

clevelandclinicmagazine

Winter / 2005



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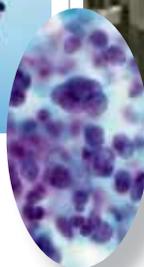
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My Story

Perfect Match

By Aaron Viny
as told to Cleveland Clinic Magazine
"My brother was never supposed to be born, but because of him, I'm alive today..."

To read more stories from this issue or to take our Readers' Poll, go to our Web site: www.clevelandclinic.org/clevelandclinicmagazine

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LETTERS TO THE EDITOR

Outstanding Online

Great new feature to have the magazine available online! Easy to use, saves trees, saves time, saves postage.

Also, the entire Clinic Web site is one of the most comprehensive and easiest to use of all of the medical institutions I have viewed online.

Many people (non-medical) do not yet know that CCF is one of the world's best. Many have asked me, "Why there?" or "How'd you find out about it?" When I explain your *U.S. News* rankings and my experience, they usually say, "Wow, I didn't know that. I'll certainly remember it."

*Ginger Johnson
Peoria, Illinois*

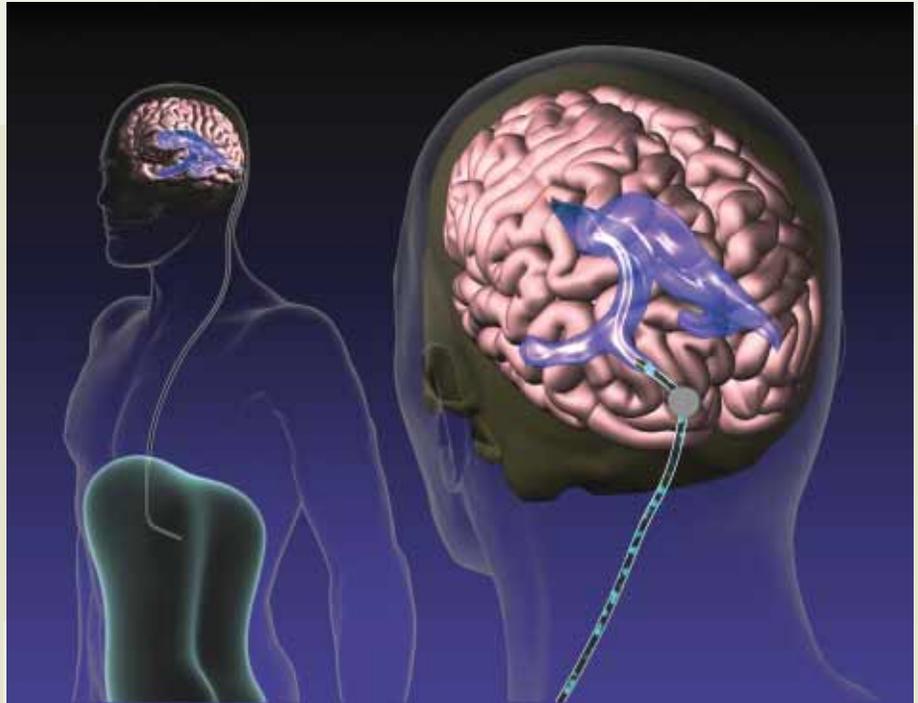
A Letter of Gratitude

I read the article "Better Relief for Incontinence" [Summer 2004] and I, too, have a success story. I suffered for several years from stress incontinence. After two unsuccessful operations with two different doctors, I was directed to the Clinic and Dr. Mark Walters. He performed my third surgery, which was unsuccessful. The difference was that Dr. Walters did not give up on me. His patience, understanding and perseverance gave me hope. Eventually, we decided to try a new procedure and it worked! Now, six months later my lifestyle has improved 100 percent and I shall be forever grateful to Dr. Walters, his nursing staff, Beth his receptionist and to the Clinic.

*Louise Sternberg
Beachwood, Ohio*

If you would like to comment, send email to: clevelandclinicmagazine@ccf.org

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Treatment for normal pressure hydrocephalus (NPH) involves surgically implanting a shunt, which diverts the excess fluid from the brain or spinal canal to another part of the body, where it is easily and safely absorbed.

Treating Fibroids

WITHOUT SURGERY

A slim, 5'7" aerobics teacher can't get rid of her "basketball tummy." A 40-year-old mother of four bleeds profusely during her periods. A young wife has one heartbreaking miscarriage after another.

The single cause behind these different problems is fibroids, benign tumors that arise from smooth muscle cells in the uterine walls. About 40 to 70 percent of American women develop fibroids; African-American women are particularly susceptible.

"The uterus is normally the size of a lemon. With fibroids, it can grow to the size of a grapefruit, a cantaloupe or a watermelon," explains Linda Bradley, M.D., director of z Services for the department of Obstetrics and Gynecology.

Fibroids usually send women to the doctor because heavy, painful periods interfere with normal activities. Other "bulk-related" symptoms make the abdomen bulge, pressuring the bladder and bowel, or triggering leg and back pain. Recurrent miscarriage, premature labor and delivery problems also may be related to fibroids.

When it may not be OLD AGE

Linda Craig had been on medication for Parkinson's disease for about eight months when her symptoms rapidly worsened. She experienced increased difficulty walking and talking, had a harder time controlling her bladder and trouble performing multiple tasks.

"I really was in bad shape," the 64-year-old Kansas City resident recalls. Any distraction would cause her to forget her prior task. "If my husband said something to me, I would forget I had food cooking on the stove," she says, as an example. Only when the food began to burn would she remember that she'd been cooking. "The best time was when I was completely alone and not interrupted," she says. "But you can't live like that."

Her physician in Kansas City acknowledged that her symptoms were worsening and recommended increasing her medication. Then, by chance, she learned of a little-known condition called normal pressure hydrocephalus or NPH. Defined as a build-up of fluid in the ventricles of the brain, NPH causes the same symptoms Mrs. Craig was experiencing. Desperate for a second opinion, she contacted The Cleveland Clinic.

"The three hallmark symptoms of NPH – gait imbalance, mental slowing and urinary incontinence – resemble those of other age-related diseases, so patients often are misdiagnosed," says Clinic neurosurgeon and co-director of the Aging Brain Clinic, Mark Luciano, M.D.

It is unknown exactly how many people who are diagnosed with dementia or other diseases of aging actually have NPH, but there are some estimates of between 5 and 10 percent – around 375,000 people. Generally, the symptoms don't occur simultaneously, which makes diagnosing NPH trickier still. "Taken individually, the symptoms could be caused by other conditions. But when they are presented together, they strongly suggest NPH," explains Dr. Luciano. "A CT or MRI scan is vital to making an accurate diagnosis."

Unlike strokes or Alzheimer's disease, the symptoms of NPH can be reversed. Once diagnosed, treating NPH is straightforward and almost always effective. Treatment involves surgically implanting a shunt, which diverts the excess fluid from the brain or spinal canal to another part of the body, where it is easily and safely absorbed.

Imaging tests revealed that Mrs. Craig did indeed suffer from NPH. She underwent treatment at the Clinic and was back home within just a few days. Less than two weeks later, her symptoms were already fading.

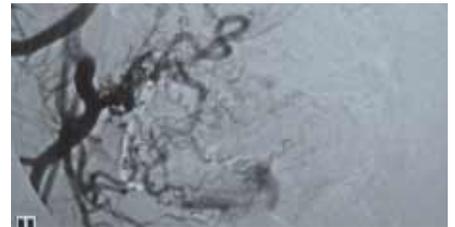
Twenty years ago, hysterectomy was routine for women with large fibroids. And while hysterectomy may still be an option, newer fibroid treatments include myomectomy (fibroid removal), and various means of destroying fibroids, including one method called uterine fibroid embolization (UFE). "With UFE, I've witnessed high patient satisfaction," says Dr. Bradley. "Studies show excellent recovery, no change in sexual function and libido, and no problems with bladder function or incontinence."

In 1996, Dr. Bradley spearheaded collaboration with Clinic interventional radiologists, who have performed about 400 UFEs since. Interventional radiologist James Newman, M.D., Ph.D., explains that "as fibroids grow, adjacent arteries enlarge to provide a rich supply of blood. We intentionally block these arteries with small plastic particles, which starve fibroids of oxygen and nutrients so that they start

to die right then and there. Fibroids shrink 40 to 50 percent over several months."

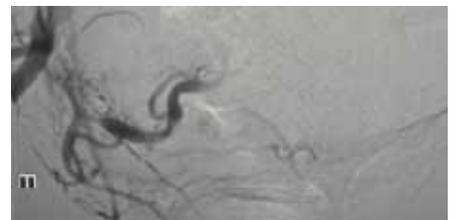
To help women decide their course of action, gynecologists consider many factors, including fibroid size and location, and fertility. "We don't offer UFE if women want babies because of concerns about the safety and strength of the uterus for childbearing," says Dr. Bradley. Thus, the young wife who miscarries may be better off with myomectomy. Although fibroids can recur, she may still bear children in the meantime.

UFE is a one- to two-hour procedure done under local anesthesia and sedation. It requires an overnight stay in the hospital, and most patients need two weeks to recover. Heavy bleeding is relieved in 90 percent of patients, and 85 to 90 percent of patients report relief from pressure symptoms such as urinary frequency and severe constipation.



(Image, above) A catheter has been placed in the right uterine artery and a contrast dye injected, showing the blood supply to the fibroid.

(Image, below) Following embolization with small plastic particles, the blood flow in the artery is now completely stopped.



New Nemesis for Voice-box Cancer



Marshall Strome, M.D.

His intentions were humble. Surgeon Marshall Strome, M.D., chairman of the Cleveland Clinic Head and Neck Institute, simply wanted a better treatment for voice-box cancer. So he envisioned an approach that offered patients the best features of the two most widely used treatments – radiation therapy, which significantly improves voice quality but requires seven weeks of radiation sessions and takes a physical toll on

patients; and laser therapy, which is quick, easy to perform and patient-friendly, but produces unwanted scarring.

Ironically, the solution already existed in a therapy Dr. Strome had developed in the mid-1970s to treat an infection that caused wart-like lesions on the vocal cords. This approach combined laser therapy, the burning away of unwanted tissue, with cryoablation, which involves freezing tissue to kill it. Dr. Strome resurrected the combination approach and used it on a patient with voice-box cancer. The results were so striking that Dr. Strome and several colleagues launched a clinical study to track and document the results in other patients.

The combination approach resolved several key problems associated with traditional treatment for voice-box cancer. For instance, in some patients, radiation therapy causes tissue sensitivity

that can precipitate lingering swelling. Such swelling can prevent accurate follow-up assessment for the presence of cancer on the vocal cords, possibly preventing timely re-treatment and adding to patient anxiety.

Laser therapy's main disadvantage is the resulting inflammation that causes scarring. It also has a crater-like effect on vocal cord muscle, and these depressions never adequately fill in with new tissue. Both of these effects compromise voice quality.

Cryoablation minimizes inflammation – and therefore scarring – and accelerates healing. Rather than resulting in problematic swelling, it produces a beneficial swelling and subsequent healing that compensates for the tissue lost to the laser. “The cryoablation,” says Dr. Strome, “causes the vocal muscle to balloon, and that’s a great thing because it helps fill that crevice created by the laser. The voice is less breathy and the vocal cords come together better.”

To date, more than 20 patients have undergone the combination therapy. Also, no cases of tumor recurrence – at an average of 25 months after the procedure – have been identified, says study co-investigator Claudio Milstein, Ph.D. And, says Dr. Milstein, “voice quality is on par or better than that associated with radiation, and without any of the radiation side-effects. In fact, the improvement is striking.”

Today, Dr. Strome recommends the combination approach to all of his patients diagnosed with early vocal cord cancer. The procedure lasts two to three hours and the patient goes home the same day.

Not for Vanity For Health

Iraida Hernandez had been morbidly obese her entire life. When, for health reasons, she finally turned to gastric bypass surgery, she hoped that would be the end of her body problems. However, that was not the case.

Although Hernandez lost 95 pounds in the 10 months after surgery, she was left with more than 15 pounds of stretched-out flesh. “I knew I’d probably need a tummy tuck after the surgery, but I figured the rest of my skin would fall into place,” she recalls. “It didn’t.”

That’s when a friend referred her to Michel Samson, M.D., a plastic surgeon at Cleveland Clinic Florida in Weston. Dr. Samson’s specialties include body lifts and other body contouring procedures for people who are left with excess skin after undergoing gastric bypass surgery. “The reason people are often left with sagging after extreme weight loss is because the skin

is like a rubber band,” says Dr. Samson, who performed Hernandez’s body lift, plus arm and breast surgery. “When it becomes overstretched it loses its elasticity and just hangs. It won’t bounce back.”

Bariatric surgery patients need to be aware of the health risks associated with carrying around all that extra skin. Where the blood supply is limited, such as in hard-to-reach areas of the body, the skin is predisposed to major infections. “Rashes often form because of moisture accumulation,” Dr. Samson explains. “These rashes can result in fungal infections, and even ulcers. In rare cases, a patient can end up with a life-threatening infection.” Dr. Samson also suggests waiting at least a year after the weight loss surgery to begin plastic surgery so that the body weight has stabilized.



Michel Samson, M.D.

Laparoscopic Hernia Repair Impacts Prostate

Specialists at the Glickman Urological Institute and the Minimally Invasive Surgery section of the Department of General Surgery advise that men who are considering laparoscopic hernia repair also should have their prostate gland screened for cancer prior to the surgery.

A hernia is a condition in which part of the intestine bulges through a weak area in muscles in the abdomen. An inguinal hernia occurs in the groin area between the abdomen and thigh near the prostate. Laparoscopic inguinal hernia repair (LIHR) involves insertion of mesh to close the space where the hernia occurred. Scar tissue grows across and through the mesh, closing off the possibility of the hernia reoccurring. But the scar tissue also grows beyond the mesh and envelops the prostate and adjacent tissues, making the prostate's future surgical removal nearly impossible without risking damage to these other structures.

"If a man between age 30 and 60 is considering laparoscopic hernia repair, he first should be screened for prostate cancer," says J. Stephen Jones, M.D., a surgeon in the Section of Urological Oncology at the Glickman Urological Institute. The testing would include a PSA (prostate specific antigen) test and a digital rectal exam.

"If your PSA score is 1.0 or higher, studies show that you are at elevated risk for prostate cancer in the future. We recommend against laparoscopic repair and suggest open surgical repair instead," explains Dr. Jones. Traditional open hernia repair causes minimal internal scarring.

"Though young men who have such laparoscopic repair aren't at higher risk for getting prostate cancer, they need to know that this type of repair can pose problems down the road, when they reach their 50s and 60s and need prostate surgery," says Dr. Jones.

Speech, Precious Speech

Amyotrophic lateral sclerosis (ALS), a neuro-muscular disorder commonly known in the United States as Lou Gehrig's disease, causes the eventual wasting of the patient's muscles. As their muscles become debilitated, patients also may develop a speech disorder, called dysarthria, which causes imprecise consonant production, harsh voice quality and a slower speaking rate. All of these symptoms combine to make it difficult for a patient with ALS to be understood.

In 2000, Salvatore Esposito, D.M.D., chairman of the Department of Dentistry and Maxillofacial Prosthetics, published a study in *The Journal of Prosthetic Dentistry* describing the palatal lift, a dental prosthesis that reduces hypernasality, allowing patients to be better understood. The palatal lift attaches to the patient's teeth and roof of the mouth to stop airflow to the nose by pushing the soft palate up. Dr. Esposito is just one of a handful of doctors in the United States using the palatal lift with ALS patients.

"When a person speaks, virtually all consonant sounds are made with the air and sound coming from the mouth. There are only three sounds made in the nose," says Dr. Esposito. "Depending on the sound a person needs to make, the fleshy part in the back of the roof of your mouth, called the soft palate, cuts off airflow through the nose. If a person's soft palate isn't functioning properly, air escapes upward through the nose during speech. This causes hypernasality, making certain sounds difficult to pronounce."



