

## P469 - Robotics, Telesurgery and Virtual Reality

### Robot-Assisted Liver Surgery: Our First 70 Patients in a General Surgery Unit. Early Outcomes

G. Ceccarelli, A. Fontani, E. Andolfi, E. Miranda, M. De Prizio, A. Biancafarina, M. Scricciolo, B. Frezza, G. Provenza, G. Pellicanò, San Donato Hospital, AREZZO, Italy

**Introduction:** Laparoscopic liver resections still remain confined to experienced teams in dedicated centers. It avoids long incisions and is associated to less postoperative pain, less blood loss, faster recovery and shorter hospital stay. In any cases laparoscopic approach may be very challenging. Robotic surgery has been introduced to overcome the limitations of conventional laparoscopic approach. The aim of this study was to review our centre's beginning experience in robotic-assisted liver resection in a Minimally Invasive and Robotic Unit, evaluating the safety and feasibility and short-term outcomes.

**Methods:** From September 2012 through December 2016, 162 patients were treated for liver resections, 70 patients (43%) underwent robotic-assisted liver resections. Diseases in the robotic group were: liver metastases (N=34), HCC (N=12), benign disease (N=21), one liver cholangiocarcinoma and two gallbladder cancer respectively. Out of 70 robotic-assisted liver procedures we have enrolled 18 consecutive patients affected by colorectal (N=13) and gastric (N=5) cancer with synchronous liver lesions suspected as metastases, those underwent one-stage robotic-assisted resections. The mean age was 67 years (25–89); men were 43 (61.4%). Patients' records were retrospectively reviewed.

**Results:** The resections performed were: 2 right hepatectomy, 5 left lateral sectionectomies and 84 non-anatomical or segmental resections. Three procedures of radiofrequency ablation were associated to a liver resection. The lesions located in the right posterior segments were 30 over 94 (31.9%). Pringle clamp was used in selected cases (32%). The mortality rate was 0%. Associated surgical procedures were performed in about 65.7% of patients: 6 right colectomies, left and colorectal resections, 5 gastrectomy, 14 cholecystectomy, 1 duodenopancreatectomy, 1 nephrectomy, 1 adrenalectomy, etc.. The posterior segments were treated for 30 over 94 lesions (31%). The total conversion rate was of 7 patients (10%).

**Conclusion:** Minimally invasive robot-assisted liver resection is a safe technique, it allows to overcome many limits of conventional laparoscopy, with a low conversion rate even when different associated diseases have to be treated. Treatment of right posterior segments may be performed safely, overcoming the Luisville restrictions; Comparative randomized trials versus conventional laparoscopy have to be performed.

## P470 - Robotics, Telesurgery and Virtual Reality

### First Series of Rectal Resection with the New Robotic Endo-wrist Staplers for da Vinci XI: A Case Match-Study vs Traditional Laparoscopic Staplers

S. Guadagni<sup>1</sup>, G. di Franco<sup>1</sup>, D. Gianardi<sup>1</sup>, M. Palmeri<sup>1</sup>, N. Furbetta<sup>1</sup>, M. Bianchini<sup>1</sup>, F. Menonna<sup>1</sup>, M. Lucchesi<sup>1</sup>, C. Ceccarelli<sup>2</sup>, P. Buccianti<sup>2</sup>, F. Melfi<sup>2</sup>, F. Mosca<sup>1</sup>, L. Morelli<sup>1</sup>. <sup>1</sup>University of Pisa, PISA, Italy, <sup>2</sup>Azienda Ospedaliero-Universitaria Pisana, PISA, Italy

**Background:** The new robotic linear stapler, for the da Vinci Xi, is a device equipped with an Endo-Wrist technology and directly controlled by the surgeon at the console. We compared the operative and short-term results between patients undergoing a robotic anterior rectal resection with total mesorectal excision (TME) for cancer with the new endo-wrist staplers, and those in which traditional laparoscopic were used.

**Materials and Methods:** We collected data about fifteen patients underwent an anterior rectal resection with TME for cancer, using the robotic Endo-Wrist 45 mm staplers (group Xi-RobSTAP) at our multidisciplinary robotic center from December 2015 to July 2016. The case-control group was composed, using a case-control methodology, by a similar pool of patients who performed the same surgery with the use of a 60 mm traditional laparoscopic endo-stapler, applied by the bed-side assistant (Xi-TradSTAP group). A diverting ileostomy was fashioned in 13 patients of each group.

**Results:** There were no significant differences in the two groups in mean operative time (315±59.2 min RobSTAP Xi group, 295±60.8 min Xi-TradSTAP group, p=0.3). The mean number of stapler's charges for each case, was significantly different (2.1±0.2 charges in Xi-RobSTAP group, 2.9±0.5 in Xi-TradSTAP group; p=0.001). The rates of intra-operative complications and the average hospital stay were similar (7.5±2.7 days in Xi-RobSTAP group, 6.8±1.3 days in Xi-TradSTAP group; p=0.5). No need to convert to laparoscopy or laparotomy in both groups. Anastomotic fistula at contrast enema (not symptomatic except for one case of Xi-TradSTAP group) performed during the follow up period, was higher in the Xi-TradSTAP group, although without statistical significance (3 leak versus 1 leak; p=0.15). Time elapsed between the intervention and stoma closure, although not statistically significant, was shorter in the Xi-RobSTAP group (4.2±3.1 month in Xi-TradSTAP, 2.7±2.1 month in Xi-RobSTAP group; p=0.17).

