groups were identified that can be used to conduct a larger study with multiple surgeons to help identify if there is an ergonomic advantage to RRC over traditional ORC.

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V12-03

THREE DIMENSIONAL PRINTING AND AUGMENTED REALITY: ENHANCED PRECISION FOR ROBOTIC ASSISTED PARTIAL NEPHRECTOMY

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INTRODUCTION AND OBJECTIVES: In minimally invasive and robotic partial nephrectomy surgeons often do not obtain a spatial familiarity with the kidney and tumor until it is removed. Pre-operative three-dimensional (3D) printing and augmented reality (AR) models are advanced imaging methods that may facilitate surgical planning and anatomical understanding by allowing surgeons to better assess the relationship of the tumor to major anatomical structures such as the renal vasculature and hilum. The objective of this study is to describe novel 3D printing and AR methods of image data visualization to facilitate anatomical understanding and assist with surgical planning and decision making during robotic partial nephrectomy.

METHODS: We created a video of the workflow for creating 3D printed and AR kidney models along with their application to robotic partial nephrectomy. Key steps in their development are 1) radiology exam (MRI, CT), 2) image segmentation, 3) preparing for 3D printing or AR, and 4) printing the model or deploying the model to the AR device.

RESULTS: We demonstrate the work flow and utility of 3D printing and AR kidney models applied to a case of a 70 year old female with a 3.4 cm renal mass of her left pelvic kidney. A 3D printed kidney model was created using multi-color polyjet technology (Stratasys J750), allowing a transparent kidney with coloring of the renal tumor, artery, vein and ureter. An AR kidney model was created using Unity3D software and deployed to a Microsoft HoloLens. The 3D printed and AR model were used pre-operatively and intra-operatively to assist in robotic partial nephrectomy. To date, we have created 15 3D printed and AR kidney models to use for robotic partial nephrectomy planning and intra-operative guidance. The application of 3D printed and AR models is safe and feasible and can influence surgical decisions.

CONCLUSIONS: Our video highlights the work flow and novel application of 3D printed and AR kidney models to provide pre-operative guidance for robotic partial nephrectomy. The insights gained from advanced visualization can influence surgical planning decisions.

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V12-04

TELECYSTOSCOPY: USE OF REMOTE VIDEO TECHNOLOGY FOR BEDSIDE FLEXIBLE CYSTOSCOPY

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INTRODUCTION AND OBJECTIVES: The healthcare environment continues to evolve. As medicine becomes increasingly compartmentalized there is increased demand for access to specialists. Telemedicine is loosely defined as the use of telecommunication and information technology to provide clinical health care from a distance. The increased demand for specialized care will necessitate advances in telemedicine specific to each subspecialty allowing for increased access to high quality care. Cystoscopy is one of the most common procedures in the Urologic practice with multiple indications. Urology's continued advancement into the field of telemedicine would be greatly propelled by the development of a system for remote cystoscopy without sacrificing quality of care provided to our patients. We present a method for remote cystoscopy to be performed by any healthcare provider under the direct supervision of a Urologist in real time.

METHODS: In the William Beaumont Hospital Urology Staff clinic four cystoscopies were performed using the Quintree software that allows for the 'expert' Urologist to be available remotely.

RESULTS: Four cystoscopic evaluations were performed during the proof of concept period. We found excellent results in terms of the use of telecommunication software, allowing providers the ability to perform basic cystoscopic procedures under the real-time supervision of an attending Urologist. Throughout each procedure the attending Urologist was able to communicate with the provider, as well as patients. During one procedure the 'expert' was able to direct the attention of the provider to an area of abnormal appearing mucosa concerning for malignancy. No adverse events occurred during any of the procedures.

