MAYO CLINIC

Clinical Update

Current Trends in the Practice of Medicine

Vol. 27, No. 3, 2011

INSIDE THIS ISSUE

Surgery for Liver-Limited Metastases of Colorectal Cancer: Considerations and Advances

The Challenge

Liver metastases develop in approximately 60% of patients with colorectal cancer at some point during the course of their disease. Left untreated, patients with metastatic liver disease have a poor prognosis.

Liver resection, paired with chemotherapy, has been shown to improve survival rates among patients with resectable colorectal liver metastasis (CLM). The 5-year survival rates for patients with CLM who undergo liver resection now range from 27% to 45%. Current indications for resectability include the ability to obtain a complete resection (macroscopic and microscopic negative margin); the ability to preserve 2 adjacent liver segments with adequate vascular inflow/outflow and biliary drainage; and the ability to preserve an adequate future liver remnant (at least 20%-25% in a healthy liver).

Many patients with CLM are initially poor candidates for liver resection because of the distribution of tumors within the liver at presentation. Multiple advances, including new methods to improve the tumors' resectability and new surgical techniques, have increased the pool of patients eligible for surgical resection and improved patient outcomes.

Points to Remember

- Liver resection, paired with chemotherapy, has been shown to improve survival rates among patients with resectable colorectal liver metastasis.
- Preoperative therapy, including chemotherapy and portal vein embolization to induce tumor shrinkage and increase liver remnant volume, has increased the number of patients eligible for liver resection and improved patient outcomes.
- Improved surgical instrumentation and laparoscopic resection can help experienced surgeons reduce the complications associated with liver resection.

New Approaches to Improve Resectability and Patient Outcomes

Chemotherapy

Advances in chemotherapy to induce tumor shrinkage have increased the number of patients with tumors eligible for surgical resection. Some studies involving a combination of FOLFOX (comprising folinic acid [leucovorin], fluorouracil, and oxalipatin) and bevacizumab have shown that initially unresectable livers can become resectable in 13% of patients after they undergo preoperative chemotherapy.

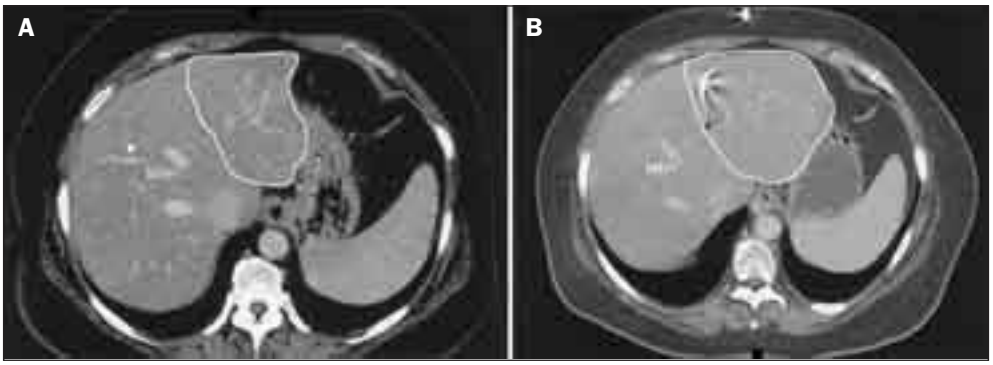

Figure 1. *CT scans before (A) and after (B) portal vein embolization to improve expected liver remnant volume. MHV indicates middle hepatic vein.*

Portal Vein Embolization

Patients in whom 75% or more of the liver needs resection may be

candidates for portal vein embolization prior to resection. This procedure involves blocking blood flow to part of the liver where the tumor is located to allow more healthy liver to grow before resection (Figure 1). Regeneration of the expected liver remnant increases the number of candidates for liver resection where previously their tumors were considered unresectable.

Resection of Tumors Outside the Liver, Repeat Resections

Selected patients with disease outside the liver, including those with liver and lung metastases, may also be candidates for surgical resection. In a Mayo Clinic–led retrospective review of 58 patients with liver and lung metastases (57% with solitary lesions and 17% with 2 lesions), the 5-year survival rate was 30%.

Data from Mayo Clinic and other centers also suggest that re-resection in selected patients with recurrent CLM offers improved survival, with approximately 40% 5-year survival if complete resection is possible.

