Novel Heart Transplants Target High-risk Patients

UCLA heart transplant physicians, who perform an average of 100 transplants per year, have developed innovative ways to save the lives of patients with end-stage heart failure who otherwise may die while waiting for a donated organ because they are considered too old or sick.

Alternate Hearts

Alternate, or nonstandard, donor hearts are increasingly used at UCLA for higher risk recipients and critically ill patients with end-stage heart failure. “These patients would be turned down in many other transplant programs because of their age or multiple risk factors,” explains Hillel Laks, M.D., head of UCLA’s Heart Transplant Program. Currently, 13 percent of people on the waiting list for donated hearts are over age 65. “By using a marginal heart that would not be appropriate for someone on the regular transplant list, we have been able to expand the number of patients who can get a transplant.”

UCLA’s program was the first to propose the alternate list concept. Over the past 13 years, close to 90 alternate heart transplants have been performed at UCLA on high-risk candidates—those who are over 65 or suffer from another condition such as kidney trouble, diabetes with complications, or cancer in remission. The types of hearts used have expanded to include borderline-functioning hearts that surgeons operate on before transplanting—coronary disease that can be bypassed, holes in hearts that can be closed, and leaking valves that can be repaired.

Preservation of a borderline heart is crucial so that deterioration of function remains minimal. “By removing the white blood cells and controlling reperfusion when blood first enters the organ, we achieve better function of the heart compared to many centers that use standard techniques. Reperfusion also allows us to accept hearts outside our local area,” Dr. Laks notes.

UCLA uses ingenuity matching donor hearts to recipients. “For example, an older donor with a hypertrophied heart due to high blood pressure involves a higher risk for the recipient. If a long transport time is avoided and you use the heart on someone much smaller than the donor—an
“The reason the survival decreases after five or six years with the alternate heart is that older people start to get other diseases. However, increasing the longevity by even five years in a functional person in their late 60s or 70s is extremely valuable.”

—Dr. Hillel Laks

**Heart Failure Treatment Revolutionized**

A combination of medical and device therapy has revolutionized treatment for patients with heart failure. “Today, 80 percent of potential candidates can avoid heart transplantation using medications and device therapies,” notes Gregg Fonarow, M.D., director, Ahmanson-UCLA Cardiomyopathy Center.

Medications are always the first line of therapy—and successful strategies include the use of ACE inhibitors, aldosterone antagonists and the beta-blocker carvedilol. UCLA researchers were the first to demonstrate that, in addition to these medications, cholesterol-lowering statins may improve survival in heart failure.

UCLA also pioneered the notion that preventatively implanting pacing devices—implantable defibrillators—reduces sudden death and prolongs life in appropriate heart failure patients when combined with medical therapy.

**Ventricular Assist Devices**

The future of ventricular assist devices is heading down three paths with UCLA on the front edge of all three: bridge to transplant, destination therapy and artificial heart,” says Mark Plunkett, M.D., director of UCLA’s pediatric heart transplant program.

These devices currently play a major role in keeping patients with end-stage heart disease refractory to medical therapy alive until a suitable donor becomes available as a bridge to transplant. At UCLA, approximately 25 devices are implanted each year. The devices sustain circulation by taking over up to two-thirds of the heart’s pumping, thus allowing some patients to leave the hospital and wait at home for a heart to become available for transplantation.

Because of the limited supply of heart donors, these mechanical pumps have begun to be used as destination therapy—a new concept used primarily for patients older than age 70 or for patients who are not candidates for transplantation. “The limiting factor right now is the durability of the mechanical pump that has been used,” Dr. Plunkett explains. This pulsatile pump is larger than a fist and usually is implanted in the abdomen with tubes connecting to the heart through the diaphragm.

The good news is that three newer, much smaller pumps are being tested in patients at UCLA. This new generation of thumb-size devices sits either inside or outside the heart. Known as axial flow pumps, they contain a little propeller (called an impellor) that pumps seven to 10 liters of blood per minute, but without pulsatility. “The issue of pulsatility is an interesting current topic of research. If we implant a pump that generates a lot of blood flow but no pulse, will the patient benefit? If that proves to be true, it would mean that the new devices we are using would work very effectively.” Dr. Plunkett reflects. “Ultimately, all this is leading up to a perfected artificial heart.”

