What should be in the Toolbox

advances in instruments…

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Disclosure

• I hold a US patent for an esophageal anastomosis device
• Advisory board for Boston Scientific
Objectives

• Review new enabling technology available for thoracoscopic lobectomy and lung cancer treatment
• Discuss advantages of the new technology
• Discuss potential pitfalls in the new technology
Outline

• Approaches
• Robotic Evolution
• Instrumentation
• Stapling
• Staging
• Nodule Localization
• Imaging
• Energy
• Ablation
There are a lot of new tools in the toolbox...
Timeline of minimally invasive surgery...

- Morton invents anaesthesia
- Thomas Edison invents incandescent light, ushering in an era of electrical illumination in endoscopy
- Jacobaeus describes the first laparoscopy in humans
- Coelioscopy of the peritoneal cavity described in dogs by Kelling
- Fibre-optic cold light instruments developed
- Zollikofer described CO₂ insufflation of the peritoneum
- Semm performs first laparoscopic appendicectomy
- Mouret performs first laparoscopic cholecystectomy
- First description of a robotic surgical procedure: a prostatectomy using the PROBOT performed at Imperial College London


- First reports of nondiagnostic uses of peritoneoscopy such as adhesiolsis
- Diagnostic bladder endoscopy by Desormeaux using candles and prisms as light sources
- Kalk, the father of modern laparoscopy, devises an oblique viewing lens and dual trocar technique to permit instrumentation
- Boisseau de Rocher creates an endoscope with separate light and instrument channels permitting instrumentation rather than just diagnostic viewing
- Semm pioneers gynaecological laparoscopy with new techniques for diathermy and suturing
- da Vinci® system developed and advent of robotic surgery
- Massive expansion of range of minimally invasive surgical techniques: rectal surgeries, cystectomy, and gastrectomy, for example
What will the future of lung cancer treatment look like?
How to bring New Technology Into Practice

**STS EXPERT CONSENSUS STATEMENT**


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Checklist for Privileging

☐ Verification of knowledge and skills assessment
  - ABTS-eligible or ABTS-certified surgeon
  - Documented completion of a course or didactic session
  - For recent graduates of an accredited program, case logs and a program director letter attesting to competence

☐ Team management
  - Draft of implementation program complete
  - Education plan for team members complete
  - Crisis management plan complete

☐ Institutional collaboration
  - IRB and/or institutional innovative care/new technology committee approval

☐ Monitoring of outcomes
  - Participation in a continuous quality improvement committee and/or morbidity/mortality conference
  - Participation in an auditable database (e.g., National Surgical Quality Improvement Program, STS National Database, Michigan Society of Thoracic and Cardiovascular Surgeons Quality Collaborative) or registry or shared database that is accessible by the host institution
  - Demonstration of ability to present accurate and detailed morbidity and mortality rates to administration upon request

☐ Patient-centered transparency
  - Provide appropriate consent forms for IRB and/or innovative committee approval
  - Provide the patient information on the risks and benefits of the new procedure, alternative treatments, general costs (i.e., to the patient or payer, or both), and comparative effectiveness of the new technology vs existing treatment options
  - Provide the patient with information on the surgeons training and experience to date
Approaches have evolved to be less painful

MS → VATS → VATS uniportal → Robotic → Microlobectomy/Subxyphoid
Sib-xiphoid Single-Incision VATS LUL

*problem: L sided cases - the heart is in the way…
Transoral Surgery: future approach for some cases?
New Robotic Equipment

- Robotic Stapler
- Smaller Platform
- XI
- Other competitive systems (Johnson & Johnson)

Camera-VATS → DaVinci → Intuitive S → Intuitive SI + teaching console → XI
*da Vinci® Xi™* Patient Side Cart

- **Boom**
- **Boom Rotation**
- **Column**
- **Helm**
- **Cart Base**
- **Instrument Arms**
- **FLEX Joints**
- **Patient Clearance Joint**

PN 10173

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Advocates of robotic surgery...
Robotic Endobronchial Guidance

auris surgical robotics is a technology company based in silicon valley

We Are Here to Serve the Patient

Auris is a technology company dedicated to improving healthcare for all patients who need medical intervention. We believe that healthcare is a sacred right of all individuals and that each human deserves the most effective care possible.
ARCHIMEDES – TOTAL LUNG ACCESS PLATFORM

Archimedes, including BTPNA (Bronchoscopic Trans-Parenchymal Nodule Access), takes virtual bronchoscopic navigation to the next level by incorporating a novel approach to the peripheral lesions that are not adjacent to the airway.