The palatal lift attaches to the patient's teeth and roof of the mouth to stop airflow to the nose by pushing the soft palate up.

The success of the palatal lift depends on the level of speech damage and the aggressiveness of the disease. "Results are modest to good, but it's different for everyone," says Dr. Esposito. "It works best when the disease is caught early. About 80 percent of patients show at least minimal improvement, and the change I hear in some patients' speech is remarkable."

There are many health care issues our readers want to know about. Here is a question we posed to some of our expert staff:

A group of well-known medical journals has announced that they will not publish the results of clinical trials unless a test is registered from its beginning in a public database. How do you think this will affect reporting of trial test results and new medicines becoming available?

Steven Nissen, M.D. *Department of Cardiovascular Medicine*

“From my perspective this is a very important and needed change. The problem of negative publication bias, meaning trials conducted but never published, undermines scientific integrity. Now trials will be registered and we will be aware of their existence. Everyone, especially those who are actively at work in health care research, will expect to see the results and will confront companies that do not release the results.

I don't believe that trial registration will slow the release of new medicines to patients. Almost all of these trials are Phase IV trials. This means that the drugs being studied are already approved by the Food and Drug Administration and are already available.”



Michael S. Lauer, M.D. *Department of Cardiovascular Medicine / Vice-chairman, Institutional Review Board / Contributing Editor, Journal of the American Medical Association*

“Almost everyone at some point becomes a patient and therefore eligible to participate in a clinical trial. People who participate in trials do so believing that they are contributing to science and helping future patients.

Unfortunately if the trial results don't look good, trial sponsors – usually private for-profit companies – sometimes don't publish or delay publication. Information is buried, giving the public a skewed view of what the trial actually shows.

By requiring registration, we hope to see more balanced reporting – good news and bad – of clinical trials. Pharmaceutical companies want to get published by major medical journals – it's good for their business – so they'll register their trials. For the public, all results will be out in the open.”



READERS' POLL

Low-carb Food for Thought

On our Web site, readers were invited to tell us about their own low-carb dieting efforts. Here's what we heard from those who took our informal poll*:

61%	have tried a low-carb diet
63%	thought they were likely to try a low-carb diet
60%	thought that in five years, they would be on a low-carb diet
30%	were currently cutting carbs and of those
50%	were following the South Beach diet while
32%	were loyal to Atkins
<i>Readers found good reasons for cutting carbs:</i>	
30%	want better nutrition and a healthier lifestyle
22%	thought losing weight was key
18%	enjoyed choices allowed on a low-carb diet
<i>Readers also found good reasons to avoid low-carb dieting:</i>	
39%	feel these diets are unbalanced
30%	said low-carb diets contain too much fat and protein
22%	worry about effects on future health

*Each percentage is based on a separate question. Answers given here are those of the readers polled and do not necessarily reflect opinions of The Cleveland Clinic. For more information on low-carb dieting go to www.clevelandclinic.org/clevelandclinicmagazine.

To take our next Readers' Poll “Shared Medical Appointments: Would You or Wouldn't You?” and to read additional magazine stories, go to *Cleveland Clinic Magazine Online!* at www.clevelandclinic.org/clevelandclinicmagazine.



“You have to be prepared for anything, and you have to work on the fly,” says Michelle Cepik, R.N., director of Event Medicine, a service that launched in 1999 with the return of the Cleveland Browns football team to Cleveland. Composed of a team of 32 registered nurses, 47 paramedics and two emergency doctors, Event Medicine delivers medical care to fans on site at sports-related venues and events in Cleveland, including those at Jacobs Field, Gund Arena and Cleveland Browns Stadium.

Since that first Browns game in 1999, Event Medicine has provided care for thousands of injured fans, including intervention in three cardiac arrests at Browns stadium. Cepik attributes her own success to emergency room training

– and an innate love of crisis management. “I like the action,” she admits, explaining that the setting requires the same quick reaction time she practiced during 14 years of working in emergency care at a local hospital before joining the Clinic’s Corporate Health division in 1996. “I’m an emergency department nurse by training – that’s my first love.”

In addition to keeping up her own nursing and advanced cardiac life support (ACLS) certification, Cepik also holds a nursing license in Florida. So when the Clinic worked with the staff of Dolphins Stadium to provide Miami Dolphins and Florida Marlins fans with medical support, Cepik was able to pick up the ball and run with the launch of an Event Medicine team for Cleveland Clinic Florida.

Besides professional events, Cepik and her team assist in supporting several Cleveland-area universities. They also provided medical support for the 2004 International Children’s Games and the 2003 Gravity Games.

At events, each incident leaves an impression. “The ones that always stick out in your mind are the cardiac arrest cases that happen right in front of you,” Cepik says. “You perform CPR, shock them, administer IV drugs and transport them to the hospital knowing that you were able to provide them with the emergency care they needed to make a difference in their ultimate result.” These are the times when Cepik is most proud of her medics and nurses. “It takes a total team effort to achieve a good outcome,” she says.

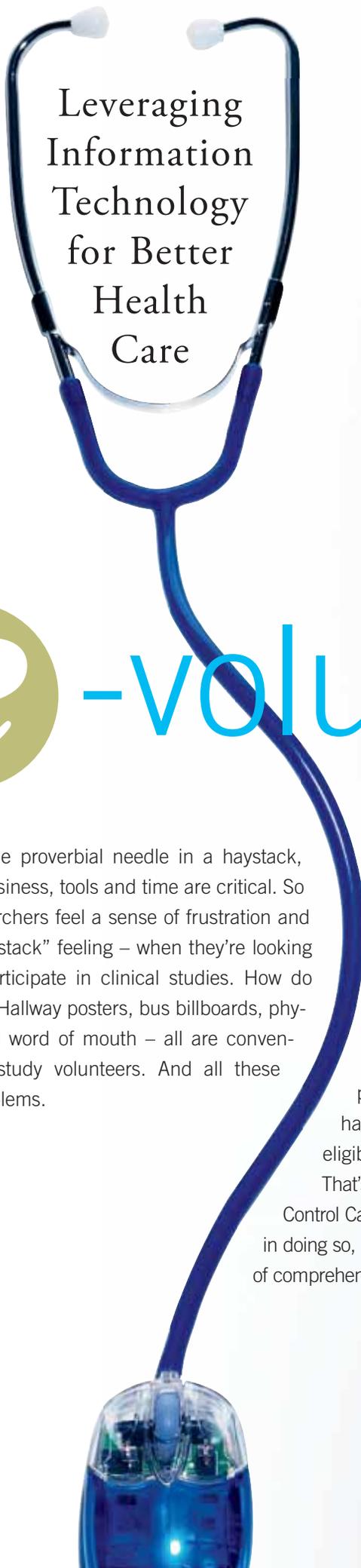
“It takes a total team effort to achieve a good outcome.”

Michelle Cepik, R.N.

Working at events, particularly Cleveland Browns games, provides a thrill. Football is her favorite fare, though she says she will sit in on a quarter of the Cavaliers home games and a handful of Indians games. “I prefer the rowdy Browns games because that’s my personality,” she remarks, adding that the more “low-key” venues provide variety for the medical staff, most of whom work in Event Medicine part-time in addition to other, full-time responsibilities.

Being the director of Event Medicine, Cepik notes, is like managing a small business. Her success depends on her team and she ensures that members are up to date in their nursing and paramedic certifications. Additionally, data collected from treatment forms after each event are used to note the quantity of patients and conditions treated in preparation for future events and for training purposes. “We log everything. We take nothing for granted,” she says.

Sports define Cepik’s family life and social circle, and her role in Event Medicine rounds out her passion for activity. “My life is on the go constantly, Monday through Friday, but I don’t think about it because I don’t think of my job as being work. It’s so rewarding. I’ve had amazing opportunities.”



Leveraging
Information
Technology
for Better
Health
Care

e-volution

When you're searching for the proverbial needle in a haystack, especially in the life-saving business, tools and time are critical. So it's understandable that researchers feel a sense of frustration and futility – that “needle in a haystack” feeling – when they're looking for qualified volunteers to participate in clinical studies. How do physicians usually find them? Hallway posters, bus billboards, physician memos, even plain old word of mouth – all are conventional methods for locating study volunteers. And all these methods are fraught with problems.

But what if you had a list of the study qualifications and a list of possible patients for the study? Run both lists through an electronic screening program, matching patient to criteria, and the haystack falls away leaving only the needles – the eligible patients – to shine.

That's exactly what the Clinic did for the national Action to Control Cardiovascular Risk in Diabetes (ACCORD) study and, in doing so, became a vivid case study of the extraordinary value of comprehensive, well-conceived electronic medical systems.

A Big Target Made Small

The ongoing multi-center ACCORD study is examining the best approaches to lowering the risk of heart disease and stroke in adults with type 2 diabetes. It has a target enrollment of 10,000 patients nationally which, using standard recruiting techniques, could take a very long time.

But not at The Cleveland Clinic.

During an office visit, Clinic physicians type information directly into the patient's electronic record, hosted on the secure hospital-wide online medical system. Software running beneath that system looks for matches that meet a set of given conditions. When it finds a complete match, the software sends out a short notice saying that the patient is eligible for a particular study.

"Physicians are notified during office visits of a patient's eligibility. The patients can decide at the time of the visit if they want to be contacted to hear more about the study," explains C. Martin Harris, M.D., the Clinic's chief information officer and executive director of e-Cleveland Clinic, the Clinic's e-health services program.

"One of the biggest values I see," says ACCORD study coordinator Susan Bizjack, R.N., "is the time saved for the patient. Instead of asking a patient to take the time to come in so that we can see if they meet the criteria of the trial – and they may not – we now can pre-screen them electronically. Then we only invite those who already meet the study criteria to consider enrolling."

Adds Dr. Harris, "Here's the power of this technology: Not only did we double the number of patients identified as eligible for the study, but the number of patients who actually participated also doubled. The entire standard of recruitment has been raised to the next level."

"Here's the power of this technology: Not only did we double the number of patients identified as eligible for the study, but the number of patients who actually participated also doubled."



C. MARTIN HARRIS, M.D.

“Our hope is that patients will manage their disease better if they’re empowered.”



HOLLY MILLER, M.D.

Patient Empowerment

Patient enrollment in clinical trials is just one of the many ways technology is changing the face of patient care. A virtual revolution is quickly transforming how physicians interact with patients and, perhaps more significantly, how patients interact with their health care providers.

Thanks to the Internet, the number of people electronically seeking health-related information is expected to reach 81.6 million by 2006. And this number will only continue to increase dramatically as Internet broadband service becomes the industry standard. “Health care consumerism is a phenomenon that is here to stay,” says James M. Blazar, the Clinic’s chief marketing officer. “Increasingly, people are becoming proactive health care consumers, searching the Internet for medical information and the best physicians and hospitals to treat their specific condition. People also are bringing this information with them to their doctor visits and are becoming more assertive in asking questions.”

In addition to empowering patients to be more fully informed consumers, e-health initiatives like e-Cleveland Clinic are empowering patients to take a more active role in their own health care, including making lifestyle choices that will ultimately reduce the need for medical intervention. Says Holly Miller, M.D., managing director of e-Cleveland Clinic, “Our hope is that patients will manage their disease better if they’re empowered. I believe patients should become the captains of their own medical team, and that when patients have access to their own health information, they will become more involved in their own care.”

Untying the Paper Knot

The electronic medical record, or EMR, is the key part of the internal electronic “plumbing” that Dr. Harris and his staff have put in place in the last three years at the Clinic. It is the hub around which everything else rotates. With 2.7 million patient records now in digital form, the Clinic has been able to electronically write about three million prescriptions annually and another three million orders for tests such as electrocardiograms (EKGs), computed tomography (CT) and magnetic resonance imaging (MRI) scans. Because of the electronic infrastructure, physicians also can respond efficiently to mounting requests for virtual second opinions from nearly every state in the United States and more than 20 countries around the globe. “Technology like e-Cleveland Clinic allows our medical staff to provide high-quality medical services to patients wherever they are in the world,” says Dr. Harris. “In doing so, we continually add methods that allow for the more efficient use of resources in treating an increasing number of patients in a more effective, timely manner. Online services offer the potential for lower medical costs and less disruption of patients’ lives.”

In some respects, these sprawling initiatives are essentially a series of practical answers to various medical challenges that Dr. Harris, Dr. Miller and Jonathan Schaffer, M.D., managing director of e-Cleveland Clinic, have observed and struggled with throughout their careers. Ever since he entered the profession, Dr. Harris, an internist, has been interested in the closely connected issues of quality and cost in the practice of medicine. “I

noticed that public policy was poor because most of the data came from insurance databases, not the practice of medicine.” He consequently became acutely interested in how the system could collect and focus useful clinical information and bring it to bear on medical practice. Eight years ago, just as the Internet first began to draw serious general attention, he joined the Clinic and began getting his arms around the problem. A few years later he began recruiting the critical members of his team.

A key piece of the e-Cleveland Clinic team was Dr. Miller, an internist who had been working for a medical software company in San Francisco, the epicenter of the Internet, while thinking incessantly about the tremendous improvements that could be gained in patient care by harnessing the power of information technology and the Internet. In 1999, she joined the Clinic.

Dr. Schaffer, an orthopedic surgeon and Cleveland native, came aboard in 2001. Dr. Schaffer had spent several years as part of the management team in the Medical Informatics Lab at Brigham and Women’s Hospital and Harvard Medical School, where he was responsible for applying pure IT research to various practical challenges in an affiliated teaching hospital. One of his team’s more commercially viable ideas was spun off into a private, venture-backed company, which was later sold.

Before all the grand e-visions could be realized, the group had some serious grunt work to accomplish. The central goal was to convert patient paper-based files to an electronic format. This would allow everyone in the patient-care chain – doctors, nurses, pharmacists and back-office billing professionals – to more easily collaborate, tapping into one centralized, secure and regularly updated patient database. Thus, it followed that in 2002 Clinic physicians began using desktop devices during every outpatient visit to document the patient care provided. Information and results from pathology tests and radiology reports were added as they became available. Today, about three million pieces of patient data are being added to the system monthly.

However revolutionary the implications of the electronic medical record might be, it’s been largely unnoticed by the average patient. Dr. Harris professes amazement at how few of his patients seem to be aware

that he's inputting new medical data into a computer as he listens to their recitation of symptoms and performs his routine office exams. With that in mind, he tries to drive home the power of electronic medical records whenever he speaks to groups of patients. He'll ask: How many of you have seen a doctor recently? Perhaps 80% of audience members will raise their hands. How many of you have a medical record? About the same number indicate yes. Then, the clincher: How many of you have actually seen that medical record? No one raises a hand. The reality, he argues, is that, "If you can't see your information, it's going to be very difficult for you to participate in the decision-making, to be an active participant in your health care."

Real World Solutions

Another very real potential of this empowering technology is the way it invites innovative thinkers to solve medical puzzles. Clinic doctors began coming to their e-colleagues with various ideas and technical challenges to chew on. Says Dr. Schaffer, gesturing to a stack of files behind his desk: "Every one of those files represents a project in which a patient or a doc has asked us, 'Can we do this?' So now, you have 1,400 extremely creative doctors, who are leaders in their specialties, asking how they can do things better. And our goal is to always say 'yes.'"

Among the more intriguing Web-based initiatives rolled out recently in response to inquiries from Clinic doctors was a project for a group of physicians in a family health center in Lorain, Ohio. When they noticed the onslaught of immunization forms they were being asked to fill out every August as families sent their children back to school, the doctors worked with the internal IT group to develop a system to perform all this paperwork online. Now, the forms can be filled out and then sent to parents online, with a copy automatically forwarded to the appropriate state regulators. Time, money and untold clerical complications are thus eliminated.

Throughout the process of first imagining, then designing and later executing these e-systems, Drs. Harris, Schaffer and Miller have continued to see their own patients. They wouldn't have it any other way. For example, Dr. Schaffer, a knee surgeon, operates on Mondays and sees patients each Wednesday, the same schedule he's been on for the last 15 years. "To do this kind of work requires combining clinical activities, such as seeing patients in the office and in surgery, with systems development efforts. A lot of the planning and design that goes into our systems has to be grounded in personal experience with patients." *(Continued on next page)*



JONATHAN SCHAFFER, M.D.

