

ABSTRACTS

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Poster Presentation #2
 Cardio Thoracic Surgery

EFFECT OF INTRAOPERATIVE FLUIDS ON OCCURRENCE OF POST-OPERATIVE ATRIAL FIBRILLATION AFTER ROBOTIC-ASSISTED PULMONARY LOBECTOMY

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Purpose: We investigated whether intraoperative fluids given to patients during robotic-assisted pulmonary lobectomy correlate with frequency of postoperative atrial fibrillation (PostOp Afib).

Materials and Methods: We retrospectively studied all patients who underwent robotic-assisted pulmonary lobectomy from September 2010 through May of 2017 by one surgeon. A total of 419 patients were analyzed for types and volumes of intraoperative fluids received, such as intravenous (IV) crystalloid, colloid, packed red blood cells (PRBC), fresh frozen plasma (FFP), platelets, and phenylephrine, for fluids that were lost during surgery, such as estimated blood loss (EBL) and urine output (UOP), and for the calculated balance of these fluids. These patients were then analyzed based on whether they had PostOp AFib (n=39) or not (n=380). We also grouped patients by level of intraoperative crystalloids given (<1500 mL, n=86; 1500-2500 mL, n=211; >2500 mL, n=122) and analyzed differences in demographics and in perioperative complications and outcomes. Statistical significance was defined as p-value≤0.05.

Results: Patients who had PostOp Afib had a significantly higher mean fluid balance than those without PostOp AFib (2273±499 mL vs 1532±100 mL; p=0.034), while none of the IV fluids given, including PRBC, FFP, platelets, or phenylephrine, nor EBL or UOP significantly differed between the two groups. When grouped by IV crystalloid volume received, proportionately more females receive <2500ml IV crystalloid, while proportionately more males received >2500 ml (p=0.012). Higher IV crystalloid volumes correlated with higher rates of intraoperative complications (p<0.001), which was mainly bleeding (p<0.001) during the robotic portion of the procedure (p<0.001), higher rates of overall conversions (p<0.001), emergent conversions due to bleeding (p<0.001), and elective conversions due to pleural or tumor adhesions (p=0.001), and higher rates of postoperative complications regardless of whether these were solely cardiac complications (p=0.003), solely pulmonary complications (p=0.012), or combined pulmonary and cardiac complications (p=0.001), but no individual complications correlated with IV crystalloid volume received (all p>0.206). Higher IV crystalloid volumes also correlated with EBL (p<0.001), skin-to-skin operative time (p<0.001), chest tube duration (p=0.006), and hospital length of stay (LOS; p=0.004)

Conclusion: Occurrence of PostOp Afib was associated with greater positive fluid balances after robotic-assisted pulmonary lobectomy, but not with greater volumes of crystalloid, colloid, PRBC, FFP, platelets, or phenylephrine received nor with EBL or UOP. Higher IV crystalloid volumes received were associated with higher conversion rates, EBL, and operative times, increased pulmonary and/or cardiac complication rates, and longer chest tube duration and hospital LOS.

Poster Presentation #4 General Surgery

ROBOTIC COLORECTAL RESECTION AND ERAS: THE MOVE TOWARDS SAME DAY SURGERY

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Purpose: Enhanced recovery after surgery protocols (ERAS) using a multimodality approach have been used to reduce hospital stay and improve patient satisfaction and outcomes for a variety of surgical procedures. The purpose of this study was to determine if the addition of an ERAS protocol would be of benefit to patients undergoing robotic colorectal resection at our institution. We report a single surgeon experience of our first 100 patients undergoing robotic colorectal resection under our ERAS protocol.

Materials and Methods: The first 100 patients included 49 males and 51 females with a mean age of 61 (range 32-85). 99 procedures were completed robotically with one conversion. The most common indications for surgery were diverticular disease (53), cancer (32) and adenomas (11). The most common procedures performed were sigmoid/left colon resection (64), right hemi-colectomy (23) and low anterior resection (10). Average procedure time was 154 minutes with range of 72-301 minutes. Preoperative steps focus on nutrition, exercise and spirometry. Operative management includes transverse abdominal plane (TAP) blocks, goal directed fluid therapy, minimizing narcotics and the use of Exparel® at the end of the procedure. Postoperative management includes early ambulation in the post anesthesia care unit, minimizing narcotics, liquid diet immediately and a discontinuation of intravenous fluids when tolerating oral intake.

Results: Length of stay ranged from 1-6 days with a mean of 1.59 days. 56% of patients were discharge home on postoperative day (POD) 1. 90% of patients were discharged by POD 2 and 97% were discharged home by POD 3. Three patients required readmission. Two patients were readmitted for postoperative ileus. One had been discharged on POD 1 and the other on POD 2. Both patients were managed conservatively with additional hospital stays of 3 and 4 days respectively. One patient discharged on POD 1 was readmitted with a pneumonia on POD 6 requiring 3 additional days hospitalization.

Conclusion: Prior to the adoption of a robotic approach to colon and rectal resections, our length of stay for laparoscopic resection was 4.42 days. Conversion to a robotic technique produced multiple benefits including a reduction in procedure time and conversion rates which helped reduce length of stay to 3.23 days. The addition of an ERAS protocol to our robotic approach added an additional 50% reduction in length of stay to 1.59 days. We have found the combination of a robotic approach with an ERAS protocol for patients requiring colorectal resection provided a significant reduction in length of stay compared to our earlier approach while maintaining a low rate of readmission.

Poster/Oral Presentation #5 General Surgery

MORBIDITY AND MORTALITY IN COMPLEX ROBOT ASSISTED HIATAL HERNIA SURGERY

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Purpose: Robot-assisted surgery in diaphragmatic hiatal hernia repair is rapidly gaining popularity in complex cases and redo surgery. However, published data regarding this approach are mainly limited to small cohorts. This study aimed to provide information on the safety of robot-assisted diaphragmatic hiatal hernia repair and anti-reflux surgery in a high-volume center.

Materials and Methods: All patients that underwent robot-assisted diaphragmatic hiatal hernia repair between 2011-2017 at the Meander Medical Centre, Amersfoort, the Netherlands were evaluated. This included all redo procedures. Analysis was performed on intraoperative details, 30-day morbidity and mortality. Complications were classified according to the Clavien-Dindo classification. Major complications were defined as Clavien-Dindo $\geq 3b$.

Results: *Primary Surgery* 215 primary surgeries were performed by two surgeons in total. The median age was 67 (IQR 58-73) years. The majority of the patients had an American Society of Anaesthesiologists (ASA) score of 2 (ASA1 18.1%; ASA2 65.1%; ASA3 16.1%; ASA4 0.5%). 82.8% of patients had a type III or IV hernia (9.8% Type I; 1.4% Type II; 44.7% Type III; 38.1% Type IV). In 2.8% no herniation was seen perioperatively. In 3.7% of procedures conversion to open surgery was required. 16.7% of patients experienced complications of any severity. The incidence of major complications was 5.6%. Nine patients (4.2%) were readmitted within 30 days. Symptomatic early recurrence occurred in 0.9%. The 30-day mortality was 0.9%.

Redo surgery 151 redo procedures were performed by two surgeons in total. The median age was 60 (IQR 51-68) years. The majority of the patients had an ASA score of 2 (ASA1 22.5%; ASA2 70.9%; ASA3 6.6%). In 2.0% the procedure was converted to open surgery. The overall incidence of complications of any severity was 11.3%, while the incidence of major complications was 2.6%. Three patients (2.0%) were readmitted within 30 days. One patient (0.7%) had a symptomatic early recurrence. No patients died in the 30-day postoperative period.

Conclusion: This study showed that robot-assisted laparoscopic repair of a diaphragmatic hiatal hernia is a safe procedure when performed in an experienced high-volume center and can safely be applied in complex cases and redo surgery.

Poster/Oral Presentation #6 General Surgery

THE ABILITY TO PERFORM SIMPLE AND COMPLEX LAPAROSCOPIC OPERATIONS AS SOLO-SURGERY – A RANDOMIZED CONTROLLED TRIAL OF ROBOTIC- VERSUS HUMAN CAMERA ASSISTANCE

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Purpose: Due to increasing healthcare costs and demand for care, ways to make laparoscopic operations more efficient are sought after. The introduction of robotic camera enabled surgeons to perform solo-surgeries. In this study the use a robotic camera holder (AutoLapTM) is compared to conventional surgical procedure.

Materials and Methods: A total of 50 procedures were performed with the AutoLapTM system and 50 procedures with human camera assistance. Stratified block randomisation was used for group allocation. Four types of surgery were included: right hemicolectomy, fundoplication, sigmoid resection and cholecystectomy. During all operations it was recorded whether the operation was carried out as solo-surgery. In addition, the duration of the operation (skin-to-skin), length of hospital stay, number of cleaning moments of the laparoscope and the user experience of the AutoLapTM system were recorded.

Results: The randomization was successful per procedure. Nine right hemicolectomies (five AutoLapTM, four control), 43 funduplications (21 AutoLapTM, 22 control), seven sigmoid resections (three AutoLapTM, four control) and 41 cholecystectomies (21 AutoLapTM, 20 control) were performed. Mean ASA scores (1.78 vs. 1.72), age in years (58.8 vs. 52.7) and BMI (26.7 vs. 27.3 kg / m²) were not significantly different between both groups. In the AutoLapTM group, 49/50 (98%) of the operations were carried as solo-surgery. The average total operating time (62.5 versus 57.9 minutes) was not significantly different, as was the operating time per procedure, cleaning of the laparoscope (2.5 versus 2.6) and the length of hospitalization. The questionnaires also showed excellent user satisfaction of the AutoLapTM system (2.3 on a scale of 1-7).

Conclusion: With the use of the AutoLapTM system, both simple and complex operations can be performed as solo-surgery. The operative time remains unchanged when using the AutoLapTM system. There were also no objections with regard to safety and patient-related outcomes.

Poster Presentation #7
General Surgery

FLUORESCENCE-GUIDED ROBOTIC RIGHT COLECTOMY WITH COMPLETE MESOCOLIC EXCISION, D3 LYMPHADENECTOMY AND BOTTOM-TO-UP APPROACH

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Purpose: In robotic right hemicolectomy for cancer, appropriate lymphadenectomy and anastomotic leak prevention are critical. Moreover, the identification of the site of an initial tumour can be demanding. Visualization of draining lymph nodes, site of primary tumour and blood flow with near-infrared (NIR) fluorescence DaVinci® imaging system is a recent development. We present the technique of robotic right colectomy with complete mesocolic excision (CME) and D3 lymphadenectomy using Indocyanine Green (ICG) fluorescence.

Materials and Methods: The day before surgery, in patients scheduled for robotic right colectomy a colonoscopy is performed and four injections of 1.5 ml of ICG solution are realized around the tumor in the submucosa. Robotic right hemicolectomy is performed with suprapubic trocars layout and bottom to up dissection, realizing a CME with central vessel ligation and a D3 lymphadenectomy. Site of primary tumour is identified as a fluorescent colonic area, and lymphatic basin is visible with the Firefly camera modality. In the case of fluorescent lymph nodes (LN) detected outside standard lymphadenectomy area, these are removed with the "berry-picking" technique. ICG is then intraoperatively administered intravenously (0.05 mg/kg of ICG solution at a dilution of 2.5 mg/ml) to objectively assess bowel perfusion before bowel anastomosis. After a short time (approximately 30–60 s), perfusion of terminal ileum and colon is visually confirmed. In cases of malperfusion the resection is extended. Facultatively intravenous ICG administration can be performed after anastomosis to confirm its adequate perfusion.

Results: From July 2016 to september 2017, 32 patients received a robotic right colectomy with CME, D3 lymphadenectomy and bottom-to-up approach with Da Vinci Xi system. ICG intravenous injection was realized in all patients, with a correct visualization of bowel stumps perfusion in 100% of cases. The site of bowel resection was never changed because of malperfusion. In 12 patients, ICG submucosal injection was performed: visualisation of the site of primary tumour was possible in all cases, LN in the D3 area were identified in 11/12 patients (92%); in 5/12 patients (42%), LN out from anatomical lymphatic basin were identified. No side effects were observed.

Conclusion: In this series, intravenous and submucosal ICG injection confirmed to be feasible and safe; identification of site of primary tumour and of bowel stumps perfusion were possible in all cases. The accuracy in identification of D3 lymphatic basin was high, thus permitting an image-guided radical lymphadenectomy. Fluorescent technology represents an interesting innovation to ameliorate surgery of colon cancer.