“These smaller pumps are much simpler and less likely to break down,” notes Jaime Moriguchi, M.D., medical director of UCLA’s Mechanical Circulatory Support Program. “More importantly, they can be placed in smaller men, women and children who currently are not candidates for the larger pulsatile pumps.”
The axial flow pumps are less traumatic to implant, Dr. Laks adds, since patients do not require the heart-lung machine during surgery. UCLA is one of the few centers in the country approved to use assist devices for destination therapy.

“All of these pumps have a finite lifespan due to wear and tear,” Dr. Moriguchi notes. “By combining adjuvant heart failure therapies, such as cell transplant or muscle-building drugs like the asthma medication clenbuterol, it appears that heart muscle can significantly recover to the point where the pumps can actually be removed. It is quite possible that the most significant contribution of these mechanical pumps will be in their role as bridges to recovery so that these patients will never need a heart transplant.”

**Reducing Rejection**

As one of the largest heart transplant programs in the country, UCLA sees some of the most critically ill patients, yet the survival rates are impressive. One-year survival is 90 percent, and three year is 75 percent, both figures higher than the national average.

A contributing factor to these statistics is the after-transplant care and control of rejection factors.

“We’ve changed our anti-rejection regimen over the past decade. In 1990, 40 percent of our patients would not experience biopsy-proven rejection; today that figure is 96 percent,” notes Jon Kobashigawa, M.D., medical director of UCLA’s Heart Transplant Program. His groundbreaking work with statins in the 1990s demonstrated that cholesterol-lowering drugs knocked out the natural killer cell activity in patients with heart transplants. Later studies proved that combining mycophenolate mofetil, tacrolimus and pravastatin significantly decreases rejection episodes. Beginning in 1986, UCLA went against common wisdom and began to wean post-transplant patients off steroids after six months to avoid long-term complications of the drugs and showed that patients can do very well without steroids. Newer drugs are also being used.

Everolimus, a proliferation signal inhibitor, and its sister drug sirolimus help prevent cell growth. Sirolimus is also being used at UCLA to treat transplant coronary artery disease, a condition occurring more often as recipients live longer.

Innovative ways to identify rejection include a simple blood test that uses genomics to detect 12 genes that up-regulate specifically when rejection is present. With this blood test, UCLA has decreased the number of heart biopsies needed to detect rejection in the first year. Heart biopsies are no longer performed after one year post-transplant.

New frontiers of rejection research include antibody-mediated rejection, which Michael Fishbein, M.D., at UCLA has championed. Cellular rejection can be detected through biopsy. However, antibodies are too small to be detected. Dr. Fishbein has developed C4D staining to detect this form of rejection. If rejection is identified, patients can be treated with high-dose corticosteroids.

Extracorporeal photopheresis is also used to treat antibody-mediated rejection and recurrent rejection. In this technique, white blood cells are removed, a compound is added and then treated with ultraviolet light to cause an irreversible bond with the white cells—signaling the suppression regulatory cells in the body to shut down the part of the immune system involved in the rejection process.

“We have it all here at UCLA—a tremendous cardiomyopathy program, world-class surgical physicians and outstanding post-transplant care that all work very well together,” Dr. Kobashigawa notes.

**Recommended Reading**


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**Can Stem Cells Improve Heart Function?**

Researchers at UCLA are exploring the idea that transplanted stem cells can help treat patients with narrowed, blocked arteries and weakened cardiac muscle.

Excess fat turns out to be an abundant source for stem cells—the immature and unspecified cells critical to the body’s ability to renew and repair its own tissues. Marc Hedrick, M.D., a plastic surgeon and now president of the biotechnology firm MacroPore Biosurgery, was part of UCLA when he was the first to grow human tissue—including bone, muscle and cartilage—using stem cells derived from fat obtained from liposuction procedures.