"A lot of the planning and design that goes into our systems has to be grounded in personal experience with patients."

GOING NATIONAL

In October 2004, C. Martin Harris, M.D., chief information officer of The Cleveland Clinic and executive director of e-Cleveland Clinic, was named by President George W. Bush and Congress to a new commission, called the Commission on Systemic Interoperability. This commission is part of the larger, federal "e-Health Initiative" whose goal is to improve the quality, safety and efficiency of health care through information and information technology. It is responsible for working with public and private health sectors to develop a strategy and timeline for implementing health care information technology standards. These standards will serve as the foundation for establishing a system of universal health records and the group must recommend standards by November 2005.

"Using data effectively means treating patients effectively," says Dr. Harris. "It is essential that we have a way for health care providers to talk to each other and provide patient information easily and quickly across the country and the world. This is about translating ideas into action to improve lives."

In January of this year, President George W. Bush hosted a forum at the Clinic on the benefits of health care information technology.

Remote Control

One of the more promising avenues for taking medical care to the patient centers around remote monitoring. The Clinic is just now beginning to roll out a remote monitoring function, in a pilot study with device manufacturer Baxter International, which allows patients to send their medical device information securely from home to their electronic medical record for their doctors to view. "Most people, when they think of kidney dialysis, think of going to a hospital or clinic to do it," says Dr. Harris. "But more people actually do it at home."

With remote monitoring, the device feeds data regularly to the patient's care team, who monitor the trends. And, says Dr. Miller, "More and more medical devices are in development to be used in the home. Right now, for instance, patients generally need to come in to a clinic or hospital to get a blood test, but soon they'll be able to do it from home and forward the results over the Internet in a secure manner to their doctor for further monitoring. The physician can then analyze the information and determine if an office visit is necessary."

In a different direction, the Food and Drug Administration recently approved the use of an implantable electronic chip in humans to make it easier to speed care to emergency and other critical care patients. A unique serial number in the chip allows emergency care personnel to quickly pull up the patient's blood type, allergies, prior treatments, and other key medical information from a secure database. A small number of people have had the chips implanted on an experimental basis; however, a significant amount of infrastructure still needs to be put into place before there can be widespread use of the chip.

Some of these contemplated improvements, however, are neither complicated nor so futuristic. Later this year, Dr. Miller hopes to begin offering patients a chance to assemble their medical information and any questions they might have for their doctor on electronically-sent questionnaires before their visits. "So often a patient has their hand on the door, ready to leave, and they suddenly remember something they forgot to ask about," says Dr. Miller. This pre-visit questionnaire would allow

patients to organize the focus of their visit with the doctor and to provide their physician with a fuller picture of the patient, thus facilitating a deeper conversation between them and their doctor.

The point of all of these advances, of course, isn't the simple fact that they can technically be accomplished, but that they hold the promise of improving medical outcomes in measurable ways while also lowering overall costs. But for her part, Dr. Miller thinks there's an even more powerful payoff: Less disruption in the lives of patients, especially those who suffer from chronic conditions.

"If we could imagine a world in which we combine the subjective information, such as the patient's discussion of how they feel and what they want looked at, with the objective data, like test results and scans, and have the physician synthesize that, then you give the doctor the ability to better gauge who should come in to the office and when," explains Dr. Miller. "That has obvious implications for lifestyle and cost. People can get on with their lives, and seek care only when they really need it." ■

For more on leveraging information technology in health care, go to www.clevelandclinic.org/clevelandclinicmagazine

e-Cleveland Clinic: Patients First

With the burgeoning cost of health care, patients are more interested than ever in taking an active role in health care decision-making. "The goal is choice for patients," says C. Martin Harris, M.D., the Clinic's chief information officer and executive director of e-Cleveland Clinic. "Patients want to participate in their routine

health care in an interactive way and e-Cleveland Clinic is a tool that lets them take control." Among other things, the services of e-Cleveland Clinic provide patients with access to their personal health records, remote second opinions and useful, related medical information. Current services include:



MyConsult®: Allows patients from around the world to request specialist second opinions through a secure Web site for more than 600 life-threatening/life-altering diagnoses.



MyChart®: Provides patients with electronic access to their medical information as released by their physician, with special health reminders, educational information and options to receive certain laboratory and other test results.



MyPractice®: A secure, remote access service that connects physicians to an electronic medical record database where they can update patient information and review patient records.

For more information about e-Cleveland Clinic, go to www.elevelandclinic.org

What a cancer patient needs most.



Answers.

The Cleveland Clinic Cancer Answer Line allows you to speak with nurses specializing in oncology. So you can get answers to all your cancer-related questions and advice on treatment options. It's world-class service from one of the nation's top hospitals, from the comfort of your home.

Cleveland Clinic Cancer Answer Line: 866-CCF-8100.



THE CLEVELAND CLINIC

Taussig Cancer Center

Every Life Deserves World Class Care





SMART

MEDICINE

TARGETING
CANCER
INSIDE
AND
OUT



When Hubbard, Ohio, radiologist Jim Goettsch, D.O., heard ringing in his ears, he first chalked it up to aging. But at 53, it just didn't seem right. He ordered his own MRI, which came back negative. He breathed a sigh of relief and kept working. Less than a month later, however, his legs became unusually tired. As a physician, he knew the combination of ringing in his ears and leg fatigue might mean something terrible. He ordered another MRI, this time with a contrast dye that showed the difference between various internal-tissue densities. He took one look at the image and thought, "I'm dead."

The image wasn't one he had seen often in his practice. In fact, it was one of the deadliest forms of brain tumor – a glioblastoma.

Dr. Goettsch immediately underwent surgery, which removed about 80 percent of the tumor. In addition, he began chemotherapy and radiation therapy, both typical treatments for brain tumor patients. At the conclusion of his therapy the tumor hadn't grown any, but it also wasn't any smaller. The outlook remained grim: Dr. Goettsch was given less than a year to live.

Faced with that devastating news, he volunteered to take a new chemotherapy drug called Tarceva. This drug, in theory, would target specific cells within the tumor rather than kill off cells in general, the way traditional chemotherapy does. Dr. Goettsch credits Tarceva with allowing him to continue living months beyond that fatal prediction.

Modifying Chemotherapy

Cancer isn't a single disease; it is numerous diseases with one key factor in common: Somewhere in the body, the natural process of new cells dividing to replace those that have died spirals out of control. Cells proliferate at a fierce rate, causing an unnatural growth. If that growth continues, other organs and body processes are affected and possibly shut down.

To stop the unwanted growth, patients typically undergo chemotherapy. While it

can be effective, traditional chemotherapy uses too broad of a brush. Good cells die along with the bad, often causing terrible, debilitating side effects and weakening a person's immune system. Scientists are looking to modify this approach – to make chemotherapy "smarter" and more effective in killing cancer while having little-to-no negative side effects on the patient.

Genetics and Cell Growth

Some researchers refer to the emerging field of targeted medicine as "personalized" medicine. While one person may beat cancer, another may die – even if the two tumors look exactly the same. Why? What makes the individual difference?

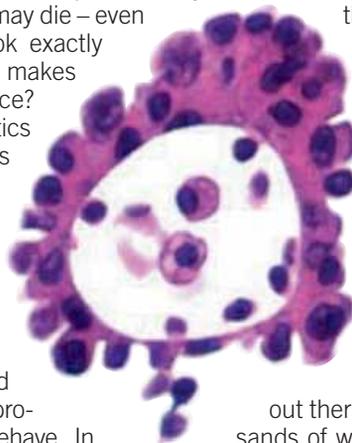
That's where genetics comes in. Genetics control the way cells behave and function. Fifty years ago the discovery of DNA set scientists on the journey to uncover more details about how cells – and the molecules and proteins within them – behave. In 2003, the finished mapping of the human genome gave researchers even more information about finding ways to attack cancer at the cellular level.

Joseph Crowe, M.D., director of the Cleveland Clinic's Breast Center, calls the sequencing of the human genome "huge." "Over the past 50 years, major steps have been made in understanding how DNA governs the growth of cells, the behavior of cells," he explains. "In many respects, we're way ahead of the ballgame because we know a lot about the structure of what makes us human. Our job now is to figure out, of all the DNA that we have, what is the important DNA and what does it do?"

Is it the person's genetics, meaning the wiring he or she was born with, that can predict the likelihood of who will get – or who will recover from – cancer? Or does recovery depend on the genetic make-up of the tumor itself? Likely, it is both.

Currently, one of the best examples of a genetic cause of cancer is in patients who carry the genes for breast cancer, called BRCA-1 and BRCA-2. But of all the types of breast cancer

out there that impact the lives of thousands of women each year, only an estimated five percent of women carry either of those genes. However, that information is critical to those five percent: If a woman carries even one of those genes, she has up to an 85 percent chance of developing the disease.



A DNA strand (image, left), and an epithelial cancer cell (image, right) called an adenocarcinoma.

Research is being done, as well, on who might recover from cancer. Once a person develops cancer, how he or she responds to drugs might be estimated by a look at the individual's genetic make-up. "An area of interest is the side effects of chemotherapy," says Ronald Bukowski, M.D., director of Experimental Therapeutics in the Cleveland Clinic Taussig Cancer Center. "We're just starting to learn the kinds of genes people carry that can predict for slow metabolism of the drugs, and therefore, greater side effects for so many medicines."

But predicting a person's responsiveness through genetics has to take into account other variables. "There's a certain amount of basic genetic instability that's present in all living organisms," says Michael Vogelbaum, M.D., Ph.D., associate director of Neurosurgical Oncology at the Clinic's Brain Tumor Institute. "Much of this instability is environmentally influenced. And much of it is random."

Still, many scientists believe that since most cancers occur randomly, caused by something triggering the cells to grow out of control, it's best to focus on the genetic make-up of the tumor, rather than the person.

"The nature of cancer is such that it's a process where you lose growth control in some part of the body," says Derek

Raghavan, M.D., Ph.D., chairman and director of the Taussig Cancer Center. "Our understanding of the human genome has allowed us to get a better handle on what controls growth. In some cases, activation of certain genes allows stimulation of unwanted growth, turning normal tissue cancerous. If we can identify those genes, the trick then becomes to block them and therefore block the growth."

Adds Dr. Bukowski: "You identify something in the tumor that you think is a critical determinant of that cancer cell and how it functions. Then you develop a drug that can interfere with it, bind to it. That something can be on the surface of the cell or it can be inside the cell. It also could be something outside of the tumor cell that the cell then takes inside and is consequently destroyed."

Missing Puzzle Pieces

Traditionally, cancer doctors have given patients an estimate of how they'll do based on what life-cycle stage the cancer is at and how far the cancer has spread to other organs. Now tumor genomics, which looks at the genetic make-up of a tumor, is playing a role in assessing the treatment protocol and projected outcome for the patient.

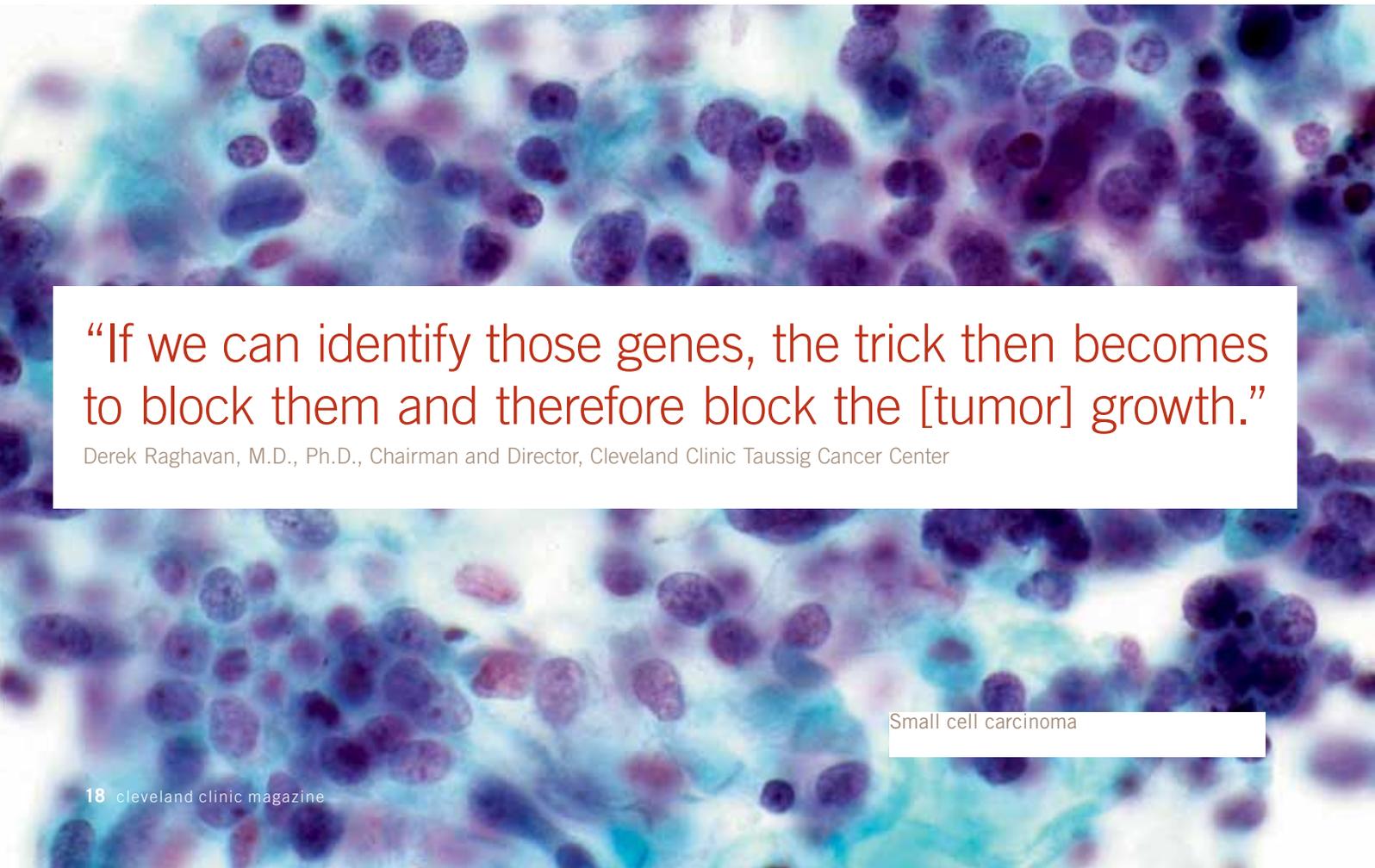
Physicians are using genomics to help decide the course of treatment for patients with a type of primary brain tumor called an oligodendroglioma.

Researchers have known for many years that genetic alterations are present in a wide variety of brain tumors. But only within the last five years have physicians been able to use this information as a tool to decide the treatment regimen for a patient.

It turns out that some oligodendrogliomas are missing pieces of two different chromosomes, called 1p and 19q. Like two jigsaw puzzle pieces whose interlocking knobs are missing, they do not fit together. The genetic information in these tumors is incomplete.

"In a study conducted five years ago, researchers showed that the subset of patients who responded to chemotherapy were the patients who were missing these chromosomes," says Susan Staugaitis, M.D., Ph.D., a researcher in the department of Neurosciences and Anatomic Pathology at the Clinic's Lerner Research Institute. "That was a big splash because it was one of the first times in brain tumors where there was a molecular predictor of prognosis." In other words, patients who had both incomplete puzzle pieces in their brain tumors got better with chemotherapy. Patients who had oligodendrogliomas that still had all their chromosomes intact didn't do as well.

Today, each patient who has a brain tumor gets a biopsy of that tumor. The physicians can send the biopsy to an



"If we can identify those genes, the trick then becomes to block them and therefore block the [tumor] growth."

