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Advanced Arthroscopic Techniques Expand Applications

Arthroscopy's minimally invasive approach is now being offered to patients with a wider range of hip disorders. This development requires the mastery of advanced arthroscopic techniques to fully leverage the more effective instrumentation now available, as well as the enhanced recognition of hip anatomy (Figure 1).

Elements of success

Innovative applications are typically seen at high-volume specialty orthopedic centers staffed to accommodate the steep learning curve of advanced arthroscopy. According to Mayo Clinic orthopedic surgeons, hip arthroscopy can be especially technically demanding. One key to success is development of a supportive infrastructure of surgical expertise that

Points to remember

- Patients with a wide range of hip disorders, including gluteus medius tears, internal snapping hip syndrome and femoroacetabular impingement (FAI) can benefit from hip arthroscopy.
- Because hip arthroscopy is technically demanding, the best surgical outcomes are obtained at high-volume specialty orthopedic centers that have experienced surgeons and dedicated orthopedic aftercare and rehabilitation specialists who are integral members of the team.

can rapidly adapt to new arthroscopic applications as the technology becomes available.

For the best outcomes with advanced arthroscopic techniques in the hip, Mayo Clinic specialists note the importance of having dedicated orthopedic aftercare and rehabilitation specialists who are integral members of the team. Expanding applications of hip arthroscopy can also be attributed to improved understanding of the specific pathoanatomy of the hip. When combined with technical advances in surgical instrumentation, this understanding enables more areas in and around the hip to be accessed through arthroscopic surgery. One such area is the peritrochanteric space, the area outside the hip joint where the powerful abductor muscles are located, including the gluteus medius and minimus and the associated trochanteric bursa.



Figure 1.
Arthroscopic image of the labral seal against the femoral head obtained after labral repair.

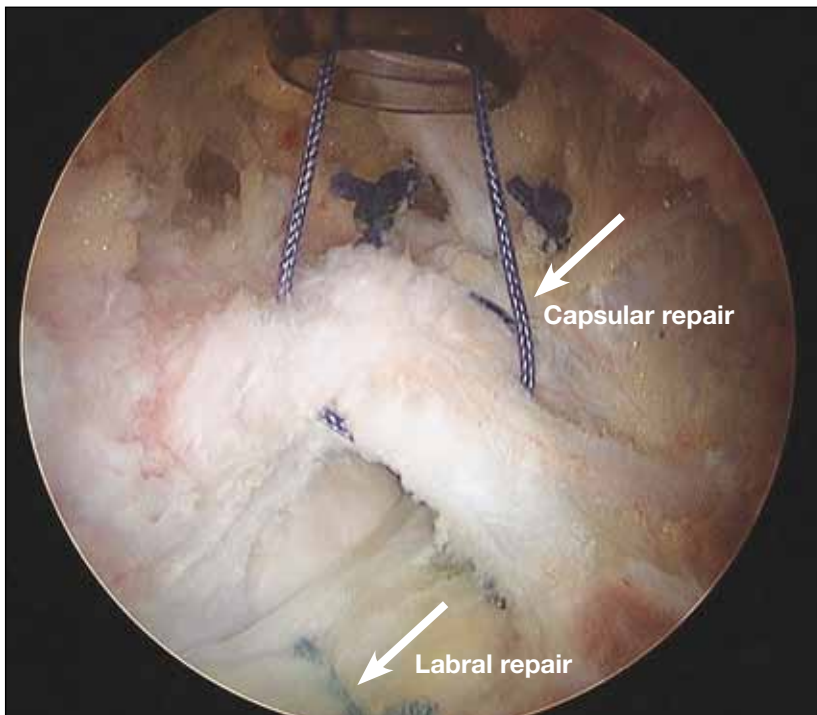


Figure 2. Capsular repair (superficial) is being performed. Labral repair is viewed below.

Gluteus medius repair

The gluteus medius is the main abductor muscle in the hip that allows a person to walk with a level pelvis. Some patients with lateral hip pain and weakness may have a gluteus medius tear. This tendon can be accessed arthroscopically in the peritrochanteric space of the hip and can be thought of as very similar to the rotator cuff of the shoulder.

Internal snapping hip syndrome

In patients with internal snapping hip syndrome, a painful sensation is caused by slippage of the iliopsoas tendon as it crosses the anterior femoral head or the iliopectineal eminence. It typically occurs as the hip comes from the flexed, abducted, externally rotated position toward extension. Pain emanates from the groin and can be confused with hip joint pathology.

