Image-Guided Robotic System Utilized to Facilitate a Long and Complex Surgical Procedure

A Case Study

Long and complex surgical procedures demand heroic concentration and unremitting precision of the surgeons and surgical staff from beginning to end. Outcomes depend on accuracy in surgical performance and dexterity.

Over the last decade, laparoscopy has become the standard of care for abdominal and gynecological surgical procedures. The surgeon’s performance in minimally invasive surgery (MIS) relies on the image provided by the camera. Image quality has greatly improved over the years with higher pixel count and higher resolution displays, but image stability, scope and field of view is still highly dependent on the person holding the camera.

An assistant’s ability to anticipate the next camera placement is not always optimal, and communication problems occasionally occur. This lack of coordination between surgeon and assistant often results in incorrect or unwanted camera motion.

Holding the camera may also be exhausting in long surgical procedures, leading to fatigue, neck and back pain and, potentially, unsteady images.

The AutoLap system was introduced at Wilhelmina Ziekenhuis Assen as a way to improve surgical staff wellbeing – during the more extended and complex MIS procedures conducted at the facility in particular; to optimize visual capability in MIS; to increase surgical efficiency; and to provide a cutting-edge robotic program at low cost.

Wilhelmina Ziekenhuis Assen

Wilhelmina Ziekenhuis Assen (WZA) is a medium-sized hospital serving a northeastern region of the Netherlands with some 300 beds and 1,200 employees.

WZA’s mission is to provide quality and efficient patient care with short waiting times, supported by a commitment to continuous improvement and innovative approaches to medical treatment. The hospital also implements advanced systems and practices that promote the wellbeing of its staff.

WZA performed 737 laparoscopic procedures in 2016 (532 general surgery; 205 gynecological surgery) and has observed the ergonomic stress that surgical assistants holding the laparoscopic camera frequently experience in these procedures.

Bas van Vugt, MD

Bas van Vugt, MD is a GI surgeon at WZA, specializing in colorectal surgery, pelvic floor surgery, hernia surgery and proctology.

He has extensive experience working with surgical teams across the Netherlands, developing an integrated approach to surgery to support optimal outcomes for the patient, surgeon, surgical team and surgical facility.

Introducing AutoLap at WZA

Drs. Bas van Vugt is a pioneer of the AutoLap image-guided robotic laparoscope positioning system in Europe and together with Dr. W. Bleeker led a surgical team in performing the first ever minimally invasive APR (Abdominoperineal Resection) procedure utilizing AutoLap.

Abdominoperineal Resection (APR)

Abdominoperineal resection is a surgical procedure to treat anal or rectal cancers and is one of the most complex of general surgery procedures.

During the procedure, a section of the sigmoid colon, the rectum and anus are removed. The procedure begins with laparoscopic anterior abdominal incision for colon dissection and removal. The remaining section of the sigmoid colon is diverted through the abdominal wall and a colostomy is placed on the abdomen. The surgeon proceeds to remove the rectum and anus by perineal incision.

There are two approaches to the procedure: consecutive and simultaneous. When performed consecutively, the perineal dissection is carried out by the surgical team once the abdominal section of the case is completed. In a simultaneous procedure, the perineal dissection is conducted by a second surgeon simultaneously with the abdominal part of the surgery.

Case Study

Image-Guided Robotic System: AutoLap Utilization for APR Procedure

Due to personnel limitations, APR procedures at WZA have generally been non-simultaneous, taking an average of 220 minutes per procedure. Positive reports of the combined (simultaneous) approach performed at other hospitals, along with the availability of the AutoLap system at WZA, encouraged the team to perform simultaneous APR.

网贷 Procedure Time – Reduced

120 minutes

In this case, AutoLap utilization enabled reduced APR duration, completing the entire procedure in approximately 120 minutes – about 45% less than WZA’s average. Utilizing AutoLap allowed WZA to optimize OR staff resources so that OR time could be reduced with the simultaneous approach.

网贷 Surgical Team Size – Reduced

6 team members

Using AutoLap enabled Dr. van Vugt and Dr. Bleeker to work simultaneously and only 6 team members were required.

Performing APR with the simultaneous approach – i.e., two surgeons performing both the abdominal and perineal stages at the same time – generally requires two surgical teams, involving altogether 7-8 surgical personnel, not including the circulating nurse, and up to 10 surgical personnel at sites that include trainees in such a procedure. (Otherwise performing the procedure consecutively requires only one team, but significantly protracts the length of the procedure.)

Dr. van Vugt performed the abdominal stage laparoscopically and Dr. Bleeker worked on the rectal procedure using an open technique with a self-retaining retractor. As the camera was held and controlled with the AutoLap system for much of the abdominal portion of the procedure, only one scrub nurse was required to assist the surgeon abdominally and a second scrub nurse assisted the surgeon performing the perineal procedure. No extra operating nurses were required in order to perform the simultaneous approach.