Derek Raghavan, M.D., Ph.D., Chairman and Director, Cleveland Clinic Taussig Cancer Center

Small cell carcinoma

“You identify something in the tumor that you think is a critical determinant of that cancer cell and how it functions. Then you develop a drug that can interfere with it, bind to it.”

Ronald Bukowski, M.D.

approved reference laboratory that uses a specialized process to specifically look for the absence of 1p and 19q. In general, if the patient is missing these chromosomes, he or she will probably be given chemotherapy before radiation.

In another example, breast cancer researchers have discovered “gene patterns” within breast cancer tumors that may play a bigger role than previously thought in determining a woman’s outcome in treatment.

“If we look at a car, we can tell what make it is, and we know a lot about it just by looking at it because of the exterior appearance. Or, we think we do,” explains Dr. Crowe. “But what we really don’t know is what the performance of that car is going to be. Does it run? Can you even turn it on? If you turn it on, how fast is it going to go?” In this analogy, it’s as if the tumor genes are the engine. Looking for gene patterns or biomarkers may be the future of predicting outcome.

“We’ve always done things the same way for everybody,” says Dr. Crowe. “What I’d like to see is to take cancerous tissue and do a biochemical analysis. Rather than subject a breast cancer patient to a large operation, radiation and chemotherapy, we would be able to begin a tailored systemic medical treatment that would be easy for the patient to tolerate and would be something she would take for a long time. While it’s hard to think about this as an aspirin a day, it may not be that far from the truth.”

Targeted Drugs

The key in getting to that point, however, is the development of smart drugs, which is well on its way. “What used to be an occasional trial is now turning into the

predominance of trials of targeted agents,” says Dr. Vogelbaum.

Although targeted therapy is growing rapidly, it’s actually been around since the 1970s. One of the first smart drugs was tamoxifen, used to treat breast cancer. Discovered in the 1970s, Dr. Crowe holds it up today as still “the single most important drug for breast cancer ever.”

Tamoxifen targets a part of the cell called the estrogen receptor protein. This protein attracts estrogen to it, allowing cancer growth. Tamoxifen blocks the interaction of the estrogen on the estrogen receptor protein, stopping this process.

In addition to treating breast cancer, tamoxifen also is given to women who are at high risk of developing this disease. This way the process can be blocked before it has even started. But, because estrogen receptors aren’t present in all breast cancers, tamoxifen won’t work for all women.

A different receptor, called epidermal growth factor receptor or EGFR, appears to be a key area in glioblastomas, the type of brain tumor Dr. Goettsch has. In 2002, the Clinic was one of the first medical centers to start clinical trials of the drug Tarceva in patients with glioblastomas. The drug also is being tested for treatment in other types of cancer, including lung cancer.

“Tarceva is designed to be a smart drug,” explains Dr. Vogelbaum. “High levels of EGFR are seen only in a tumor. In the rest of the body there are normal levels of EGFR. If the receptor is there, the drug affects it. If the receptor isn’t there, it should not affect that cell.”

So, in theory, the Tarceva would be drawn to the tumor cells by sheer numbers, and wouldn’t cause many side effects in the rest of the body. The Clinic’s initial study showed an astounding 40 percent response rate.

Like Tarceva, a new, targeted drug called Avastin also has been approved by the FDA. Avastin binds to a different receptor, this one called the vascular endothelial growth factor or VEGF. This growth factor, however, deals with the vascular element of cancer so, rather than acting like a barrier to block the receptor from getting what it needs to interact and create the cancer, the drug works more like a rubber band, choking off the blood vessels that feed the tumors. It is the first drug of its kind to work this way on a tumor, starving the blood vessel production to the tumor, medically termed “angiogenesis.”

Unfortunately, Avastin doesn’t work across the board. It had little effect on breast or lung cancer, but great effect shrinking colon cancer tumors. “Avastin was tried in colon cancer patients, along with chemotherapy, and there was a definite improvement in how the patient did,” says Dr. Bukowski. “Patients lived longer. The tumors were smaller. It was a very significant difference.” In fact, Dr. Bukowski says, the research strongly supports using a combination of Tarceva and Avastin, especially for kidney cancer.

The area of targeted drug development has evolved from targeting receptors to also targeting critical enzymes within the cancer cell. Sometimes, it’s even a dozen enzymes that all function together. Two enzyme-targeting drugs, as yet unnamed, are in trials right now for kidney cancer. But Dr. Bukowski likes what he sees so far. “These drugs will change how we treat the disease,” he says. “This is an example of medicine where the target is not just one molecule, one receptor. It’s multiple targets in the cell.”

(Continued on next page)

“[W]hen we know that a certain group of patients have their cancers behaving because of a certain biochemical or molecular pathway, we can develop for those patients a very specific, not very toxic treatment.”

Joseph Crowe, M.D.

Attacking From The Inside Out

In the ancient Greek story of the Trojan horse, soldiers hid inside a large wooden horse, which was then placed outside the impenetrable walls of the city of Troy. Thinking it a gift, the citizens of Troy wheeled the horse inside the city. Once inside, the soldiers sneaked out and overtook the city.

Now think of that strategy in terms of battling cancer. What if something could hide until it has made its way deep inside the tumor, then suddenly become active and kill off all the cancer cells from the inside out? The Trojan horse anecdote is one that Joseph Bauer, Ph.D., a research scientist with the Taussig Cancer Center, uses to illustrate how his approach to chemotherapy works.

One day, while in graduate school and reading a biochemistry book about vitamin B-12, it hit him. Why not get the vitamin to secretly carry a deadly chemotherapy agent into the tumor? Dr. Bauer's invention uses B-12 to deliver the anti-cancer drug, nitric oxide, to the tumor. Cancer cells love B-12 and even have receptors to draw it into the tumor. But in this case, they're completely fooled because they have no idea that a deadly agent lurks inside.

“The nitric oxide that's released inside the tumor cell has a half-life outside the cell on the order of milliseconds. It doesn't have time to kill the surrounding cells, so it just kills the tumor cell,” Dr. Bauer explains. Then, with the cancer cells dead and the nitric oxide no longer active, the vitamin B-12 can get out into the blood stream and help the body heal (see sidebar, right).

Dr. Bauer's “biological Trojan Horse” may be one of the best things to happen in cancer research in recent years. Preliminary independent testing by the National Cancer Institute noted that it had anti-cancer effects – showing inhibition of the growth of human tumor cells – on 60 different types of cancer. It did best among blood cancers, breast cancer and ovarian cancer. In fact, it destroyed the breast cancer 100 percent. However, while it had some impact, it was less effective on prostate cancer and melanoma. Those results make sense to Dr. Bauer. It turns out that some cancers have more vitamin B-12 receptors than others. The more receptors, the more the drug gets into that cell.

Unfortunately, the drug hasn't made it into trials in human patients yet – and it may be well beyond a year before such tightly regulated trials get underway. In the meantime, Dr. Bauer has expanded his research – and has made even more powerful discoveries. He found that if he adds interferon to the mix, then the interferon stimulates the tumor cell to develop more B-12 receptors – and that means more drug can get into the tumor. Dr. Bauer cautions that while he's very excited about his work, strict FDA protocols mean that this therapy is years away from hitting the general market. It must first go through numerous trials to assert its effectiveness and safety.

The Right Direction

Researchers agree that a cure is a long way off – and that traditional chemotherapy probably won't disappear in the near future. But, they also agree that the direction of the research is having a profound impact on the treatment for cancer.

“It's unlikely we're going to find one key that unlocks the answers for everyone who develops cancer,” admits Dr. Crowe.

One tough hurdle researchers and drug developers face in creating targeted therapies is a phenomenon that's common in antibiotic usage: drug resistance. That is, as more potent antibiotics are used, viruses find ways around those drugs. They become stronger and more resistant.

It appears that cancer does the same thing. A few years ago, one drug was hailed as a cure for a type of leukemia. Patients immediately got better. But then the cancer got smarter. It returned in some patients and part way through the treatment, the drug was no longer effective.

“Cancer cells are pretty smart, so when you give them these drugs, they start to recognize that there's a medicine around. They mutate themselves to create resistance to that medicine,” says Dr. Bukowski. “Does that happen in all instances? Thankfully, it doesn't. But it's just another problem that you face when you start to bring up a cure for cancer.”

Still, the future of targeted medicine is very bright. “We're going to be able to group individuals by knowing their genetic and molecular make-up as well as the genetic and molecular make-up of their cancers,” says Dr. Crowe. “Then, when we know that a certain group of patients have their cancers behaving because of a certain biochemical or molecular pathway, we can develop for those patients a very specific, not very toxic treatment. One that doesn't affect other, healthy cells. That's what targeted therapy is all about.” ■

To read more about targeted medicine, go to www.clevelandclinic.org/clevelandclinicmagazine

A Biological Trojan Horse

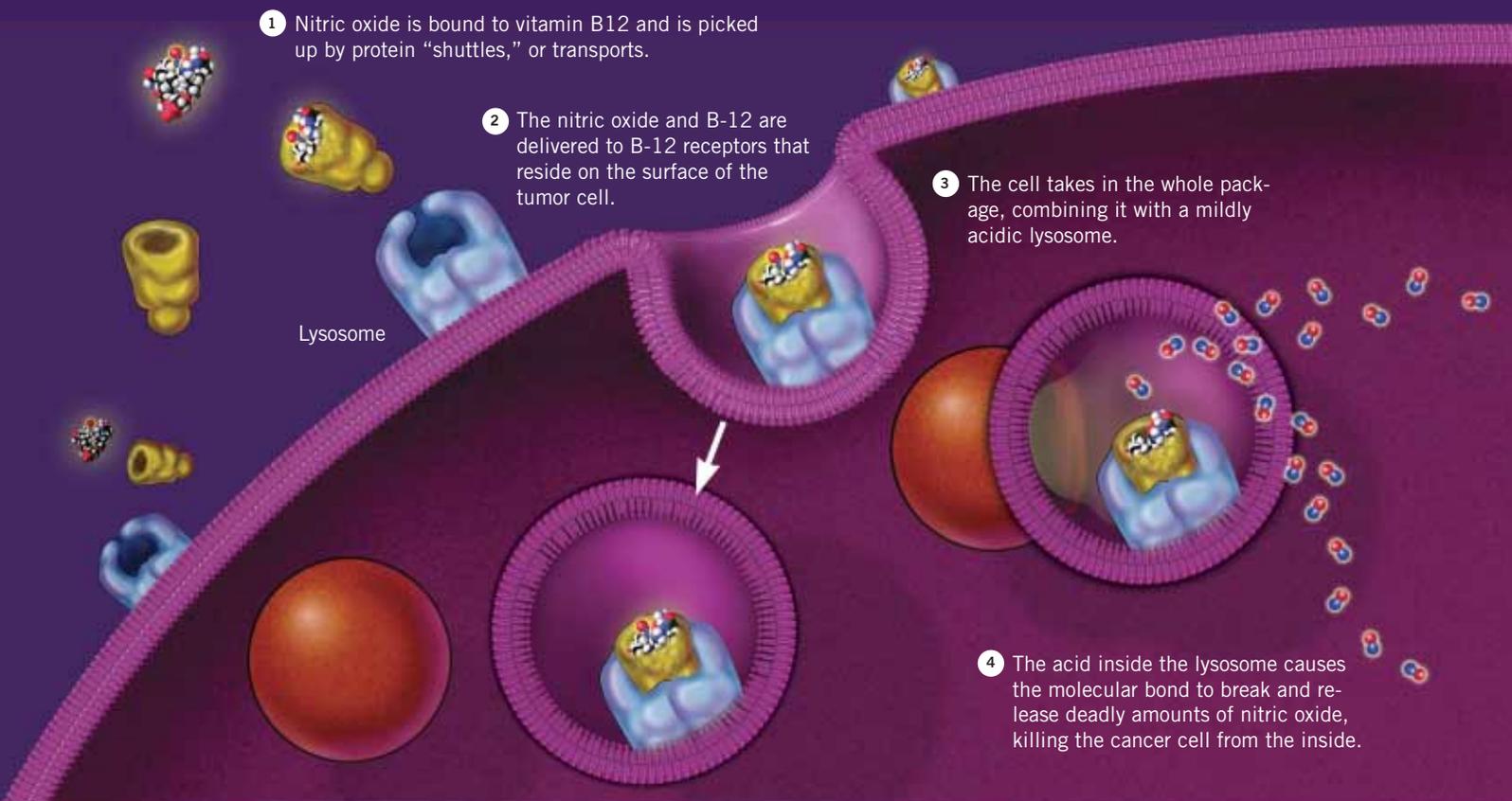
1 Nitric oxide is bound to vitamin B12 and is picked up by protein "shuttles," or transports.

2 The nitric oxide and B-12 are delivered to B-12 receptors that reside on the surface of the tumor cell.

3 The cell takes in the whole package, combining it with a mildly acidic lysosome.

4 The acid inside the lysosome causes the molecular bond to break and release deadly amounts of nitric oxide, killing the cancer cell from the inside.

Lysosome



CALMING THE

CHAOS

Rewiring the Brain Through Neuromodulation

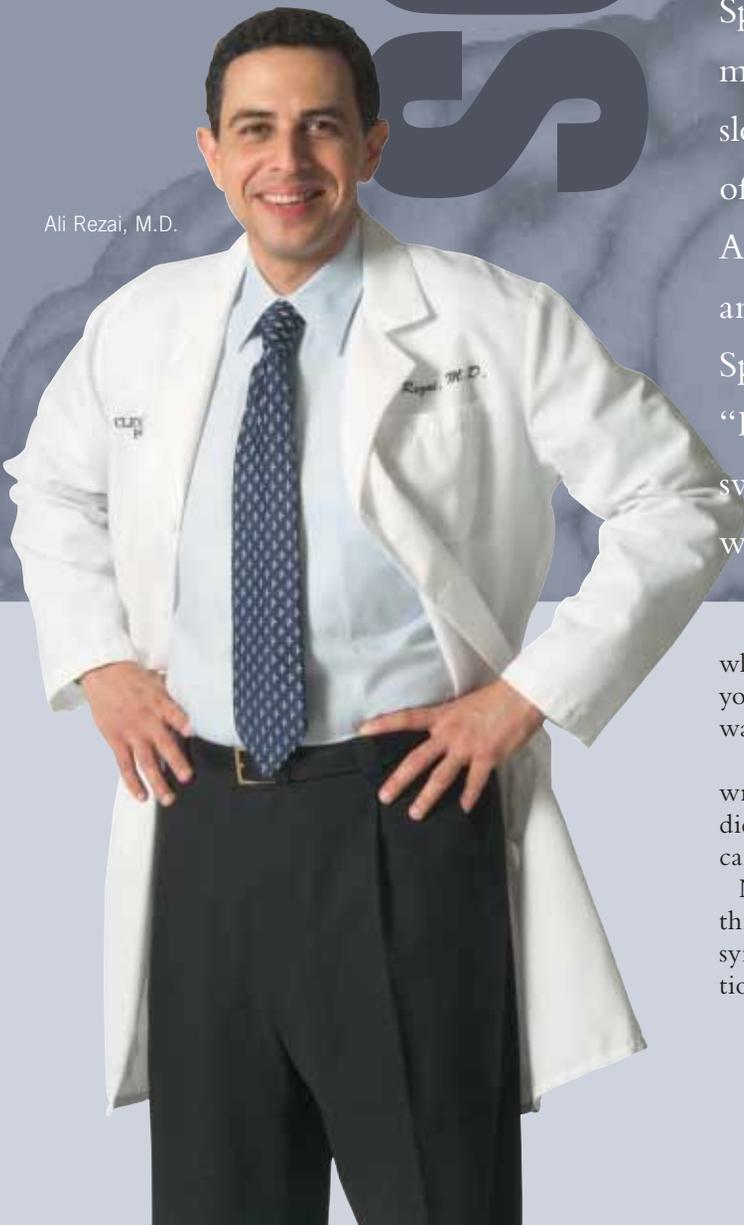
Before her brain pacemaker surgery, Jacqueline Sprague simply hoped to write again. A movement disorder, called essential tremor, had slowly robbed the Middlefield, Ohio, resident of any control of her shaking hands and voice. After 20 years of suffering with the disease and gaining no relief from medications, Sprague wasn't afraid to undergo the surgery. "I wasn't scared. I figured either sink or swim. I put it in the Lord's hands and there were lots of people praying for me," she says.