Poster Presentation #8 General Surgery

ERGONOMICS OF LAPAROSCOPY: ROBOTIC- VERSUS HUMAN CAMERA CONTROLLED – A RANDOMIZED CONTROLLED TRIAL

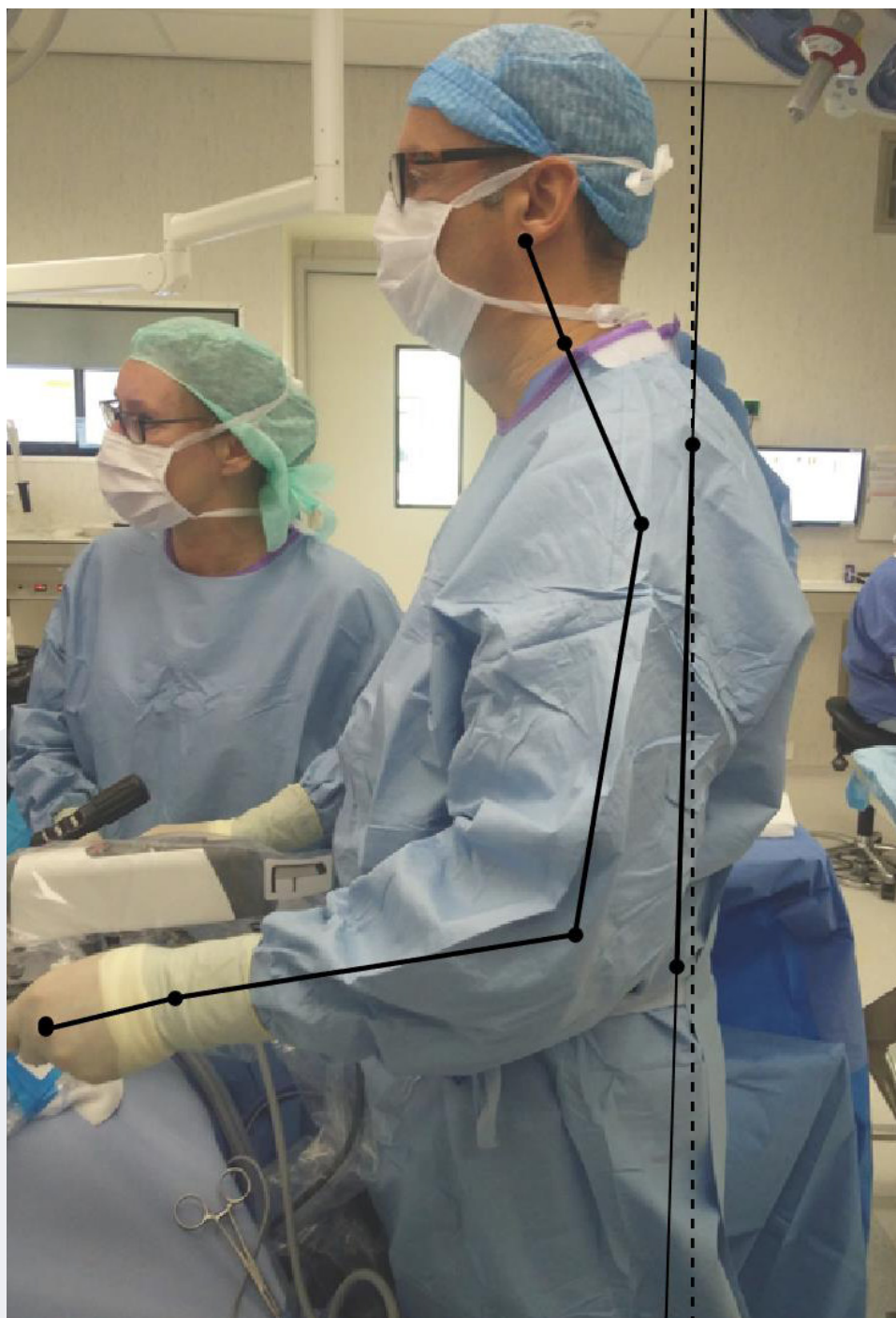
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Purpose: Minimal invasive surgery has become the gold standard due to distinct benefits for the patients over open surgery. However, laparoscopy has an increased burden to OR-personnel and many experience fatigue and physical discomforts. This study aims to evaluate if a robotic camera holder (AutoLap) can improve the ergonomics of the surgeon and camera-assistant during laparoscopy.

Materials and Methods: A total of 30 cases were included and randomized using stratified block randomization (15 AutoLap, 15 control). Five types of surgery were included: right hemicolectomy, fundoplication, sigmoid resection, rectopexy and low anterior resection. Posture of the surgeon and assistant were photographed during pre-defined steps of the procedure. MATLAB was used to calculate the necessary angles for the RULA score. Two investigators assessed the RULA score independently. Also, subjective questionnaires (SMEQ, NASA TLX, LED) were used to assess mental and physical discomfort.

Results: Randomization was successful, no differences in patient characteristics were observed. 16 fundoplication, seven right hemicolectomies, five sigmoid resections, one rectopexy and one low anterior resection were performed. The mean RULA score of the surgeon was not significant different, 2.58 (AutoLap) versus 2.72 (control). The mean RULA score of the assistant was 2.55 (AutoLap) versus 3.70 (control), $p=0.000$. The inter-observer variability (ICC) was 0.93 and 0.965, which is excellent. The questionnaires showed a significant difference for the assistant for LED (0.7 vs. 10.47), SMEQ (28.8 vs. 53.3) and the NASA TLX on all domains: mental (4.97 vs. 7.17), physical (4.10 vs. 9.00), temporal (2.8 vs. 5.47), performance (4.07 vs. 6.53), effort (4.93 vs. 8.13) and frustration (2.77 vs. 4.53) in favor of the AutoLap system.

Conclusion: The ergonomics and current setting are still not optimal. The posture of the assistant is improved with the aid of a robotic camera holder, while the ergonomics of the surgeon remains unchanged. Moreover, the subjective work load is reduced with the use of robotics. Finally, OR-personnel should receive instructions how to improve posture and pay more attention to it.



Angle measurement with MATLAB used for the calculation of the RULA score

Poster Presentation #9
Innovative Technologies

THERMAL-BASED SLIP SENSING FOR IMPROVED, INTELLIGENT GRASPING AND MANIPULATION OF BIOLOGICAL TISSUES IN ROBOT-ASSISTED SURGERY

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Purpose: Grasping and manipulation of biological tissue are crucial processes during robot-assisted surgery. They enable standard tasks like dissecting, moving, stabilizing, and suturing tissue, but they require surgeons to balance two competing goals: maintaining grasp stability while avoiding damage due to excessive grip force[1,2]. An intelligent system that could aid a surgeon in maintaining a stable and atraumatic grasp on tissue would allow them to focus on the clinical task and potentially improve safety and efficacy. To this end, we investigate slip detection of grasped tissue and aim to detect it within 3mm, or far less than a typical grasper width. Our target procedures include any grasping process where it would be dangerous, annoying, and/or time-consuming to the surgeon if tissue slip or rupture occurred. The source of this aggravation may be loss of a difficult-to-establish critical view, gushing blood inhibiting a clear view, tissue damage, or leak of an infectious fluid.

Materials and Methods: Because tissue is moist, conformable, and delicate and the sensor must work in a surgical environment, this application requires a departure from conventional slip sensing methods. The proposed sensor has thermal probes surrounding a heating element which establishes a thermal gradient in grasped tissue[3]. When an object in contact with the sensor slips, the spatial temperature distribution generated in the tissue shifts over the thermal probes. Thus, the temperature signal is related to slip onset and direction. This sensor has been integrated into a tool compatible with the da Vinci® Surgical System, and experiments were conducted to validate its performance and establish a detection threshold on ex vivo porcine lung, esophagus, ovary, fallopian tube, and intestine. We then tested slip detection during realistic tissue manipulation. To avoid cognitively overloading surgeons, we developed an algorithm to first identify when the surgeon has established a stable grasp on tissue and then check for release of tissue or a slip event. This algorithm requires sensor fusion with the da Vinci® Surgical System and ensures slip detection only occurs when relevant. Tissue motion was measured using optical tracking techniques.

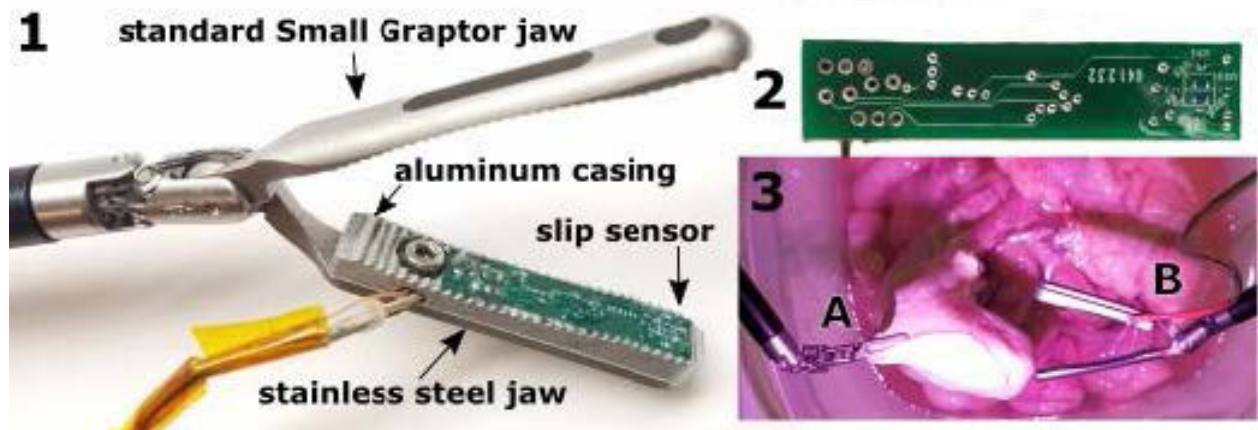
Results: The sensor detected tissue slip within 2mm on average for all tested tissues, far below our design specification. Sensor responsiveness increased as slip onset velocity decreased. In our tissue manipulation experiments, our algorithm robustly identified stable grasps, slip events, and tissue release without missing any manipulation events.

Conclusion: The proposed thermal-based sensing method is suitable for the proposed application. The presented sensor is integrated with a da Vinci EndoWrist instrument and has validated slip sensing performance on five types of recently excised porcine tissue. Sensor fusion was implemented with the da Vinci Surgical System, and the ability to detect slips after identifying stable grasps using a novel algorithm was demonstrated. Future work will include user studies to test the sensor's ability to detect slip before the user and compare various feedback methods.

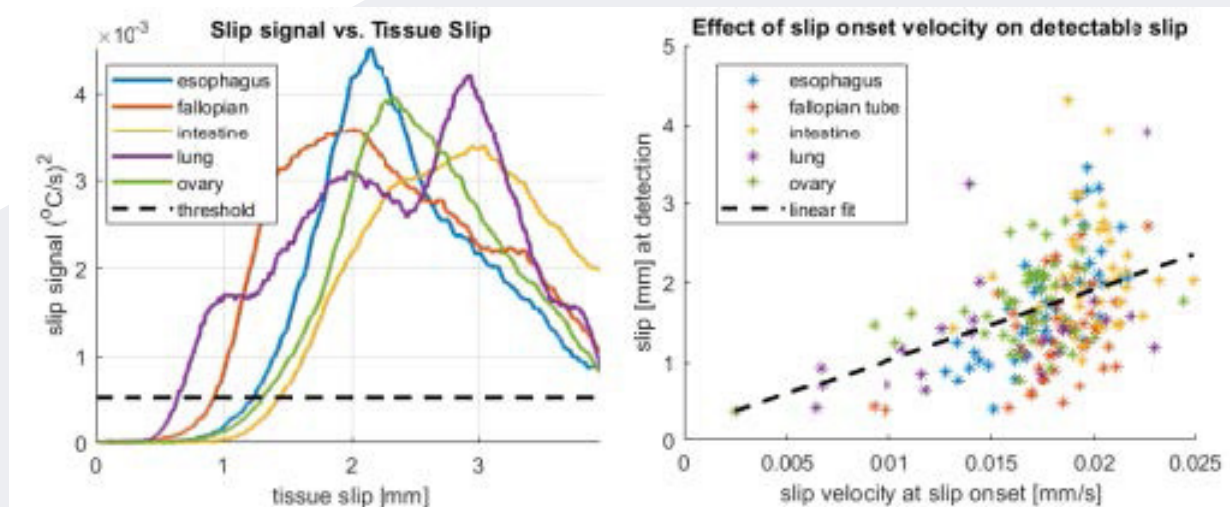
[1]De et al., BioRob2006.

[2]Cartmill et al., ANZ Journal of Surgery 1999.

[3]Burkhard et al., IROS2017.



1: Slip sensor on Intuitive Surgical EndoWrist instrument. 2: Sensor PCB. 3: Porcine tissue manipulation experiment on with (A) grasper and (B) slip sensing instrument.



Top: Onset slip velocity vs. detectable slip; moderately linear correlation.
Bottom: Mean signal vs. porcine tissue slip. Mean slip < 1mm.

Poster Presentation #10 Innovative Technologies

MULTISPECIALTY SINGLE PORT ROBOTIC TECHNOLOGY APPLIED IN THE LIVE ANIMAL MODEL: PROOF OF CONCEPT

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Purpose: As the field of robotic surgery advances and technology improves, delivering a less invasive surgical option that continues to decrease the morbidity associated with multi-port laparoscopic and open surgery is at the forefront of most companies' design efforts. In this light Titan Medical Inc. (Toronto, Ontario) is developing a single port robotic platform (SPORT Surgical System) that can be utilized across multiple surgical specialties.

Materials and Methods: The SPORT Surgical System is a single port robotic platform that is comprised of two main components: a surgeon workstation and a patient cart. The surgeon workstation is where a surgeon operates the multi-articulated instruments and 3D high-definition camera using a natural handle interface and a 3D high-definition flat-screen display. The patient cart is a single boom system which suspends a central unit that connects to the 3D high definition camera and two 8mm multi-articulating exchangeable instruments. The SPORT Surgical System offers a comprehensive set of instruments including monopolar and bipolar instruments along with needle drivers and graspers. The SPORT Surgical System was installed at the Florida Hospital Nicholson Center training facility in September 2017 to conduct feasibility studies. To date, there have been five surgeons across three specialties who have used the single port technology to perform a variety of specialty-specific procedures on live animals.