CONCLUSIONS: This proof of concept project successfully identified a technique for performance remotely of cystoscopic procedures. Though not formally measured, initial review by patient, provider, and expert demonstrated positive results with successful completion of the procedures and no detrimental effects on efficacy, comfort of both the patient and provider, or communication. Further formal investigation of this technique is necessary to demonstrate patient and provider satisfaction as well as to determine effects on outcomes in terms of diagnostic capabilities compared to standard procedures. While the software provides an excellent platform for our initial investigation, further tailoring to allow for ease of use in a more mobile platform would aid in furthering the use of telecystoscopy to more locations and departments.

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V12-05

INTRAOPERATIVE NERVE VISUALIZATION WITH GE3126

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INTRODUCTION AND OBJECTIVES: Iatrogenic nerve injury is a leading cause of morbidity associated with many common surgical procedures, including radical prostatectomy, herniorrhaphy, thyroidectomy, hysterectomy, and colectomy. Nerve-sparing techniques rely primarily upon white light optical identification of nerves, with varied results. There are currently no approved intraoperative agents to aid in the identification of vital nerve structures. GE3126 is a fluorophore that binds to myelin-basic protein and produces fluorescence in myelinated nerves. The objective of this video is to demonstrate the use of this nerve visualization technology in a porcine model.

METHODS: Laparoscopy was performed in adult Yorkshire pigs under general anesthesia. GE3126 was administered intravenously at a concentration of 1.0 mg/kg. A modified commercially-available laparoscopic imaging system was used for white-light and blue-light illumination. Optical filters were used to tailor the xenon excitation light and to optimize the detection of emitted light according to the characteristics of the fluorophore.

RESULTS: Real-time enhanced intraoperative visualization of nerves was consistently achieved in the porcine model. The modified commercially-available laparoscopic equipment camera system proved to be a feasible platform for continued use.

CONCLUSIONS: Research in human subjects is warranted, and the first-in-human study of GE3126 in men undergoing minimally invasive radical prostatectomy at Memorial Sloan Kettering Cancer Center is expected in 2018. The potential also exists for use of this nerve visualization technology in other disciplines to minimize nerve injury at multiple anatomic sites.

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V12-06

INDOCYANINE GREEN FOR URETERAL IDENTIFICATION DURING NON-UROLOGIC ROBOTIC SURGERY: MAYO CLINIC PILOT EXPERIENCE

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INTRODUCTION AND OBJECTIVES: Ureteral injury during non-urologic abdominoperineal surgery can occur in up to 10% of cases. Surgeons often use additional techniques for identification of the ureter including stents, lighted stents, or post-operative cystoscopy. While it may appear that ureteral stenting is a benign procedure, there is minimal data to suggest it prevents injury; and, in fact, iatrogenic ureteral injury can occur during stent placement. Indocyanine green (ICG) is a fluorochrome that can be injected intravascularly to visualize vascular and lymphactic channels. Early reports have suggested that intraureteral ICG is a beneficial adjunctive maneuver for ureteral identification during robotic assisted surgery. We present our initial experience with intraureteral ICG during robotic colorectal surgery.

METHODS: Patients who would potentially benefit from adjunctive ureteral identification during robotic colorectal surgery were prospectively identified. Our technique has evolved through our initial experience. Currently, we perform rigid cystoscopy (22 Fr) and a 5 Fr open-ended ureteral catheter is inserted up to 20 cm. 5 mL of 2.5 mg/mL ICG is gently injected as the ureteral catheter is withdrawn to the ureteral orfice. No stent is left in place. Intraureteral ICG is detected using near-infrared laser fluorescence technology (Firefly®).

RESULTS: Intraureteral ICG enhanced ureteral identification was performed in 12 renal moieties of 6 patients under robotic colorectal surgery. ICG ureteral identification was successful in 5 of 6 patients (10 of 12 moieties). ICG remained visible for up to 11 hours following instillation. No intraoperative ureteral injuries occurred. ICG Failure occurred in 1 patient with an atretic duplicated collecting system undergoing sigmoid colectomy. ICG was injected at level of ureteral orfices due to inability to advance a 6 Fr ureteral catheter. There was immediate extravasation of ICG into surrounding tissue in the setting of severe peri-ureteral inflammatory reaction from associated diverticulitis. There was no evidence of ureteral perforation on further evaluation.

