MINIMALLY INVASIVE SURGERY

Specialists test latest in advanced robotic surgery technology

The Ohio State University Medical Center, a leader in robotic surgery, recently became one of only a few hospitals in the world to perform surgery using a robotic device with four arms, rather than the three that are the current standard in computer-assisted surgery.

Dr. W. Scott Melvin, associate professor of surgery, chief of the Division of General Surgery, and director of the Center for Minimally Invasive Surgery, recently performed several abdominal procedures using a new robotic device with four arms. He says that initial results suggest the additional robotic arm helps the surgeon perform the most precise manipulations more easily, and eliminates the need for a second surgeon to assist with the operation.

“The additional arm for instrumentation likely provides some advantages for abdominal surgeries,” Melvin says.

Until recently, robotic procedures conducted at Ohio State used three robotic arms: two for instrumentation and one for a miniature camera that allows the surgeon to see inside the body. The newest model, which Melvin is studying, features an additional, third arm for instrumentation.

“For many complex abdominal procedures, it takes more than two robotic arms to get the work done,” Melvin says. “We can suture and tease fibers apart without cutting open the patient to do so. The arms are less rigid than tools used in laparoscopic surgery. They can twist, they can turn, and they can allow multiple things to take place at once. We can also adjust the scale to one-fifth of the real distance to perform small, precise manipulations.”

With the robotic arms inserted into the patient’s body through pencil-sized holes, the surgeon manipulates the controls at a console in the operating room, looking through a view-finder at magnified images transmitted from inside the patient’s abdomen. The robotic arms reproduce the motions of the surgeon’s wrists in real time, while the camera provides three-dimensional images from a variety of angles.

Surgeons in the Center for Minimally Invasive Surgery have completed a number of studies comparing standard laparoscopic techniques with robotically-assisted procedures, particularly in the treatment of gastroesophageal reflux disease.

Their results demonstrate that robots in the operating room produce outcomes with few complications, similar to standard laparoscopic antireflux procedures, and provide improved visual displays. However, robotic procedures take about 45 minutes longer to complete than standard laparoscopic operations.

The robotic antireflux techniques produce results similar to those provided by standard laparoscopic procedures, allowing patients to return to routine activities significantly faster than patients who undergo the traditional open procedure. Melvin says that despite the advantages of clearer optics and more flexible instrumentation, further studies are needed to determine the advantages.

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Robotic surgery
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of robotic procedures over standard laparoscopic operations, especially in the management of acid reflux disorders.

Currently, procedures that are less commonly performed appear to more clearly demonstrate the benefits of robotically-assisted general surgery. Specialists in the Center for Minimally Invasive Surgery performed the first known pancreatic resection using the standard three-arm robotic device, removing a tumor from a patient’s pancreas. Melvin was lead author of a recent article in The Journal of Laparoendoscopic and Advanced Surgical Techniques that discussed the procedure.

“The patient did well and returned to full activity promptly,” Melvin says. “So in some cases, it appears that robotic technology may enhance advanced laparoscopic procedures.”

Melvin and colleagues also published the first case report of the use of the new robotic technology to perform a Heller myotomy. The operation is used to treat achalasia, a disorder of the esophagus that interferes with swallowing.

“The fourth arm has applications in a number of gastrointestinal and other general surgeries,” Melvin says. “We’re still in the process of developing programs in anticipation of more routine use of a four-arm robotic-assist device in surgery.

“Robots in some form or another are here to stay, and as advanced as they seem now, this is just the first generation of robots in the operating room.”

MINIMALLY INVASIVE SURGERY

Procedure replaces abdominal surgery, drugs for some patients

Surgeons in the Center for Minimally Invasive Surgery are using a minimally invasive endoscopic procedure that can replace more invasive abdominal surgery and eliminate a lifetime of medications for some patients with gastroesophageal reflux disease.

Experts say that about 10 percent of Americans suffer from gastroesophageal reflux disease. The disorder occurs when the lower esophageal sphincter does not close properly, allowing stomach contents to leak back into the esophagus. The main symptom is persistent heartburn, but some people experience pain in the chest, morning hoarseness, trouble swallowing, or a sensation that food is stuck in the throat.