In this BTPNA, the software creates a tunneled path through the lung parenchyma and around the blood vessels directly to the peripheral lesion, which can then be sampled and treated. All during one visit.

VIRTUAL BRONCHOSCOPIC PLANNING, NAVIGATION AND TUNNELING

Image Guidance for Bronchoscopy and Fused Fluoroscopy

- Real-time navigation within the lungs for lung biopsy and other diagnostic and therapeutic procedures
- Side-by-side navigation pairs real-time and virtual images throughout procedure
- Navigation guides user to target with 3mm accuracy
- Airway path allows access to lesions without specialized, disposable instruments
- BTPNA Module enables direct access to lesions using standard 2 mm working channel
Discovery IGS 740
Rediscover space and movement.

The Discovery IGS 740 angiography system brings both extremely high-quality imaging and complete workspace freedom to the hybrid operating room for endovascular, hybrid and open surgical procedures.

Contact Us
Subscribe to SmartMail
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Newer Robots…
NEUWAVE™ Microwave Ablation System

A minimally invasive option for soft tissue lesions in the liver, kidney and lung. Learn how this versatile system allows physicians to ablate lesions of many shapes and sizes with consistency and control.†,*
Instrumentation

• Normal instrumentation (McKenna et al.)
  • Port placement crucial

• Long double-action curved/articulating (D’Amico et al.)
  • Flexible port placement/ more forgiving

• Hand-held devices
  • Ergonomic design
  • Articulating
  • Smaller: 5mm instruments
VATS Lobectomy
Instrumentation has improved
Bone cutting devices

Kerrosin punch made by Medtronic and Scanlan: Dennis Rib Cutter
Instrumentation

- Limiting ports:
  - Drop-in clamps and deployable devices
  - Trans-fascial suture passing devices
- SILS Instrumentation
Instrumentation

• Haptic Technology

Minimally Invasive Robotic Surgical Tool Feels for Tumors

Tumors often look identical to healthy nearby tissue, but they tend to feel different. Surgeons often use their fingers to feel the size and shape of what’s to be resected, but palpation is essentially impossible when relying on minimally invasive...
Instrumentation

• New Suturing Tools
  • Robotic suturing
  • Knot pushing devices
    • Cardiovations
    • Scanlan
  • TiKnot Device
  • Endostitch
  • Roticulating Needle Drivers
Endo360°

Reusable suturing devices for minimally invasive surgery
Endo 360°
Endo 360°
Knot-tying Devices
New Stapler Technology

GI Staplers → varying height → Reinforcement → Curve Tip → Robotic

- Curved tip stapler
- Smaller profile
- More degrees of articulation/rotation
- Black loads
- Powered stapling
- Smaller hands
- Anvil Fixation
Smaller Platform Staplers

• 5mm stapler platform
New Scope Technology

Low Definition → High Definition → 3-D → Holographic/submersive
Welcome to Lightpoint Medical

Lightpoint Medical is a medical device company dedicated to improving health outcomes for cancer patients through image-guided surgery.

The company's molecular imaging technology, based on Cerenkov Luminescence Imaging, has the potential to detect cancer in real-time during surgery, providing more accurate cancer treatment while sparing healthy tissue.

Learn more »

News

Lightpoint Medical announces exclusive global license agreement with the University of Arizona
May 16, 2016

Lightpoint Medical announce first hospital installation of LightPath Imaging System
Feb 4, 2016

Lightpoint Medical receives 2.4M Euro grant for breast cancer clinical trial
Nov 26, 2015
Pintpoint Immunofluorescence
How do we do better staging of mediastinum?