Surgical Advances

Newer surgical instruments that coagulate tissue to reduce blood loss are helping experienced surgeons reduce the complications associated with hepatic resection.

Available at Mayo Clinic since 2001, laparoscopic liver resection (Figure 2) can provide a variety of benefits, including a magnified clear view of the operating field for the surgeon and shorter hospital stays, reduced postoperative pain, and less incisional morbidity for patients. Laparoscopic resection also increases the ease of reoperation for repeat resections. While laparoscopic resection can provide some clear advantages for select patients, this procedure requires an experienced surgical team to ensure vascular control and complete specimen extraction.

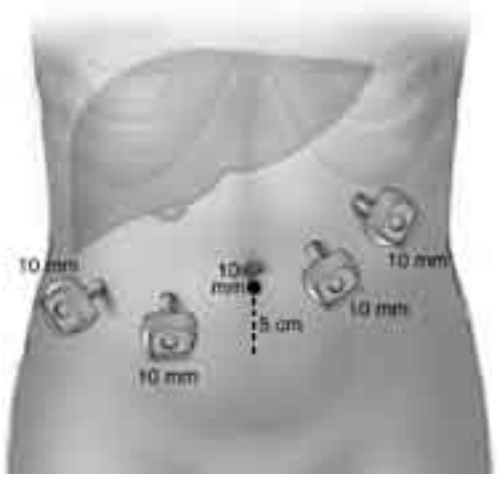

Figure 2. *Trocar position for laparoscopic right hepatectomy. Umbilical incision is extended just enough for specimen extraction.*

Improving Surgical Management of Male Urinary Incontinence

The Challenge

Studies have shown that men consider incontinence the most disruptive—but silent—assault on their quality of life and one of their greatest fears associated with prostate surgery. Men with bladder sphincter deficiency grow fearful of coughing, sneezing, laughing, or lifting in public, so they stop going out, interacting, and enjoying life. Fortunately, for most patients, the underlying voiding pathophysiology of stress urinary incontinence (SUI) can be well managed. While urinary incontinence is a daily challenge to quality of life, surgical options continue to evolve, with improved outcomes.

Male Artificial Urinary Sphincter

In the year following radical prostatectomy, SUI usually improves. But chronic, severe SUI—requiring 3 pads per day or more—is estimated

Points to Remember

- Stress urinary incontinence (SUI) can dramatically affect and decrease quality of life for many men.
- In selected patients with chronic, severe SUI, an artificial urinary sphincter is the gold standard of therapy.
- Patients with light leakage are generally good candidates for a suburethral sling, which is implanted underneath the bulbous urethra to elevate and compress it, thereby decreasing leakage.

to occur in approximately 5% of men. For these patients, an artificial urinary sphincter (AUS) is the gold standard of care.

Mayo Clinic has been an international leader in AUS implantation in the United States since the device became available in 1972. Mayo's outcome data show that 75% of AUS patients achieve dryness; 25% have marked improvement. Literature reports suggest an eventual failure rate of first-time sphincters of 25% to 30%, typically due to erosion, urethral atrophy, or infections. For these patients, Mayo Clinic offers a range of advanced options:

- **Tandem cuff.** Two cuffs are placed to increase sphincter control. In patients who have a previously failed single-cuff AUS placement, this procedure results in an average decrease in the number of daily pads used from 4.3 to 1.6, according to a Mayo Clinic study published in 2003. The study involved 18 patients in whom AUS failed, with a mean follow-up of 3.3 years. Additionally, 56% of men required no more than 1 pad a day after the procedure, and 94% of patients indicated that they would recommend the procedure.
- **Transcorporal cuff.** In this procedure, part of the corpus cavernosum is cuffed. Results show approximately 65% of patients achieve dryness, 30% have improved symptoms, and 5% have complications such as need for reoperation, device malfunction, and infection requiring device explantation.
- **Soft tissue graft**. In unusually complex cases, Mayo Clinic surgical teams are pioneering use of a collagen-based, nonimmunogenic porcine material that serves as bulk insulation around the urethra. Once this material is wrapped around the urethra, the cuff is placed over it (Figure). In 8 Mayo patients who have undergone the procedure since 2008, with an average follow-up of 16.5 months, 4 (57%) have achieved considerable improvement or complete dryness.