The minimally invasive treatment is a 45-minute outpatient operation called the Stretta procedure, which involves placing a specially-designed catheter through the sedated patient’s mouth, through the esophagus and into the sphincter, or valve, between the esophagus and stomach. The catheter delivers radiofrequency energy to the muscle of the valve, heating the tissue and creating small lesions that produce tissue constriction.

Dr. W. Scott Melvin, associate professor of surgery, chief of the Division General Surgery, and director of the Center for Minimally Invasive Surgery, is an authority on the Stretta procedure, demonstrating the treatment for physicians from throughout the United States through the Center’s educational programs for physicians.

“This procedure allows us to remodel the muscle tissue where the esophagus meets the stomach,” Melvin says. “We’re able to fix gastroesophageal reflux disease without making any incisions.”

“The heat actually creates scar tissue, which is what we want,” he says. “It’s very effective and very safe, and is definitely not as invasive as surgery. Patients can safely resume most normal activities the next day.”

Human tissue responds to the heat by shrinking, Melvin says. Some shrinking occurs immediately, and it continues during the gradual healing of the esophagus after the procedure, eventually eliminating the need for supplemental medications to control reflux in most patients.

Melvin says the treatment is approved for patients with normal anatomy, but not those with a hiatal hernia. A hiatal hernia occurs when the upper part of the stomach protrudes above the diaphragm, and is a contributing factor in many cases of gastroesophageal reflux disease.

Some patients with reflux disease respond to life-style changes and medications. The standard surgical treatment is fundoplication, in which the upper part of the stomach is wrapped around the lower esophageal sphincter to strengthen it.

Untreated, gastroesophageal reflux disease can result in serious complications.
The Centers for Medicare and Medicaid Services have designated The Ohio State University Medical Center as one of only 18 hospitals to provide patients with the latest surgical treatment for emphysema. The designation is based on demonstrated expertise in performing lung volume reduction surgery and participation in a five-year National Institutes of Health-funded clinical trial that demonstrated the advantages of the technique for selected patients.

Dr. Patrick Ross Jr., associate professor of clinical surgery and director of thoracic surgery in the Division of Cardiothoracic Surgery, and co-investigator in Ohio State’s arm of the national clinical trial, says approval of the lung volume reduction procedure for Medicare coverage will help many patients who suffer from the progressively disabling disease.

“This procedure greatly improves the quality of life for people with the disease,” Ross says. “While we were conducting the National Emphysema Treatment Trial, we saw firsthand the vast improvement this procedure can make in people who have had the disease for several years. It practically gives them a new life, with increased levels of activity and fewer health restrictions.”

Emphysema is a disorder in which a breakdown of the walls of the alveoli, or air sacs, in the lungs causes a decrease in respiratory function. People with emphysema suffer from chronic shortness of breath, and often require the assistance of oxygen.

According to the American Lung Association, almost 44 percent of those diagnosed with emphysema report that their regular activities have been limited by the disease.

During the lung volume reduction procedure, the surgeon removes diseased portions of the lung in order to allow the remaining, healthy portions of the lung to expand freely in the chest cavity.

The new Medicare coverage guidelines indicate that patients who receive the surgical treatment and medical therapy are more likely to function better and face a lower risk of death two years later than those who receive medical therapy alone.

Dr. Philip T. Diaz, associate professor of internal medicine, a pulmonary specialist at the Davis Heart and Lung Research Institute, and co-investigator in Ohio State’s clinical trial, says that Medicare’s provision of coverage for the procedure is good news for patients. “Because of the fragile nature of these patients, I agree with the other experts that this treatment should be provided in selected centers that have considerable experience with the procedure,” Diaz says.