As soon as her brain pacemaker was turned on, Sprague, who is 78 years old, says she felt a little jolt, similar to what you would feel if you jabbed your funny bone. Her change was immediate – the tremors were gone.

"It was wonderful," she says. "I was hoping to be able to write, but I never dreamed that it would come back like it did. I look at myself in the mirror now and think, 'Wow, I can do that now.'"

Neuromodulation is the use of electrical stimulation through an implanted nervous system pacemaker to treat the symptoms of a neurological disorder. Today, neuromodulation is building on the innovative advances in treating move-

Ali Rezai, M.D.



ment disorders made throughout the past decade. Currently, neuromodulation therapies such as brain pacemakers, also referred to as deep brain stimulation (DBS), are being considered for a host of other disorders including intractable epilepsy, obsessive-compulsive disorder (OCD), major depression, Tourette's syndrome, cluster headaches, chronic pain syndromes, addictions and traumatic brain injury.

"The brain is the final frontier of medicine," says Ali Rezai, M.D., director of Functional Neurosurgery and co-chairman of the Clinic's Center for Neurological Restoration. "It's where some of the most exciting discoveries and advances in medicine will be made in the next century."

Pinpoint Accuracy

In neurodegenerative diseases such as Parkinson's disease and movement disorders such as dystonia and essential tremor, abnormal electrical signals are at work in the brain. Using brain pacemakers, tiny electrical impulses are sent to the appropriate areas of the brain to regulate or interrupt these signals and, as a direct result, improve the patient's ability to function. Using special imaging techniques, surgical navigation computers, physiological brain mapping and robotics, surgeons can pinpoint down to the millimeter the correct position in the brain for implanting the brain pacemaker electrode.

"For Parkinson's and other movement disorders we can target the exact area of abnormal function deep inside the brain. We now can navigate more precisely and safely than ever before to get to that identified region. In order to do this, the surgical team must use special surgical computers and brain navigation devices – like a GPS [global positioning system] for the brain," Dr. Rezai explains. "This is a very delicate surgery and if you're off by a couple of millimeters, you may not get the most benefit from the therapy."

Jerrold Vitek, M.D., Ph.D., co-chairman of the Center for Neurological Restoration, notes that one of the most critical parts of the surgery is the mapping of the brain. "With micro-electrodes, you can record brain



"You can know where you are in the brain by the patterns of activity the cells make."

Jerrold Vitek, M.D., Ph.D.

activity – you can record a single cell in your brain. By monitoring that activity you can develop a sort of road map of the area," says Dr. Vitek, a neurologist. "You can know where you are in the brain by the patterns of activity the cells make. These patterns are converted into sounds and we can listen to these sounds using special equipment."

Once implanted, the brain electrodes are then connected to a pacemaker battery and chip, similar in function to a heart pacemaker. These are then implanted just under the skin below the collarbone on either side of the chest. Depending on the severity of the symptoms and whether both sides of the body are affected, patients can have one or two pacemakers implanted. Shortly after surgery, the pacemakers are turned on and adjusted remotely with a hand-held device during an office visit (*see illustration, page 24*). The benefits can be immediate, as is the case with tremor, or may take up to six months as the pacemakers are adjusted for optimal improvement in the patient's symptoms.

The results of the surgery are excellent for Parkinson's disease, dystonia and tremor. For Parkinson's patients, brain pacemakers reduce tremors by more than 80 percent. In addition, the therapy improves other symptoms such as rigidity and movement slowness by more than 50 percent while cutting medication intake in half.

"Brain pacemakers essentially disrupt the abnormal brain activity causing the disorder. It calms the chaos in the brain that generates these symptoms," Dr. Rezai says.

Advancing into Psychiatric Disorders

The enormous success of brain pacemakers in the treatment of movement disorders has resulted in the expansion of the application of the therapy. Momentum now is building for brain pacemakers as a therapy for OCD, major depression and other psychiatric disorders. However, surgical treatment options for psychiatric conditions have had a long and varied history, with

sometime negative outcomes. Physicians are mindful of this past while pursuing brain pacemakers as a new treatment option for the many patients with intractable psychiatric disorders.

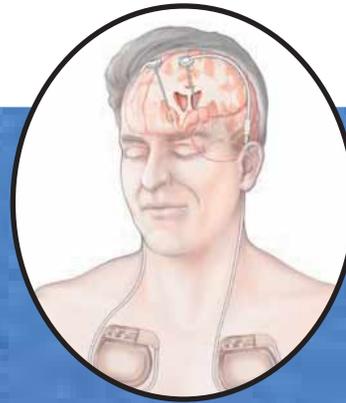
“It goes back to the frontal lobotomy days and things like that which were done without proper studies and with, at times, limited benefits and significant side effects for individuals,” says Donald A. Malone, Jr., M.D., section head of Adult Psychiatric Services. “The difference now is that we target down to the millimeter where we want to go. We take great pains in our studies to really look at what we’re doing. We don’t damage the surrounding tissue and we don’t destroy the target area as in the past. Instead, we implant a reversible, adjustable device. We’re carefully monitoring these patients monthly, sometimes daily, and we only enroll patients that clearly understand what they are doing.”

Cynthia Kubu, Ph.D., staff neuropsychologist, says one of her roles is to evaluate all of the brain pacemaker patients before surgery and monitor them closely after surgery to assess if there have been any changes in various thinking skills, as well as mood and personality.

“I also make sure that the patient’s goals are realistic,” Dr. Kubu says. “If a Parkinson’s patient thinks that they are going back to ballroom dancing and running marathons – that is not very realistic for most of the patients that we see. Expectations such as reduction of medication and extending their good time during the day are reasonable goals.”

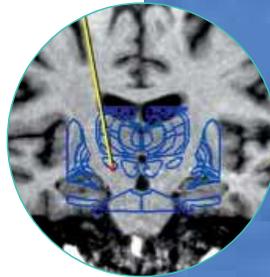
Beginning in the 1950s, neurosurgical intervention was focused on lesioning, or making cuts in the brain, which was effective but also destroyed relatively large parts of the brain. With brain pacemakers, there is no lesioning and the procedure is both reversible and adjustable. If needed, the device can be removed without any damage to the brain.

Dr. Malone says that most people think of psychiatric disease as being emotional, but the reality is that with these disorders there are abnormalities in the circuitry of the brain. With OCD, for example, there are various areas of the brain that are overactive and brain pacemaker electrodes go down into the area where a lot of these overactive pathways pass through. The electrical current disrupts those pathways, in effect normalizing the transmission.



GOING IN

DEEP



1

THE PROCESS BEGINS WITH AN EXTENSIVE MAPPING OF THE TARGET AREA OF THE BRAIN. SURGEONS PINPOINT DOWN TO THE MILLIMETER THE CORRECT POSITION WHERE THE ELECTRODES WILL BE PLACED.



2

DURING SURGERY TWO SMALL HOLES ARE MADE IN THE SKULL. WITH THE USE OF SPECIAL COMPUTERS, IMAGING SYSTEMS AND BRAIN NAVIGATION DEVICES, TWO ELECTRODES ARE THREADED INTO THE CORRECT AREA OF THE BRAIN.



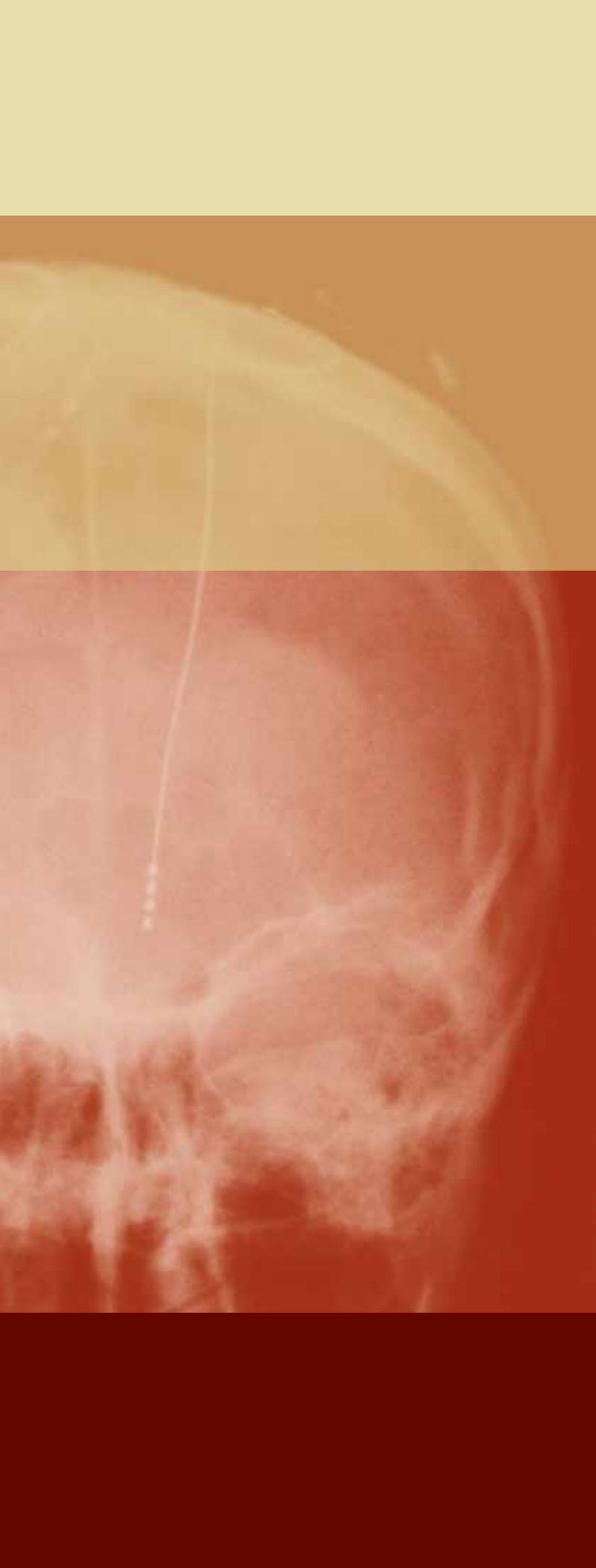
3

IN A SECOND SURGERY, THE BRAIN PACEMAKERS ARE IMPLANTED JUST UNDER THE SKIN BELOW THE COLLARBONE ON EITHER SIDE OF THE CHEST.



4

IN MULTIPLE OFFICE VISITS, THE PATIENT'S PACEMAKERS ARE ADJUSTED FOR OPTIMAL BENEFIT.



A Better Quality of Life

Tucked beneath the skin of Carolyn Card's collarbone, lightweight brain pacemakers send electricity through wires that follow a path into her skull, traveling deep inside her brain. With exacting precision, the wires deliver electrical current to a very specific part of her brain. The aim of this therapy: disrupt the abnormal activity in her brain believed to be responsible for the OCD that has held Card prisoner. Card's OCD made her unable to get out of bed on most days and unable to leave her house. This, in turn, impacted her ability to hold a job and take care of herself. She was thoroughly, clinically depressed. After 20 years of coping, neither behavioral therapy nor medication helped.

Now, nearly three years after her brain pacemaker surgery, Card says her life is better and happier. She has two brain pacemaker electrodes implanted, one on the right and one on the left side of her brain. Although she has not been cured of her OCD, she has not fallen into another debilitating depression.

Card, 37, was one of a handful of patients with OCD selected to receive the brain pacemaker surgery as part of an investigational study conducted at The Cleveland Clinic. All of the study patients were severely disabled by their disorder and had not responded to any other treatments including medication and behavioral therapy.

For the past three years, the Clinic has focused on the effects of brain pacemakers on OCD. It is now beginning to evaluate the effects of the procedure on depression. "Ten to 15 percent of the population will suffer from a major depressive episode at some point in their life. And, of that 10 to 15 percent, about 10 percent won't respond at all to various treatment options," Dr. Malone says. "Over and above that, they also have to be severely disabled by their disease – nothing else has worked for them. Those are the people who would be potential candidates for brain pacemakers."

Psychiatric patients would have to have had no success with multiple medications and multiple rounds of behavioral and psychotherapy. In the case of depression, candidates also would have to have had no success with electroconvulsive, or shock, therapy.

Of the small group of OCD patients implanted with brain pacemakers, more than half showed substantial improvements over the last three years. Dr. Malone notes that the marked improvements from surgery were visible over six to 12 months. "Even for the patients who haven't substantially improved, we have seen some positive changes in them. There is an initial benefit, especially with regard to mood, and that is why we are so hopeful about the depression study," he says. Two of the five OCD

patients have gone to work for the first time and some have begun to have dating relationships. The oldest patient was 55 and the youngest was 24.

“If we can change the lives of the people who are completely debilitated – I mean, to see a patient go from being unable to leave the house, taking five-hour showers, not being able to have a relationship, and certainly not being able to work – to leading a more normal life, that’s exciting,” Dr. Malone says.

“There has been an enormous movement over the last several decades where neuroscience, as a field, has emerged as

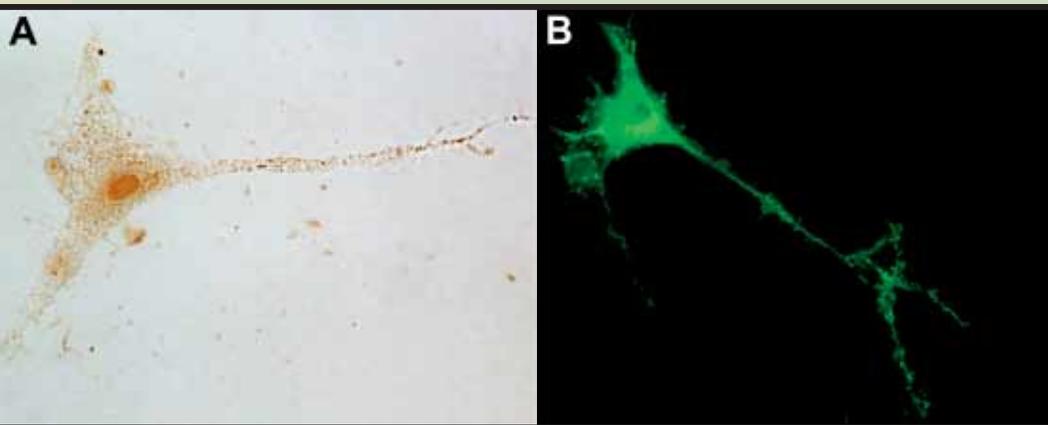
a very powerful force that has made incredible progress,” says neurosurgeon Nicholas Boulis, M.D. “Do we really understand everything about how the brain works? No, but there has been an enormous accrual of information and understanding that hasn’t existed before. It motivates us to take that understanding and create therapies out of it.”

The goal of improving the quality of life for patients is a mission that sends Dr. Rezaei and other center doctors to the laboratory late in the evening after a long day of surgery. “It’s very gratifying that we are developing therapies to help these patients. We’re talking about

patients with no hope and years of trying medications; patients who are severely disabled by their neurological disorder,” Dr. Rezaei says. “It’s really about restoring quality to the life of these patients.” He likens the field to where heart pacemakers were 25 years ago. “In the next 20 years there’ll be dramatic benefits that are just going to revolutionize this field. We are at the tip of the iceberg.” ■

To read more about neuromodulation, go to www.clevelandclinic.org/clevelandclinicmagazine

Neurorestoration: RESTORING THE SYMPHONY



Spinal motor neuron shown through two different kinds of microscopy. Image B pictures the same type of neuron as Image A; however, the green indicates where a virus has delivered a gene that changed the targeted protein.

