd robotic urology program was started in 2008; 3 and a half years later and at a state hospital. In our center, robotic surgery program is running with a multidisciplinary approach, including cardiovascular surgery, gynecology and general surgery. There are 20 da Vinci systems throughout the country and all of them are being used actively. Robot assisted radical prostatectomy is the most common procedure performed. The number of the cases have been increasing over the years (Fig 1).

Figure 1: The number of RARP cases by the years



Robotic State of the Art Colon and Rectal Surgery

Vincent Obias, MD

Laparoscopic surgery has been proven to have reproducible positive outcomes for the patient in colon and rectal surgery. Unfortunately, certain procedures such as Low anterior resections and abdominal perineal resections, have high conversion to open rates, worse mesorectal excisions, and increased nerve injury when done laparoscopically. Robotics is a new modality which can improve the outcomes of laparoscopic surgery.

I will discuss the current clinical robotic state of the art in reference to robotic colon and rectal surgery. We will discuss the current literature on new modalities such as the robotic firefly and single incision surgery. Not only does robotics improve the poor outcomes of laparoscopy, with new state of the art techniques and technologies such as firefly and single port surgery, robotics can go beyond simple laparoscopy.

State of the Art in Robotic Simulation and Training

Mona E. Orady MD, FACOG

Advancement in surgical techniques and instrumentation is challenging residency programs to adequately teach various methods of surgery to the surgeons of tomorrow. With ever- increasing resident work-hour restrictions limiting the time that residents can spend in hands on training, innovative curricular developments must be undertaken to help improve efficiency and quality of learning. To add to that challenge, at the same time that we are focusing on resident training, fellows, and other staff are also being trained in the rapidly spreading field of robotic surgery in many surgical specialties. Therefore organized multifaceted curricular approaches including traditional training techniques along will other tools such as simulation, videos, observation, and practice must be utilized to attain effective and efficient training while preserving patient safety. Simulation training is playing a key role in any of these educational tracts, as well as in maintenance of certification, credentialing, and privileging. This presentation will outline new and innovative approaches to resident education, as well as review state of the art methods of teaching and assessment. It will highlight the different simulator platforms available, methods of assessment, and utility of different applications. In addition, the future of simulation at it relates to robotic training will be discussed.

State of the Art with Robotic Valve Surgery

Robert Poston, MD

Robotic valve surgery has demonstrated measurable, unambiguous benefits compared to a standard open approach including smaller incisions, less pain, shorter length of stay, and quicker return to preoperative level of functional activity. As a result, it is the standard of care at many institutions. However, there remain major challenges from abandoning old ways. The first hurdle has been the training surgeons and their teams. Many cardiac surgeons have experience only with open surgical approaches and must learn how to use the robot at the same time they master a new less invasive surgical approach, making

their learning curve steep and prolonged. The team's retention of training is likely to be hindered by a slower pace of suitable candidates referred for mitral valve repair as compared to other cardiac procedures. A second issue is the requirement for interdisciplinary collaboration amongst multiple stakeholders throughout the life cycle of the robotic program. Addressing this need starts by creating trust from consistent, clear communication about the vision of the program and well designed processes for real time feedback about lessons learned from early cases. Regular review of a broad array of metrics of the program should be coupled to clear action plans for improvement. Few robotic valve programs that are initiated enter a mature, sustainable stage where this procedure becomes embedded into routine work processes and culture of the organization. Those that do often have a project champion strategically placed to prove that the challenges of robotics are congruent with the mission of the organization. We believe that this life cycle perspective provides a more comprehensive understanding of the challenges for robotic cardiac surgery and will help streamline the adoption of innovations associated with steep learning curves.

State of the Art in Robotic Thyroidectomy

Nader Sadeghi, MD

Thyroidectomy is a common surgery, primarily performed for thyroid cancer, indeterminate thyroid nodules, and compressive thyroid goiters. It is highly successful surgery. Patients with localized thyroid cancer carry a 5-year survival rate of 99.9%. Those with regional metastasis have a survival of 97.4%. Only 5% of patients presenting with thyroid nodule are diagnosed with thyroid cancer. Another 20% are indeterminate on needle biopsy.