University Medical Center and the other selected hospitals will serve as hubs for lung volume reduction surgery for up to 41 million Medicare beneficiaries. With approval of Medicare reimbursement, more people with emphysema are expected to consider lung volume reduction surgery as a treatment option. To accommodate an increasing number of patients, the Division of Cardiothoracic Surgery has recruited Dr. Abass E. Abass as assistant professor of surgery.

According to the American Lung Association, almost 3 million Americans have been diagnosed with emphysema. Men tend to have higher rates of emphysema than women.
Powerful 8-Tesla MRI technology sheds new light on kidney cancer

Investigators say blood vessels supporting kidney tumors look very different from normal structures.

Pioneering work using one of the world’s most powerful magnets is helping investigators form a clearer picture of minute vascular changes linked to kidney tumors, which are among the most difficult cancers to diagnose.

“Using our 8-Tesla magnetic resonance imaging system (MRI), we are able to see blood vessels much smaller than a human hair,” says Dr. Robert R. Bahnson, the Dave Longaberger professor of surgery and chief of the Division of Urology. “These are important in identifying certain tumors, and they are structures that we have not been able to see before.”

The power of an MRI system, which uses magnets and radio waves to produce cross-sectional images of the body, is measured in Teslas, units of magnetic field strength. Many clinical MRIs operate at only 1.5 Tesla. Some institutions are now upgrading to 3- or 4-Tesla systems, but The Ohio State University Medical Center was the first in the world to build an 8-Tesla system and use it for research and clinical applications.

Although the 8-Tesla system at the Medical Center is usually used to form images of brain tumors and neurological disorders, scientists are beginning to use the system to help them see characteristics of tumors in living tissue that they previously were able to detect only through biopsy and pathological examination.

In a recent study, Bahnson and Dr. Robert W. Reagan Jr., then a chief resident in the Division of Urology, discovered that blood vessels supporting kidney tumors look very different from normal vessels: there are more than there should be, and they are comparatively large and contorted.

“The ability to see this phenomenon in real time, in living patients, will help us diagnose kidney cancers more efficiently and more accurately,” Bahnson says.

He says this is good news for patients, who often have to undergo repeated imaging procedures and invasive biopsies before physicians can finally tell them whether they have kidney cancer and which kind they have.

Although there are many types of kidney cancer, solid renal lesions detected through traditional imaging, such as X-ray or CT scan, are assumed to be renal cell carcinoma until proven otherwise. The problem is that the lesions may not be cancerous at all, but benign tumors that require far less aggressive treatment.

“The ability to see this phenomenon in real time, in living patients, will help us diagnose kidney cancers more efficiently and more accurately.”
Researchers at The Ohio State University Medical Center have uncovered a mechanism that the heart may use to repair tissue damaged during a heart attack.

A recent study led by Chandan K. Sen, Ph.D., suggests that oxygen is the trigger that helps certain genes transform heart cells called cardiac fibroblasts into cells called myofibroblasts after a heart attack. Scientists believe the myofibroblasts help new tissue grow and replace damaged tissue.

A heart attack occurs when a clot clogs an artery and blocks the blood flow and oxygen supply to the heart.

Sen says removing the clot allows oxygen-rich blood to flow into damaged tissue around the site of the primary injury. The rush of oxygen activates oxygen-sensitive genes in cardiac fibroblasts, and these genes respond by transforming cardiac fibroblasts into myofibroblasts.

“Now that we’ve identified the mechanism in this band of cells, we may be able to develop therapies that target these healing cells, thus enhancing their ability to replace the tissue damaged during a heart attack,” says Sen, associate professor of surgery and director of the Laboratory of Molecular Medicine at the Davis Heart and Lung Research Institute (HLRI).

The study has been published on-line in The Journal of Biological Chemistry.

In the study, researchers took fibroblasts from mouse hearts, and exposed the cells to a sudden rush of oxygen, mimicking the sudden exposure of oxygen-deficient heart tissue to additional oxygen after removal of a clot. The sudden rush of oxygen transformed mouse heart fibroblasts into myofibroblasts.

“Myofibroblasts go to work after you cut yourself,” Sen says. “They have muscle-like properties and try to contract and close a wound. These are robust cells. They remain at the damaged site even when all of the heart muscle cells have died.