Neurosurgeon Nicholas Boulis, M.D., says that when he is not seeing patients or performing one of the 170 operations he does each year, he is in the lab. While his clinical practice deals mainly with attempting to treat the symptoms of a functional disorder by focusing on the brain’s circuitry, or neuromodulation, Dr. Boulis says his research in the lab is devoted to intervening at a deeper mechanistic level with neuroprotection – the attempt to prevent cell death and destruction – and neurorestoration, or repairing the damage that has been done.

“With neurological restoration we are trying to get the nervous system to do what it did when it formed originally. We have to figure out those processes and to orchestrate that symphony, or to get it going again,” Dr. Boulis says. His lab is very involved with furthering research in motor neuron diseases such as amyotrophic lateral sclerosis (ALS), also known as Lou Gehrig’s disease. In ALS, which affects about 20,000 people in the United States, nerve cells in the brain

and spinal cord gradually degenerate, causing the muscles under their control to weaken and waste away. ALS victims eventually become disabled, have difficulty speaking and swallowing, and may succumb to infections, particularly pneumonia.

“Our research has focused on engineering mechanisms to deliver genes to the nervous system to protect cells and to cause them to regenerate,” Dr. Boulis says. “We are developing strategies to deliver genes to motor neurons, which exist in the spinal cord and the brain and tell your muscles to move.

“Gene therapies for neurodegenerative diseases are very close to the clinical trial stage,” adds Dr. Boulis. “There are four or five different companies that are moving to clinical trials with gene therapies for Parkinson’s disease and at least one trial moving toward ALS. I think that these therapies have a great deal of promise.”



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MORE THAN SLEEP: *Anesthesia Moves Beyond the OR*

Fawzy George Estafanous, M.D.

Advances in surgery and surgical techniques make the popular news every week. But without corresponding advances in anesthesiology, surgery would still be only for the most desperate of patients.

During the past 20 years anesthesiologists have become much more than the suppliers of sleep. Anesthesiologists have become an integral part of the entire before-, during- and after-surgery care. They have made advances in the number of anesthetic agents available to patients and in the methods used to give anesthesia, including the creation of custom-made plans for each patient.

SPECIALIZATION IS KEY

Over the years the Division of Anesthesiology and Critical Care Medicine has grown in size and capability. “Our anesthesiologists constantly match advances and specializations with those in every area of surgery,” says Dr. Estafanous.

Currently, the division comprises four clinical departments and more than 15 subspecialized sections. Armin Schubert, M.D., chairman of General Anesthesiology, says that highly evolved subspecialization has contributed to the Clinic’s leadership across disciplines. “We have the largest accumulation of experts and subspecialists in the world,” Dr. Schubert says. In all, anesthesia procedures exceed 100,000 a year.

One of the areas that has experienced tremendous growth is pain management. As early as the 1920s, George W. Crile, Sr., M.D., one of the Clinic’s “founding fathers,” wrote this about pain: “[Pain] is the cardinal symptom underlying diseases. It is a completely subjective phenomenon. No one else knows when, where, or how bad pain is.”

With Dr. Estafanous’s appointment as chairman of the entire Division of Anesthesiology in 1986, a commitment was made to setting up a comprehensive program covering acute and chronic pain management, as well as pain research and education. A dedicated Pain Management Center was created that, a little more than a decade later, became the Department of Pain Management. The department staff, lead by Nagy Mekhail, M.D., basically drew the map for this particular subspecialization.

“Nothing is more satisfying than helping people conquer pain and regain their lives,” says Dr. Mekhail. The department evaluates and treats patients for numerous types of pain and is linked closely to the departments of Psychiatry and Psychology, Physical Medicine and Rehabilitation, Neurosurgery, Orthopaedic Surgery, the Taussig Cancer Center and the Spine Center. Only about one-third of hospitals across the nation maintain any kind of formal pain management program, but an aging population, combined with new pain relief technologies and procedures, has made pain management one of health care’s major growth areas.

Another area of extreme subspecialization is pediatrics and obstetrics. Julie Niezgoda, M.D., section head of Pediatric Anesthesia, is passionate about the need for highly specialized care when working with children. In the not-so-distant

past, children were treated as miniature adults. Medicine dosages were scaled down to take the weight differential into account, but that was about all that was different. Today, anesthesiologists know better. Says Dr. Niezgoda, “A growing child’s physiology is quite different from that of an adult and when you also take into account their age-related ability – or, more often, inability – to communicate specifically how they feel and what they need, specialization in this area makes sense.”

Because of the complex physiology and pharmacology of children, pediatric anesthesia has even further subspecialized into additional areas such as pediatric cardiac anesthesia and pain management. Dr. Niezgoda tells of a recent case in which an infant underwent surgery to remove a cyst in the lung that had grown so large it caused the child to have heart failure. What’s remarkable about this case is that the surgery, including the administration of anesthesia, was performed while the baby was still in the mother’s uterus.

A second surgery was performed on the child’s day of birth to remove the remaining lung cyst. “Anesthetic has to be tailored to the age, size and developmental stage of the child,” comments Dr. Niezgoda. Using equipment specifically designed for small infants, she gave the baby an epidural after the child was asleep to decrease the need for anesthesia and to give pain control after the surgery so that the infant could breath more easily. Dr. Niezgoda concludes, “Without the advances we’ve made in anesthesia, a case like this would have been impossible ten years ago.”

(Continued on next page)



Julie Niezgoda, M.D. (left) with a medical resident and patient.

Anesthesiologists also are among those caregivers responsible for improvements in patient monitoring, enhancing the process from simply checking the patient’s pulse and skin color to using a comprehensive hemodynamic program that ensures the best functioning of a patient’s vital organs. In addition to the development of new anesthetic agents and corresponding technology within the overall field of anesthesiology, anesthesiologists have moved beyond the operating room, subspecializing in such areas as anesthesia for cardiology, pediatrics, orthopaedics, gastroenterology, and pain management, to name but a few.

A DEPARTMENT IS BORN

“In the midst of all the change – new anesthetic agents, monitoring tools, patient pre-screening – subspecialization began of necessity,” remarks Fawzy George Estafanous, M.D., chairman of the Division of Anesthesiology and Critical Care Medicine. “Now, extreme specialization is what sets us apart.”

Dr. Estafanous, who will retire in 2005, has served as the chairman of the Division of Anesthesiology and Critical Care Medicine for the past 18 years and has been with The Cleveland Clinic for 34 years. Dr. Estafanous is credited with numerous achievements including the founding of the world’s first Department of Cardiothoracic Anesthesia 30 years ago at the Clinic.

Early in his career at the Clinic, Dr. Estafanous recognized the need for anesthesiologists to develop excellence around specific areas of the body, to take the existing specialized area of anesthesiology and further subspecialize. At the Clinic, he established a close partnership with cardiac surgery and focused on the study of cardiac anesthesia. In 1976, the Clinic’s Board of Governors granted departmental status to Cardiothoracic Anesthesiology and Dr. Estafanous was appointed as the first department chairman.



George W. Crile, Sr., M.D. (framed photo) and early anesthesia instruments.

ANESTHETIC DRUGS EVOLVE

Prior to the mid-nineteenth century, only the most desperate of patients opted for surgery. Over the centuries, numerous techniques were used to dull sensation for surgery, usually to minimal or detrimental effect. Soporifics and narcotics were derived from various plants, including marijuana, belladonna and mandrake. Mesmerism and hypnotism were options. Rubbing the patient with counterirritants, such as a stiff wire brush or stinging nettles, could provide distraction. But, by the 1840s, alcohol and opium had become the anesthetic mainstays, despite their negative side effects.

In the latter half of the 1800s the use of anesthetics for surgery took a turn for the better. Dr. Crawford Williamson Long of Jefferson, Georgia, published the results of his surgeries that used ether as an anesthetic and Dr. William T.G. Morton of Boston, Mass., publicly demonstrated the beneficial use of ether during the surgical removal of a tumor from a patient's jaw. Nitrous oxide also proved to be useful, although its effects did not last very long so it was unsuitable for extended medical procedures. Chloroform held some promise and for a time was popularized by England's Queen Victoria for use in childbirth. However, it was eventually discovered that chloroform was more toxic than ether and so, as experience and knowledge of its dangers spread, the use of chloroform as an anesthetic became less common.

CUSTOMIZED CARE

Today, ether has been replaced by newer and safer anesthetic agents that allow more precise control of consciousness and result in fewer side effects like nausea. Methods of patient pre-surgery eval-

uation and monitoring also have evolved. "We've gone from a technical approach to a scientific approach, from a standard recipe for all patients to a custom design for each," says Dr. Estafanous.

Norman Starr, M.D., chairman of Cardiothoracic Anesthesiology, thinks the most patient-friendly advance in the field of cardiac anesthesiology is the marked reduction in time patients have to spend preparing for and recovering from surgery.

"In the past, patients would prepare for three or four days – while they were already in the hospital – before their surgery and then spend up to 24 stress-filled hours on a ventilator after surgery.



Norman Starr, M.D.

Today, 70 percent of our patients come to the hospital on the day of their surgery," Dr. Starr says.

These days, instead of just a short friendly chat with an anesthesiologist, pre-operative care is a comprehensive, customized patient evaluation using the latest technology and a multitude of carefully monitored anesthetic agents. As part of their pre-surgery preparation, patients now use a friendly, touch-screen system, called HealthQuest, to provide information about their current health. It's a timesaving tool for everyone involved and allows healthy patients to bypass unnecessary steps in pre-anesthesia testing, further reducing patient time in the hospital.

Dr. Starr also attributes progress in the field of anesthesia to changes in anesthetic agents and how they are administered. Previously, cardiac surgical patients would receive high doses of narcotics as a primary anesthetic and consequently would require ventilator support for 12 to 24 hours after their operation.

"When you speak to former cardiac surgical patients, you'll often find they relate that waking up from surgery while breathing through a tube connected to a ventilator as one the worst experiences of their lives," Dr. Starr says. "It's disorienting and painful."

That was five or six years ago. Since then, Dr. Starr and his team have replaced the high doses of narcotics with combinations of inhalation agents, sedatives and lower narcotic amounts. The result is that patients may not need ventilator support when they wake in the intensive care unit, or they may wake and, using minimal pain medication tailored to their specific needs, need ventilator support for less than eight hours. Comments Dr. Starr, "I've had patients reading the newspaper two hours after undergoing heart valve repair."

Many patients also express concern about experiencing pain during surgery or becoming marginally aware of their surroundings during surgery. "The bispectral index [BIS] monitor is one type of monitor available to help prevent such an episode," says Dr. Starr.

The BIS monitor measures to what degree the patient is sedated by monitoring the patient's brain activity. A sensor strip placed on the patient's forehead records brain activity and sends it to the BIS monitor. The monitor then computes a number ranging from zero to 100, correlating with the patient's level of consciousness. At 100, the patient is wide-awake; under 60, the patient is likely to be unconscious.

The monitor allows Clinic anesthesiologists to tailor a patient's dose of anesthesia to meet individual needs, which can vary based on many factors such as age, weight, and medical history. Prior to the development of such monitors, anesthesiologists relied on vital signs such as heart rate and blood pressure and the use of standard dosages to ensure that the patient received adequate levels of anesthetic. "In the end, this process helps patients wake more quickly, feel more clear-headed, and experience fewer anesthetic side effects after surgery," Dr. Starr says.

BETTER ANESTHESIA THROUGH RESEARCH

Unlike investigators studying one of hundreds – perhaps thousands – of diseases and conditions throughout the Clinic, the doctors and scientists who perform anesthesiology research don't study a specific disease. "We don't have a disease. Our disease is pain and our mission is simple: to study and learn how anesthetics work," says Paul A. Murray, Ph.D., director for the Center of Anesthesiology Research. Clinic researchers pioneered the use of intravenous nitroglycerin to prevent and



Paul A. Murray, Ph.D. reviews a project proposal.

control the decreased supply of blood flowing to the heart, or ischemia, in cardiac patients. Presently, nearly 40 studies are on-going within the Center for Anesthesiology Research.

Dr. Murray says the hottest thing in anesthesiology research now is the study of anesthetic pre-conditioning. In other words, can the introduction of an anesthetic agent prior to surgery reduce the adverse affects of the surgery itself?

As an example, a current investigation by Andra Duncan, M.D., is designed to explore the ability of isoflurane, an anesthetic agent, to protect the heart muscle from injury in patients prior to undergoing aortic valve replacement surgery. Another noteworthy study is contained in the research of Manjunatha Bhat, Ph.D., which looks at the most commonly used intravenous anesthetic, propofol. Dr. Bhat is investigating the molecular mechanisms by which propofol causes an acute burning sensation under the skin when it is injected before surgery. His goal is not only to determine if that pain can be avoided, but also to understand how pain develops in the first place.

Anesthesiology research at the Clinic isn't limited to developing new ways to reduce and eliminate pain. A team of clinical engineers works closely with anesthesiologists to continuously improve technology and systems for monitoring, recording and administering anesthesia before, during and after surgery. Over the years, the clinical engineering department has garnered 13 patents for their work.

Most notably, scribbled, often unreadable, anesthesia records are being replaced by the scholarly, automated Anesthesia Record Keeping System (ARKS). This system was developed by the division's Clinical Engineering Research Group, in conjunction with a General Electric (GE) Medical Systems design team, to provide a comprehensive database – from pre-operative status to surgical and anesthesia information to care given in recovery and intensive care units. "Dr. Estafanous and I looked at some comparable products on the market, but none were designed to be used by physicians, so we decided to design something ourselves," says John Petre, Ph.D., director of Clinical Engineering.

ARKS has brought automation to the laborious process of monitoring patient vital signs and then recording them. Instead of writing down vital signs every five minutes and copying other data from various report screens, ARKS allows staff to concentrate on giving patient care. Comments Dr. Petre, "The documentation occurs automatically and the system gives a minute-by-minute account of all vital signs."

The unit, which includes a 19-inch touch screen and a swipe-card log-in, automatically monitors and records temperature, blood pressure, cardiac output, blood gas concentration levels, respiration and other functions. Results are generated on computer printouts and data collected help maintain quality assurance protocols, accurate billing and inventory control. The system's effec-



John Petre, Ph.D. (left) with Dr. Estafanous.

tiveness has been impressive, so much so that GE has purchased the ARKS technology for commercial development.

Dr. Estafanous notes that ARKS is the result of more than three years of research and testing and that it will soon be expanded to cover the intensive care and the post-anesthesia care units. Unlike most software that is developed by programmers, ARKS was defined and specified by clinicians. "It matches so well with our work because we designed it," he says. ■

Center for Anesthesiology Education Re-named to Honor Fawzy G. Estafanous, M.D.

Clinician, educator and leader, Dr. Fawzy G. Estafanous has enhanced countless lives, advancing the science, practice and teaching of anesthesiology.

A former president of the elite Association of Cardiac Anesthesiologists, he also is a founder and former president of the Society of Cardiovascular Anesthesiologists. He is the editor of several textbooks on anesthesiology, including the classic *Cardiac Anesthesia: Principles and Clinical Practice*.

After a remarkable career of more than 40 years, which includes the founding of the world's first Department of Cardiothoracic Anesthesiology, Dr. Estafanous will retire this year. To honor his contribution, The Cleveland Clinic is renaming and rededicating one of his most cherished projects, the Center for Anesthesiology Education.

"As division chairman, Dr. Estafanous developed anesthesiology at The Cleveland Clinic to the clinical, scientific and educational eminence it enjoys today," says Floyd D. Loop, M.D., chief executive officer of The Cleveland Clinic from 1989 to 2004.

The Fawzy G. Estafanous Center for Anesthesiology Education will promote lifelong learning through problem-based education and evidence-based teaching. It is designed to produce skilled practitioners with a deep sense of humanity and a passion for innovation and clinical care.