Today, Drs. Ramin Beygui and Robb MacLellan at UCLA are conducting laboratory studies to see if stem cells can be used to improve the function of the heart after myocardial infarction. They are testing two approaches: recruiting stem cells using tissue engineering technology and then engrafting them into the heart; or directly bringing in scaffolds that release stem cells to recruit agents into the heart.

In the second approach, the researchers try to induce fat-derived stem cells to differentiate into cardiac myocytes. “We have been able to show in our lab that these adipose-derived stem cells can be induced to show some of the characteristics present in heart muscle cells and also start contracting spontaneously under laboratory conditions,” Dr. Beygui relates.

Since the stem cells used are from the patient, the implication is that the need for immunosuppressive therapy could be obviated if this research, which is still in its infancy, bears out. Further, if stem cells can be used at the same time an assist device is implanted, the patient may be able to be weaned off the device once the heart has recovered enough cells to resume contraction.
The success rate for liver transplantation has improved so dramatically in the two decades since UCLA became one of the first to offer the surgery that all patients with end-stage liver disease should be referred for evaluation as potential transplant candidates, says Ronald Busuttil, M.D., Ph.D., Dumont Professor of Transplantation Surgery and chief of the Division of Liver and Pancreas Transplant at the David Geffen School of Medicine at UCLA. “In 2005, for any type of end-stage liver disease—be it acute or chronic, and for many types of cancer of the liver—transplantation is now recognized as the treatment of choice,” Dr. Busuttil says. “There were once fairly select indications for a liver transplant, but now, patients with end-stage liver disease of any type are considered candidates.”

UCLA’s Liver Transplant Program, one of the largest and most experienced in the world, has seen one-year patient survival rise from below 70 percent to above 90 percent during the course of its history, thanks in part to refined surgical techniques and the advent of better postoperative drugs to prevent rejection. When the program was started 20 years ago, two-thirds of patients experienced rejection; now, only 15 percent do. And, 15 years after receiving their new liver, nearly two-thirds of patients will be alive. “We’re able to control many of the infectious complications that occur after liver transplantation,” he says, “and we’re able to decrease some of the toxicity that from the drugs that we have to give these patients.”

Perhaps the best illustration of the expanding indications for liver transplantation in adults is the fact that one in five liver transplants at UCLA now involves a patient with liver cancer. “Twenty years ago, we couldn’t cure any of these patients, and now 75 percent of them will live five years,” says Dr. Busuttil. Similar gains have been made in liver transplant outcomes for patients with hepatic ailments ranging from chronic hepatitis, autoimmune disease and metabolic diseases to alcoholic liver disease, acute liver failure, and other forms of liver failure.

In the June issue of Annals of Surgery, Dr. Busuttil and colleagues reported on the Dumont-UCLA Liver Transplant Program’s experience with its first 3,200 patients, the second-largest single series of liver transplants ever reported in the world. Dr. Busuttil’s team has pioneered many new approaches, largely driven by the shortage of donor organs. The 5,000 liver donors each year don’t come close to meeting the needs of the population requiring an organ. Dr. Busuttil notes that an estimated 4 million people in the United States have hepatitis C; conservatively, one in five of those patients, 800,000 people, needs a new liver.

UCLA’s program has developed new strategies to increase the organ supply, including the split-liver transplant, techniques that enable successful use of donor organs that previously would have been unsuitable, and transplantation from living donors.

Under highly selective criteria, the Dumont-UCLA Liver Transplant Program has performed more than 40 adult-to-adult living donor liver transplant procedures in the past four years, with excellent results for the recipients and minimal complications to the donor. “At our center, this has proved to be an important and effective alternative for patients who would otherwise get sicker and possibly die while waiting for a cadaveric organ,” says R. Mark Ghobrial, M.D., Ph.D., professor of surgery and surgical director of the UCLA Living Liver Donor Program.