With advanced arthroscopic techniques, the surgeon can pass through the central compartment of the hip during arthroscopy, making a small window in the capsule to locate the tendon and release it. At this level it's approximately 50 percent muscle and 50 percent tendon, so it's more like a fractional lengthening of the muscle as opposed to a complete detachment.

Treatment of the capsule

Among the most recent advances in arthroscopic hip surgery is the treatment of the capsule. In the past, to access the hip joint the surgeon

would cut through the capsule and often remove significant amounts of capsule. This may have contributed to instability of the hip in the form of microinstabilities (Figure 2).

Now, with newer techniques and instrumentation, arthroscopic surgeons usually can restore the anatomy by closing the capsule that has been cut. This minimizes the amount of capsule resected and helps stabilize the hip.

Femoroacetabular impingement

Recently it has been recognized that there is a pathological relationship between femoroacetabular impingement (FAI) and the development of early osteoarthritis of the hip joint in young adults.

This patient group has an underlying structural deformity in one or both of the two parts of the hip joint, the femoral head and neck or the acetabulum. These deformities give rise to distinctive types of lesions: Pincer rim lesions (Figure 3A) amount to an over-coverage of the femoral head by the acetabular rim. Cam lesions (Figure 3B) create a bony protuberance that forms at the junction of the femoral head and neck.

Patients typically seek medical care due to pain from a labral tear. In the past, all FAI patients were treated with an open surgical hip dislocation to gain access. Labral tears were repaired with sutures and anchors, and the normal geometry of the hip joint and sphericity of the femoral head-neck junction were restored surgically.

These same repairs can now be made in carefully selected patients using advanced arthroscopic technique and improved instrumentation (Figures 4A, 4B). Experience among Mayo Clinic orthopedic surgeons and reports in the literature show that arthroscopic FAI patients tend to have less morbidity, significantly less pain and less challenging rehabilitation due to the minimally invasive nature of the procedure.

Clinical trials test open vs. arthroscopic management of FAI

To further improve the evidence base of FAI management, Mayo Clinic orthopedic surgeons are developing two randomized clinical trials. One evaluates open surgery vs. arthroscopic management of FAI, and the other addresses perioperative pain management with nerve blocks vs. absence of nerve blocks.

Young Hip Clinic

Mayo Clinic orthopedists also are expanding the Young Hip Clinic to provide the most current care to young adults with disabling hip pain. Both open and arthroscopic hip surgeons participate in surgical consultations to assure that each patient receives individual and optimal treatment based on unique needs.