David L. Bronson, M.D., F.A.C.P.,

Chairman, Division of Regional Medical Practice, answers questions about **SHARED MEDICAL APPOINTMENTS.**

A new trend in health care takes the traditional one-on-one office visit to a different level, offering patients the chance to participate in medical appointments shared with other patients. Patients and physicians appreciate these “group encounters” because they provide quicker access to care, and give patients more time to discuss their health concerns in a relaxed and friendly environment with their physician and with people who may have similar health problems.

Q. What is a shared medical appointment?

A. Shared medical appointments, which we call “Clinic Care Plus,” don’t replace an office visit – they are one. But they are 90 minutes, rather than the usual 10 or 15. During the appointment, while the physician does individual private exams in a nearby exam room, a nurse or other support person, such as a health psychologist, does patient education that’s appropriate for that particular group, finds out what prescriptions need filling, and gets patients’ questions ready for discussion.

When the doctor returns, the rest of the appointment is spent discussing individual patient concerns one-on-one with each patient, but in a group setting where others can learn. Because of the one-on-one encounters with the physician, and the intensity of the patient education that’s going on, group appointments are very interactive. Patients aren’t just hearing what the doctor or nurse says, they are learning from each other, too.



Q. How are privacy issues handled with group appointments?

A. Doctors don't do private types of exams in front of the others during the appointment – they take patients to an exam room. And every patient signs a confidentiality statement making everything they hear in the shared appointment confidential. The people who participate in our groups take the statement very seriously. That's been the experience nationally, too.

Q. What types of shared appointments are offered at The Cleveland Clinic?

A. Right now we offer two kinds of appointments. One is for people who are doing an annual physical. It's scheduled for people with similar medical concerns, and it's usually done with a gender- and age-specific group, such as women under the age of 50 years.

The other type is for follow-up care. Currently we are doing them for patients with hypertension and cardiac risk factors; diabetes; movement disorders; asthma; fibromyalgia, chronic pain and weight loss management; post-cancer treatment and post-bariatric surgery care; women's health and other medical or chronic conditions that require a checkup every three months or so. We are thinking about adding appointments for heart transplant patients. At these appointments there is really a lot of support – and mentoring – because when patients see and talk to each other they begin to realize that others have gone through the same thing, and that they aren't just surviving, they are thriving.

Since everyone is there for the same reason, not only are these appointments effective for the patient, but they also are efficient for the physician – who'd otherwise be giving the same information 10 or 12 times in one- to two-minute discussions. Instead, the physician can discuss a topic in more depth because there is more time available and many patients benefit.

Q. What's been the patients' reaction after they've had a shared appointment?

A. Feedback has been very positive. We were worried that people would feel that they were getting less care, but that's not the case. In fact, 85 percent of those who have had a group appointment sign up for one again. And, our patient satisfaction surveys on the doctors doing shared appointments shows patients have a higher satisfaction level in their group settings than in their individual settings.

I think patients find the whole experience better because they feel they are getting more time with their physician, more care, more information, and more support. And, because of where we are meeting – it's not the exam room, we are sitting in a larger group, usually in a semi-circle – things are less rushed and stressful, too.

Q. What is the best group size for a shared medical appointment?

A. That depends on the purpose of the appointment. If it's a group physical, it's six to eight patients. If it's for follow-up care, it can be between 10 and 16 patients.

Q. When did the Clinic start offering shared appointments?

A. We've been doing them since October of 2002. As of the end of August 2004, we've had 5,518 patients participate in 718 group appointments. This is a national trend. Many other major academic medical centers also are doing group appointments.

Q. Who is the ideal patient – the one who'll benefit most – for a shared medical appointment? And who are they not appropriate for?

A. Doctors know their patients, so they are only going to suggest them for patients who'll benefit from them. That said, it's most appropriate for people who need a routine physical or who are dealing with chronic conditions or illnesses, or are recovering from procedures – such as a hip replacement or bariatric surgery – that require close and coordinated follow-up care.

It's not appropriate for very young children. And it's not appropriate for people with hearing loss, or for those who are cognitively impaired or have serious psychiatric problems. It's not for people who require an interpreter, because of difficulties with English. And it's not for those who will have trouble maintaining confidentiality.

Q. How do patients sign up for a shared medical appointment?

A. We are doing them system-wide – here in Northeast Ohio and in Florida – so all it takes is a call to their physician. Doctors are being proactive, too. If they think a patient would benefit from receiving their health care in a shared setting and a longer, more interactive appointment, they are suggesting them.

Q. What happens if a patient decides they don't like or want to participate again in a shared appointment?

A. Shared appointments are an option. If patients find they are uncomfortable in a group, they can switch back to individual office visits. But we don't see that happening very often. Patients seem to like group appointments, especially if they miss one, because it's easy to re-schedule them into the doctor's next group appointment.

Q. How are shared appointments billed?

A. Shared appointments are covered by insurance and Medicare. Doctors are thorough and deliver the medical care that would normally be provided in a regular office visit, so patients are billed as if they'd been seen in a regular, brief office visit. We don't bill for 90 minutes of time, and we don't bill for a patient education session. That's why we call this program "Clinic Care Plus." The "plus" is the education, the support and the motivation that patients get in a group appointment.

*Read what patients are saying about their experiences with shared medical appointments and take our Readers' Poll: **Shared Medical Appointments: Would You or Wouldn't You?** at www.clevelandclinic.org/clevelandclinimagazine*

A WOMAN'S heart



Early one Sunday morning, Eleanor Kindree woke up with a nagging ache between her shoulders. The 62-year-old resident of the Bahamas figured she must have pulled a muscle, so she headed for the medicine cabinet. But the two aspirin she took didn't even begin to touch the torment she was feeling. Her back pain grew more severe with each passing hour.

The next day, a weary Kindree headed straight to her chiropractor's office to get the spinal adjustment she was sure would ease her aching back. But instead of an adjustment, the mother of two received a shock: she had suffered a heart attack.

"I never dreamed it was a heart attack," she recalls many weeks later. "Heart attacks usually mean pain in the chest. Or down the left arm. One moment, I thought I had a backache. The next thing I knew I was having bypass surgery."

A Higher-risk Procedure for Women

Developed in the 1960s, coronary artery bypass surgery was a revolutionary procedure that transformed the field of cardiac surgery. In 1967, Cleveland Clinic cardiothoracic surgeon René Favaloro, M.D., credited with pioneering the procedure, grafted a vein removed from a

patient's leg to the patient's diseased coronary arteries to increase blood flow to the heart. From this single operation, hundreds of thousands of lives have been saved, making coronary artery bypass surgery one of the most successful means of treating heart disease.

The success of this treatment, however, has not been equally shared. Studies show that women undergoing traditional bypass surgery, as a group, do not fare as well as men. Women have higher mortality rates, stay longer in intensive care units, and continue to suffer more heart problems after the procedure.

"One of the reasons why women don't do as well as men is because, on average, they come into the hospital in worse condition," says Mercedes K.C. Dullum, M.D., a cardiothoracic surgeon at Cleveland Clinic Florida Weston. "These women generally have other health problems, including high blood pressure, diabetes, kidney disease, elevated cholesterol and heart failure. This makes the surgery a higher-risk procedure for women than it is for men."

Off-pump: A Better Option

These are just some of the reasons why Dr. Dullum prefers to use a newer type of

bypass surgery, called “off-pump” or “beating heart” surgery, for her high-risk patients, particularly women. During traditional bypass surgery, the patient’s heart is stopped, making it easier for the surgeon to work on it. The patient’s blood is shunted to a machine that pumps and oxygenates that blood. Once the procedure is done, the surgeon restarts the heart and finishes the surgery. In off-pump surgery, the heart never stops beating. Instead, surgeons use newly developed, clamp-like devices to flatten and stabilize small portions of the heart’s

and there is lower mortality in women who undergo this kind of bypass surgery.” The Clinic study also noted less kidney failure requiring dialysis after off-pump surgery.

There are cosmetic advantages too, according to Dr. Dullum. The procedure leaves only a two- to three-inch scar, which may be covered by the breast. Older women have the option of a small incision near the lower end of the breastbone – making the procedure even less painful.



“ [Off-pump bypass surgery] is a life-saving improvement for women cardiac patients everywhere. ”

Mercedes K.C. Dullum, M.D.

surface while they work. The devices can be moved to wherever the surgeon needs to bypass a blocked coronary artery.

Dr. Dullum is a pioneer in the development and use of off-pump surgery. She is one of only a handful of female cardiac surgeons in the United States and the only one in south Florida. “The benefits of beating heart surgery are many, particularly in high-risk patients,” Dr. Dullum says. “A Cleveland Clinic study comparing the results of on- and off-pump coronary artery bypass surgery demonstrated fewer cognitive side effects with off-pump patients, as well as less red blood cell usage. There are fewer chest incision infections in the off-pump patients

In addition, new developments in vein harvesting contribute to bypass surgery becoming more woman-friendly. In Eleanor Kindree’s case, small incisions were made in her leg to remove a vein to graft into the artery. So instead of the traditional cut down the leg that leaves a painful scar, Kindree has only two small incisions that healed quickly. Two weeks after her quadruple bypass, Kindree was able to fly back to her home on Grand Bahama Island.

According to Dr. Dullum, bypass surgery will continue to improve. “We’re constantly enhancing the surgery, and the benefits will become even more obvious in years to come. This is a life-saving improvement for women cardiac patients everywhere.”

Robotic Surgery Benefits Women With Atrial Fibrillation

Atrial fibrillation (AF) is one of the most common irregular heart rhythm conditions. It affects more than 2.2 million people in the United States, and more than 160,000 new cases are diagnosed each year. Twenty-five percent of women over age 40 get AF, and women are at least 30 percent more likely than men to die early from the disease.

There are several treatment options for AF. A new surgical option in limited availability uses a minimally invasive robot-assisted procedure, helping surgeons repair the defects that cause AF through smaller incisions.

“The primary advantage of this technique is that the patient recovers more quickly,” says cardiothoracic surgeon Mercedes K.C. Dullum, M.D. “With traditional surgery, the patient spends four to seven days in the hospital and has six to eight weeks of recovery. With robot-assisted minimally invasive surgery, the patient stays in the hospital overnight, and recovers over two to three weeks.”

AN INVENTOR WITH A HEART AS BIG AS THIS WORLD



Left to right: Margaret Rudy, Scott Hamilton, Frank Rudy, granddaughter Lauren, and daughter Kim

An accomplished inventor and a figure skater seem an unlikely combination. But Cleveland-area native and Case Institute of Technology graduate Marion “Frank” Rudy and four-time World Champion figure skater Scott Hamilton are a formidable duo in the fight against cancer.

When Mr. Rudy, who has lost family and friends to cancer, learned of the Scott Hamilton Cancer Alliance for Research, Education and Survivorship (CARES) Initiative at the Cleveland Clinic Taussig Cancer Center, it struck a chord with him.

“I wanted to invest in something I believed in,” he says. “And when I met Scott I thought, ‘Here is a giant among giants with the determination to succeed and the chemistry to make it happen.’” Mr. Rudy responded with a \$1 million endowment to CARES in 2003, followed by a second \$1 million

Frank Rudy commits \$2.0 million to cancer research.

gift in 2004. At the recent Scott Hamilton and Friends CARES for a Cure Gala, Scott Hamilton paid tribute to Mr. Rudy and his generosity, calling him “an inventor, an engineer and a man with a heart as big as this world.”

Through the M. Frank and Margaret Domiter Rudy Endowment Fund in Cancer Research, Mr. Rudy supports research that reflects his personal theories about the origins of cancer. He is intensely interested in the work of Cleveland Clinic immunologist James Finke, Ph.D., who is investigating cancer’s effects on the immune system. The Rudy endowment funds a post-doctoral fellowship to delve further into these questions and explore the genetic and bioelectric events that may cause cancer.

Mr. Rudy is quick to acknowledge that his philanthropy is made possible through the royalties he receives from Nike for the Nike-Air athletic shoe – one of his most successful inventions over a remarkable career that has spanned 50 years. “This is my way of sharing the wealth that Nike has brought me,” he says.

Mr. Rudy’s lifelong fascination with medicine dates back to WWII, when his engineering studies at Case were interrupted by a call to service. Four years as

a non-commissioned medical officer sparked the young Frank Rudy with a determination to become a doctor. But after the war he was disappointed to learn that the wait to enroll in a pre-med program was at least two years. So Mr. Rudy returned to his original studies and graduated with a mechanical engineering degree from Case in 1950.

Eventually he and his wife, Margaret, settled in California, where he pursued a career in avionics, his original passion. It was there that Mr. Rudy discovered his talent for developing and marketing inventions – his own and other people’s.

In 1969 Mr. Rudy left the corporate world to pursue his own dreams. He has enjoyed stunning success as an inventor, including the development of the Head-Air ski boot, as well as the Nike-Air shoe.

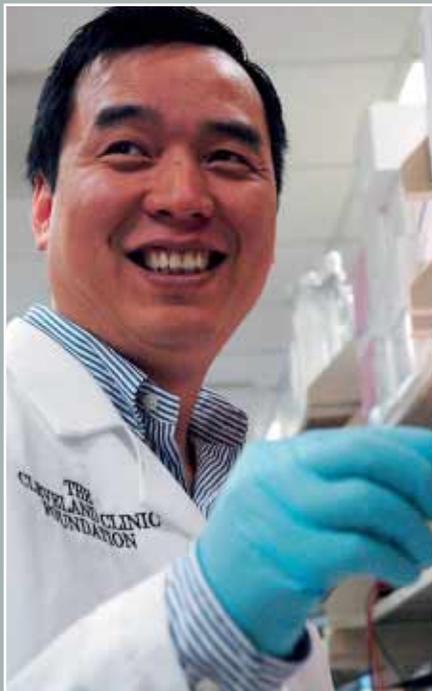
Although his professional life took him in diverse directions, Mr. Rudy maintained his avid interest in medicine and has devoted years to researching cancer. Now, in using the fruits of his professional career to impact cancer research through CARES, he feels that his life has come full circle. “My life experiences have opened new doors, interests and challenges,” he says. “But helping to find the answer to cancer – that will be one of my greatest achievements.”

Finding a New Piece of the Alzheimer's Puzzle

Renowned Alzheimer's researcher Riqiang Yan, M.D., has recently found another piece to the puzzle of Alzheimer's disease that may lead to new therapeutic treatments.

Alzheimer's disease, which afflicts more than 4.5 million Americans, is the most common age-dependent brain disorder that causes the gradual loss of brain cells. With Alzheimer's disease, the areas of the brain that control memory and thinking skills are affected first; but as the disease progresses, cells die in other parts of the brain.

Dr. Yan is widely known in Alzheimer's research circles as the co-discoverer of BACE1, beta-secretase. This is an enzyme that is involved with the body's production of beta amyloid, a small protein that is found in plaque, which is suspected of triggering the debilitating and deadly disease. Alzheimer's patients have an excessive accumulation of beta amyloid in their brains.



Riqiang Yan, M.D.

Since 1999, when Dr. Yan discovered BACE1, drug companies have focused on developing new medications that could reduce the production of beta amyloid and slow the disease's progression. In his latest research, which appeared in the September 2004 edition of *Nature Medicine*, Dr. Yan and his research team identified a natural protein called reticulon, or Nogo. Dr. Yan says this is significant because Nogo interacts with BACE1 and reduces the production of amyloid.

"I'm very excited about this finding because if we can turn on the expression of Nogo in the human brain, I think it will be likely that we may see the reduction of amyloid plaque in the brain," says Dr. Yan. "If we can reduce the production of amyloid plaque we can likely delay the onset of the disease, or perhaps even prevent it." Studies are underway to determine whether reticulon can reduce amyloid production; they are expected to be completed in about a year.

Inner Ear Inflammation: Friend or Foe?

One out of 700 babies born in the United States is found to have some degree of hearing loss. Many more people who were born with normal hearing acquire hearing loss during their lifetime. While the causes of hearing loss are many, some important causes include age-related hearing loss and noise-induced hearing loss.