Male Suburethral Sling

Patients with light leakage are generally good candidates for a suburethral sling. The male sling continues to be refined, and the newest generation of compression-based polypropylene mesh male sling was introduced more than 5 years ago. During a 30-minute, minimally invasive outpatient procedure, the sling is implanted underneath the bulbous urethra to elevate and compress it, thereby preventing leakage. In carefully selected patients, 60% to 70% of patients achieve dryness, 20% have markedly improved symptoms, and 10% have minimal improvement.

The potential for worsening incontinence following this procedure must be emphasized during patient counseling. Patients may not lift more than 10 pounds and should avoid high steps for 6 weeks after the procedure to avoid stretching and dislodging the sling. In patients who have had irradiation or transurethral resection of the prostate, the procedure may be less successful, and these patients need to be counseled appropriately.

With continued experience placing the male sling, Mayo Clinic urologists are refining the surgical procedure and expect continued improvement of outcomes. Thanks to high patient volumes and opportunities for long-term follow-up, Mayo Clinic urologists have an objective, evidence-based platform for continuous improvement and innovation to relieve patients' incontinence.

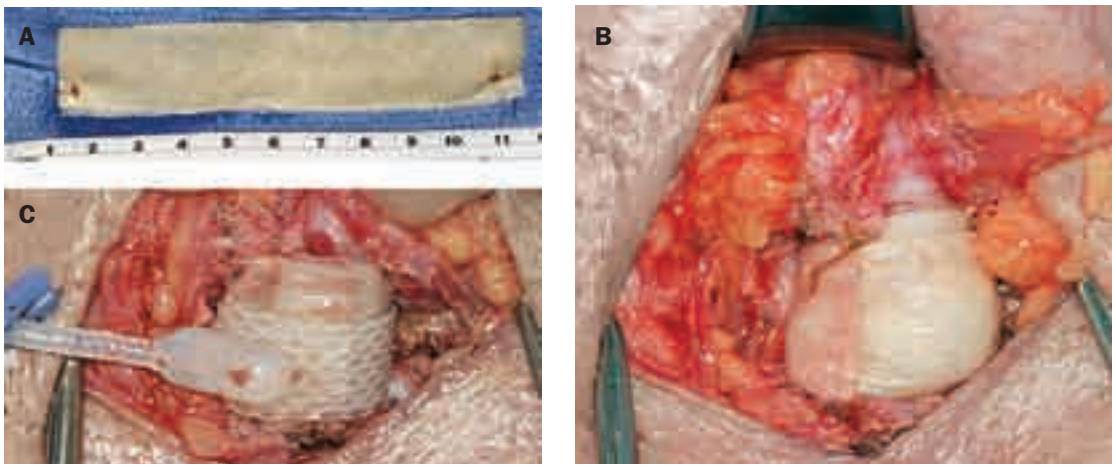

Figure. *Soft tissue graft technique. A, A collagen-based graft serves as bulk insulation. B, It is wrapped around the urethra (≥360˚) and secured to itself and to bulbospongiosus. C, A 4.5- to 5.5-cm cuff is placed over the graft material.*

Diagnosing and Treating Sports-Related Concussion

The Centers for Disease Control and Prevention estimate that approximately 1.6 million to 3.8 million sports-related concussions occur annually in the United States, although the true incidence is probably much higher. Underreporting may be due to the fact that athletes, coaches, trainers, family, and even some health care professionals are unaware of the symptoms and treatment options for concussion. And athletes who experience concussion sometimes fail to report their symptoms to avoid losing playing time.

Concussions that are unrecognized or are mismanaged put athletes at considerable risk for potentially catastrophic sequelae from reinjury. Repetitive head trauma from participation in contact sports such as boxing, football, and ice hockey can lead to a permanent decrease in brain function, including memory loss, early Alzheimer disease, movement disorders (eg, parkinsonism), and emotional disturbances. The most notable complication of concussion is second impact syndrome. In this syndrome, an athlete who is recovering from an initial concussion sustains a subsequent concussive injury, resulting in diffuse brain swelling and severe, permanent neurologic dysfunction or death.