Results: The five surgeons performed eleven procedures on nine live animals. The three specialties involved were urology, colorectal surgery, and gynecology. All three of the urological surgeries performed were renal procedures. The first two procedures were attempted by a combination of two surgeons (attending and fellow). These procedures were attempted to assess feasibility/ease of port placement and the docking process. Once access was achieved, hilar dissection with identification/isolation of the renal artery, vein, and ureter were completed. The third urologic procedure was a partial nephrectomy which was completed with a cross clamp time of twelve minutes. After initial evaluation and usage of the SPORT Surgical System by the urology team other specialties became involved. Four procedures were performed by the colorectal surgeons. Two colectomies were completed without incident, one by a single surgeon and a combination of two surgeons for the second. The other procedures performed were a low anterior resection and a cholecystectomy. The gynecologist completed four hysterectomies in total. The first two were simple hysterectomies with bilateral salpingo-oophorectomies and pelvic lymphadenectomies. The second two were radical hysterectomies with radically wide margins and pelvic/para-aortic lymphadenectomies. There were no conversions to open procedures or major complications in any of the procedures.

Conclusion: The SPORT Surgical System is a robotic single port platform that has been shown to be successful in the live animal model across several specialties. In our experience, multiple surgeries have been completed by multiple surgeons of varying experience with this developing technology. Further study and evaluation of more data points with eventual transition to the human model needs to be undertaken, but as of now the SPORT Surgical System by Titan Medical is proving to be a feasible and reliable advancement in the field of single incision robotic surgery.

Poster Presentation #11
Innovative Technologies

IMAGE ANALYSIS OF ENDOSCOPIC CAMERA STEERING: ROBOTIC VERSUS HUMAN CONTROLLED - A PHANTOM STUDY

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Purpose: Multiple passive and active camera holders have been developed to improve camera control during surgery. All systems currently on the market use a certain interface (eyeball tracking, head movements, joystick, voice control, foot pedals etc.) to control the laparoscope, which can only move in one direction at a time. A different method of steering based on image analysis ("Go-to mode") has been developed that is not limited to perpendicular movement alone. In this article the effectiveness of the "Go-to mode", an image-based steering method is compared to conventional steering methods.

Materials and Methods: A total of four test subjects, all with extensive experience in laparoscopic surgery have been enrolled in this phantom study. The participants have conducted a camera steering exercise on a specially designed phantom with 3D printed organs. Three modes of operation were compared in randomised order, Go-to mode and joystick mode (both AutoLap™), and human control. Steering of the laparoscope was evaluated by execution time, pathlength, subjective experience (SMEQ, NASA TLX) and learning curve. The learning curve was determined by comparing the first half of measurements with the second half. The pathlength was measured using the SURF algorithm (image analysis). Repeated measures ANOVA was used to analyse the results.

Results: A total of 279 camera steering exercises were performed by four test subjects. The Go-to mode was superior in terms of execution time and pathlength compared to joystick mode (114.2 versus 122.1 seconds). Human controlled (45.0 seconds) was the fastest mode of control, $p=0.000$. The 'Go to mode' turned out to be very intuitive: only a small learning curve could be determined (121.0 versus 115.5 seconds). Joystick mode showed the longest learning curve (140.7 versus 117.7 seconds). By analyzing the SMEQ, the Go-to mode (23.6) took the least amount of effort to execute, followed by human control (31.7) and joystick mode (41.4), $p=0.000$. The NASA TLX questionnaire showed similar results for Go-to- and human control. Joystick-mode scored significant lower than Go-to mode on all dimensions, $p=0.000$.

Conclusion: Image based steering is superior to conventional joystick steering in terms of execution time, pathlength and subjective user experience. In terms of user experience it is comparable with human controlled steering. Robotic control of the laparoscope, using advanced image analysis, is a promising technique to ensure optimal image quality during laparoscopic surgery.



A photo of the test setup

Poster Presentation #12 Innovative Technologies

SEEKING THE IDEAL ROBOTIC TRAINING EXPERIENCE: A COMPARISON OF FIVE ROBOTIC SURGERY SIMULATION TRAINING PROGRAMS

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Purpose: It has recently become increasingly difficult to provide adequate training in all forms of surgery including Open, Minimally Invasive and Robotic. Many residents feel unprepared to operate with proficiency in all areas after graduation. Simulation has been shown to be beneficial in helping students master psychomotor skills in a safe environment prior to performing live surgeries. Although many institutions are relying on simulators as part of their training, there has been no consensus on what training best leads to proficiency.

Materials and Methods: This study compares the outcomes of five different robotic surgery simulation training programs from four institutions. Each program developed its own definition of proficiency based on achieving passing scores on exercises that demonstrated both surgical efficiency as well as avoidance of critical safety errors. The courses varied from a labor intensive one-week course requiring 102 exercises successfully passed to less rigorous courses spread out over one year requiring 22-54 exercises to pass. Data was collected and analyzed for each student and for the programs in aggregate. We evaluated the time required for students to reach "proficiency" in each program as well as the range and the total numbers of students who actually achieved this status. The students were primarily General Surgery Residents and Fellows (88%) with other specialties represented as well.

Results: The programs had variable definitions of "proficiency." The number of successfully completed exercises to become proficient at each program varied quite a bit and amounted to 22, 39, 45, 54 and 102 exercises respectively. The average time spent to become 100% proficient however ranged between 4.3 and 5 hours for those students who achieved this. The number of trainees who achieved proficiency ranged from 0% in two programs to 70% in a program that only required one successful passing grade for each exercise (22). For the three programs that required two consecutive passes with three or five total passes per exercise, 31.7% of students achieved "proficiency" in the programs with 39 and 46 exercises, and 12.5% succeeded in the program that required 102 passing exercises.

Conclusion: Based on this comparison of five innovative robotic training programs, it is clear that there is no consensus on what is "proficiency" and what is the best curriculum for today's residents and fellows. Having a simulator available does not ensure that students will utilize it in the most effective ways to improve their skills. While all students benefited by showing improvement in overall scores while using simulation, only a small percentage of students were able to achieve "proficiency" as defined by their programs. These students may have more innate ability to perform robotic surgery. Also, other programs may have been too short or too busy. The programs with ongoing longterm commitment to simulation had more success in students achieving passing scores than did the shorter, focused courses. However, it is clear that passing a series of exercises only once does not in reality mean that the learner is proficient. This comparison can help program directors develop more useful and reproducible training curricula.

Poster Presentation #13

Urology

URETEROENTERIC STRICTURES FOLLOWING TOTALLY INTRACORPOREAL ROBOT ASSISTED RADICAL CYSTECTOMY WITH BRICKER ILEAL CONDUIT, CAN WE IMPROVE THE NUMBERS USING ROBOT ASSISTED TECHNIQUE?

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Purpose: Ureteroenteric strictures (UES) is one of the most frequent complications of a Bricker ileal conduit. Usually the left ureter is involved probably due to compromised vascularization. The potential benefit of the three-dimensional high-definition robotic approach is a hypothetical refinement of the surgical technique. The aim would be an improved conservation of the ureteric blood supply. We report the UES results of a single centre prospective cohort of robot assisted cystectomies and intracorporeal reconstruction (RARC-IC).

Materials and Methods: From november 2010 till july 2017 a total of 173 patients were operated. For 153 patients a minimal follow-up of 6 months was available. In 143 patients a Bricker reconstruction was performed. All (a)symptomatic UES were reported and analyzed.

Results: A total of 115 men and 28 women, mean ASA-score of 2, mean age of 69 yrs, BMI of 27 (range 16-38) and follow-up of 29 months (range 6-81). Left-sided UES was seen in 14 patients (9,8%), no right-sided UES. Mean time to presentation was 149 days postoperatively. Two patients (1,4%) developed EUS within 30 days and were initially treated with a nephrostomy followed by open reimplantation.

Conclusion: RARC-IC does not seem to result in lower rates of UES compared to an open approach. In half of the patients UES was treated endourological, although open surgery was sometimes invaluable. The learning curve did not appear to change the outcome. Mean time to presentation was 149 days in this study. We propose that database registration should always include long-term complications such as UES.

Poster Presentation #14

Urology

PERIOPERATIVE OUTCOME AND COMPLICATIONS FOLLOWING LAPAROSCOPIC VERSUS ROBOTIC-ASSISTED DISMEMBERED PYELOPLASTY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Purpose: Pelvi-ureteric junction obstruction (PUJO) can be treated by robotic-assisted or laparoscopic pyeloplasty, with the dismembered (Anderson-Hynes) technique being most common. Previous comparisons of robotic-assisted pyeloplasty (RP) and laparoscopic pyeloplasty (LP) have been difficult due to a paucity of comparative studies. We therefore aimed to analyse the current difference between dismembered RP and LP for PUJO patients by means of a systematic review and meta-analysis. Outcomes analysed were operative time, length of hospital stay, complication rate, and success rate. This study was registered with PROSPERO (no.42017056676).

Materials and Methods: PubMed, Medline and Embase databases were searched for studies comparing dismembered LP and RP between 1993 and June 26 2017. We also consulted experts, reviewed reference lists, used the related articles PubMed feature and reviewed scientific meeting abstracts. Operative time referred to total time in the operating room. Complication rate referred to any complication sustained intra- or post-operatively, classified using Clavien-Dindo grades. Success rate was defined as relief of related symptoms and absence of obstruction on renogram. Quality assessment of each eligible study was conducted using a modified Newcastle-Ottawa scale. The GRADE system was used to assess the overall quality of evidence for each outcome analysed. We performed subgroup analyses regarding patient age, single or multisurgeon experience, presence of complex renal anatomy, study quality, duration of follow-up, and Clavien-Dindo grades.

Results: From 4101 identified articles, 17 full-text studies met our eligibility criteria, encompassing 602 RP and 765 LP patients. This included the addition of previously unpublished data from the authors of an eligible study. All 17 studies were observational, 7 had high methodological quality, 13 were retrospective, 2 used patient matching and 6 were single surgeon experiences. Meta-analysis demonstrated that RP had a 27-minute shorter operative time (WMD: -26.71; 95% CI: -44.42 to -9.00; $p=0.003$) and a 1.2-day shorter length of hospital stay (WMD: -1.21; 95% CI: -1.84 to -0.57; $p=0.0002$). Significant heterogeneity was found when analysing operative time ($I^2=93\%$) that could not be explained through subgroup analyses. Significant heterogeneity was also found on analysing length of hospital stay ($I^2=94\%$). Subgroups examining adult patients ($I^2=45\%$), presence of complex renal anatomy ($I^2=33\%$) and high quality studies ($I^2=0\%$) may explain the heterogeneity of the overall effect for length of hospital stay. The quality of evidence for these 2 outcomes was rated as very low. RP also had a lower complication rate (OR: 0.56; 95% CI: 0.37 to 0.84; $p=0.005$) and a higher success rate (OR: 2.76; 95% CI: 1.30 to 5.88; $p=0.008$). However, given the excellent success and complication rates that LP normally produces, we question whether these statistical advantages translate into clinically-significant advantages. The quality of evidence for these 2 outcomes was rated as low.

Conclusion: For PUJO patients, RP is advantageous over LP concerning operative time, length of hospital stay, complication rate, and success rate. Our conclusions, however, are weakened by poor study quality and significant heterogeneity. In addition, whether statistical significance demonstrated here translates into clinical significance is an important question. Further high quality studies, particularly randomised controlled trials, are necessary to strengthen conclusions.

Poster Presentation #15

Urology

SINGLE CENTER EXPERIENCE OF SIMULTANEOUS EN-BLOC ROBOT-ASSISTED RADICAL CYSTECTOMY AND NEPHRO-URETERECTOMY – A SERIES OF 18 PATIENTS

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Purpose: To report surgical bench marks and perioperative outcome of simultaneous en-bloc robot-assisted radical cystectomy and nephro-ureterectomy.

Materials and Methods: After written informed consent, we prospectively enrolled consecutive patients undergoing simultaneous en-bloc robot-assisted radical cystectomy and nephro-ureterectomy in a prospective institutional database. All procedures were conducted by one surgeon, using DaVinci Si-HD®, a four-arm robotic system.

Results: We conducted the procedure (55.5% right-sided) in 18 patients, aged a mean of 73 years (SD 7.4). A majority of patients suffered from severe comorbidities (66.7% ASA III, 16.7% ASA IV). Indication for cystectomy was transitional cell cancer (TCC) of the bladder in 17 (94.4%) and prostate cell cancer in one patient. Nephrectomy indication resulted from TCC of the upper urinary tract in 4 (22.3%), from oncocytoma in 1 (5.5%), and from functionless kidney in the remaining patients (72.2%). Urinary diversion consisted in 13 (72.2%) ureterocutaneostomies and in 5 (27.8%) ileum conduits. The decision to perform ureterocutaneostomy was dictated either for palliative situations or 1) to reduce surgery duration due to severe cardiovascular and pulmonary comorbidities or obesity, or 2) to avoid bowel resection/anastomosis due to comorbidities or steroids intake. The median surgery duration was 319 min (interquartile range [Q1-Q3 267-369]), thereof 229 min console time (Q1-Q3 171-235). Median blood loss was 220 mL (Q1-Q3 200-250). We did not register any intraoperative complications or conversions to open surgery. Postoperatively, 4 patients suffered a Clavien-Dindo (CD) grade 1 (paralytic ileus), 2 patients CD-grade 2 (transfusion of 1 RBC and 4 RBCs), 1 patient a grade 3b complication (port hernia). One patient died 1 month after surgery from a newly diagnosed acute leukemia. After a median follow-up of 6.5 months (Q1-Q3 3.5-17.5), we registered one recurrence, a metachronous transitional cell cancer of the contralateral kidney 24 months after the initial procedure.