“Other scientists have detected an abundance of myofibroblasts in heart tissue after a heart attack,” he says. “But our study is the first to suggest the mechanism behind this differentiation: that a sudden exposure to higher oxygen pressure causes significant changes in the gene expression, appearance, and function of cardiac fibroblasts.”

Sen says that because a clot develops over time, heart cells slowly adjust to chronic hypoxia, a deficiency of oxygen. Sudden re-oxygenation of the tissue at the site of the clot can result in cell injury or death. However, oxygen also triggers the healing genes around the damaged area.

“Imagine a series of concentric circles surrounding the damage. Oxygen shock progressively lessens the further you move away from the bull’s-eye,” he says. “While the tissue in the bull’s-eye is the most shocked and the heart cells here die, the shock at the perimeter of the damage is not lethal. This shock at the perimeter serves as a wake-up call to trigger healing, and now you have a healing band of tissue around the injured site.

“It is important to appreciate that the heart has a built-in healing component,” Sen says. “Focusing on this healing band of tissue at the perimeter of the damaged site is likely to provide effective therapeutic solutions.”

Sen conducted the study with Dr. Jay L. Zweier, professor of internal medicine and HLRI director.
### ABSTRACTS


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### PRESENTATIONS


**Melvin WS.** Clinical applications of robots in the operating room. Tampa Bay Surgical Society, Tampa, Fla., Sept. 15, 2003.


**Orosz CG (Visiting Lecturer).** Remodeling the basic concepts about pathogen tissue remodeling in grafts. University of Calgary, Calgary, Canada, Sept. 24, 2003.


**Sen CK.** Perceived hyperoxia: a new dimension in oxygen sensing. The Ohio State University Medical Center trauma service, which is directed by **Dr. Larry C. Martin**, associate professor of surgery in the Division of General Surgery. The Medical Center received a Level I ranking, which denotes it as a regional resource trauma center capable of caring for the most critically ill and injured patients.

**Charles G. Orosz, Ph.D.,** professor of surgery, director of the transplantation sciences program in the Division of Transplantation, and director of the Clinical Histocompatibility Laboratory at University Medical Center, has been appointed president-elect of the American Society for Histocompatibility and Immunogenetics (ASHI). Orosz has also been named the ASHI representative to the board of the United Network for Organ Sharing for 2004.

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**Dr. William E. Carson III,** associate professor of surgery in the Division of Surgical Oncology, has been named associate director for clinical research at The Ohio State University Comprehensive Cancer Center. In this role, Carson is supervising and coordinating the efforts of more than 200 OSU scientists and physicians involved in the development of strategies for the prevention and treatment of cancer through clinical trials.

**Dr. E. Christopher Ellison,** the Robert M. Zollinger professor and chairman of surgery and associate vice president for health sciences and vice dean of clinical affairs in the College of Medicine and Public Health, has been appointed chairman of a search committee assigned to find a new vice president for health services and chief executive officer of The Ohio State University Health System.

The American College of Surgeons has re-issued its highest possible ranking to The Ohio State University Medical Center trauma service, which is directed by **Dr. Larry C. Martin**, associate professor of surgery in the Division of General Surgery. The Medical Center received a Level I ranking, which denotes it as a regional resource trauma center capable of caring for the most critically ill and injured patients.

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Orosz served as a grant reviewer for the awards committee of the International Society for Heart and Lung Transplantation, at the society’s 23rd annual meeting, in Vienna, Austria, on April 9–12, 2003.

IN THE NEWS

The appointment of Dr. William E. Carson III, associate professor of surgery in the Division of Surgical Oncology, as associate director for clinical research at The Ohio State University Comprehensive Cancer Center was noted in the Columbus Dispatch on Oct. 1, 2003.

Dr. William B. Farrar, professor of surgery and chief of the Division of Surgical Oncology, was interviewed on Oct. 9–10, 2003, by the Columbus Dispatch, WBNS-TV/10, and WCMH-TV/4, about a study that was terminated early so that women randomized to take a placebo would be able to take letrozole, the drug under study, which was found to reduce breast cancer recurrence.