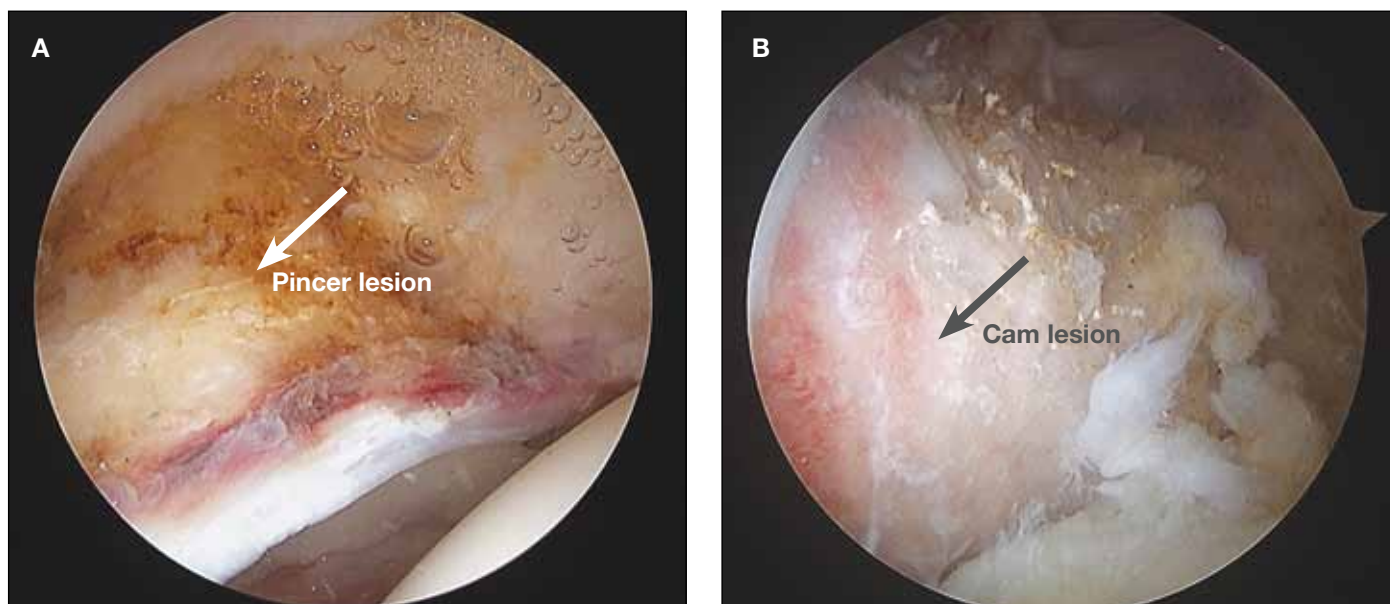


Figure 3. (A) Acetabular bony overcoverage (pincer lesion) and (B) femoral bony bump (cam lesion) prior to surgical resection.

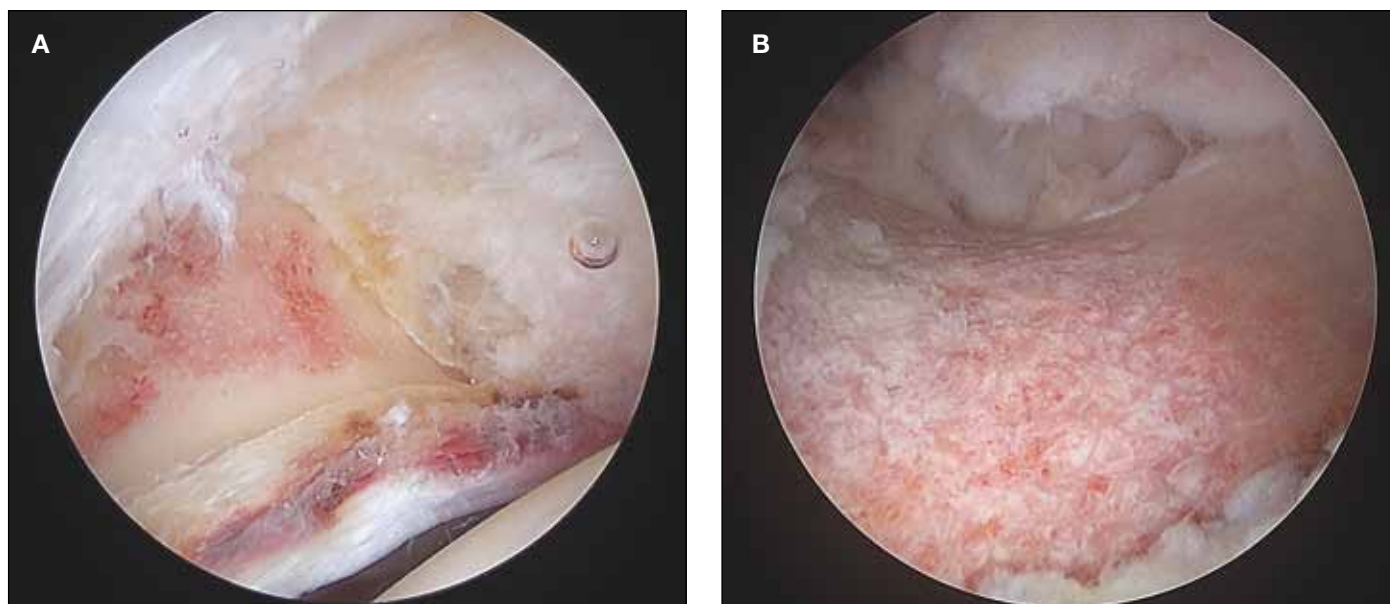


Figure 4. Post-resection images of (A) acetabular bony overcoverage (pincer) removal and (B) recontouring of the femoral neck after bony bump (cam) removal.

Surgical Management of Ureteropelvic Junction Obstruction in Children

Ureteropelvic junction (UPJ) obstruction is characterized by impairment in urinary flow as it travels from the renal pelvis to the bladder.