- EBUS
- New N1 EBUS scope coming…

Mediastinoscopy → CT → Video med → PET → EBUS → N1 EBUS →
EBUS

Endobronchial ultrasound view
Lung Nodule localization

- Technetium injection (CT-Guided)
- Methylene blue injection with ENB guidance
- Indocyanine green injection
“Firefly” Fluorescence Imaging $100,000

- New camera head can pass fluorescence signal
- Fluorescing signal overlaid with green hue in surgeon console
- Laser Excites Indocyanine-Green and Fluoresces
- Renal arteries - fluorescence mode (NIR)
Hybrid Room Applications

• GE 740 Imaging System

• Novel Lung Mapping from CT → Mapping from Cone Beam CT
Hybrid Localization of Nodules
Coil and Methylene Blue Dye
Hybrid Needle Localization
Hybrid Needle Localization
Hybrid Needle Localization
GE Discovery 740 System: Hybrid Room

• Advantages:
  • Wide Bore; distance between the gantry and detector is 138cm, easy to perform CBCT
  • CTHD software
  • Currently loaded with Vision, soon to have Thoracic VCAR
5 sec CTHD to localize the nodule
3D Nodule Overlay w/Vision
Fluroscopic Guidance
Imaging

CT scan → 3-D reconstruction → 3-D printing → 5D Printing → Holographic Projection
3D Imaging Projection
Segment Localization

CT scan → 3-D reconstruction → 3-D printing → Thermography

• Intraoperative Thermography to detect intersegmental plane for segmentectomy
Imaging Segmentectomy

- Varian (JTCVS) 3-d segmental visualization to detect and plan segmentectomy
Pre-op planning for segmentectomy
(A) A 3-dimensional computed tomographic image of the right pulmonary vessels.
(A) The 3-dimensional computed tomographic image of the right pulmonary vessels showed that this patient had triple middle lobe pulmonary artery branches.
3D Imaging

- Chest wall cases
- Complicated anatomy
- Pancoast cases
Mayo Clinic
3-d printing
Mayo Clinic
3-d printing
3D Printing Enables Novel Approaches to be Practiced
5D printing

Microsoft Hololens
Energy devices

Bovie → Harmonic → Argon → Bipolar → Aqua Mantis → HiFU

SEPTEMBER 22ND, 2014

THORACIC SURGERY

Covidien Expands Lineup of Sonicision Cordless Ultrasonic Dissection Devices (VIDEO)

Covidien announced that the FDA has cleared three additional sizes of its Sonicision Cordless Ultrasonic Dissection Devices, allowing surgeons to use them for a greater variety of procedures and patient sizes. These are the only cordless...
Energy devices: Aquamantys
HARMONIC® HD 1000i

Designed for complex open and laparoscopic procedures, the new HARMONIC® HD 1000i provides:

**Precision**
Unique shape mimics a mechanical dissector*, reducing the need to use a separate dedicated dissecting instrument†

**Strength**
Unique blade design delivers consistent and reliable hemostasis‡ and can be used in challenging conditions

**Efficiency**
Increased sealing speed, multi-functionality, and simplified steps for use allow for optimal efficiency†‡§∥

Thoracic
Jaw design, device ergonomics, and modulated energy delivery of Adaptive Tissue Technology enable the HARMONIC® technology to be used in thoracic procedures to dissect lymph nodes, seal lymphatic ducts, and seal vessels with diameters of less than 7 mm.
New Hemostasis Tools

Surgicell → Tisseel → Biogluce → Fibrin Glue → Arrista
Lung Ablation- we may not always need resecting by VATS…

- Cryo
- MWA
- RFA
- SBRT
- Protons
Putting all of the players on the same team

Mayo Lung Ablation Tumor Board
The **EMPrint™** Ablate and **RESect** Study in Patients with Metastatic Lung Tumors Post-Approval Study (**EMPRESS**)  

- Site Initiation  
  - Rachael Gianzero, Covidien Clinical Project Manager  
  - Donna Schow, Covidien CRAII  
  - Casey Ladtkow, Covidien Staff Development Engineer  
  - Charlie Chrisawn, Health Decisions Clinical Project Manager  
  - Jane Parr, Histology Technologist, National Jewish Health  
  - Andrea Falkoff, Intrinsic Imaging
• Medtronic Bronchoscopic MWA
• Awaiting IDE with FDA

**ARSENAL Trial**
Cryospray Therapy

• Pleural application
• Endobronchial application
• Clinical trials
• Early results

TruFreeze Technology
New Technology that may change the way we treat lung cancer outside of surgery…

- Ablation
- SBRT
- Targeted Therapy
- Screening
- Prevention
OR of the future…

• Hybrid room
• Ablation
• Holograms
• Image guidance
• Enhanced optics
• Improved equipment
• Telementoring
• Telepresence
Questions & Discussion
Questions & Discussion
3D Printing Enables Novel Approaches to be Practiced
Hybrid Surgery
3D Printing Enables Novel Approaches to be Practiced