Conclusion: En-bloc robot-assisted radical cystectomy and nephro-ureterectomy was associated with moderate procedure duration, minor blood loss and minor morbidity even in patients with severe comorbidities.

Poster Presentation #16

Urology

FACTORS INFLUENCING CONTINENCE RECOVERY AFTER SALVAGE ROBOT-ASSISTED RADICAL PROSTATECTOMY FOR RECURRENT PROSTATE CANCER

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Purpose: The American Cancer Society's estimates that every year more than 160,000 men are newly diagnosed with a prostate cancer diagnosis in the United States. Approximately one-third of them are treated with radiation or focal therapy. At least 25% of them recur prostate cancer over a period of time. Very limited number of treatment options with curative intent are available for the recurrent prostate cancer (rPCa). Many surgeons have reservation over salvage radical prostatectomy (sRP) procedure due to higher complications rate and poor functional outcomes. We intended to analyze the factors affecting continence recovery after salvage robotic-assisted laparoscopic radical prostatectomy (sRALP).

Materials and Methods: We retrospectively reviewed the IRB approved database. Between 2008 and 2016, eighty patients underwent sRALP by a single highly experienced surgeon. Out of 80 patients, 63 had received radiation therapy (external beam-38, brachytherapy- 13, both -12) and 17 had received other focal therapy (cryotherapy-9 or HIFU-4 or microwave/electroporation-4). Median follow up time was 24 months ranging from 12-72 months. Full continence was defined as no need to use pads to control urine leakage. We analyzed the parameters predicting continence recovery following sRALP. Univariate and multivariate logistic regression analysis was performed using software SPSS v24.

Results: Median Age was 65 years and pre-operative mean PSA was 4.4 ng/ml. Overall 60% (48/80) men regained full continence and median time to achieve continence was 3 months. 52% (33/63) regained complete continence after sRALP post radiation and another five patients required less than 2 pads per day. Whereas 88% (15/17) were completely continent after sRALP for recurrence after focal therapy other than radiation. Our study showed that age and BMI did not affect the continence outcomes in sRALP ($p > 0.05$). Similarly, oncological and nerve spare status did not predict the continence outcome. Radiation vs other focal therapy was the only factor that predicted continence outcome in multivariate logistic regression analysis.

Conclusion: Full continence was regained in 60% of men following sRALP in a highly experienced surgeon's hands. Compared to other forms of focal therapy, prior treatment with radiation adversely affected the continence recovery in salvage robotic-assisted radical prostatectomy. Patients may be counseled accordingly.

Parameters	All patients (n = 80)	Continence Achieved (n=48, 60%)	Continence Not Achieved (n=32, 40%)
Age	65 ± 6.5	66	67
BMI	28.7 ± 4.2	28.4 ± 4.4	29.3 ± 3.7
Pre-operative AUA score			
Mild Symptoms (1-7)	38 (48%)	25 (42%)	13 (41%)
Moderate Symptoms (8-19)	37 (46%)	20	17
Severe Symptoms (20-35)	5 (6%)	3	2
Prior Therapy			
EBRT/IMRT	38 (48%)	20	18
Brachytherapy	13 (16%)	6	7
EBRT + Brachytherapy	12 (15%)	7	5
Cryotherapy	9 (11%)	8	1
HIFU	4 (5%)	4	0
Others (Electroporation, Microwave)	4 (5%)	3	1
Preoperative PSA	4.4 ± 3.4	4.2 ± 2.9	4.7 ± 4.0
Clinical Stage T1	63	37 (77%)	26 (81%)
≥ T2	17	11 (23%)	6 (19%)
Pre-op D'Amico class			
Low Risk	21 (26%)	12	9
Intermediate Risk	31 (39%)	20	11
High Risk	28 (35%)	16	12
Pre-operative SHIM			
No Erectile Dysfunction (SHIM ≥ 22)	19 (24%)	15	4
Mild Erectile Dysfunction (SHIM 17-21)	17 (21%)	7	10
Mod to severe ED (SHIM < 17)	44 (55%)	26	18
Post-op Gleason Score			
Gleason Score ≤ 6	10 (12%)	5	5
Gleason Score = 7	39 (49%)	26	13
Gleason Score ≥ 8	31 (39%)	17	14
Nerve Sparing			
Non Nerve sparing (<50%)	35 (43%)	28	7
Partial Nerve Sparing (50-75%)	19 (24%)	12	7
Full Nerve Sparing (75-100%)	26 (33%)	12	14
Prostate weight	42.3 ± 13.2	42.2 ± 14.5	42.5 ± 11.0
PSA density	0.11 ± 0.09	0.10 ± 0.07	0.12 ± 0.11
PSM	15 (19%)	11	4
Post-operative anastomotic leak	14 (18%)	10	4
Catheter days (Mean, SD)	13.4 ± 9.3	13.1 ± 7.4	13.8 ± 11.8
Potency in preop SHIM > 17 (n=36)	13/36 (36%)	11	2
PSA Persistence	17 (21%)	11	6
PSA recurrence	8 (10%)	5	3
Peri-operative Hormone therapy	13 (17%)	10	3

Table 1. Demographic parameters of men that underwent salvage robot-assisted radical Prostatectomy

Parameters	Univariate analysis OR (95% CI)	p value	Multivariate analysis OR (95% CI)	p value
Age	0.97 (0.90-1.04)	0.45	0.98 (0.90-1.06)	0.60
BMI	1.05 (0.94-1.17)	0.34	1.04 (0.91-1.18)	0.58
Pre-operative AUA symptoms score (< 8 vs ≥8)	1.6 (0.64 – 3.92)	0.32	1.78 (0.58-5.44)	0.31
Prior Therapy (Other focal therapy Vs Radiation)	6.8 (1.44 – 1.34)	0.02*	7.3 (1.27 – 12.74)	0.03*
D'Amico class (Low/intermediate vs high risk)	1.2 (0.47-3.05)	0.70	1.04 (0.29 – 3.71)	0.94
Nerve spare (< 50% vs > 50%)	1.90 (0.76 – 4.80)	0.17	2.4 (0.77 – 7.46)	0.13
Anastomotic leak in cystogram	0.54 (0.15 – 1.91)	0.34	0.4 (0.08 – 2.0)	0.26
Prostate weight	1.0 (0.96-1.03)	0.93	0.98 (0.94 -1.02)	0.42
Catheter days	1.0 (0.96 – 1.05)	0.76	1.02 (0.95 -1.09)	0.59
Peri-operative hormone therapy	2.54 (0.64 – 10.0)	0.18	3.74 (0.8 – 7.3)	0.09

Table 2. Logistic regression analysis of factors influencing continence after salvage robotic radical prostatectomy (age, BMI, prostate weight, catheter days as continuous variables)

Poster Presentation #17

Urology

ROBOT PROSTATECTOMY STAGE MIGRATION: OUTCOME OF 3051 PATIENTS FROM TWO HIGH VOLUME ROBOTIC CENTERS OVER THE PAST 9 YEARS.

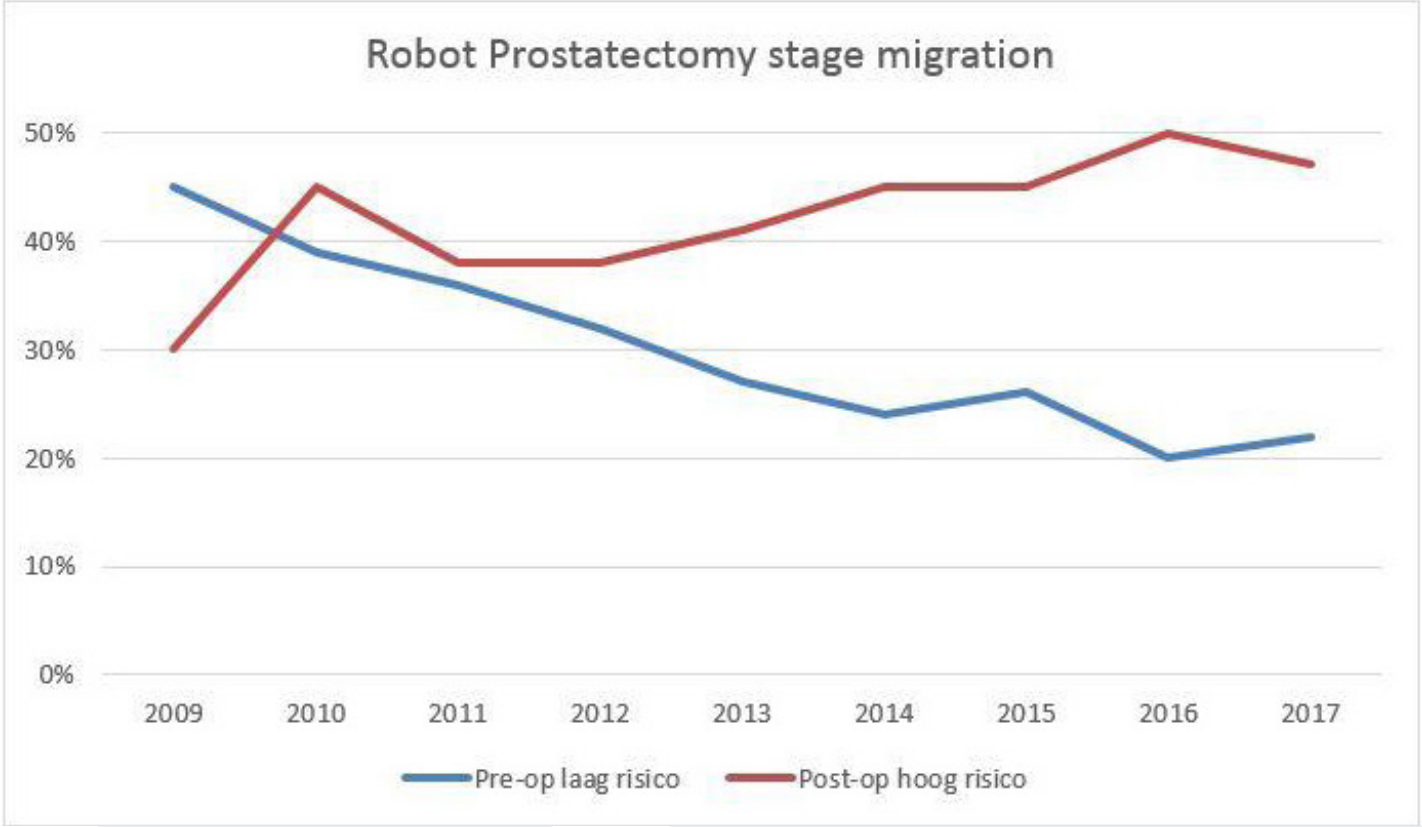
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Purpose: In recent years, prostate cancer has been proposed for active risk monitoring of Active Surveillance. In high risk prostate cancer, the indication for prostatectomy is indicated more and more. In the diagnostic process, an MRI scan is used more frequently. This may change the risk group distribution; patients who are currently undergoing a prostatectomy may have a prostate cancer with a higher risk profile than before. The aim of the study is to confirm this stage of migration.

Materials and Methods: Retrospective analysis of two partly prospective datasets. The interventions took place between January 2009 and July 2017. Pre-risk stratification based on iPSA, cT and biopsy Gleason Grade Group (GGG); low (GGG1, PSA <10, cT1c-2a), medium (GGG2, PSA10-20, cT2b) and high (GGG3,4,5, PSA > 20, cT3) risk. Post-risk groups based on pT and Gleason Grade Group; low (pT2abc and GGG1,2) or high (pT3ab and / or GGG3,4,5) risk.

Results: A total of 3051 patients underwent a robot-assisted radical prostatectomy (RARP) in two Dutch high volume centers. Pre-operative average PSA 11.7 (0.6-170) and risk distribution as follows: low 29%, average 42% and high risk 29%. Post-operative low risk 57% and high risk 43% of patients. See the graph for stage migration shown over the years. We saw a significant decrease in pre-operative low-risk patients (45% to about 20%) and a significant increase in post-operative high risk patients (30% to about 50%). Pre-operative or high-risk groups are significant predictors of post-operative high risk prostate cancer ($p < 0.01$ and HR 3.7 and 12.0).

Conclusion: This analysis of 3051 patients from two high volume centers shows that there is a stage migration towards high risk prostate cancer.



Robot Prostatectomy stage migration

Poster Presentation #18

Urology

PREDICTIVE FACTORS FOR BIOCHEMICAL RECURRENCE AFTER ROBOT ASSISTED RADICAL PROSTATECTOMY; DO ISUP GRADE AND PROSTATE SIZE MATTER?