Sometimes UPJ obstruction is detected during an ultrasound before birth. Antenatal hydronephrosis, which may be caused by intrinsic UPJ obstruction, may be found by ultrasound as early as the second trimester of pregnancy. Other cases of UPJ obstruction may be discovered during an evaluation for signs and symptoms such as recurrent vomiting and feeding difficulties.

In older children, UPJ obstruction may be an extrinsic problem caused by compression of crossing vessels. Symptoms in these children can include nausea, vomiting, abdominal-flank pain, urinary tract infection and hematuria.

In lower grade obstructions, immediate surgery may not be necessary. If the obstruction is not causing loss of kidney function or pain, observation and monitoring may be indicated. Newborns should have renal ultrasound at age 2 weeks, and then every three months thereafter during the first year. A renal scan can be performed at age 6 to 8 weeks and repeated at age 1 year if ultrasounds are stable and baby is asymptomatic. Sometimes the condition resolves as the child grows.

Because prolonged high-grade blockage, particularly with infection, can be harmful

Points to remember

- Pyeloplasty, the removal of the abnormal segment of ureter, is the most common surgical treatment for ureteropelvic junction (UPJ) obstruction in children.
- When performed by experienced surgeons, robotic-assisted pyeloplasty now provides an effective, minimally invasive alternative to open pyeloplasty for the treatment of UPJ obstruction.

to the kidney, surgery usually is necessary to prevent further kidney damage. Kidney stones, failure to thrive, recurrent urinary tract infections or loss of kidney function are indications for surgery.

Pyeloplasty, the removal of the abnormal segment of ureter, is the most common surgical treatment (Figure 1). During a traditional open pyeloplasty, the surgeon makes an incision below the rib cage in the upper abdomen or in the back. A nephrostomy tube or a ureteral stent or both are placed in the kidney. A small, plastic drainage tube may be placed near the repair as well.

When performed by experienced surgeons, robotic-assisted pyeloplasty now provides an effective, minimally invasive alternative to open pyeloplasty for the treatment of UPJ. The robotic-controlled surgical instruments are equipped with articulating tips and wrist mobility that improve precision, and the robotic camera gives 10 times magnification. These characteristics enhance a surgeon's ability to navigate challenging anatomy, to deftly perform microdissections and to precisely place sutures.

The advantages associated with the robotic approach include shorter hospitalization (overnight stay vs. two to five days), less pain and scarring, and shorter recovery (Figure 2). No external drains or stents are typically required for patients undergoing the robotic procedure. If a stent is needed, it may be left on a string so that it can be removed without additional surgery.

In addition to open and robotic-assisted surgeries for treatment of UPJ, Mayo Clinic pediatric urologists also offer consultation and surgical management for a wide range of pediatric genitourinary problems, including hypospadias, cryptorchidism, vesicoureteral reflux and urologic problems associated with

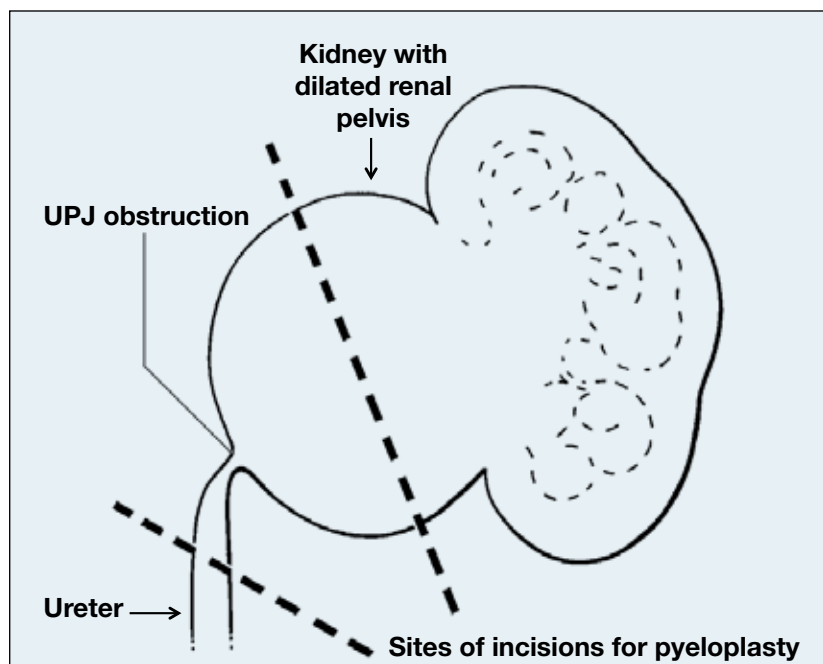


Figure 1. Pyeloplasty, the removal of the abnormal segment of ureter, is the most common surgical treatment for UPJ obstruction.