Points to Remember

- A concussion does not require a loss of consciousness. If an athlete sustains a blow to the body or head and postconcussive symptoms subsequently develop, by definition, that athlete has sustained a concussion.
- Obtaining preinjury baseline data on athletes who engage in contact sports can make sideline assessment more accurate.
- Timely diagnosis and prompt treatment can help prevent more serious concussion complications, including diffuse brain swelling and severe, permanent neurologic dysfunction or death brought on by subsequent concussive injury.

Standard neuroimaging studies are typically normal; therefore, concussion is a clinical diagnosis. The most common symptom is headache. Other symptoms include dizziness, nausea, vomiting, balance problems, fatigue, sleep disturbance, sensitivity to light and noise, mood changes, and difficulty with concentration and memory.

Each concussion presents in a unique manner, and it is well established that a concussion does not require a loss of consciousness. Furthermore, a brief loss of consciousness

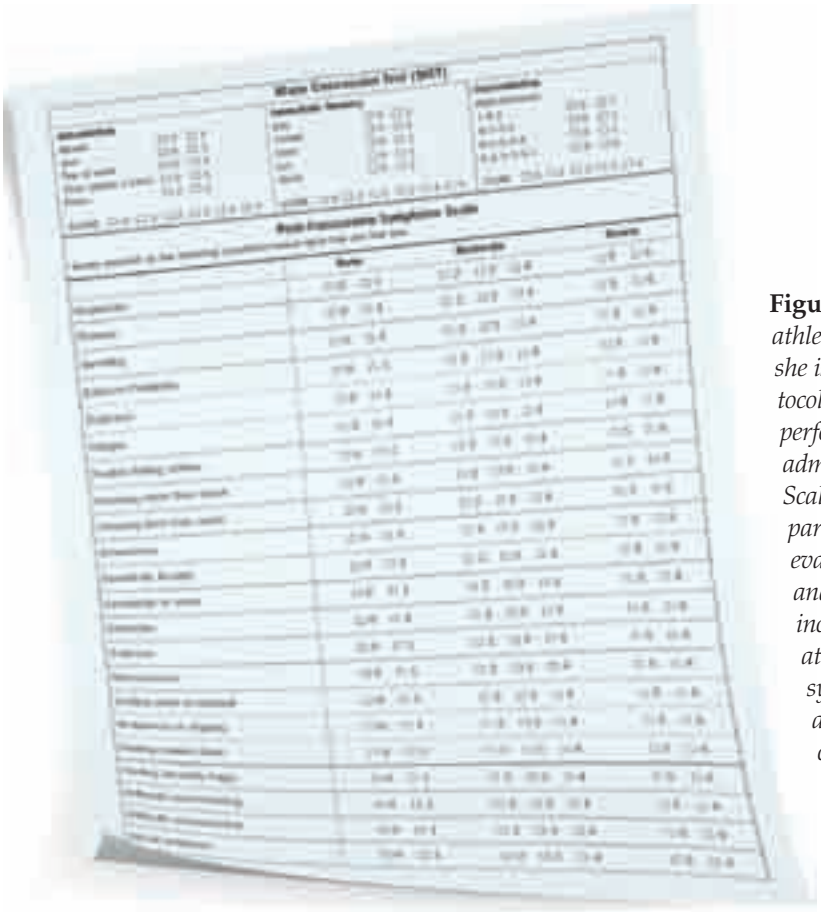

Figure. *The Mayo Concussion Test (MCT). When an athlete is suspected of having sustained a concussion, he or she is removed from play (see Table on page 5 for this protocol), and the clinician or athletic trainer on the sidelines performs a brief history and physical examination and administers the MCT and Post-Concussion Symptoms Scale (PCSS). The results of the MCT and PCSS are compared with baseline results of the same tests. The MCT evaluates orientation, immediate memory, concentration, and delayed recall. Correct answers are given a score of 1, incorrect answers are given a score of 0. The PCSS evaluates for symptoms associated with concussion. Each symptom is given a score between 0 (no symptoms) and 6 (severe symptoms). Ultimately, the diagnosis of concussion is confirmed if the athlete's sideline PCSS reveals new or more severe postconcussive-type symptoms or if the athlete's sideline MCT score is lower than the baseline score. The athlete is removed from play and receives follow-up monitoring, as indicated in the protocol.*

does not provide any information regarding concussion severity. What clinicians need to remember is that if an athlete sustains a blow to the body or head and postconcussive symptoms subsequently develop, by definition, that athlete has sustained a concussion.