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Purpose: Several prognostic variables for biochemical recurrence (BCR) after robot assisted radical prostatectomy (RARP) are known. BCR after RARP is manifested by elevated levels of PSA, it indicates relapse of prostate cancer with possible metastases. Pre- and post-operative predictive factors for BCR can define patients who are at a higher risk. We analyse pathological weighed prostate size together with the well-established predictors for BCR and the recent introduced ISUP grades.

Materials and Methods: Retrospective analysis was performed. From January 2010 until December 2016, in total 953 patients diagnosed with clinical localised prostate carcinoma underwent RARP in our referral hospital. The procedures were performed by three surgeons of our hospital. 176 patients were excluded from analysis because of incomplete data. We evaluated 777 patients. Pre-operative PSA, pTumor stage, pGleason score, ISUP grades, positive surgical margins (PSM) and pathological prostate size were analysed. End variable BCR is defined as a two times consecutive PSA measurement of $>0.2 \mu\text{g/L}$.

Results: 46.3% (360/777) of pts presented with high risk $\geq \text{pT3a}$ and/or ISUP grade 3, 4 and 5 ($\geq \text{pGI } 4+3$) disease. BCR occurred in 140/777 (18%) of the patients, with a mean follow up of 40 months. The mean time to BCR was 16.8 months (SD ± 18.9). Multivariate Cox-regression analysis showed significance in several factors. A pre-operative PSA value $>25,00$ was a significant predictor for BCR ($p < 0.001$). The ISUP grades differ in significance: ISUP grade 2 was not significantly associated ($p = 0.233$) where ISUP grade 3 was significantly associated with BCR ($p = 0.001$). Subgroups ISUP 4 and 5 were significant associated with BCR ($p < 0.001$; HR 7.213 & 7.163). A significant difference for BCR between pTumor stage 2abc and 3ab ($p < 0.001$) was observed. Prostate size showed no significant result for BCR ($p = 0.398$). PSM appeared not to be a significant predictor for BCR ($p = 0.268$).

Conclusion: With a mean follow-up time of 40 months, up to 82% of the 777 patients who underwent RARP were free of biochemical recurrence, despite our population consisted of 46% high risk patients with $\geq \text{pT3a}$ and/or ISUP grade 3, 4 and 5 ($\geq \text{pGI } 4+3$) disease. Risk factors for BCR were preoperative high PSA levels, ISUP grade 3 or higher and pT3 disease. One might take into account the significant difference for risk of BCR in ISUP grade 2 and 3 disease. In this analysis positive surgical margins were not an independent risk factor for BCR. Pathological prostate size was not an associated risk factor for BCR.

Variable	Significance	Exp (B)	95,0% CI for Exp (B)
PSA pre-operative	<0,001	1,031	1,017 - 1,046
ISUP 1 (pGI 6) <i>reference</i>			
ISUP 2 (pGI3+4)	0,233	1,507	0,768 - 2,961
ISUP 3 (pGI4+3)	0,001	3,347	1,687 - 6,639
ISUP 4 (pGI 8)	<0,001	7,213	3,718 - 13,995
ISUP 5 (pGI 9, 10)	<0,001	7,163	3,627 - 14,146
pT2abc <i>reference</i>			
pT3ab	<0,001	3,714	2,439 - 5,657
Prostate size	0,398	0,996	0,988 - 1,005
Positive surgical margin	0,268	1,237	0,849 - 1,804

Multivariate Cox-regression analysis

Poster Presentation #19

Urology

PERI-OPERATIVE OUTCOMES AFTER ROBOTIC-ASSISTED RADICAL PROSTATECTOMY IN PATIENTS WITH PRIOR ABDOMINAL SURGERY: A PROPENSITY SCORE-MATCHED STUDY

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Purpose: The effectiveness of robotic assisted radical prostatectomy (RARP) in men with prior abdominal surgery has not been clearly defined in a large cohort of patients. The objective of this study is to assess the perioperative outcomes of propensity score-matched groups undergoing RARP by a single surgeon in a high volume institution.

Materials and Methods: From 2008 through 2016, approximately 10,000 men underwent RARP by a single surgeon (VP). Salvage patients and those with prior prostate intervention were excluded from the study sample. There were 3085 patients who had prior abdominal surgery and who were computer matched to patients without prior abdominal surgery (n=3085) using a 1:1 propensity score analysis.

Results: The two groups were homogenous in selected epidemiological and preoperative clinical and pathological variables. The mean operative time (OT: incision to closure) was 125.7 +/- 28.15 minutes and 120.9 +/- 22.9 minutes with and without prior abdominal surgery. Console time for the surgeon was 78.6 +/- 11.74 minutes and 77.5 +/- 10.7 minutes for the two groups as well. The differences in OR and console time were both statistically significant with a p value equal to <0.001 for both. The estimated blood loss was comparable for both groups (119.9 +/- 85.3 cc vs. 117.1 +/- 81.2 cc) and the transfusion rate was equivalent (0.8% vs. 0.8%). The rate of nerve sparing was comparable for both groups. Postoperative pathological outcomes were similar between groups. Postoperative pain scores, length of stay and indwelling catheter duration days were comparable.

Conclusion: RARP in patients with prior abdominal surgery is a technically demanding procedure. However, the procedure is feasible, safe and can be accomplished in patients with a wide variety of prior abdominal surgeries with excellent perioperative outcomes.

Parameters	All patients (n = 6170)	Group I (Prior Abd Sx) n=3085	Group II (No Prior Abd Sx) n=3085	p value
Age (Mean, SD)	62.3 (7.3)	62.5 (7.37)	62.2 (7.24)	0.10
BMI	28.3 (4.3)	28.29 (4.22)	28.32 (4.38)	0.75
Pre-operative AUA score				
Mild Symptoms (1-7)	3215 (52.1%)	1589 (51.5%)	1626 (52.7%)	0.39
Moderate Symptoms (8-19)	2372 (38.4%)	1201 (38.9%)	1171 (38%)	
Severe Symptoms (20-35)	583 (9.4%)	295 (9.6%)	288 (9.3%)	
Pre-operative SHIM				
No Erectile Dysfunction (SHIM ≥ 22)	2645 (42.9%)	1308 (42.4%)	1337 (43.3%)	0.67
Mild Erectile Dysfunction (SHIM 17-21)	1477 (23.9%)	753 (24.4%)	724 (23.5%)	
Mod to severe ED (SHIM < 17)	2048 (33.2%)	1024 (33.2%)	1024 (33.2%)	
Preoperative PSA	6.69 (6.15)	6.64 (6.24)	6.74 (6.05)	0.53
D'Amico class				
Low Risk	2431 (39.4%)	1202 (39%)	1229 (39.8%)	0.72
Intermediate Risk	2718 (44.1%)	1376 (44.6%)	1342 (43.5%)	
High Risk	1021 (16.5%)	507 (16.4%)	514 (16.7%)	
Preop Gleason Score				
Gleason Score ≤ 6	2738 (44.4%)	1359 (44.1%)	1379 (44.7%)	0.85
Gleason Score 7	2600 (42.1%)	1315 (42.6%)	1285 (41.7%)	
Gleason Score ≥ 8	832 (13.5%)	411 (13.3%)	421 (13.6%)	
Prior Abdominal Surgery				
Colectomy		104 (3.4%)		
Appendectomy		1002 (32.5%)		
Cholecystectomy		494 (16%)		
Umbilical Hernia Repair		305 (9.9%)		
Single side Inguinal Hernia Repair		1201 (38.9%)		
Bilateral Inguinal Hernia Repair		364 (11.7%)		
Upper Abdominal Surgery		92 (3%)		
Other Abdominal Surgery		272 (8.7%)		
More than one abdominal surgery		749 (24.7%)		

Table 1: Patient Demographics

Parameters	All patients (n = 6170)	Group I (Prior Abd Sx) n=3085	Group II (No Prior Abd Sx) n=3085	p value
Total operative time in minutes	123.3 (25.8)	125.7 (28.15)	120.9 (22.9)	<0.001
Total console time in minutes	78.1 (11.25)	78.6 (11.74)	77.5 (10.7)	<0.001
Estimated blood loss in ml	118.5 (83.3)	119.9 (85.3)	117.1 (81.2)	0.18
Blood transfusion rate	51 (0.8%)	26 (0.8%)	25 (0.8%)	0.88
Nerve Sparing				
Non Nerve sparing (<50%)	177 (2.9%)	88 (2.9%)	89 (2.9%)	0.42
Partial Nerve Sparing (50-75%)	3255 (52.8%)	1643 (53.3%)	1612 (52.3%)	
Full Nerve Sparing (75-100%)	2738 (44.4%)	1354 (43.9%)	1384 (44.9%)	
Post-operative Complications (Overall)	457 (7.4%)	242 (7.8%)	215 (7%)	0.18
Minor Grade	413 (6.7%)	220 (7.1%)	193 (6.3%)	0.16
Major Grade	44 (0.7%)	22 (0.7%)	22 (0.7%)	1
Positive Surgical Margin	1031(16.7%)	493 (16%)	538 (17.4%)	0.12
Hospital Stay in days	1.24 (2.06)	1.27 (1.92)	1.21 (2.2)	0.22
Catheter days	5.31 (2.3)	5.32 (2.4)	5.29 (2.3)	0.66

Table 2: Comparison of Perioperative Outcomes

Poster Presentation #20

Urology

INTERMEDIATE TERM OUTCOMES OF DEHYDRATED HUMAN AMNION/CHORION MEMBRANE WRAPPING OF THE NEUROVASCULAR BUNDLE FOLLOWING ROBOTIC ASSISTED LAPAROSCOPIC RADICAL PROSTATECTOMY

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Purpose: Robotic Assisted Laparoscopic Radical Prostatectomy (RALP) is one of the standard management options for localized prostate cancer. Trifecta is not guaranteed even in an ideal patient with organ confined disease. Recovery of potency is the main limiting factors to achieve complete trifecta. Potency recovery adversely affected by neuropraxia and nerve damage. Nerve wrapping with protective membranes are well established practice in neurosurgery. Dehydrated human amnion/chorion membrane (dHACM) contains many neurogenic growth factors and anti-inflammatory mediators. We report the intermediate term outcomes following dHACM nerve wrapping during RALP.

Materials and Methods: We retrospectively analyzed the prospectively collected data from a IRB approved prostate cancer database. Between Aug 2013 and Dec 2016, 440 men received dHACM wrapping of neurovascular bundle with minimum 6 months follow up. All men provided written informed consent for the membrane usage. They formed the study group (I). Control Group (II) was selected from the men operated during the same period propensity score matched for age, preoperative SHIM score, Gleason score and D'Amico risk category (logistic regression nearest neighborhood method at 1:1 ratio). We analyzed the demographic parameters, oncological and functional outcomes. Factors affecting potency recovery were analyzed using univariate and multivariate logistic regression analysis.

Results: Median follow up duration was 18 months (range 6-36) months. There was no significant difference in the demographic and oncological parameters between the two groups. More than 97% continence was achieved in both groups with in median time of 60 days. Potency recovery was higher in dHACM group (76% vs 66%) irrespective of age, prior sexual function and nerve spare status. Both in univariate and multivariate analysis, nerve wrapping positively affected the potency recovery.

Conclusion: this propensity score matched retrospective analysis, dHACM nerve wrapping independently improved the potency recovery. Randomized control trials are recommended to confirm this finding. Funding: MiMedx ® provided the membranes free of cost for this study, and author Patel is a medical consultant for MiMedx.

Parameter	Univariate analysis OR (95% CI)	p value	Multivariate analysis OR (95% CI)	p value
Age at the time of surgery (continuous variable)	0.94 (0.91 - 0.95)	< 0.001	0.94 (0.92 - 0.96)	< 0.001
Pre-operative SHIM score (continuous variable)	1.13 (1.07 - 1.19)	< 0.001	1.11 (1.05 - 1.17)	< 0.001
D'Amico category (Low vs Intermediate & High risk)	0.82 (0.60 - 1.10)	0.18	0.98 (0.72 - 1.36)	0.94
Nerve sparing status (Full vs partial)	1.62 (1.18 - 2.23)	0.003	1.54 (1.10 - 2.15)	0.013
Amniotic membrane nerve wrapping	1.61 (1.20 - 2.17)	0.001	1.46 (1.07 - 1.98)	0.015

Table 1. A Trifecta outcomes with dHACM use within 18 months median follow up time (Range 6-36 months)

Parameters	All patients (n = 880)	Group I (Amniotic Membrane) n=440	Group II (Control) n=440	p value
Continence achieved (0-1 safety pad per day)	858 (97.5%)	430 (97.7%)	428 (97.2%)	0.66
Full continence (no pad usage)	820 (93.2%)	412 (93.6%)	408 (92.7%)	0.59
Number of days to continence (mean, IQR)	61	62	60	0.54
Potency achieved	627 (71.3%)	335 (76.1%)	292 (66.4%)	0.001*
Number of days to potency (mean, IQR)	130	115	148	0.006*
PSA recurrence	22 (2.5%)	11 (2.5%)	11 (2.5%)	1
Trifecta achieved (0-1 safety pad per day)	593 (67.4%)	319 (72.5%)	274 (62.3%)	0.001*
Trifecta achieved (full continence)	578 (65.7%)	311 (70.7%)	267 (60.1%)	0.001*

Table 2. Univariate and multivariate analysis of factors predicting potency recovery after robotic assisted laparoscopic radical prostatectomy

Poster Presentation #21

Urology

LONG TERM (>90 DAYS) COMPLICATIONS AFTER ROBOT ASSISTED RADICAL CYSTECTOMY WITH INTRACORPOREAL RECONSTRUCTION (IRARC)

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Purpose: Minimal invasive surgical techniques are used with the goal to lower the chance of complications. Complications are reported within the first 30 or 90 days, but serious complications can occur > 90 days. We report the > 90 days complications after iRARC.