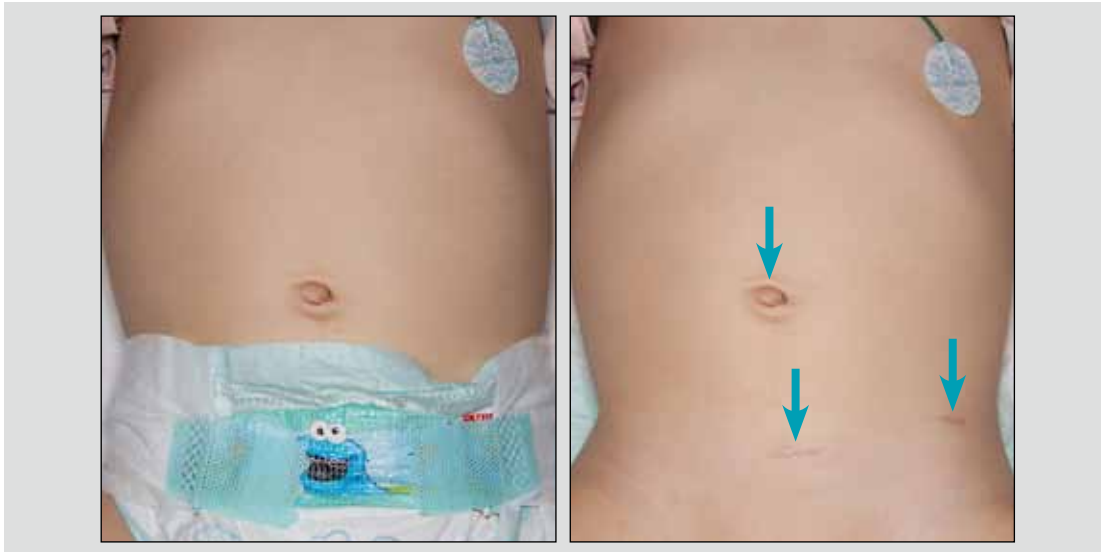


Figure 2. Port placement for robotic-assisted pyeloplasty. Incisions are hidden within the bellybutton and below the bikini line (arrows), rendering them nonvisible when wearing a bathing suit.

spina bifida. In addition, Mayo Clinic specializes in a multidisciplinary approach to the treatment of more-complex urologic disorders

including exstrophy, intersex disorders, Wilms' tumor and bladder rehabilitation secondary to neurogenic lesions.

New Subcutaneous ICD Offers Less Invasive Alternative to Select Patients

In 2012, the Food and Drug Administration approved the first subcutaneous implantable cardioverter-defibrillator (S-ICD) system for use in the United States. The approval was granted after extensive review of data obtained from pilot studies and the European EFFORTLESS registry.

The challenge

Traditional ICD systems comprise the generator and one or more transvenous leads, and they have sensing, anti-bradycardia and anti-tachycardia pacing, and shocking capabilities. The need in some patients for a system that avoids the use of transvenous leads has been long recognized.

Patients with underlying congenital or structural cardiac abnormalities or with limited or difficult vascular access that precludes placement of transvenous leads require epicardial leads and patches. Epicardial leads are more challenging to place surgically. Individuals with channelopathies that confer risk of sudden cardiac death (SCD) often have no need for routine anti-bradycardia pacing, and transvenous leads rarely last the life of the (usually) young individuals receiving a device for this indication. Since intravascular leads become fibrosed in place over time, lead revision and extraction procedures are challenging and not without risk.

Points to remember

- Approved for use in the United States in 2012, the subcutaneous implantable cardioverter-defibrillator (S-ICD) is a system without transvenous leads that provides defibrillation for patients at risk of sudden cardiac death (SCD) caused by ventricular tachyarrhythmias.
- Candidates for S-ICD include patients who lack venous access for transvenous lead placement and patients with channelopathies that confer risk of SCD and who do not need anti-bradycardia pacing. Other candidates include some patients awaiting cardiac transplantation, and those primary prevention patients who are best treated without a transvenous lead due to tricuspid valve concerns or a previously infected transvenous system.