**Conclusion:** In our preliminary experience the new robotic linear staplers seemed to give some advantages in terms of easy transection that could result in a reduction of average number of stapler firing used during rectal resection and with a lower incidence of anastomotic leakage. These promising data are very preliminary and need to be verified on larger experiences.

## P471 - Robotics, Telesurgery and Virtual Reality

### Hands-Free and Sterile Control of PACS and Endosuite Using Wearable Sensors During Laparoscopic Surgery and Telementoring: A Feasibility Study

H.A.W. Meijer, M. Graafland, J.C. Goslings, M.P. Schijven, Academic Medical Center, AMSTERDAM-ZUIDOOST, The Netherlands

**Background:** In the operating theatre, wearable sensors allow for direct, sterile and hands-free interaction with computers housing radiological imaging in a picture archiving and communication system (PACS). The aim of this presentation is to illustrate our experiences with TedCube™ technology, controlling PACS and Endosuite, and show its feasibility in long distance telementoring.

**Methods:** The TedCube™ hands-free control system was used to control PACS and Endosuite in the operating theatre, using voice commands and gesture control. To test feasibility in long distance telementoring, two stand-alone computers, one located at an academic hospital in the Netherlands, the other at a surgical research facility in Spain, were connected using TeamViewer™ software to allow for remote, hands-free controlling of radiological images using Myo™ gesture control armband. The surgeons communicated through an audio, video, and desktop sharing system during a live surgical procedure in a porcine model. The system was analyzed for feasibility, also including quality of the video and audio connection.

**Results:** The surgeons could successfully use hands-free control of the Endosuite and PACS, with only the varying time until confirmation of command execution being a limiting factor. There was a successful connection established between both medical centers without any downtime and with only a minor time lag, not interfering with telementoring processes. The operating surgeon could effectively consult with the remote surgeon, both through video, audio, as well as the desktop sharing system, using the wearable sensors.

**Conclusions:** This study shows the feasibility of using hands-free gesture control for both PACS and Endosuite control by the operating surgeon in the operating theatre. It also shows the potential of using an internet-based remote desktop sharing system in combination with wearable sensors and TedCube™ technology for telementoring purposes during surgical procedures.

## P472 - Robotics, Telesurgery and Virtual Reality

### Comparative Study of the da Vinci XI Versus the da Vinci SI Surgical System for Bariatric Bypass Surgery

N. Niclauss, M.E. Hagen, M.K. Jung, P. Morel, Geneva University Hospitals, GENEVA, Switzerland

**Background:** To date, the da Vinci Surgical System family (Intuitive Surgical Inc., Sunnyvale, CA, USA) remains the most widely used surgical robotic systems for laparoscopy and its latest addition has been released in 2014 with the da Vinci Xi Surgical System. When compared to the da Vinci Si Surgical System, this novel system offers distinct features targeting towards a facilitated setup and a greater ability for multi-quadrant procedures. Detailed data about bariatric surgery with the Xi system are not available yet. We report our experience with bariatric bypass surgery comparing the Xi to the Si system.

**Methods:** All robotic bariatric bypass procedures performed between January 2013 and September 2016 were included in this retrospective analysis. Patient demographics, operative- and postoperative outcomes up to 30 days were compared between cohorts containing surgeries with the Xi and the Si system. Robotic costs per procedure were modeled based on a standard set of robotic instruments, capital investment and yearly maintenance of the robotic system.

**Results:** 144 Xi Surgical System and 192 Si Surgical System procedures were identified for this analysis. Mean age, gender distribution, BMI and ASA scores were similar in both cohorts. Surgical procedures were mainly primary Roux-en-Y gastric bypass (95.1 vs. 95.3% in Xi vs. Si, p=1.0). Operating room times were similar in both groups (221.6±62.1 vs. 227.5±61.4 min for Xi vs. Si, p=0.40). Docking times were significantly longer with the Xi compared to the Si system (8.8±4.7 vs. 5.8±4 min, p<0.0001). There was no difference in the incidence of minor (grade I+II) and major complications (grade III+IV) between the two groups (minor: 10.4 vs. 9.9%, p=1.0; major: 4.2 vs. 5.2% for Xi vs. Si, p=0.80). Costs per procedure were higher for the Xi system caused by higher capital investment and yearly maintenance.

**Conclusions:** Bariatric bypass surgery can be safely performed with the da Vinci Xi Surgical System. Drawbacks of the Xi system include longer docking times and higher costs per procedure. Health care providers that are not targeting surgical procedures during which the Xi feature brings incremental clinical value might consider choosing the less costly option of the Si system.