Materials and Methods: 173 consecutive patients were operated between November 2010 and July 2017. Out of this group, 153 patients had at least >90 days follow-up. A prospective database was used to analyze all complications, using the Clavien-Dindo classification.

Results: In table 1 all complications are depicted per 30 and 90 day period. Mean follow-up was 26 months (range 3-76 months). In the period beyond 90 days, 18 patients (11,7 %) developed a complication (range 96-552 days). Of these 18 patients, 7 did not have a complication < 90 day. Ten out of 18 patients had a ureter-bowel stenosis, 1 patient had a vaginal prolapse which needed surgical repair. One patient had a pneumonia (197 days) and 2 had a hernia cicatricialis (377 and 448 days). One patient had a parastomal hernia and needed surgery after 552 days.

Conclusion: Long term complications (>90 days) occurred in 11,7%. The total chance of any complications in 90 days after iRARC was 54%. Major complications <90 days (Clavien Grade 3-5) occurred in 13.1%. Patients should be informed about the chance of complications within 90 days, but also for longer term complications. We recommend that future studies should report complications rates at least until 1 year after surgery.

Table 1 Clavien patients	30 days		31-90 days		0-90 days	
	N = 173	%-age	N = 153	%-age	N = 154	%-age
No complications	90	52,0	84	55	70	45,5
Grade 1	18	10,4	1	0,6	19	12,4
Grade 2	48	27,7	3	1,9	48	31,4
Grade 3a	5	2,9	4	2,6	9	5,9
Grade 3b	5	2,9	0	0	5	3,3
Grade 4	6	3,5	1	0,6	5	3,3
Grade 5	1	0,6	0	0	1	0,6
Grade 3-5	9,8 %		3,2 %		13,1 %	

Poster Presentation #22 Urology

CONTEMPORARY TRIFECTA OUTCOMES FOLLOWING ROBOT-ASSISTED LAPAROSCOPIC RADICAL PROSTATECTOMY IN A SINGLE HIGH-VOLUME CENTER

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Purpose: Technological and technical advancements helped to improve the trifecta outcomes. Here we report the trifecta outcomes from a high-volume tertiary referral center.

Materials and Methods: Follow up data were prospectively collected at regular interval using validated questionnaire (EPIC and SHIM) in the IRB approved prostate cancer database. We analyzed all men that underwent robotic-assisted laparoscopic radical prostatectomy (RALP) between Jan 2008 and Dec 2016 with minimum 6 months follow up. Data of 6132 patients were available for analysis excluding salvage radical prostatectomy. Full continence was defined as no pad usage. Potency was defined as able to penetrate and satisfactorily complete the intercourse with or without PDE5 inhibitor usage. Logistic regression analysis was used to determine the factors predicting trifecta outcomes.

Results: Median age was 62 years and BMI 27.7. Overall 42.5% (2604/6132) had D'Amico low-risk disease and another 42 % {2576/6132} had intermediate risk prostate cancer. The remaining 15.5% (952/6132) had high risk disease. Preoperatively, only 47.8% (2933) had no erectile dysfunction (preop SHIM \geq 22), 22% had mild ED (SHIM score 17-21) and 30% (1853) had moderate to severe ED (SHIM score \leq 16). Bilateral full nerve sparing (NS) RALP was performed on 50.1% (3017), unilateral full NS with partial NS on the other side was performed in 15.4% (944), bilateral partial NS in 31.3% (1918) and remaining 3.2% (199) had non-nerve sparing RALP. Overall 96.9% (5944) patients achieved continence (requiring 0-1 pad per day); of them 93% had full continence (no pad required). Mean time to continence was 11 weeks. Mean time to potency was 5.5 months. Irrespective of age, pre-operative SHIM score and NS status, 63.1% (3867) men were potent. Potency recovery was best (91.8%) in the group of men younger than 55 years with good pre-op SHIM who had full nerve sparing RALP. In post-operative period 3.6% had PSA persistence and 7.6% had PSA recurrence. Overall Trifecta rate was 56.6% irrespective of age, Pre-operative SHIM, cancer stage and nerve spare status. In the multivariate logistic regression analysis, age, pre-operative SHIM score, Charlson comorbidity index, D'Amico risk category and nerve sparing status predicted the trifecta.

Conclusion: Urinary continence recovery after RALP is excellent (96.9%). Potency recovery was the main limiting factor in achieving trifecta. Nearly half of the men (49.9%) had erectile dysfunction before surgery and only 65% was oncologically/technically feasible to get at least unilateral full nerve spare. Age and pre-operative SHIM score independently affect the potency recovery after RALP.

Parameters	All patients (n = 6132)
Continence achieved (0-1 safety pad per day)	5944 (96.9%)
Full continence (no pad usage)	5705 (93%)
Number of days to continence (median, IQR)	81
Potency achieved (Irrespective of Age, Pre-op potency and NS)	3867 (63.1%)
Number of days to potency (median, IQR)	171
PSA persistence	218 (3.6%)
PSA recurrence	467 (7.6%)
Trifecta achieved (0-1 safety pad per day)	3472 (56.6%)
Trifecta achieved (full continence)	3404 (55.5%)

Table 1. Trifecta outcomes within 18 months median follow up time (Range 6-36 months)

Parameter	All patients n = 6132
Age Groups (Irrespective of Pre-op potency and NS)	
Age ≤ 55	1209/ 1466 (82.5%)
Age 56-65	1815/2714 (66.9%)
Age > 65	843/1952 (43.2%)
Nerve spare (Irrespective of Pre-op potency and age)	
Full Nerve spare	2355/3071 (76.7%)
Partial Nerve Spare	1458/2862 (50.9%)
Non-nerve sparing	54/199 (27.1%)
Pre-operative potency (Irrespective of NS and age)	
No Erectile Dysfunction (SHIM ≥ 22)	2360/2933 (80.5%)
Mild Erectile Dysfunction (SHIM 17-21)	872/1346 (64.8%)
Moderate to Severe Erectile Dysfunction (SHIM ≤ 16)	635/1853 (34.3%)
Full nerve spare (Irrespective of Pre-op potency)	2355/3071 (76.7%)
Age ≤ 55	823 / 937 (87.8%)
Age 56-65	1120/1461 (76.7%)
Age > 65	412/673 (61.2%)
Full nerve spare and normal pre-operative erectile function (SHIM ≥ 22)	1533/1774 (86.4%)
Age ≤ 55	627 /683 (91.8%)
Age 56-65	699/822 (85%)
Age > 65	207/269(77%)

Table 2. Number of men achieved potency after RALP analysis based on age categories and pre-operative erectile function

Poster Presentation #24
Urology

ONCOLOGIC OUTCOMES OF ROBOT ASSISTED VS. OPEN RADICAL CYSTECTOMY: RESULTS FROM A HIGH-VOLUME REFERRAL CENTRE.

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Introduction and Objective: Radical cystectomy (RC) is the gold standard treatment for muscle invasive bladder cancer and high-risk, BCG refractory, non-muscle-invasive disease. Historically, this procedure is performed with an open approach. Since its introduction in 2003, robot assisted radical cystectomy (RARC) is becoming more and more popular. Even though, to date, oncologic outcomes from large cohorts with a long follow up are scarce. The aim of this study is to evaluate and compare the oncologic outcomes of patients with bladder cancer who underwent open radical cystectomy (ORC) and RARC.

Material and Methods: Clinical, pathologic and survival data of patients who underwent RC for Bladder cancer at our institution between 2006 and 2016 were retrospectively collected. Differences in categorical and continuous variables were analysed using the chi-squared test and the Mann-Whitney U-test, respectively. Outcomes of interest cancer-specific survival (CSS), and overall survival (OS), were plotted using Kaplan-Meier survival curves.

Results: Overall, 817 patients underwent RC within the study period. ORC and RARC were performed in 347 (42.5%) and 470 (57.5%) patients, respectively. No significant differences in term of age, BMI, clinical stage and operating time were found between the two groups. Patients who underwent RARC had higher ASA score ($p<0.001$) and were more likely to receive neoadjuvant chemotherapy ($p<0.001$). Pelvic lymph node dissection ($p<0.001$) and neobladder reconstruction ($p<0.001$) were more frequently performed in the RARC group. After a median follow up of 35 months, 139 (40%) and 132 (28%) patients died for bladder cancer in the ORC and RARC group, respectively ($p=<0.001$). The estimates cancer specific survival rates at 5 years were 60% and 72 % in the ORC and RARC, respectively ($p=0.12$). See Figure 1 and table below.

Conclusions: Within limitations, our large single institution study found that RARC and ORC provides similar oncologic outcomes.

Poster Presentation #25

Urology

UTILISING THE DELPHI PROCESS TO DEVELOP A PROFICIENCY-BASED PROGRESSION (PBP) TRAIN THE-TRAINER COURSE FOR ROBOTIC SURGERY TRAINING

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Introduction: As the role of robot-assisted surgery continues to expand, the development of standardised and validated training programs is increasingly important. A 'train the trainer' (TTT) course is an educational program for surgical trainers, in which delegates learn a standardized teaching technique for skills acquisition. We aimed to define the key elements within a TTT course by seeking consensus with a specialist committee formed of professionals with expertise in training.

Methods: 32 clinicians, academics and industry experts were invited to attend a Delphi process. The project was carried out in phases: a systematic review of the current evidence, a face-to-face meeting in Philadelphia, then an initial survey was created based on the current literature and expert opinion and sent to the committee. The Delphi process underwent 3 rounds in total. Additions to the second and third-round surveys were formulated based on the answers and comments from the previous rounds. Consensus opinion was defined as $\geq 80\%$ agreement.

Results: There was 100% consensus that there was a need for a standardised TTT course in robotic surgery. Consensus was reached in multiple areas, including: 1. Definitions and terminology; 2. Qualifications to attend; 3. Course objectives; 4. Pre-course considerations; 5. The requirement of E-learning; 6. Theory and course content; 7. Measuring outcomes and performance level verification. The resulting formulated curriculum showed good internal consistency among experts, with a Cronbach alpha of 0.90.

Conclusions: Using the Delphi methodology we achieved international consensus among experts to develop and reach content validation for a standardised 'Train-The-Trainer' curriculum for robotic surgery training. This defined content lays the foundation for developing a proficiency-based progression model for trainers in robotic surgery. This TTT curriculum will require further validation.

Poster/Oral Presentation #26 Transoral Surgery

Inside-Out Laryngectomy: Improved Margin Delineation Using the Flex® Robotic System

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Purpose: Margin assessment for patients with chemoradiation (CRT) failure requiring total laryngectomy can be challenging due to the radiation effects on local tissues and lack of clear-cut planes visible to the naked eye. In addition, accurate margin assessment is vital because salvage surgery is often a last viable curative option in this patient population. There are reported cases of transoral robotic surgery total laryngectomy (TORS-TL) using the Da Vinci® surgical system (Intuitive Surgical, Sunnyvale, CA); however, the system requires a direct line of sight and manipulation of multiple rigid arms within the limited space of the hypopharynx which are technical challenges. The Flex® Robotic System (Medrobotics, Raynham, MA) offers a flexible approach to permit better visualization of deep structures within the hypopharynx and glottis, and we believe that this will increase the likelihood of achieving negative margins in previously treated laryngeal cancer patients presenting with persistence or recurrence.

Materials and Methods: TORS-TL was performed using the Medrobotics Flex® robotic system and associated disposable instruments in 2 patients with squamous cell carcinoma (SCC) of the supraglottis who had persistent disease after CRT and 1 patient with a newly diagnosed hypopharyngeal cancer. A neck dissection was performed where appropriate, and a free flap or rotational flap was used for reconstruction of pharyngeal defects. Intra-operative margins were sent for frozen section analysis and final margin assessment was deferred to permanent pathology.

Results: The first case is a 59 year old male with cT3N2bM0 SCC of the hypopharynx who underwent TORS-TL and was found to have negative margins on final pathology. The second case was a 66 year old female with persistent tumor burden after CRT for a cT2N0M0 SCC of the supraglottis who underwent TORS-TL and was found to have ypT2N0M0 with negative margins. The final patient was a 55 year old female with persistent disease after CRT of a cT3N2cM0 SCC of the supraglottis who underwent TORS-TL and was found to have ypT3N0M0 SCC with negative margins.

Conclusion: In carefully selected patients we demonstrate that the Flex® robotic system can be used to perform TORS-TL with a higher degree of visualization to allow for better margin assessment especially in patients with prior CRT. Since the instrument arms and endoscope are flexible and positioned to operate parallel to one another in a snake-like fashion, the number of instrument collisions is decreased compared to using the rigid arms of the Da Vinci® System. Another advantage as compared to an open approach, which first requires laryngeal entry via external incisions, is that mucosal margins can be defined at the beginning of the case and allow for prompt determination of reconstructive flap dimensions by the reconstructive surgeon.