The S-ICD system

A system that does not require intracardiac leads may be appealing in other primary prevention settings. The S-ICD is a system without transvenous leads that provides defibrillation for patients at risk of sudden cardiac death due to ventricular tachyarrhythmias.

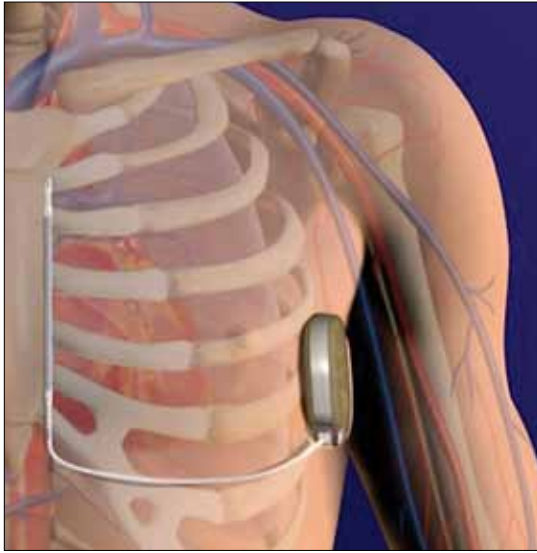


Figure 1. Optimal S-ICD placement of pulse generator and subcutaneous lead.

Clinical trials involving S-ICDs have demonstrated the efficacy and optimal configuration of the device. The pilot study, published in the July 2010 issue of the *New England Journal of Medicine*, established concept viability and identified the ideal device configuration: the pulse generator along the left lateral chest wall and the subcutaneous electrode in a left parasternal position (Figures 1 and 2). The device was as effective as

standard transvenous devices in terminating induced ventricular fibrillation, although with higher energy requirements 36.6 ± 19.8 J for S-ICD vs. 11.1 ± 8.5 J for transvenous ICD. The higher impedance and greater distance from the heart inherent in subcutaneous systems increases the energy requirements approximately threefold for successful defibrillation. Induced ventricular fibrillation was detected by the device in all 137 episodes.

A subsequent investigational device exemp-

tion trial with 330 patients and the ongoing European EFFORTLESS registry have confirmed these initial positive results. The incidence of inappropriate shocks in EFFORTLESS is about 7, percent, and most occurred in individuals who received early implants and who did not have recommended preprocedural ECG screening to ensure proper QRS and T wave sensing. Current devices have both a “shock zone,” which commits to shock therapy based strictly on heart rate, and a “conditional shock zone,” which employs additional discriminators to determine whether shock therapy is warranted.

The system has some limitations. S-ICD is not indicated in patients who require anti-bradycardia pacing or in those with heart failure for whom cardiac resynchronization is indicated.

The device can deliver post-shock pacing therapy, but in doing so, it also paces the muscle wall, which can be uncomfortable in conscious patients. It cannot provide anti-tachycardia pacing, which can painlessly terminate ventricular tachycardia, and is not designed to treat ventricular arrhythmias at rates lower than 170 beats per minute.

The incidence of device infection was 2.5 percent in the EFFORTLESS registry. The use of lead anchoring sleeves mitigated the risk of subcutaneous lead migration. Mayo Clinic campuses in Arizona, Florida and Minnesota offer S-ICD to patients for whom standard ICD placement is precluded or not preferred.