In the procedure, a suitable living donor—usually a relative or close friend—volunteers to have a portion of his or her liver surgically removed and placed into the recipient. UCLA’s results—a patient survival rate of 90 percent and graft survival rate of 85 percent—are among the nation’s best and stem from the program’s overall experience as the world’s busiest liver transplant center and a cautious screening protocol. Nationally, though, results vary widely; this prompted the National Institutes of Health to initiate the Adult to Adult Living Donor Liver Transplant Cohort Study (A2ALL), a seven-year study that includes UCLA and eight other centers that is focused on understanding the long-term effects and comparing outcomes of living-donor liver transplantation with those for patients who receive cadaveric liver donations.
In the split-liver transplant, an adult cadaveric liver is divided into two functioning allografts. The procedure has represented an especially important advance for children—particularly those in their first year of life, who, nationally, are at the highest risk of dying while waiting for an organ. “There aren’t many donor organs available for children,” says Dr. Busuttil, “so in many cases, the only way these babies get transplanted is if you put a split into them.” With the split-liver technique, healthy cadaveric adult livers that would be too large for pediatric recipients—the majority of whom are under 2 years old—are divided into two transplantable segments, with outcomes that are similar to those of whole-graft transplants; as a result, far fewer children on the UCLA waiting list are dying before an organ becomes available.

The UCLA team has also been successful with extended-criteria cadaveric liver donations, making use of organs that are less than ideal through pharmacological manipulations, quicker operating times and sound patient selection.

Many people Dr. Busuttil encounters are surprised to learn about the success rates of transplantation. “The first thing a lot of people ask me is, ‘Can you survive a liver transplant?’” he says. “They don’t realize that in fact, liver transplantation is probably the most important advance in the treatment of patients with end-stage liver disease in the history of medicine. The progress has been remarkable—for the 90 percent of end-stage liver disease patients who survive one year after the transplant, it’s going from a death sentence to a relatively normal life.”

**Recommended Reading**


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**Great Strides Made in Small Bowel Transplantation**

Small bowel transplantation, though still far less common than other organ transplants, now offers a viable alternative for intestinal failure patients for whom conventional therapy does not produce good outcomes.

Advances in surgical technique, immunosuppression and infection control continue to make small bowel transplantation a safer procedure for patients. Since the intestine presents unusual transplantation challenges, only 152 small bowel transplants were performed in the U.S. last year. For the past four years, UCLA has performed eight to 12 such transplants annually.

“The intestine is an immune organ in its own right, like the spleen or tonsils or lymph nodes. The immune tissue within the bowel causes a strong immune reaction against the transplanted bowel. The intestine is potentially the most fiercely and aggressively and frequently rejected organ,” says Douglas G. Farmer, M.D., director of UCLA’s Intestinal Transplant Program.

Since the late 1960s, total parenteral nutrition (TPN)—a form of liquid intravenous nutrition—has replaced the function of the small bowel in patients with intestinal failure by delivering calories and nutrients directly into the circulatory system. “TPN provides a good, long-term solution for most patients who are unable to meet their own caloric, fluid and nutritional needs,” Dr. Farmer says. “TPN’s success halted the practice of small bowel transplantation until recent advances have made it a viable alternative for patients who do not tolerate TPN well.”

TPN can be used to treat patients with short bowel syndrome (e.g., utero volvulus, intestinal atresia, necrotizing enterocolitis, volvulus, clotting, trauma and inflammatory bowel disease). Often, the shortened segment of the bowel in these patients compensates with increased functional capacity, and thereby allows TPN to be discontinued. This adaptation process usually maximizes in two to four years from the removal of the intestine or the beginning of short bowel syndrome.

Patients in which adaptation does not occur are considered to be in intestinal failure. “However, just because you have intestinal failure and live with TPN dependence doesn’t mean you need a bowel transplant,” states Dr. Farmer. “With specialized medical care and nightly connection to TPN, these patients can lead relatively normal lives, go to school or work, and have families.”

Certain complications from TPN may indicate that the patient should be evaluated for small bowel transplantation, liver failure, clotting at TPN catheter sites, recurrent infections in the TPN catheter lines and excessive fluid loss. Surgical outcomes for small bowel transplantation have improved rapidly since the first one was performed in 1987. “Our results today are better than they’ve ever been—as a matter of fact, in certain groups of patients we can offer 70, 80, 90 percent chance of survival. Ten years ago, we could offer a 30, 40, 50 percent chance of survival,” Dr. Farmer says.

