DANIEL J. SCOTT, MD

RESEARCH PROJECTS

General Scope:

Dr. Scott has been actively involved in minimally invasive surgical research since his fellowship experience in 1998. He helped pioneer new techniques and was part of the team of researchers at UT Southwestern Medical Center that performed the first laparoscopic Roux-en-Y gastric bypass in Texas (May 1999). He has also published landmark articles in Surgical Education, documenting the transferability of skills acquired using simulators and developing proficiency-based curricula that enhance learning and maximize efficiency. His interests include advanced laparoscopic surgery, robotic surgery, obesity surgery, surgical simulation, and surgical education. He has won seven awards for outstanding research papers and was the recipient of the 2004 SAGES Young Researcher Award and the 2005 SSAT Traveling Fellowship Award. Dr. Scott currently has numerous ongoing research projects in the areas of surgical education and new minimally invasive technologies.

1. Surgical Education and Simulation Research

Dr. Scott has a keen interest in research involving surgical education and simulation. Specifically, the use of simulators for teaching laparoscopic skills has become well established as a useful adjunct to conventional on-the-job training. Dr. Scott's research focuses on the development of new curricula, validation of new curricula (often in terms of transferability to a real operation, human or animal lab), improvement of training methods, development of strategies to improve skill maintenance, methods for assessment of operative performance, and methods for verifying proficiency. The center's simulation and training lab (E 6.202) is a state of the art facility capable of performing high quality prospective randomized IRB approved studies. The center's education coordinator supervises and coordinates much of the training activities and numerous faculty are involved. Below is a partial list of ongoing research projects being led by Dr. Scott.

Robotic Suturing Curriculum – curricular development using inanimate models on the DaVinci robotic platform

Fundamentals of Laparoscopic Surgery (FLS) Curriculum – develop proficiency-based curriculum with SAGES for use in FLS course, similar to ATLS

Pilot study on proficiency levels, multicenter trial on pass rate of FLS exam after completion of curriculum

Collaborative plans with Uniformed Services University, McGill, SAGES, et al.

Promis Suture Study – collaboration with Bay State Medical Center, Uniformed Services University, Tony Gallagher at Royal College of Surgeons in Ireland, et al. to validate transferability of a laparoscopic suturing curriculum on the Promis simulator using automated metrics

OR Assessment of Residents- collaboration Imperial College of Medicine (London), refine methods for intraoperative assessment for ongoing resident evaluation purposes, integrate into bigger outcomes study measuring impact of curricular changes over time

Skill Maintenance – refine methods for achieving optimal skill maintenance after demonstrating initial proficiency

Virtual Lap Chole Training – validate transferability of Simbionix lap mentor gallbladder module to 1) ex-vivo porcine gallbladder model and 2) live human operations; collaboration Imperial College of Medicine (London) using motion tracking device (ICSAD)

Bariatric Surgery Curriculum – use a validated ex-vivo porcine small bowel model for jejunojejunostomy construction as part of a curriculum for bariatric surgery. Further develop gastrojejunostomy model, validate skill acquisition by measuring performance of bariatric minifellowship participants on live porcine model and human cadaver model. Collaboration Imperial College of Medicine (London) using motion tracking device (ICSAD). Follow-up study will teach similar skills to residents and evaluate impact on performance during live human gastric bypass operations. VR simulators will be incorporated and evaluated.

Global Outcomes of Curricula Changes – Patient safety, Operative performance (ongoing globals), OR time, % resident involvement, # cases, ABSITE scores, and other measures to document outcomes related to curricular changes over time

Virtual OR Training – evaluate improvement in learning by incorporating physiologic parameters, situational constraints, and team interactions simulated for laparoscopic cholecystectomy and other operations in a virtual operating room environment

2. Gastrointestinal and Endoscopic Research using Large Animal Models and Cadavers

Dr. Scott has a keen interest in new minimally invasive technologies. One of the most exciting areas of research is centered on the technique of flexible transgastric endoscopic surgery. Known also as incisionless or natural orifice surgery, this technique may well be

the next evolution of minimally invasive surgery. The potential to perform intraabdominal surgery without making abdominal incisions is very attractive from the standpoint of wound healing and minimizing postoperative pain, and hence enhancing postoperative recovery. Proof of concept has already been established by Kalloo, and associates at Johns Hopkins University as well as by a number of other authors.