CONCLUSIONS: Intraureteral ICG effectively augments ureteral identification during robotic assisted surgery. Even with lengthy operative times, durable results were feasible with a modified retrograde technique and no stenting. ICG extravasation may occur with severe peri-ureteral inflammation or high pressure instillation technique.

Source of Funding: none

V12-07

IMPLEMENTATION OF MULTIPARAMETRIC MAGNETIC RESONANCE IMAGING INTO ROBOTIC – ASSISTED RADICAL PROSTATECTOMY USING VIRTUAL REALITY

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INTRODUCTION AND OBJECTIVES: Multiparametric magnetic resonance imaging (mpMRI) of the prostate has been proven to improve cancer detection and staging. It has been more commonly used during urology practice at several stages of urologic management, one of which is pre-surgical planning. Currently, urologists check mpMRI data at picture archiving and storing systems (PACS) before or during robotic-assisted radical prostatectomy (RARP) to deliver better care. In this video, we demonstrate implementation of mpMRI data into intraoperative stereo imaging during a laparoscopic RARP procedure using the da Vinci® surgical system in 72-year-old patient with Gleason 4+4 prostate cancer (PCa).

METHODS: mpMRI revealed a 1.8cm tumor in the left apical-mid peripheral zone which was assigned a category 5 according to the Prostate Imaging-Reporting and Data System version 2. The lesion showed aggressive features with possible extraprostatic extension and invasion of the left neurovascular bundle (NVB). T2W MRI component of mpMRI was utilized to create 3D models of the prostate, bladder, rectum, NVBs, seminal vesicles, urethra and PCa lesions by manually contouring process. These contours were then used to create 3D mesh models for a commercially available VR platform with head mounted display (HMD) and touch controls (Oculus Rift®). Prior to RARP procedure, surgeons checked the MRI derived 3D model of prostate and its surrounding anatomy. During RARP, stereo images of the laparoscopic views were extracted using the da Vinci® DVI outputs. Both models were then aligned to each other using an in-house algorithm and provided to urologists during RARP.

RESULTS: Invivo imaging derived 3D models of the prostate, index lesion and periprostatic anatomy was successfully delivered to urologist during RARP procedure. This interactive visualization method enabled the surgeon to conduct a wider excision of the NVB at this spot without increasing the procedure′s time significantly. The final histopathology revealed clean margins at the wide excision zone.

CONCLUSIONS: Realtime use of in-vivo mpMRI derived 3D prostate and periprostatic anatomy information during laparoscopic RARP procedure via the da Vinci® surgical system can be advantageous to better tailor the surgery procedure and can potentially improve spatial awareness.

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V12-08

INITIAL EXPERIENCE WITH VIRTUAL REALITY ENHANCED PARTIAL NEPHRECTOMY

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INTRODUCTION AND OBJECTIVES: For over half a century surgeons have used axial imaging in the form of two-dimensional computed tomography (CT) or magnetic resonance (MR) imaging for pre-operative planning. Despite this robust clinical experience, surgeons do not always have a precise understanding of the final surgical anatomy. Virtual reality (VR) models allow surgeons to immerse themselves and manipulate a three-dimensional (3D) representation of the anatomy. We compared standard axial imaging to VR immersion and anatomical engagement for anatomic understanding.

METHODS: Patients undergoing partial nephrectomy (PN) for tumor were identified. Standard axial non-contrast and contrast CT and/or MR images of the patient (in DICOM file format) were used to create computer-assisted designs (CAD) of the kidney using 3D Splicer 4.8 software. Subsequently, for virtual model creation, these CAD designs were uploaded to a VR program (Bosc) for use with the Oculus Rift and Touch (a commercially available head-mounted display) and Leap Motion. The virtual model of the entire kidney and the relevant anatomy