Research continues in the arenas of developing newer immunosuppressive regimens, understanding the immune system in a more detailed way, and inducing tolerance. “Studies at UCLA are looking at ways to limit injury (ischemia and reperfusion) that occurs to transplanted intestines during the perioperative period,” Dr. Farmer notes. “We have some very exciting results demonstrating that this injury can be ameliorated and that lymphocytes may play a key role in the process.”
Criteria for Lung Transplantation

Expanding

Compared with other solid organ transplants, lung transplantation is a relatively new field that has faced some of the most difficult challenges—not least of which is that, as the only solid organs continually exposed to air, the lungs are bombarded by a variety of external antigens that increase the risk of infection. Nonetheless, there have been significant improvements in lung transplantation over the last decade, including surgical approaches pioneered at UCLA that have improved results as well as expanded the pool of lungs available for transplant.

UCLA’s Lung Transplant Program has achieved results that are the best in the country among programs that have done more than 10 transplants. Survival following transplant is 97 percent at 30 days, approximately 90 percent at one year, and approximately 80 percent at three years—all well above the national mean. Moreover, these results have been obtained while accepting patients for transplantation who are older than most programs would consider, as well as patients with conditions that would disqualify them elsewhere. “Most transplant centers will not consider patients older than 60 or 62, and rarely up to age 65,” notes Joseph Lynch III, M.D., UCLA pulmonologist and member of the team. “In the last 12 to 18 months, we have had several patients age 70 and older. We have also accepted patients with scleroderma and other disease states where previously transplant was considered to be contraindicated because of the anticipated high morbidity.”

Nonstandard Donor Lungs

The UCLA program is also unusual in its acceptance of so-called nonstandard donor lungs. “For the last five years we have been accepting certain donor lungs that other centers will not, and our results testify to the fact that these donor organs are indeed useable,” says Abbas Ardehali, M.D., surgical director of the UCLA Lung Transplant Program. “As a result, the median waiting time for lung transplant patients is only five to six months, as opposed to 12 to 18 months in Southern California as a whole.”

A key to UCLA’s ability to accept nonstandard donor lungs is its pioneering effort in the technique known as modified reperfusion. The process, developed by Dr. Ardehali and colleagues, combines the patient’s blood with added elements that ultimately help to resuscitate the new lungs. Modified reperfusion replenishes the new lung with nutrients while removing any white blood cells that might injure the lung and cause organ failure. In addition to improving surgical results, modified reperfusion enables the UCLA team to use imperfect donor organs that would otherwise be at risk of developing a severe form of dysfunction. “In the future, we’re going to see more liberal use of donor organs,” Dr. Ardehali says. “Transplant centers are becoming more comfortable with using organs that may not be perfect, given the donor shortage we face.”

Because of the expanded criteria for acceptance and the improving results, Dr. Lynch notes, physicians should consider referring patients with severe, potentially life-threatening chronic lung diseases to a transplant center. The most common indications for transplant are, in order, emphysema, pulmonary fibrosis, cystic fibrosis, and pulmonary vascular disease, such as pulmonary hypertension. For the latter category of patients, a new program of medical therapy offered at UCLA has postponed for several years or longer the need for transplantation among many patients who previously would have required it.

Lung Volume Reduction Surgery

For selected patients with non-severe emphysema who are not yet transplant candidates, lung volume reduction surgery (LVRS) has emerged as an alternative to transplant. Emphysema causes the lung to expand and compress healthy tissue; in LVRS, up to 30 percent of the lung volume is removed, creating more room in the chest cavity for the healthy tissue. But Dr. Lynch points out that the improvement is both modest and temporary. “If you start out with 30 percent lung function, you might jump to 40 percent, and then in two to three years, most of that gain dissipates,” he says. “It’s not the equivalent of lung transplant, in which you go from being wheelchair-bound and on continuous oxygen to being off oxygen and having lung function of up to 65 percent for a single lung and 100 percent for a double lung.”