"Hearing loss has a significant impact on people's lives because it affects their ability to communicate and interact," says Keiko Hirose,

M.D., with the Clinic's Head and Neck Institute. Although it has been well established that excessive noise causes hearing loss, the exact mechanism of damage to the ear is not understood. Dr. Hirose and her research team are trying to find some of the answers.

"We believe that hearing loss is due to a number of different problems within the ear," explains Dr. Hirose. "What we recently discovered is that after the cochlea has been damaged from acoustic trauma,

there is a very significant inflammatory response in the inner ear. This finding was unexpected and the role of the inflammatory response is not yet clear."

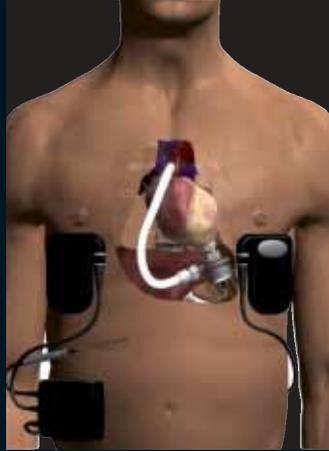
The cochlea, a small, curled tube in the inner ear, is filled with liquid that is set in motion by sound waves that are funneled in from the outer and middle ear. The cochlea is lined with cells that are covered in tiny hairs. When sound reaches the cochlea, the vibrations cause the hairs on the cells to move, producing nerve signals that

Pumping More to Beat Heart Failure

A new implantable heart pump may be able to help a greater percentage of the more than five million people who suffer from chronic congestive heart failure (CHF) than current traditional pumps.

Leonard A.R. Golding, M.D., and his team have developed the CorAide Ventricular Assist System,[®] a continuous-flow blood pump that is smaller than a credit card and can be implanted in the chest. The CorAide acts like a booster pump, helping to take some of the workload off the heart. It also is simpler than traditional “pulsatile” pumps that mimic the heart in intermittently ejecting blood.

“For people who have chronic heart failure and are waiting for a transplant, the CorAide can be used as a bridge to transplantation,” says Dr. Golding. “But our real intent with this assist device was to design it so that it can last for a long, long time and have wider applications for heart failure patients.” CHF contributes to 250,000 deaths every year.



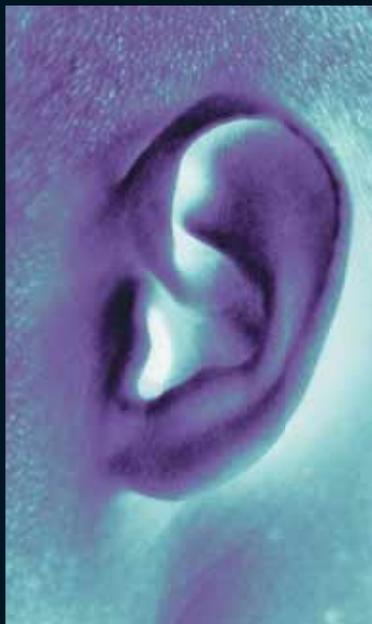
CorAide Ventricular Assist System[®]

The CorAide’s design includes only one moving or rotating part, which is suspended by hydraulic and magnetic forces. “If the internal parts are not touching each other that means there is nothing to wear out. The CorAide should last for at least five years, possibly 10 years,” Dr. Golding explains. The assist device can partially or completely replace the function of the failing left ventricle of the heart and is capable of automatically adjusting to changing physiological blood flow requirements, such as when the patient is active or at rest. The device runs on 6.5 watts of continuous power – battery or line current – and can generate blood flow and blood pressure required for normal organ function.

“In the long run, we’re hoping that the CorAide can be used for people who suffer from CHF but who may not yet need a heart transplant,” says Dr. Golding. “In addition, we hope that it can be used for those patients who have reversible heart failure conditions.” Clinical trials may begin in the United States as soon as this year.

the brain understands as sound.

“Traditional thinking leads us to believe that inflammation is detrimental to the ear,” says Dr. Hirose. “However, in this case, it is possible that the inflammatory cells promote healing and recovery. At this point, we don’t know if these cells are hurtful or helpful.” Dr. Hirose’s current and future research work focuses on how inflammation interacts with the auditory system, what the steps are that lead



to the beginning of the inflammatory response in the inner ear and how to intervene in a therapeutic manner in cases of acute injury to the inner ear.

Depending on whether the inflammation is determined to be beneficial, detrimental or neutral, Dr. Hirose and her team hope to gain a better understanding of the steps that lead to cochlear injury and possible repair. In doing so, they may eventually be able to create therapies or surgery that may halt the progression of hearing loss.

New Tools in Fighting Cancer

Chemotherapy and radiation therapy are the most common approaches to treating cancer. But one of the downsides of this treatment is that healthy cells are often destroyed along with the cancer, triggering side effects that make patients vulnerable to other illnesses.

Andrei Gudkov, Ph.D., chairman of Molecular Biology, is conducting research that someday may help protect healthy cells from the onslaught of chemotherapy and radiation therapy, and in doing so reduce or eliminate cancer treatment side effects.

In his search for this type of treatment, Dr. Gudkov and his research team have extensively studied the mechanisms used by treatment-resistant tumors. Specifically, the team focused on two cellular factors, p53 and NF-kappaB, that normally determine cell response to a variety of stresses. For example, when DNA in a cell is damaged, p53 is activated and essentially makes the sick cell commit suicide, a process known as “programmed cell death” or “apoptosis.” While studying several normal organs, Dr. Gudkov’s team found that p53 was activated during radiation or chemotherapy leading to an excessive loss of healthy cells. However, many cancer tumors turn off the p53 mechanism as part of their survival strategy, allowing the sick cells to continue living.

Dr. Gudkov’s team decided to develop a mechanism that would imitate this p53 “off switch” to protect healthy cells. They identified a molecule called Pifithrin-alpha (PFT) that effectively protects normal tissues from radiation by inhibiting p53. Although this molecule provided convincing proof for a new therapeutic approach, it cannot be used clinically because of its high toxicity level.

“We are isolating new classes of PFTs,” says Dr. Gudkov. “Those classes share the same apoptosis inhibition properties as p53, but are less toxic.” Dr. Gudkov’s team already has identified and begun testing some new molecules that might help them to develop a new drug.

Another anti-apoptosis mechanism frequently used by tumors involves a cellular factor called NF-kappaB, which is used by the body to respond to infection by inducing inflammation and controlling apoptosis. While in normal tissues NF-kappaB is usually shut off and gets activated only in the presence of infective agents, tumors frequently have NF-kappaB active since this helps them to avoid apoptosis. “NF-kappaB activation is a frequent property of the tumors, so we thought that maybe we could ‘turn on’ NF-kappaB to protect normal tissues during chemo and radiation therapy,” Dr. Gudkov says. Dr. Gudkov’s

research team is rapidly developing new inducers and methods of turning on NF-kappaB as yet another mechanism for preventing damage to normal tissue in cancer patients.

Because NF-kappaB protects against cell death, there is an obvious threat that the use of NF-kappaB-inducing drugs would help the tumor. But Dr. Gudkov and his team don’t believe that’s the case. “Our experimental data show that by inducing NF-kappaB we can achieve better anti-tumor effect in radiotherapy by increasing tolerable radiation dose. The tumors do not get protected by this treatment, while normal tissues do,” Dr. Gudkov explains.

Based on these principles, Dr. Gudkov’s research team has developed several prototypes of tissue-protecting drugs that currently are being tested and are showing strong results. “In our research, we see that NF-kappaB induction, if it is done in the right cells, can result in a fantastically strong radioactive effect,” says Dr. Gudkov. “Although we are still at an exploratory stage in testing NF-kappaB induction as a therapeutic approach, years from now these NF-kappaB inducers we are currently developing may help improve cancer treatment outcomes.”

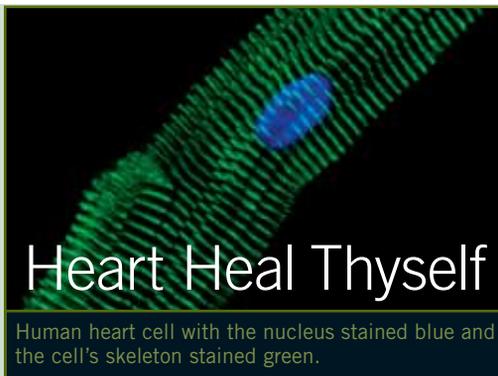
For years medical doctors and scientists have thought that heart failure, which afflicts millions of Americans, was irreversible. But this long-held belief is not true.

“We looked at some of the things that cause changes in the heart’s contraction and relaxation cycle, changes that lead to heart failure,” says Christine S. Moravec, Ph.D., an associate staff scientist in the department of Molecular Cardiology. “We found that some of these changes are reversible.”

That finding is now leading Dr. Moravec and her research colleagues to identify other specific changes in the cardiac muscle that contribute to impaired contraction and relaxation. From there, they are working to determine which changes may be reversible, and in doing so allow the heart to heal itself.

When the heart is not contracting and relaxing properly, it leads to congestive heart failure (CHF). Though CHF is treated with various medications, the disease can worsen rapidly. The only long-term treatment for this disease is a heart transplant.

Every time the heart contracts it pumps blood out, and every time the heart fills up with blood, it relaxes. Dr. Moravec’s team is studying the signaling pathways of heart cells that control the contraction and relaxation function of the heart muscle. “We think there are common pathways in the cardiac cells that lead to heart failure and those are the



Heart Heal Thyself

Human heart cell with the nucleus stained blue and the cell’s skeleton stained green.

pathways we are trying to get at to influence,” says Dr. Moravec.

For example, in the heart muscle cell there is a place where non-dietary calcium is stored. For the heart to contract effectively, that reservoir releases calcium in the cell. Then the calcium is taken back up, or recycled. But when there is a defect in this calcium recycling process, it can lead to heart failure.

“In our research we want to find out why this happens and whether it is reversible. And if it’s reversible, will it actually make the heart better,” says Dr. Moravec. “If reversing the defect in the calcium recycling process is possible and the heart gets better, then we may be able to treat or even cure heart failure without heart transplants.”

The ultimate goal of Dr. Moravec and her team is for their research to lead to the creation of new medications that would correct the defects in the cells that trigger heart failure.

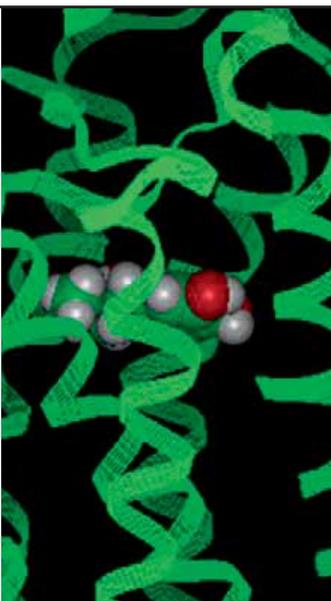
“Doctors are prescribing beta blockers to patients with heart failure because that medication corrects some of the defects on the cell level,” says Dr. Moravec. “I think eventually we will have better drug therapy for heart failure. It will be a therapy that will turn on or turn off the things that go on in the cardiac muscle cells, allowing the heart to heal itself rather than replacing it.”

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Catch a Rapid Killer

Multiple system atrophy, or MSA, is a neurological disorder that shares many of the same symptoms as Parkinson’s disease – muscle rigidity, tremors, loss of balance and bradykinesia, the slowing down of body movement. But unlike Parkinson’s, MSA progresses very rapidly. Many MSA patients die within nine years of diagnosis and, because its symptoms are similar to Parkinson’s, it’s hard for doctors to diagnose. What’s more, there are no medications that can treat or alleviate the symptoms of MSA. Although the disease is rare – about 77,000 new cases of MSA appear annually – it usually strikes people in middle age.

“MSA patients are desperate because their whole body is breaking down and doctors can’t do much for them,” says Dianne Perez, Ph.D., a researcher with the department of Molecular Cardiology. Dr. Perez’s team is investigating various unique facets of MSA including α_1 -receptors (AR), the protein molecules that control cardiovascular functions such as blood pressure constancy and cardiac contractions. The over-expression of



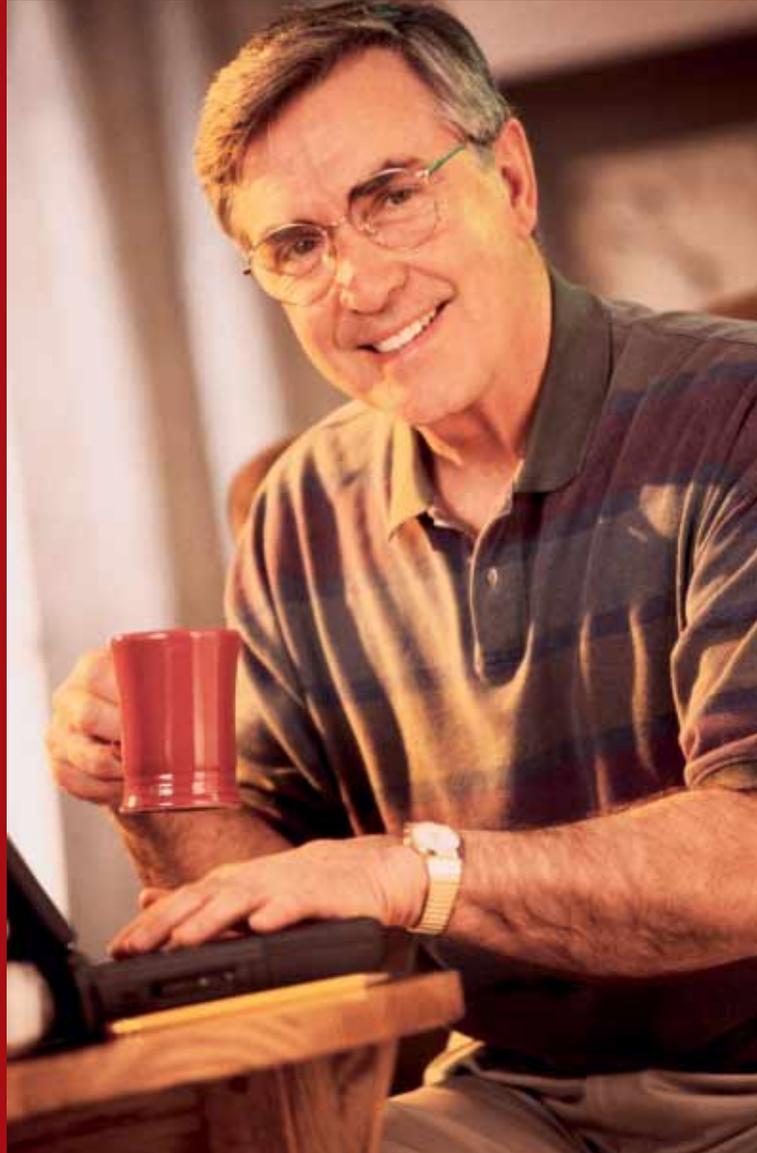
The green spiral strand of the AR weaves in and out of the neuron, allowing it to communicate signals from outside the brain cell to the inside of the cell. In this image, the green, red and gray terazosin drug is binding to the receptor, preventing it from telling the neuron to die.

these receptors causes neurodegeneration that is consistent with MSA and Parkinson’s patients.

“It appears that the way AR receptors communicate with cells in the brain can lead to neurodegeneration if this regulation is disrupted. The brain cells that control certain involuntary or autonomic functions of the body die,” explains Dr. Perez. Dr. Perez’s research involves a common drug, code-named “terazosin,” that is used to treat high blood pressure and prostate diseases. Terazosin blocks the AR receptors in the brain that somehow trigger neurodegeneration.

“We tested terazosin for a few months in models of this disease and found that not only did physical motor ability improve, but weight and life span also increased,” Dr. Perez says.

Within the Department of Neurology, clinical trials are now testing whether these AR blockers can benefit patients with MSA. What’s more, if the research does show benefits for MSA and Parkinson’s patients, doctors will be able to prescribe the terazosin blocker almost immediately because its safety has already been established by the U.S. Food and Drug Administration.



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