Dr. Mitchell L. Henry, professor of surgery and chief of clinical transplantation, was quoted in stories about a statewide living donor kidney registry published on Nov. 1, 2003 by the Associated Press, the Columbus Dispatch, the Cincinnati Enquirer, the Toledo Blade, and the Chillicothe Gazette.

Dr. W. Scott Melvin, associate professor of surgery, chief of the Division of General Surgery, and director of the Center for Minimally Invasive Surgery, was interviewed on Sept. 11, 2003 by WBNS-TV/10 about the use of a new da Vinci robotic surgery system that uses four arms instead of three.

Dr. Robert E. Michler, professor of surgery, chief of the Division of Cardiothoracic Surgery, and co-director of the Ross Heart Hospital, was quoted in a Nov. 9, 2003 Columbus Dispatch story about specialized cardiac facilities competing in Central Ohio.

On Sept. 12, 2003, Michler was interviewed about the Ross Heart Hospital by WCMH-TV/4, WBNS-TV/10, WSYX-TV/6, WTTE-TV/28, and WTVN-AM. He was also interviewed about the death of television actor John Ritter by WSYX-TV/6, WTTE-TV/28, and WTVN-AM.

Michler was quoted in a Sept. 1, 2003 story in the Urbana Daily Citizen about an Urbana man undergoing an experimental procedure at The Ohio State University Medical Center to improve his heart function.

Dr. Stephen P. Povoski, associate professor of surgery in the Division of Surgical Oncology, on Sept. 14, 2003 appeared on “Newsmakers” on WSYX-TV/6, and discussed the incidence of breast cancer and treatment approaches.

A column on the importance of early detection of breast cancer written by Povoski was published in the Cincinnati Enquirer on Oct. 16, 2003.

Dr. Richard E. Schlanger, clinical assistant professor of surgery in the Division of General Surgery and director of the Wound Healing Center at University Hospitals East, was quoted on Oct. 9, 2003 by This Week Newspapers and the Dayton Daily News, in stories on adhesion-related disorders.

Chandan K. Sen, Ph.D., associate professor of surgery and director of the Laboratory of Molecular Medicine at the Davis Heart and Lung Research Institute, was quoted in a Sept. 21, 2003 Columbus Dispatch story about a study identifying genes that help the heart heal after a heart attack.

Work from Sen’s laboratory was covered in the October 2003 issue of the Harvard Health Letter and the September 2003 issue of Findings, the newsletter of the National Institutes of Health-National Institute of General Medical Sciences.

IN MEMORIAM

Barbara Van Brimmer, associate professor at University Libraries, coordinator for affiliated library services at Prior Health Sciences Library, and curator of the Medical Heritage Center, died on Oct. 9 in Columbus, Ohio. Van Brimmer was a long-standing friend to the Department of Surgery.

CORRECTION

On page 7 of the Nov. 2003 issue of Surgery Today, Chandan K. Sen, Ph.D., associate professor of surgery and vice chairman for research in the Department of Surgery, was incorrectly identified as assistant professor of surgery. Sen has held the title of associate professor of surgery since July 2003.
INSIDE:

1 Specialists test latest in advanced robotic surgery technology

2 Procedure replaces abdominal surgery, drugs for some patients

3 Medical Center approved as site for surgical treatment of emphysema

4 Powerful 8-Tesla MRI technology sheds new light on kidney cancer

In October 2003, about 100 guests attended a reception and dinner to commemorate the 100th anniversary of the birth of Dr. Robert M. Zollinger, former chairman of the Department of Surgery, and to celebrate the publication of a special issue of The American Journal of Surgery in his honor. Above, Dr. E. Christopher Ellison, the Robert M. Zollinger professor and chairman of surgery, and Dr. Ronald K. Tompkins, professor emeritus of surgery at UCLA School of Medicine, pose during the celebration. Photo by Karen Leonhart.