Despite the recent surgical and medical advances and the often-dramatic quality-of-life gains for lung transplant recipients, there is still much room for improvement. “The Achilles’ heel continues to be rejection,” Dr. Lynch says. “That is the major cause of death after the first six months. We need to find better mechanisms to identify rejection early and prevent it, or to treat it when it occurs.” While there is good treatment for acute rejection, he notes, multiple episodes of acute rejection ultimately leads to chronic rejection, which is usually irreversible and can be fatal. A UCLA research team is trying to identify early markers of rejection, which could lead to the development of better drugs. “We’re still using non-specific, generalized immunosuppressive medications,” says Dr. Ardehali. “With better understanding resulting from our research, we should be able to develop tools to create donor-specific tolerance, which will revolutionize the field of solid organ transplantation and possibly lead to increased longevity of the transplanted organ.”
Pancreas Transplant Useful for Certain Diabetic Patients

For many years, pancreas transplantation has been offered as an option for certain patients, and in the hands of experienced teams, it has proved effective for those with long-time diabetes or diabetes with kidney failure, according to R. Mark Ghobrial, M.D., Ph.D., surgical director of the UCLA Pancreas Transplant Program.

The surgery involves transplanting a portion of the human pancreas as a way to stabilize blood sugar and glycosylated hemoglobin levels without insulin; it is often indicated for diabetic patients with kidney failure, since they are already in line for a kidney transplant and can get both organs at once, Dr. Ghobrial explains. For patients with complications from diabetes—typically those experiencing the cumulative effects from decades of type 1 disease—pancreas transplant without the kidney is also an option. “It’s usually three or more decades before type 1 diabetics develop renal failure, and not everyone does,” Dr. Ghobrial explains. Most patients with type 2 diabetes will not benefit from a pancreas transplant, because they are already able to make insulin; the problem is their lack of response to it, something that won’t change with the surgery.

Over the last year, the UCLA Pancreas Transplant Program team has achieved 100 percent patient and graft survival, a record Dr. Ghobrial attributes to the team’s surgical expertise as well as the links between the clinical work and the research component at UCLA. “If a patient has any type of problem, we are usually able to find insights through our research and clinical trials,” he says.

But despite successful outcomes, pancreas transplantation can’t come close to fulfilling the needs of all diabetic patients, Dr. Ghobrial notes. Besides the fact that there are so many insulin-dependent diabetics and so few organs, another problem is that, while patients who receive pancreas transplants may no longer require insulin, they need immunosuppressive medications. “Insulin is cheap, and immunosuppressive medications are very expensive,” Dr. Ghobrial notes. “For patients who develop renal failure, and need a kidney transplant, immunosuppression is going to be necessary anyway, so the pancreas transplant makes sense. But for those who do not have renal failure, we continue to treat with insulin.” That’s not ideal either, he adds—patients treated with insulin face quality-of-life concerns as well as being at greater risk for hypertension, high cholesterol and heart disease.

Islet Cell Transplantation

Dr. Ghobrial and colleagues are hopeful that the long-term solution for these patients is islet cell transplantation. “Islet cell transplantation, while experimental at present and so few organs, another problem is that, while patients who receive pancreas transplants may no longer require insulin, they need immunosuppressive medications. “Insulin is cheap, and immunosuppressive medications are very expensive,” Dr. Ghobrial notes. “For patients who develop renal failure, and need a kidney transplant, immunosuppression is going to be necessary anyway, so the pancreas transplant makes sense. But for those who do not have renal failure, we continue to treat with insulin.” That’s not ideal either, he adds—patients treated with insulin face quality-of-life concerns as well as being at greater risk for hypertension, high cholesterol and heart disease.

Pancreas transplantation provides an alternative for people with long-time diabetes or diabetes with kidney failure.

Pancreas transplants useful for certain diabetic patients. There was great hope in 2000 with the announcement of new successes in islet-cell transplants—removal of the islets containing the beta cells from a donor pancreas, followed by injection of these cells into a patient. But the optimism was dampened when the islets remained effective for only a few years. “Once we identify the islet stem cell, then presumably it will be possible to mass-produce islets for transplantation,” says Dr. Lipshutz. “But presently, when it takes two or three pancreases to have enough islets to make someone insulin-free—and then, perhaps only for a limited period of time—this therapy can only be thought of as an experimental endeavor, unlike solid-organ pancreas transplantation.”