Table. ***Protocol for Evaluating and Treating Suspected Concussion***

- Remove the athlete from competition immediately and do not allow him or her to resume play for the remainder of the game.
- Perform the Mayo Concussion Test and the Post-Concussion Symptoms Scale (as shown in the Figure on page 4) on-site and compare the results with the athlete's baseline data.
- Monitor for worsening of symptoms and/or focal neurologic deficits, including weakness and sensory change, every 15 to 30 minutes during the first several hours after injury.
- If symptoms worsen, the athlete should be transported to an emergency department for further evaluation, because changes may suggest an injury more serious than a concussion, such as intracranial hemorrhage.
- If symptoms remain stable or improve, the athlete can be sent home if an adult caregiver is present. The caregiver is given a list of symptoms to be aware of and that would warrant a trip to an emergency department, and the athlete is not allowed to drive.
- Place the athlete on physical (no sports, running, jumping, weight lifting, etc) and cognitive (no school, studying, video games, etc) rest to minimize stress on the brain.
- Have the athlete follow up with his or her physician within 24 to 48 hours for a physical examination and symptom evaluation, as well as additional cognitive testing.

Understanding Who Is at Risk

Athletes who engage in contact sports and female athletes are at increased risk for concussion. Young athletes may be more susceptible than adults to concussions due to a larger head-to-body size ratio, weaker neck muscles, or increased vulnerability of the young brain to concussion.

Timely Diagnosis and Treatment

Timely diagnosis and prompt treatment can help prevent more serious concussion complications. Obtaining preinjury baseline data on athletes who engage in contact sports can make the sideline assessment more accurate. Mayo Clinic's Sports Medicine Center performs baseline testing on high school athletes involved in high-risk sports as part of their preseason physicals.

Baseline assessments include a brief cognitive test (the Mayo Concussion Test), a computer-based neuropsychological test, and the Post-Concussion Symptoms Scale (Figure). These data are available during games and in the clinic and provide medical personnel with a preinjury reference point from which to judge an athlete's status following a concussion. If a concussion is suspected, Mayo Clinic sports medicine specialists follow a protocol for evaluating and treating athletes of all ages (Table).

Resuming Athletic Activity

Once an athlete is asymptomatic and has normal neuropsychological measures, he or she can begin a functional return-to-play process. This involves gradually increasing cognitive and physical challenges in a systematic, stepwise fashion, over the course of about 5 days. If the athlete has symptoms at any time, he or she rests again, until the symptoms stop. Then the athlete can resume the protocol on the level at which he or she was symptom-free.

Mayo Clinic sports medicine specialists monitor symptomatic athletes for up to 2 weeks, at which time, athletes who remain symptomatic are referred to the Mayo Clinic Complex Concussion Team, comprising a brain rehabilitation specialist, occupational and speech therapists, a rehabilitation nurse, a neuropsychologist, and other health care professionals as indicated. They manage the athlete's postconcussion symptoms and assist with modifications in work and school that are required for recovery. When the athlete's symptoms resolve and all baseline measures return to normal, he or she resumes the return-to-play protocol under the supervision of Mayo Clinic's Sports Medicine Center staff.

Hip Arthroscopy in an Expanding Patient Group—Young Adults With Femoroacetabular Impingement

The Challenge

Clinical interest in femoroacetabular impingement (FAI) has intensified since 2003 after FAI was identified as a cause of hip pain in younger individuals. In FAI, the femoral head and acetabulum rub abnormally, creating damage to the articular cartilage, a mechanism that can lead to early hip arthritis. As a result of the confluence of these 2 trends, improving early detection and treatment of FAI is a high priority for hip specialists.

In the past, treatment focused on open procedures for restoration of the structural abnormalities around the hip and treatment of labral and cartilage pathology. Today, Mayo Clinic surgeons who specialize in young hip issues are focusing on the management of selected patients with early FAI—average age about 30 years—through less invasive approaches that include hip arthroscopy.

Rise in Hip Arthroscopy

More than 30,000 hip arthroscopies were performed in the United States in 2008. That number is expected to increase consistently at an average annual growth rate of more than 15%, thus exceeding 70,000 procedures by 2013. While Mayo Clinic surgeons still use hip arthroscopy to remove loose bodies and repair traumatic labral tears, the practice is changing.