Fine needle aspiration has obviated the need for thyroidectomy in majority of patients with small nodules under 4-5 cm, when confirmed benign. It is only very large benign nodules that may require elective thyroidectomy.

The rate of complications for thyroidectomy is low with 1-2% rate of vocal cord paralysis, and <1% rate of permanent hypoparathyroidism. Hemithyroidectomy has become an outpatient procedure. Most patients with total thyroidectomy have a short overnight hospital stay. Surgical pain is minimal and it's management easy.

Robotic assisted thyroidectomy aims at eliminating the neck incision by placing more incisions in a remote position from the neck. Hence its main aim is esthetic in nature. Techniques of robotic access to neck are evolving. Technical advances in robotic assisted thyroidectomy will be reviewed. The current techniques will be reviewed critically in the context of its challenges, benefits, risks, healthcare system, and patient population requiring thyroidectomy.

State of the Art in Robotic Vascular Surgery

Petr Štádler, Assoc. Prof., MD, PhD

BACKGROUND – The feasibility of laparoscopic aortic surgery has been adequately demonstrated. Our clinical experience with robot-assisted aortoiliac reconstruction for occlusive diseases, aneurysms, endoleak II treatment and hybrid procedures performed using the da Vinci system is herein described.

METHODS – Between November 2005 and April 2012, we performed 250 robot-assisted vascular procedures. 189 patients were prospectively evaluated for occlusive diseases, 48 patients for abdominal aortic aneurysm, two for a common iliac artery aneurysm, two for a splenic artery aneurysm, one for a internal mammary artery aneurysm four for hybrid procedures, and four for endoleak II treatment post EVAR.

The robotic system was applied to construct the vascular anastomosis, for the thromboendarterectomy, for the aorto-iliac reconstruction with a closure patch, for dissection of the splenic artery, and for the posterior peritoneal suture. A combination of conventional laparoscopic surgeries and robotic surgeries were routinely included. A modified, fully-robotic approach was used in the last 80 cases in our series.

RESULTS – 241 cases (96,4%) were successfully completed robotically, one patient's surgery was discontinued during laparoscopy due to heavy aortic calcification. In eight patients (3,2%) conversion was necessary. The thirty-day mortality rate was 0,4%, and non-lethal postoperative complications were observed in 13 patients (5,2%).

CONCLUSIONS – Our experience with robot-assisted laparoscopic surgery has demonstrated the feasibility of this technique for occlusive diseases, aneurysms, endoleak II treatment post EVAR and hybrid procedures. The da Vinci robotic system facilitated the creation of the aortic anastomosis, and shortened the aortic clamping time as compared to purely laparoscopic techniques.

Telesurgery with Haptic Sensation-Experimental Use

Michael Stark, MD

Any new surgical method should add value to existing ones. Telesurgery is claimed to have many advantages in various disciplines like urology. In the gynecology and gynecologic oncology the benefits over traditional endoscopy is still controversial.

There are claims that the use of robotic surgery results in fewer conversions to laparotomy, shorter hospitalization and less blood loss.

The operative time of the total endoscopic group was significantly shorter than the robotic hysterectomy group (111.4 vs. 150.8 minutes p=0.0001), but the robotic hysterectomy group had statistically less blood loss than the endoscopic group (131.5 mL vs. 207.7 mL, p=0.0105).

The long operation time when using robotic surgery is probably due to the lack of haptic feedback. In a novel European telesurgical system this problem was solved, and the surgeon can feel the tissue consistency and of the knots tensility, which makes the telesurgical endoscopic procedure as similar as possible to open surgery. In experimental surgeries the haptic sensation contributed to the self-confidence of the surgeon.

The natural perception and dexterity, the efficient control of the endoscopic view and instruments, together with the quick docking and the possibility to access the patients from every side in case of an emergency contributes to the safety of the endoscopic procedure.

We will argue and insist that telesurgery should have defined indications and should not be used unless prospective comparative studies have proven its superiority over conventional endoscopy.