UCLA has established the Larry L. Hillblom Islet Research Center, under the direction of Peter Butler, M.D., to focus on the problem. “The excitement right now is in stem cell differentiation into islets, and islet regeneration,” says Dr. Lipshutz. “Ultimately, we would hope to be able to take a primordial stem cell—whether it be an adult-derived or embryonic cell—and have it develop into islet cells or beta cells of islets, to produce insulin. But the application of islet cell transplantation to patients outside of research protocols is, unfortunately, still years away.”

UCLA PHYSICIANS’ UPDATE 7
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**Clinical Updates**

**Cardiovascular Medicine**
- Innovative electrophysiology procedures used to treat cardiac arrhythmias.
- New bedside evaluation tool gauges mortality risk in patients hospitalized with heart failure.

**Critical Care Medicine**
- UCLA Medical Center world’s first hospital to introduce remote presence robots in the Intensive Care Unit.

**Oncology**
- Endoscopic ultrasound with fine-needle aspiration improves staging for certain lung cancers.

**Orthopaedic Surgery**
- Herniated lumbar disc and chronic lumbar discogenic pain can now be treated with the minimally invasive posterolateral transforaminal endoscopic discectomy.

**Pediatric Surgery**
- Minimally invasive laparoscopic Nissen fundoplication used to treat infants and children with gastroesophageal reflux.

**Psychiatry**
- UCLA’s Autism Evaluation Clinic introduces new assessment protocol for autism spectrum disorders.

**Pulmonary Medicine**
- New drugs enhance pulmonary hypertension treatment.
- Triplet 5-year-old girls undergo less invasive open-heart surgery using the AMPLATZER® Septal Occluder.

**Radiation Oncology**
- Stereotactic radiosurgery allows precise treatment of primary and metastatic tumors impinging on the spinal cord.

**Sports Medicine**
- Minimally invasive, ultrasound-guided procedure used to treat chronic tendonopathy at UCLA.

**Transplant Services**
- Ventricular assist devices offered in clinical trials at UCLA as a bridge to transplant and as destination therapy.

**Urology**
- UCLA Pelvic Floor Rehabilitation and Biofeedback Program treats women and men with bladder control problems and medical conditions.

**Newsletters and Reprints**

**Newsletters**
- Clark Urological Center Newsletter, Volume 17, Number 1 Spring 2005
- Jules Stein Eye Institute Clinical Update, Volume 14, Number 1 January 2005
- UCLA Pediatric Update Volume 12, Number 2 Summer 2005
- UCLA Clinical Neurosciences Update Spring 2004

**Journal Reprints from Proceedings of UCLA Healthcare**
- Infectious Mononucleosis-Like Syndrome (IMLS) Farid Farid, M.D.
- Treatment of Duodenal Carcinoid with Argon Plasma Coagulation Harry L. Green, M.D.
- Chills and Fever in an 18-Year-Old Female Nam C. Lim, M.D.
- ASCUS and Cervical Cancer Joel I. Sarachek, M.D.

**Other Reprints**
- UCLA Introduces State-of-the-Art Surgical Suites Karen Sandrick—From the Bulletin of the American College of Surgeons Volume 89, Number 1, January 2004

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UCLA Solid Organ Transplant Programs

UCLA is a national leader in the art and science of transplantation, performing hundreds of single- and multiple-organ transplants each year. Some highlights:

**UCLA’s Heart Transplant Program** is one of the largest in the world, performing nearly 1,500 adult and pediatric transplants since 1984.

**UCLA’s Kidney and Kidney-Pancreas Transplant Program**, one of the nation’s five busiest, performs 300 surgeries yearly.

**UCLA’s Liver Transplant Program**, one of the largest and most experienced in the world, has a one-year patient survival rate above 90 percent.

**UCLA’s Lung Transplant Program** ranks at the top of the National Transplant Survival list for programs that perform 10 or more transplants per year.

**UCLA’s Small Bowel Transplant Program** performs eight to 12 transplants each year.
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