Poster/Oral Presentation #27 Transoral Surgery

CURRENT EVIDENCE BASED PERIOPERATIVE MANAGEMENT IN TRANSORAL ROBOTIC SURGERY

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Aims: Trans Oral Robotic Surgery (TORS) is an evolving surgical approach that is being utilized at an increasing rate throughout the world. The leading indication for TORS is the surgical treatment of oropharyngeal SCC. The current literature for the perioperative management in TORS is explored to define the current evidence base and guide future trials.

Methods: Expert opinion of experienced TORS surgeons was used to define domains and areas of practice variability and then a focused literature search was performed.

Results: The domains and topics identified by the expert panel were as follows:

Anesthesia

- Perioperative steroids
- Ideal cardiovascular parameters
- Antibiotics
- ET tube size and site (oral versus nasal)
- Inhalational versus TIVA (Total intra venous anesthetic)

Post-operative management

- Pain control (PCA, topical or injection anesthetic)
- Feeding tube
- Swallowing regime and SLP treatments
- Overnight intubation
- Use of post op CPAP

A focused literature search identified:

Anesthesia:

One randomized controlled study assessed the use of perioperative dexamethasone. It was associated with earlier improvements in swallowing and decreased length of stay, but no change in the primary end-point of pain {1}. There were no studies assessing ideal anesthetic parameters such as blood pressure or heart rate in the setting of TORS. There were no studies detailing practice patterns for prophylaxis and post-operative antibiotic in TORS. The ideal method and position of the endotracheal tube or the necessity for a particular type of tube was not discussed in the current literature. No comparative studies examined TIVA versus inhalational anesthetics in TORS.

Post-operative management:

Post-operative pain management following TORS has been investigated in one study assessing the use of dexamethasone {1}. There are no other studies examining the use of topical or local injections of anesthetic or the use of patient controlled analgesia. The use of routine or reactionary feeding tubes has not been investigated and the routine practice of speech and language pathologist in the pre or post-operative setting had not been described. There are no studies assessing the need for a prolonged post-operative intubation period or investigating the use of post-operative CPAP.

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Poster/Oral Presentation #28 Transoral Surgery

CURRENT EVIDENCE BASED SURGICAL MANAGEMENT IN TRANSORAL ROBOTIC SURGERY

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Aims: The surgical steps used in Trans Oral Robotic Surgery (TORS) have been well defined however the technique and experience with this approach is expanding. The most frequent indication for TORS is the surgical treatment of oropharyngeal SCC. The surgical and technical aspects in the management of patients undergoing TORS is explored.

Methods: Expert opinion of experienced TORS surgeons was used to define areas and practices in the surgical and technical application of TORS and a focused literature search was performed.

Results:

The domains and topics identified by the expert panel were as follows:

Operative/surgical

- Additional procedures- tracheostomy, neck dissection-stage/ simultaneous
- Closure of defect/ secondary intention healing
- Use of Tisseal, Flowseal, Duraseal
- Use of Frozen sections, surgical specimen processing
- Comparison of "hot" instruments- Ligasure, bipolar, monopolar, suction monopolar, Da Vinci instruments, laser
- Order of procedures to be performed (Neck/ Primary)
- Method of positioning/ exposure- Gags/ retractors
- Intra operative imaging techniques

Management of pitfalls

- Oro-cervical fistulae
- Management of bleeding- primary and secondary hemorrhage
- Cervical artery ligation, Yes/ No, which and how?

A focused literature search identified:

Operative/ Surgical

The need for tracheostomy was not the focus of any surgical trials. The safety of simultaneous neck dissection was addressed in three studies {1, 2, 3} and concluded it to be a safe practice. There were no studies examining potential methods of pharyngeal closure or the use of topical tissue sealants. The methods of bleeding control have been the focus of review articles addressing different products {4}. No study addressed the need for frozen sections or oropharyngeal exposure techniques. There are not randomized studies comparing or assessing the different cutting and cautery devices available. However, one article did compare the use of laser versus monopolar cautery {5}. A number of pilot studies have examined the use of narrow band imaging {6}, image guidance systems {7}, near infrared imaging {8} and intraoperative ultrasound {9}.

Management of Pitfalls

There were no studies describing best practices in oro-cervical fistulae or describing the incidence. The use of arterial ligation has been addressed in a number of retrospective studies and concluded that the rate of severe hemorrhage was reduced with ligation {10,11,12}.

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Poster Presentation #29
Urology

ONCOLOGIC OUTCOMES OF PATIENTS WITH INCIDENTAL PROSTATE CANCER WHO UNDERWENT RARC: COMPARISON BETWEEN NERVE SPARING AND NON-NERVE SPARING APPROACH

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Introduction and Objective: Incidental Prostate cancer (iPCa) is a relatively common finding during histopathological workup of radical cystectomy (RC) specimens. To reduce the high impact of RC on erectile function, several sexual-preserving techniques have been proposed. The aim of this study was to evaluate and compare the oncologic outcomes of patients with iPCa who underwent nerve spring and no-nerve sparing robot assisted radical cystectomy (RARC).

Material and Methods: The clinicopathologic data of male patients who underwent RARC at our institution between 2006 and 2016 were retrospectively analysed. Patients with iPCa at definitive pathological examinations were stratified in two groups, according to the preservation of the neurovascular bundles (nerve sparing vs no nerve sparing). Significant PCa was defined as any Gleason score $\geq 3+4$. Biochemical recurrence (BR) was defined as a sustained PSA level >0.2 ng/mL on two or more consecutive appraisals. BR rate was assessed only in patients with incidental prostate cancer and at least two years of follow-up. Differences in categorical and continuous variables were analysed using the chi-squared test and the Mann-Whitney U-test, respectively. Biochemical recurrence curves were generated using the Kaplan-Meier method and compared with the Log rank test.

Results: Overall, 343 male patients underwent RARC for bladder cancer within the study period. Nerve sparing surgery was performed in 143 patients (41%), of these 110 had at least two years of follow up after surgery. Patients who underwent nerve sparing surgery were significantly younger ($p < 0.001$). Clinical significant PCa was found in 24% of patients. No significant differences regarding preoperative PSA value ($p = 0.3$), PCa pathological stage ($p = 0.5$), Gleason score ($p = 0.3$) and positive surgical margin rates ($p = 0.3$) were found between the two groups. After a median follow up of 51 months only one patient, in the no-nerve-sparing group had developed a biochemical recurrence ($p = 0.4$).

Conclusion: In our series most of the iPCa detected in RC specimens can be considered as insignificant with a low rate of BR (0.9%). Nerve sparing RARC is a safe procedure which didn't affect oncological outcomes of patients with iPCa.

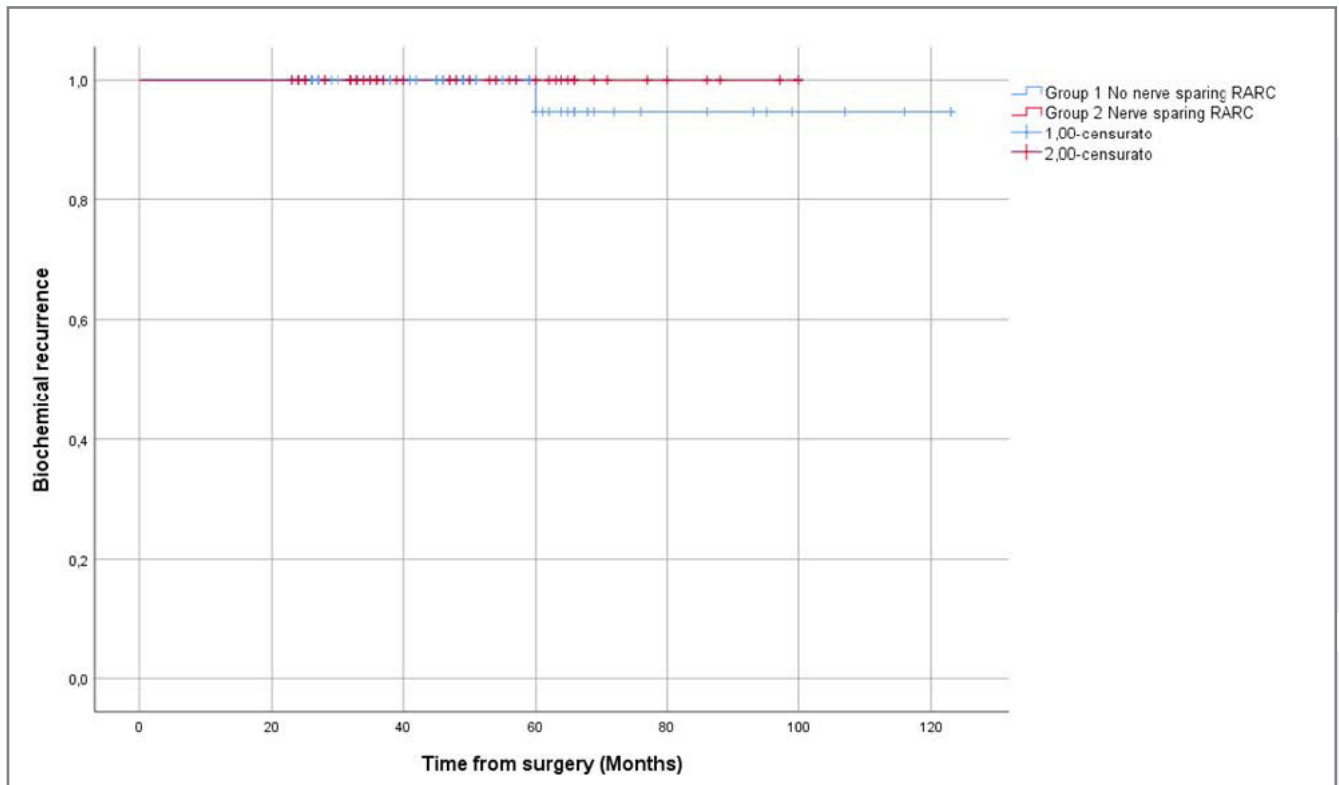


Figure 1. Biochemical recurrence rate of 110 patients with incidental PCa at time of RARC and follow up longer than 2 years, stratified by nerve sparing surgery

Poster Presentation #30 Urology

FEASIBILITY OF SINGLE-PORT PARTIAL NEPHRECTOMY USING SPORT SURGICAL SYSTEM

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Introduction: Minimally invasive partial nephrectomy has progressively replaced open surgery for the surgical treatment of small renal masses. A single port approach could be an alternative to further reduce the incisional morbidity. New surgical robots should offer the capability to develop such an approach. We present our initial experience of a Single Port Partial Nephrectomy in a porcine model with using SPORT Surgical System (Titan Medical Inc, Toronto, Ontario, CA)

Material and Methods: Two partial nephrectomies were carried out in pigs placed in a flank position. The surgical procedures began by making a 3-cm skin and fascial incision with the placement of an access device. The robotic single arm was inserted into the abdominal cavity. The camera and multi-articulated flexible instruments were deployed within the abdomen. The surgeon was seated at the workstation, next to the animal, and performed the procedures while wearing glasses for 3-D visualization.

Results: During the procedures, the instruments used were: monopolar scissors, bipolar graspers and needle drivers. To achieve the partial nephrectomies, we fulfilled the classical steps of this surgery: after dissecting the hilum, the kidney was freed. The renal artery was clamped and the renal parenchyma was transected in order to perform a heminephrectomy. The achievement of hemostasis and closure of the renal parenchyma was successfully accomplished with limited blood loss and both pigs were alive at the end of each procedure.

Conclusion: Our preliminary experience of partial nephrectomy using the SPORT Surgical System demonstrated the feasibility of the procedure without any specific difficulties, including closing the collecting system and the renal parenchyma, which are classically the most challenging steps. This promising approach should be transposed in clinics with comparative investigations to traditional multi-port robot-assisted partial nephrectomy.

Video General Surgery

ROBOTIC-ASSISTED RESECTION OF BIG GASTROINTESTINAL STROMAL TUMOR (GIST) OF THE STOMACH FOLLOWING NEOADJUVANT IMATINIB: A VIDEO CASE REPORT.

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Purpose: Surgical resection with clear margins represents the gold standard for the treatment of gastrointestinal stromal tumors (GIST). Neoadjuvant Imatinib is used in high-risk lesions or when downsizing is necessary for safe surgical resection. In this video we report a case of a huge GIST of gastric greater curvature safely resected after preoperative Imatinib therapy.

Materials and Methods: A 30 cm high risk GIST of the greater curvature of the stomach was diagnosed in a 78-year-old man. After 8 months Imatinib treatment, a significant tumor volume regression was obtained (9,5 cm) and surgical resection with Da Vinci Xi System was planned. Four robotic trocars along a horizontal line at the umbilical level and an accessory 12 mm trocar in left hypogastrium were inserted. The optical system was in arm 2, a bipolar forceps in arm 1, a robotic vessel sealer in arm 3 and a monopolar scissor in arm 4. A 9 cm exophytic mass of greater gastric curvature was identified. After section of gastrocolic ligament and short gastric vessels, wedge gastric resection was realized using robotic stapler. The surgical specimen was extracted through Pfannenstiel laparotomy.