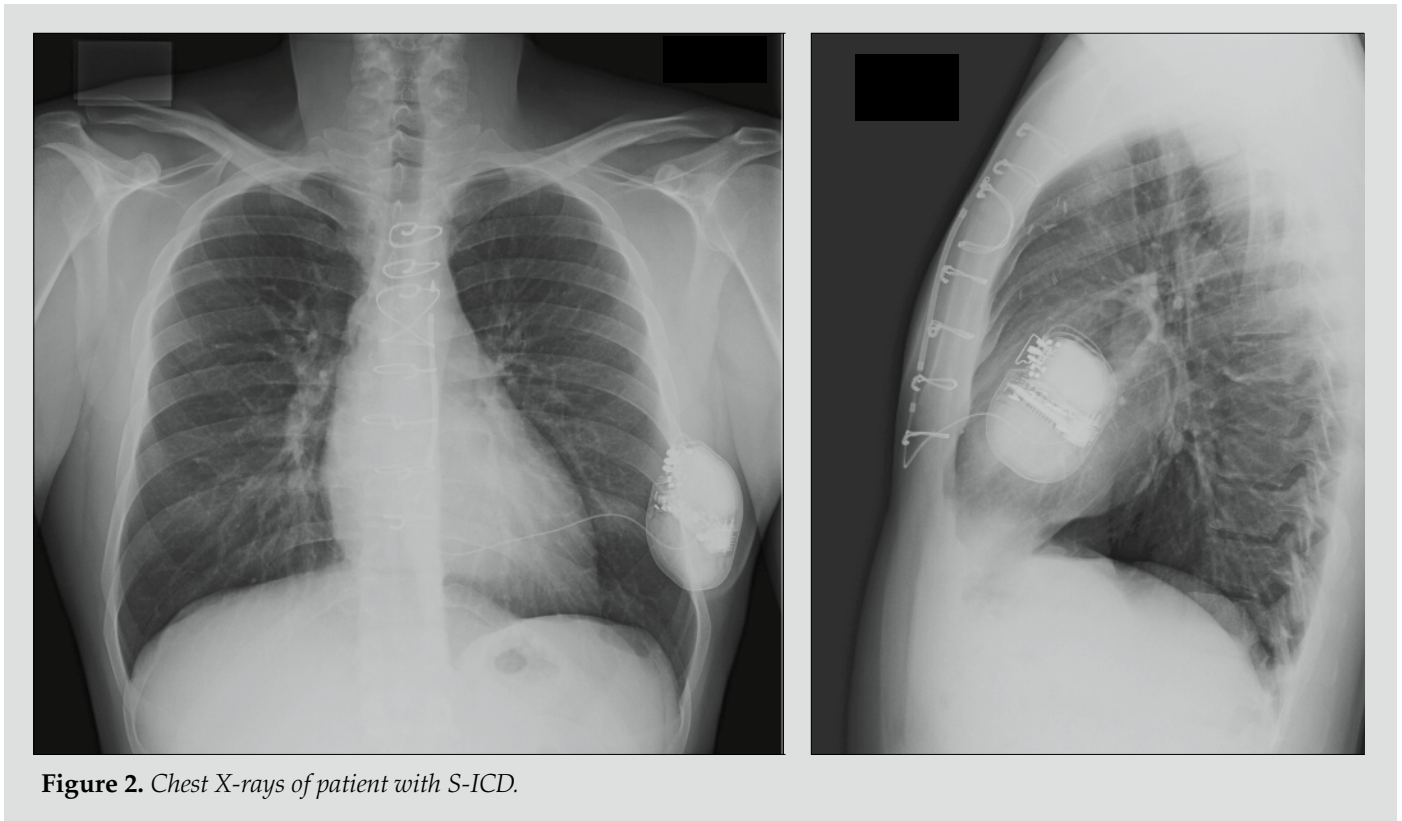


Figure 2. Chest X-rays of patient with S-ICD.

Candidates include patients with structural heart disease, patients who lack venous access for transvenous lead placement, patients with channelopathies that confer risk of SCD and who do not need anti-bradycardia pacing. Other candidates include some patients awaiting cardiac transplantation, and those primary prevention patients who are best treated without a trans-

venous lead due to tricuspid valve concerns or a previously infected transvenous system.

For more information

Bardy GH, et al. An entirely subcutaneous implantable cardioverter-defibrillator. *New England Journal of Medicine*. 2010;363:36.

Blepharoptosis Repair Improves Patients' Quality of Life

Blepharoptosis, also known as ptosis, is defined as an abnormal low-lying upper eyelid margin with the eye in primary gaze (Figure). Blepharoptosis causes substantial reduction in a patient's quality of life. The limitations resulting from this reduction may affect the patient's perceived general vision, peripheral vision and ability to drive.

A research team at Mayo Clinic in Rochester, Minn., examined the effects of blepharoptosis and its surgical repair on health-related quality of life using two validated response measures:

- The 25-item National Eye Institute Visual Functioning Questionnaire (NEI VFQ-25), a vision-specific instrument
- The EuroQol Group's EQ-5D, a generic, health-related quality-of-life instrument

Mayo Clinic researchers found that surgical blepharoptosis repair was associated with statistically and clinically significant improvement in patient quality of life comparable in magnitude to what other investigators have reported for exudative age-related macular degeneration treatment with anti-vascular endothelial growth factor therapy.