Only 6 surgical team members to perform the APR procedure

- 2 surgeons
- 2 scrub nurses
- 1 anesthesiologist
- 1 anesthesiologist assistant

AutoLap

(MST Medical Surgery Technologies)

Image-guided robotic laparoscope positioning system for minimally invasive surgery

AutoLap™ interacts with the surgeon’s movements in the surgical cavity, guiding the robotic laparoscope positioner in real time. The system offers the surgeon full and natural control of the surgical procedure and an optimal field of view.

The surgeon can choose from different modes of interaction with the robotic system. Smart features include automatic zoom correction, camera horizon correction and tissue collision warning.

AutoLap™ does not require extensive training and easily integrates with existing surgical tools, imaging systems and OR equipment. Bed-mounted and compact, AutoLap™ is easy to set up, transport and store between procedures.

FDA-cleared and CE marked, AutoLap™ is already being used in operating rooms in Europe, the United States and Asia. The AutoLap™ system is currently indicated for general, gynecologic and urologic laparoscopic procedures.
Abdominal laparoscopic ports were placed as in sigmoid resection procedures. The AutoLap laparoscope positioner was placed to the lower left-side of the patient to enable proper draping, maintain sterility and leave room for the patient’s left arm to be extended to the side as required by protocol at WZA.

Rapid OR Turnaround
< 5 minutes

For the APR procedure at WZA – as for all procedures with AutoLap - the system contributed to rapid OR turnaround, with minimal system setup and tear down time – no more than 5 minutes at each end. AutoLap setup was integrated in the normal OR setup time and was performed while the patient was being prepared for surgery, during intubation and insufflation of the abdomen.

Assistant Stress – Reduced
Eliminating ergonomic discomfort and fatigue

Surgical facilities are increasingly acknowledging the need for solutions to reduce assistant fatigue and ergonomic stress. “That has been a top priority for us too at WZA,” van Vugt emphasized. “For long procedures such as APR, the camera holder is expected to stand for 3 hours in an ergonomically awkward position. The surgical assistant must hold the camera with one hand, and part of the time also holds a surgical tool in the other. The assistant maintains a partially rotated working position that causes fatigue and back-neck pain, potentially leading to injury in the neck, shoulders and back. We were looking for a way to improve that situation,” he explains.

“When with AutoLap utilized in this APR procedure, no back pain was reported by the surgical assistant. Eliminating ergonomic discomfort and fatigue for the surgeon and assistant around the OR table was a primary incentive for AutoLap adoption and has become a key benefit of the system at WZA.”

Modular Ease of Use
Flexible positioning

AutoLap can be set up at different angles and positions along the side of the operating table.

For the APR procedure, the system was placed to the lower left-side of the patient, to enable proper draping and sterility, leaving room for the patient’s left arm to be extended to the side as required by protocol at WZA.

“Having used the system in a range of different procedures, including the APR, laparoscopic fundoplication and laparoscopic ventral rectopexy, I value its modularity. I am able to configure the best setup positions and angles to optimize it for an extensive range of procedures.” - Drs. van Vugt
Unobstructed teamwork

Two surgeons working simultaneously on the APR procedure at WZA meant that the team required space to work in many areas around the operating table.

Attached to the side of the table, its arm reaching directly over the patient’s abdomen, the AutoLap system takes up very little space on the bedside. Drs. van Vugt and Dr. Bleeker and their surgical team were able to benefit from robotic positioning for the scope while performing the procedure unobstructed.

Dr. van Vugt: “Endoscopy units are fully equipped for laparoscopic procedures, and AutoLap has its place there. "Compared to the overall cost of setting up an endoscopy suite, the price of the AutoLap is minimal and fully justified.”

AutoLap Relevance at WZA

Improved Camera View
Camera stability and positioning is prone to recede as fatigue intensifies for the camera holder. The field of view remains consistently stable when WZA teams utilize the AutoLap system.

WZA Insight: “Some camera holding assistants are well trained and experienced, specializing in GI surgery and they may hold the camera as steady as a robot in a one-hour procedure. In longer procedures, even the trained assistants will likely experience fatigue, fully justifying the introduction of AutoLap from the start.”

Reduced Stress
During long procedures, AutoLap replaces the surgical assistant holding the camera for all or part of the time. The assistant is relieved of physical stress and stressful interaction in close quarters.

WZA Insight: “The benefits of using AutoLap are possibly even greater for the surgical assistant; and that is our focus. No back or neck pain has been reported by surgical assistants following procedures using AutoLap.”

Surgical Efficiency
In particular procedures such as the APR, utilizing AutoLap is an enabler in reducing both surgical staff and operating time.

WZA Insight: “Much of our hospital’s equipment and technologies is carefully chosen to improve the efficiency of medical procedures. A low-cost system like the AutoLap that allows us to free surgical assistants for other important tasks is a definite win.”

Low-Budget Robotics
WZA benefits from having a robotic surgical system and does not have the budget to introduce, use and maintain a large robotic system like da Vinci.

WZA Insight: “We have been able to offer our patients robot-assisted surgery at low cost since introducing the AutoLap system. In comparison with the overall cost of high-end technology and equipment that we purchase, the cost of the AutoLap system is very low – just the cost of a new 3D camera is higher than one AutoLap system.”

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AutoLap™ is cleared for marketing both in Europe and the US.