Results: Operative time was 189 minutes with negligible intraoperative blood loss. Postoperative course was uneventful; the patient was discharged after 8 days. Histopathological analysis showed a ypT3 pNx GIST with 10-15% residual tumour cells and microscopically negative resection margins (R0).
Conclusion: Size of the primary tumour is considered the most important risk factor for development of metastasis or local recurrence in GIST. Preoperative Imatinib therapy of large or locally advanced GIST may allow resection and decrease morbidity of the procedure. Robotic surgery may facilitate spleen preservation and avoid intraoperative tumor rupture. Even in the absence of clear guidelines for the use of minimally invasive approach, robotic surgery is claimed to be a safe and feasible technique for GIST treatment.

Video Urology

ROBOTIC PARTIAL NEPHRECTOMY FOR BIG RENAL MASSES: CURRENT PRACTICE AND THE GUIDELINES RECOMMENDATIONS

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Purpose: The benefits of robotic-assisted partial nephrectomy is described in the literature by many groups worldwide as well as its similar oncological outcomes comparing to the open procedure. The three most followed guidelines in urology (AUA, EAU, NCCN) advocate that this surgery should be performed in a T1a and T1b (up to 7cm) tumors. Otherwise they don't describe a maximum tumor size to perform the excision with a minimal invasive procedure. The objective of this video is to demonstrate that technique for a larger volume kidney tumor.

Materials and Methods: We presented a 63 year-old male asymptomatic patient with a Bosniak 3 left renal cyst found on a routine ultrasound. The MRI requested described a 9,4 x 9,0 x 7,8 cm left kidney complex cortical cyst on middle third position with contrast enhancement. No physical exam, laboratory or other sites imaging alterations. We performed a Robotic-assisted partial nephrectomy with a Si Da Vinci console.

Results: We reported a 183 minutes operative time, 750 cc blood loss and 21 minutes of warm ischemia. The tumor measured 11cm at the operating room. There were no intra or post-operative complications. The hospital length was 48 hours and the drain placed at the surgical site was removed in the discharge day with 20cc hematic debit. The pathologic analysis described a clear cell carcinoma papillary type 1, Fuhrman 2, with free margins. No capsule or perirenal involvement.

Conclusion: Even though the guidelines suggests that minimal invasive partial nephrectomies should be performed in masses smaller than 7 cm, robotic-assisted partial nephrectomy for bigger renal masses is feasible, safe and does not compromise the oncological outcomes with positive margins. We believe that the correct anatomical plan combined with the robotic surgery expertise can improve the procedure outcomes.

Video Urology

ROBOTIC URETERAL REIMPLANTATION WITH APPENDIX INTERPOSITION AND PSOAS HITCH

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Purpose: Extensive ureteral strictures usually involve reconstruction with ureteral reimplantation, Boari flap, psoas hitch, or with intestinal interposition with an ileal segment. The interposition with vermiform appendix is a natural option because of its favorable position in right-sided stenosis and, despite consistent reports in the literature for open and laparoscopic surgery, there is still no case described of ureteral reimplantation with appendiceal interposition associated with psoas hitch performed by robotic technique. We present this case as a new option.

Materials and Methods: A 45-year-old Caucasian female patient diagnosed with cervical cancer in 2010 and underwent hysterectomy, radio and chemotherapy. After two years, there was worsening of renal function and CT scans showed large bilateral ureteral stenosis and hydronephrosis. Left ureteral reimplantation was attempted on another service without success and consequent left nephrectomy. Right ureteroscopy showed complex stenosis of the distal right ureter and we decided for a double J catheter insertion. After discussing the risks, because it would be a complex surgery in a solitary kidney, we opted for a right ureteral reimplantation. The proposal was for robotic assisted laparoscopic ureteral reimplantation. Using the DaVinci S Robotic System, the patient was positioned in Trendelenburg and the portals placed in classic position for pelvic surgery. Due to previous surgery and radiotherapy, there were many adhesions between intestinal loops and the bladder. Lysis of these adhesions lasted about 60 minutes and was performed with pure laparoscopic approach. The identification and dissection of the ureter were carried out with great difficulty due to the actinic effects of radiotherapy. As a result, the distal ureter was extremely devascularized and a complete bladder release associated with psoas hitch was required. Even with this maneuver, it was noted that there wasn't well vascularized ureter for a tension-free anastomosis. After adequate preparation of the appendix with care to maintain its blood supply, two anastomoses were carried out: appendico-ureteral and appendicovesical. Thereafter, a double J catheter was inserted.

Results: Console time was 5 hours and estimated blood loss was found to be less than 100 ml. The patient had an excellent postoperative evolution and was discharged in two days. After two weeks, cystoscopy showed the appendicovesical anastomosis and cystography allowed us to evaluate the psoas hitch.

Conclusion: Robotic appendiceal interposition with psoas hitch is a safe option for large and complex right ureteral strictures.

Video Urology

LESSONS LEARNED FROM MORE THAN 10,000 ROBOTIC ASSISTED LAPAROSCOPIC RADICAL PROSTATECTOMIES: AN EVIDENCE-BASED APPROACH

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Purpose: Radical prostatectomy is one of the standard management options for localized prostate cancer. The better understanding and visualization of the peri-prostatic surgical anatomy provided the basis for improved functional recovery after radical prostatectomy. Technological and technical advancements are helping to improve the trifecta outcomes.

Materials and Methods: Between August 2002 and February 2017, ten thousand robotic-assisted laparoscopic radical prostatectomies were performed by a single surgeon. Demographic, oncological parameters, perioperative and functional outcomes were prospectively collected in the institutional review board approved prostate cancer database. Complications, positive surgical margin data, and trifecta outcomes were constantly monitored, reviewed and technical modifications were made accordingly. These technical advancements were published in peer-reviewed urological journals. Many of these important techniques are still being used in our center with superior outcomes. In this video, we discuss the technical modifications adapted to improve the robotic-assisted laparoscopic radical prostatectomy outcomes in our center.

Results: Overall 96.9% of patients achieved continence. Men with good pre-operative erectile function (SHIM score greater than or equal to 22) and full nerve spare had potency recovery in 86.4%; of them, men younger than 55 years had best erectile function recovery (91.8%). Initial technical innovations like suspension stitch, bladder neck, and posterior reconstruction were to improve the urinary continence. Suspension stitch was used in approximately 9,500 cases and posterior reconstruction in last 9,000 cases. Further modifications were aimed to improve potency outcomes. Athermal seminal vesicle dissection and retrograde nerves paring techniques were used in 8,000 cases. The description of landmark arteries helped in graded nerve-sparing of 5,000 cases. Use of 180 degrees toggling of the camera which provides better visualization during retrograde nerve sparing is being used regularly over last 2,000 cases.

Conclusion: Constant monitoring and review of outcome data at regular intervals help the ongoing learning process. Appropriate technical modifications for robotic-assisted laparoscopic radical prostatectomy result in improved clinical outcomes.

Video Urology

CHALLENGING SCENARIOS DURING BLADDER NECK DISSECTION IN ROBOT-ASSISTED LAPAROSCOPIC RADICAL PROSTATECTOMY

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Purpose: During robotic assisted radical prostatectomy (RALP) the bladder neck (BN) can be a challenging scenario due to variations in anatomy. Some potential challenges include: Large median lobe (ML), unrecognized ureterocele, ureter orifices (UO) too close to the BN and salvage RARP after radiotherapy (XRT). In this video, we present the tips and tricks to managing difficult BN scenarios.

Materials and Methods: Challenging BN scenarios were summarized as follows: 1- Huge BN masses that distort anatomic planes, 2-UOs too close to BN that predispose ureteral injury/ligation, and 3- Prior XRT causing small prostate and extensive pelvic fibrosis. We presented our technique for each case scenario.

Results: In patients with large ML, we divided the lateral BN fibers following anterior entry to increase exposure to the mass. Following delivery of ML out of the BN, it was elevated with the fourth arm. This maneuver facilitated the identification of UOs before making any incisions at the posterior BN. In a similar case, an unrecognized ureterocele mimicked as a ML. However, consistency of the mass was soft and ipsilateral UO could not be identified. The sac was incised transversely after it was delivered entirely out of the BN. Entry into the sac established the intraoperative diagnosis of ureterocele and helped to locate the UO. UOs too close to the BN pose a high risk for ureteral injury. This case presented to our clinic with anuria 2 days after a RARP performed at an outside hospital. Review of his intraoperative video images showed bilateral ureteral ligation during BN reconstruction before vesicourethral (VU) anastomosis. UOs were noted to be in close proximity to the BN before posterior resection. During reoperation, we performed a midline anterior cystotomy to access the VU anastomosis, used iv. Methylene blue to identify the UOs, and placed bilateral ureteral JJ stents following take-down of previous anastomotic sutures. Our re-do VU anastomosis provided a successful outcome. We have noted proton beam radiation can be one of the most difficult to handle in salvage RALP. In this case of salvage RARP, the anterior BN and prostate were fused anteriorly to pubic tubercle. Following BN dissection and prostate resection, it was challenging to perform VU anastomosis due to extensive pelvic fibrosis. We released the posterior BN attachments for further bladder mobilization, but this still could not provide a tension-free anastomosis. Sufficient extra-length was then achieved through anterior midline incision of the BN and "re-location" of the outlet.

Conclusion: Use of the 4th arm to increase exposure and facilitate location of UOs, and careful BN reconstruction are keys to prevent complications during challenging BN dissections. Anterior midline BN incision and BN "re-location" provide safe exposure and tension-free anastomosis in complex cases.

Video
Urology

ANATOMICAL 3D IMAGE GUIDANCE FOR REAL-TIME LYMPH NODE LOCALIZATION DURING ROBOT-ASSISTED SALVAGE LYMPHADENECTOMY

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Purpose: To demonstrate the utility of anatomical 3D image guidance during robot-assisted salvage lymph node dissection (RA-sLND) in “node-only” prostate cancer recurrence after primary robot-assisted radical prostatectomy (RARP).

Materials and Methods: Between May 2015 and February 2017, ten patients (mean age: 64.2 ± 11.3 years) underwent RA-sLND for Choline-C11 or Fluciclovine-F18 PET/CT-detected lymph node recurrence after RARP. Mean duration between initial RARP and RA-sLND was 31.5 ± 24.2 months. Median PSA before RA-sLND was 0.58 ng/dl (range: 0.32-12.6). Targeted node dissection was performed during RA-sLND by simultaneous guidance of preoperative 3D-reconstructed PET/CT images that were visible on the surgeon’s smart phone through an application (VisiblePatient SAS, Strasbourg, France). In addition, bilateral extended pelvic LND was performed in all cases. Histopathological evaluation of extracted lymph nodes was compared with intraoperative 3D image-guided data.

Results: In total, 126 lymph nodes were removed and 21 showed metastatic involvement at histological analysis. The median maximum diameter of metastatic nodes was 13 millimeters (range: 1-21). In 8 of 10 men, positive lymph nodes on 3D guided imaging were correctly identified as metastatic. Lymph node involvement on preoperative PET/CT was false-positive compared with histological evaluation in 2 patients. In 2/10 (20%) men, a PSA decline to <0.2 ng/dl was achieved 6 weeks after RA-sLND. Postoperatively, all patients were kept on hormonal therapy and 4 men required adjuvant radiation therapy. At a mean follow-up of 10 ± 8.4 months, 50% of patients were free of biochemical recurrence.

Conclusion: Anatomical 3D image guidance helps easier targeting of positive lymph nodes during RA-sLND. However, the current sensitivity and specificity rates of preoperative PET/CT imaging make it impossible to recommend only targeted LND against bilateral, extended LND in patients with “node-only” prostate cancer recurrence.

Video
Urology

ROBOTIC PARTIAL CYSTECTOMY FOR ADENOCARCINOMA WITH EN BLOC URACHAL EXCISION-CASE PRESENTATION AND VIDEO

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Purpose: Adenocarcinoma of the bladder can be treated with bladder sparing partial cystectomy, with en bloc resection of the urachal remnant and umbilicus. There are very few reported cases performed using minimally invasive/robotic surgery. We present the first such procedure performed robotically in Ireland.

Materials and Methods: The patient is a 76-year-old gentleman presenting with gross haematuria, lower urinary tract symptoms and chronic urinary retention, with a background of significant cardiac morbidity and being on permanent antiplatelet therapy. Bladder tumour from the dome of the bladder was found to contain adenocarcinoma, and a staged approach to surgery was initiated. The patient underwent photoselective vaporisation of the prostate (PVP) to eliminate his chronic retention and underwent robotic assisted partial cystectomy with en bloc resection of the urachal remnant utilising the da Vinci Xi® robotic system.

Results: The video and discussion addresses port placement; bladder takedown with maintenance of the urachal remnant; demarcation of affected bladder portion with concomitant cystoscopic evaluation of bladder and use of the TilePro® feature; excision of bladder segment and early partial retrieval to avoid tumour seeding; bladder closure utilising double ended barbed suture and en bloc excision of umbilicus, urachal remnant and bladder segment. Discharge was on day five post operatively. Cystogram at day 10 showed no leak. The patient remained on his antiplatelet therapy throughout.

Conclusion: Despite little discussion in the literature, this case shows that robotic assisted partial cystectomy, in combination with other technologies, can allow even high-risk patients to experience the benefits of minimally invasive surgery in this uncommon procedure. Use of the Da Vinci Xi® system allows for different docking approaches and concomitant use of a simultaneous endoscopic view to facilitate precise excision of the affected bladder dome segment. Exact bladder closure using a double ended barbed suture facilitates watertight bladder closure with ensuing early catheter removal and facilitates patient discharge without an indwelling catheter.

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