The team conducted a prospective pre- and post-surgery survey analysis of 48 adults who underwent blepharoptosis surgery between March 2008 and March 2009. The study group participants were 32 women and 16 men who ranged in age from 43 to 87 years. Of the participants, 37 had bilateral and 11 had unilateral blepharoptosis repair under local anesthesia with sedation. The time between pre- and post-surgery surveys ranged from 14 to 252 days.

Survey comparisons

The NEI VFQ-25 uses 25 subscale scores in 11 categories and generates an unweighted composite score that averages all visual activity scores. The EQ-5D assesses five health-related

Points to remember

- Blepharoptosis, also known as ptosis, is defined as an abnormal low-lying upper eyelid margin with the eye in primary gaze and may markedly affect a patient's quality of life due to reduction in vision.
- A Mayo Clinic prospective pre- and post-surgery analysis of 48 adults showed that surgical blepharoptosis repair was associated with statistically and clinically significant improvement in patient quality of life.

quality-of-life domains to generate index scores that correspond to related health states. The team used t-tests for paired data to compare both the NEI VFQ-25 subscale scores and composite scores and the EQ-5D index and overall quality-of-life scores.

Prior studies show that individual subscore changes of five or more points indicate clinically significant change. Clinically significant change for this study was set at an even more conservative 10 or more points. The EQ-5D showed statistically significant change in individual scores for usual activities, with a reduction in deficits reported across all dimensions.

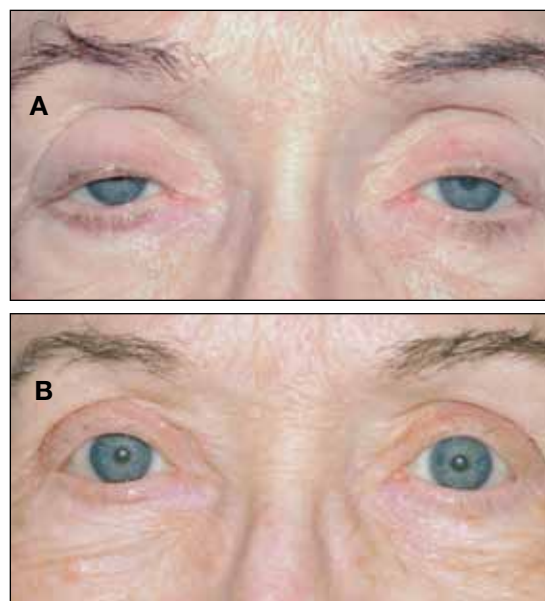


Figure. A, bilateral ptosis preoperative view. B, bilateral ptosis postop.

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Education Opportunities

2nd Annual Heart Rhythm Meeting ECG and Heart Rhythm: A Case-Based Approach

Dec. 5-8, 2013, Scottsdale, Ariz.

This course will focus on clinical and hospital-based cardiac rhythm issues and other topics for both physicians and allied health staff. For more information or to register, please call 800-462-9633 (toll-free) or email cme-jax@mayo.edu.

8th Annual Practical Course in Dermoscopy and Update on Malignant Melanoma

Dec. 6-8, 2013, Scottsdale, Ariz.

This three-day course will provide the attendee with a multidisciplinary review of standard of care management practices and state-of-the-art advances in care of the patient with cutaneous melanoma. The first day will focus on epidemiology, prevention, pathology, advances in genomics, and medical and surgical treatment in association with melanoma. The last two days are an in-depth immersion into dermoscopy for imaging of melanocytic and nonmelanocytic skin lesions, including three breakout sessions. Participants will develop practical skills that will enable them to be more comfortable approaching patients with atypical skin lesions. This dermoscopy section is primarily targeted to clinicians, but educators and residents will find it valuable as a springboard to develop dermoscopy training programs. This year, optional MOC Part II self-assessments for additional Category 1 CME credit will be available online after the course. The intended audience is dermatologists, surgeons, oncologists, and physicians in internal medicine, family practice and general practice. For more information or to register, please call 480-301-4580 or email mca.cme@mayo.edu.

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