Briefly, an endoscope can be passed transorally down the esophagus and through a gastrotomy, which is made on the anterior aspect of the stomach and procedures such as cholecystectomy, liver biopsy, or diagnostic laparoscopy may be performed using flexible endoscopic techniques.

The main problem with this surgical approach is a lack of instrumentation and a lack of refined techniques. Moreover, closure of the gastrotomy is critical to ensure a safe outcome. The main focus of Dr. Scott's research in this area is to refine the techniques for performing intrabdominal operations via a flexible endoscopic transgastric surgery.

Dr. Scott also has strong interest in minimally invasive treatment of GERD, as well as hernia surgery, with projects as noted below.

Burst Strength of Ex-vivo Porcine Stomachs - compare reliability of methods for closing gastrotomies for application in flexible transgastric surgery

Development of Endoscopic Gastrostomy Closure Methods – refine methods including clips and suturing, explore options for stapling

Burst Strength of in-vivo Porcine Stomachs - compare reliability of methods for closing gastrotomies for application in flexible transgastric surgery

Antimicrobial GI Decontamination for Flexible Transgastric Surgery – evaluate effectiveness of antimicrobial decontamination in terms of peritoneal seeding

Development of Endoscopic Cholecystectomy Techniques – refine methods and instrumentation for flexible transgastric surgery; close collaboration with UTA engineering team

Open vs. Lap vs. Flexible Transgastric Cholecystectomy – outcomes in live porcine model

Development of Flexible Transgastric Bariatric Procedures - refine methods and instrumentation for flexible transgastric surgery; close collaboration with UTA engineering team

Validation of a Large Animal Model to Study GERD – refine techniques to establish a described porcine hiatal hernia model and document physiologic parameters including pH, manometry, and impedance

Comparison of Laparoscopic vs. Endoscopic GERD Treatments – measure efficacy in terms of physiologic GERD parameter resolution

Laparoscopic Hiatal Hernia Repair Using Mesh Reinforcment – compare efficacy in terms of burst strength of laparoscopic hiatal hernia repair with and without mesh in a porcine hiatal hernia model

Laparoscopic Ventral Hernia Repair: Comparison of Fixation Methods – compare burst strength of laparoscopic ventral hernia repairs using helical fasteners alone versus buttressing with transfascial sutures

3. **Clinical:**

Dr. Scott's main clinical interests are in the areas of Bariatric surgery and other minimally invasive and robotic operations. Much of the obesity-oriented research is in collaboration with a large team of investigators at UTSW.

Relative Value of Intraoperative EGD Leak Testing for LRYGB – conduct a longitudinal cohort study using NGT with saline vs. EGD for leak testing of gastrojejunostomy and measure sensitivity, specificity, operative time, and costs of both methods

Impact of Preoperative Weight Loss on Liver Disease and Surgical Outcomes in Bariatric Surgery – develop a protocol for preoperative weight loss for bariatric surgery patients and determine the impact of preop weight loss on liver size, intraoperative and postoperative surgical outcomes, and long-term weight loss

DVT Prophylaxis in Bariatric Surgery – determine the ideal dosing of LMWH according anti-Xa levels in morbidly obese individuals

Long-term Relationship of Ghrelin to Hunger in Gastric Bypass Patients – investigate the relationship of hunger and Ghrelin levels in gastric bypass patients greater than 2 years postop

Value of Robotic Surgery for a General Surgery Training Program – document utilization, OR times, resident and fellow participation, surgeon impressions, patient outcomes, and growth of our robotic surgery program

Robotic Bariatric Surgery – further develop techniques for robotic lap banding and determine benefit

Comparison of ERCP and LCBDE – determine cost and patient outcomes for protocols at PMH using ERCP vs. LCBDE