Future Watch: Screening Teens for FAI, Conducting Clinical Trials

To advance care of femoroacetabular impingement (FAI), 2 initiatives are under way at Mayo Clinic:

- ***FAI screen.*** It is unclear who is predisposed to FAI and when onset occurs. An FAI screening program aimed at detecting patients at risk may help answer these questions. Performed as part of a teen's preparticipation sports physical, the prototype identifies teens with hip stiffness and limitation of motion. Radiographs and magnetic resonance imaging reveal tissue and bone defects. The screen has the potential to provide much-needed information about the natural history of FAI and to affect youths' lives by detecting potentially damaging changes in the hip early, just as did screening for scoliosis.
- ***Randomized clinical trial.*** One weakness in FAI surgical decision making is the lack of comparative outcome data on arthroscopic vs open techniques. Long-term follow-up data for open surgery are available, but only 1 or 2 years of outcome data have been published for arthroscopic procedures. Mayo is filling the data gap by designing a randomized clinical trial comparing the 2 techniques.

Points to Remember

- Young adults who present with disabling hip pain related to femoroacetabular impingement (FAI) are a rapidly growing cohort of orthopedic patients.
- Although open hip repairs still have an important role in treatment of FAI, Mayo Clinic surgeons now treat selected patients using hip arthroscopy.

Over the past 3 years, Mayo surgeons have also begun using arthroscopy to treat hips with FAI.

Hip arthroscopy has been performed for more than 15 years. This approach has gained renewed attention because of clinical interest in FAI and the ongoing trend toward developing less invasive treatment options. The enthusiasm for hip arthroscopy is also aided by the rapid development of hip-specific arthroscopic instrumentation.

Multidisciplinary Team Expands Expertise

Mayo surgeons team with sports medicine rehabilitation experts early—before FAI surgery. The team credits this early, synergistic melding of specialties—adult reconstructive surgery, arthroscopy, and sports medicine physical therapy—with the procedure's high success rates.

In this team model, surgeons have the capacity to perform a full open procedure, a full arthroscopy, or a combined arthroscopy and mini-open technique, as conditions indicate. Therapists can individualize a stepwise rehabilitation program before the surgery, thus optimizing chances for immediate compliance.

Choosing a Technique

Mayo Clinic orthopedic surgeons work as a team to take a well-considered approach to hip arthroscopy. To choose a technique, the team discusses all aspects of the physical examination findings, patient symptoms, and radiographic criteria. They pay special attention to the main components of FAI that determine approach: labral pathology and bony abnormalities, including whether acetabular version and normal femoral head sphericity are normal. A patient with a large structural abnormality of

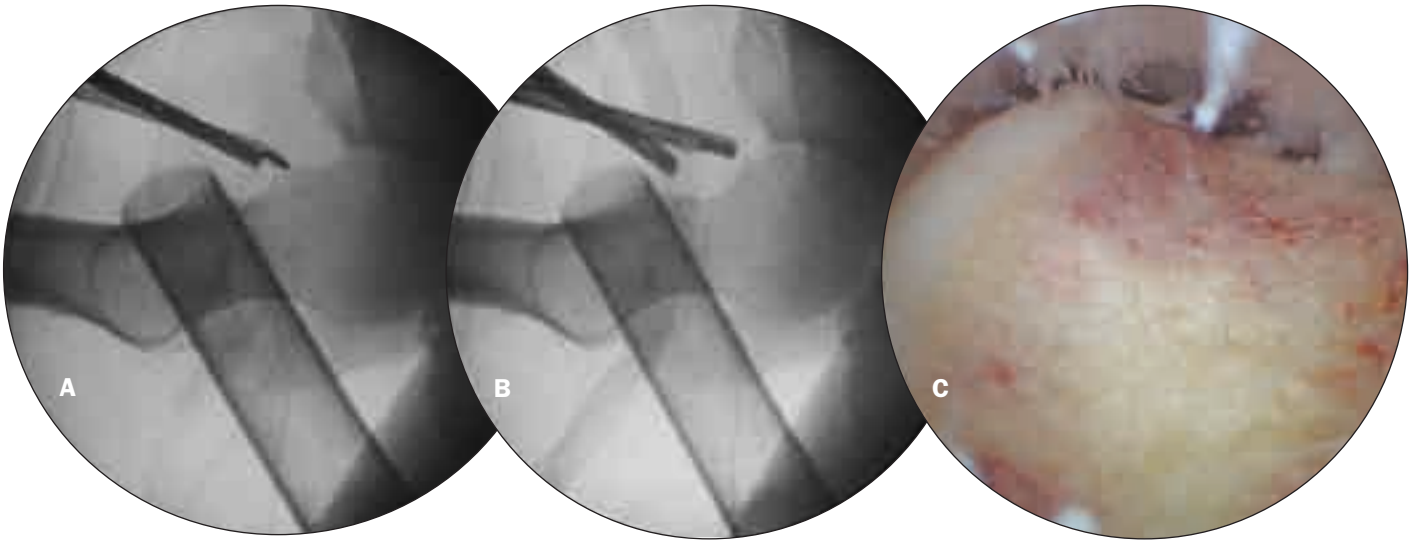

Figure. *The presence of a structural abnormality, such as this cam lesion (a condition where the femoral head is aspherical or not perfectly round) can be treated by either an open or an arthroscopic technique. A, Fluoroscopic image of the cam lesion being resected; B, postresection view; and C, arthroscopic view.*

the hip joint is typically treated with an open technique. If there are structural abnormalities that surgeons can correct safely arthroscopically, then this approach is chosen, as shown in the Figure. Safety must always guide selection of technique.

Education Opportunities

Clinical and Laboratory Update in Thrombosis and Anticoagulation
August 4-5, 2011, Rochester, Minnesota
This program will provide both clinically applicable and cutting-edge material focused on the evaluation of patients with arterial or venous thrombotic disorders. The course will refresh the basics and provide the latest information and philosophy on the evaluation and treatment of common thrombotic disorders as well as review specific aspects of uncommon thrombotic diseases. There will be emphasis on clinically applicable scenarios and ample opportunity to ask questions and discuss difficult diagnostic and management issues. To register or for more information, call 507-284-0286 or e-mail strain.diane@mayo.edu

Cardiology Update 2011: The Heart of the Matter
August 5-7, 2011, Sedona, Arizona
The program will cover a wide spectrum of topics in congestive heart failure and heart transplantation, coronary artery diseases, cardiac arrhythmias, and adult congenital heart diseases, among others. Participants will learn about the new anticoagulants, atrial fibrillation techniques, percutaneous aortic and pulmonic valve replacement, and new devices for the treatment of congestive heart failure. To register or for more information, call 480-301-4580 or e-mail mca.cme@mayo.edu.

Pulmonary Hypertension Update 2011
August 27, 2011, Jacksonville, Florida
This 1-day course is designed to improve and update the knowledge of the health care provider for evaluating and managing pulmonary arterial hypertension (PAH). It will enable the clinician to select appropriate diagnostic tests and determine the best treatment option for the patient. In addition, the clinician will understand and appreciate the role of lung transplantation in the management of PAH so patients can be appropriately counseled. Recommendations on appropriate referrals to PAH and transplant centers will be discussed. Case studies will be emphasized to illustrate practice principles. To register or for more information, call 800-462-9633 or e-mail cme-jax@mayo.edu.

Mayo Clinic
Clinical Update

Medical Editor:
Scott C. Litin, MD

Editorial Board:
Robert P. Shannon, MD
Douglas M. Peterson, MD

Clinical Update is written for physicians and should be relied upon for medical education purposes only. It does not provide a complete overview of the topics covered and should not replace the independent judgment of a physician about the appropriateness or risks of a procedure for a given patient.

Contact Us

Mayo Clinic welcomes inquires and referrals, and a request to a specific physician is not required to refer a patient.

Arizona
866-629-6362

Florida
800-634-1417

Minnesota
800-533-1564

Resources

mayoclinic.org/medicalprofs

- Clinical trials
- CME
- Grand Rounds
- Scientific videos
- Online referrals

Physician Update

Mayo Clinic has online options for medical professionals

An e-mail newsletter and a physician video blog. Visit **www.mayoclinic.org/medicalprofs** for more details.

MAYO CLINIC | mayoclinic.org

4500 San Pablo Road
Jacksonville, FL 32224

200 First Street SW
Rochester, MN 55905

13400 East Shea Boulevard
Scottsdale, AZ 85259

MC2024-0711