



Fixing a Hole in the Heart—

no surgery, no scar,
no problem

BY CHUCK WILLIAMS
PHOTOS BY PETE STONE

Life interrupted

Caring for a new baby in addition to going back to work is exhausting for anybody. New mom Melissa Ray knew that, but she still had to wonder if there wasn't more to why she was so overwhelmingly tired.

She and her husband, Marcus, delighted in playing with Mason, their little bundle of energy who was born in July 2005. "Mason never seems to slow down for anything except to watch a basketball game on TV with us – he just loves to follow the action on the screen," says Ray, who works in marketing for the Portland Trail Blazers.

But as her son's energy grew, Ray's diminished. Something was wrong. "I felt so tired," she remembers. "I constantly had headaches and it was nearly impossible for me to get out of bed in the morning."

Visits to Ray's family practice physician at first revealed nothing that would explain her symptoms, but then her doctor found something disturbing.

Recalls Ray, "Dr. Susie Bobenrieth was listening to my chest and said she heard a heart murmur. I immediately thought of Mason and was concerned that it



Interventional cardiologists can repair defective hearts without surgery. Melissa Ray had a clamshell device (shown above) close a hole between the chambers of her heart, inserted via a small catheter that entered the heart through her aortic artery.

could be something serious that would prevent me from caring for him."

A sonogram of Ray's heart revealed a small hole between the pumping chambers of her heart. "Later, Dr. Bobenrieth told me that I was very lucky that I didn't have a stroke during my pregnancy or delivery. Even though it was something I was probably born with, it was something I had to get taken care of very soon."

The cardiologist who read her echocardiogram referred her to Todd Caulfield, M.D., at Providence Heart and Vascular Institute. "He told me Dr. Caulfield was the one who could fix my heart – that he was doing some revolutionary things."

Ray sensed this was true as soon as she met Dr. Caulfield in his office at

Columbia Cardiology Associates. "He showed me the little clamshell device that he wanted to insert into my heart to close the hole, and explained that it could be placed there with just a catheter – so no open-heart surgery would be necessary," says Ray. "I was amazed something like this was possible, but his explanation and approach put me completely at ease. He was so down to earth – we talked about my job, and how the Trail Blazers finally seemed to be on

the right track. I told him if he was able to fix my heart, I would be happy to treat him to a game."

What's newest, and what's best

Dr. Caulfield wants his patients to feel at ease.

"I've always found it grounding to develop a relationship with my patients," explains Dr. Caulfield. "How else can you understand what they want from their medical care?"

Currently the director of interventional cardiology research at Providence Heart and Vascular Institute, Dr. Caulfield has impressive credentials – medical training at Harvard, clinical research fellowships at Harvard and Yale, numerous >>>



journal publications, and acting as the principal investigator for more than 20 clinical research studies. But perhaps his most important credential is the passion he has for understanding the workings of the heart.

“I love studying the complex physiology of the heart,” he says. “The first time I saw an echocardiogram in medical school I realized how much information you could get without having to get inside the patient’s body.”

Although he didn’t recognize it right away, there was a deeper reason Dr. Caulfield decided to pursue a career in cardiology. “It wasn’t until years later that I realized what my motivation really was,” he says. “When I was a boy I lost my grandfather. He died at a relatively young age after a series of heart attacks. He

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should have had many more years with us. We’re learning so many things now that could have helped him.”

Dr. Caulfield is responsible for evaluating and making available cardiology research advances to Providence Heart and Vascular Institute. “We participate in many clinical trials of newer interventional procedures – but we’re very selective in what we offer our patients. We won’t get involved in the very early trials of



procedures that are being tried on patients for the first time,” explains Dr. Caulfield. “We offer trials that already have shown some success on patients, but may not yet have gained approval from the Food and Drug Administration – so they’re not available at most centers. And patients only will be offered a trial if it has a good chance of helping them more than proven treatments we already have available to us.”

Clamshell correction

By March 2006, eight months after giving birth, Melissa Ray was a very stressed and exhausted patient. But it took no more than a couple of hours one afternoon in the Cath Lab at Providence St. Vincent Medical Center for Dr. Caulfield to repair her heart. Using X-ray fluoroscopy, he sealed the hole with the clamshell device – each half on either side of the hole. Over the course of the next few months, tissue would grow over the half-inch-wide metal device until it became completely incorporated into the heart. The entire procedure was done with the help of a narrow catheter and involved only a small incision in the groin.

Ray doesn’t recall much about the procedure itself because she was sedated, but she does remember Dr. Caulfield declaring, “Looks like I’m going to a Blazers game!” – just before she fell back into semiconsciousness.

The morning after her procedure, Ray was able to go home from the hospital. “My headaches were gone, and right away I started feeling a lot better. I was back to work in three days and feeling 100 percent in about a month or two.



Melissa Ray (right), Trail Blazer marketing executive, promised to bring her cardiologist to a game if her procedure was a success. Dr. Caulfield (center) and his wife, Yasodha Gopal, M.D. (left), had a great time cheering on the team with Ray and her son, Mason.

My energy was back and I was keeping up with Mason with no problems.”

As Ray reclaimed her life, she was very glad that she listened to her body and went back to her doctor. She knows this saved her health – if not her life. “I was always pretty healthy growing up – hardly ever got sick,” she says. “It was so important for me to be healthy again, for me and for my family. For awhile I really didn’t know if that was going to happen.”

This past winter, Ray and her family brought Dr. Caulfield and his family to a Trail Blazers game – a promise she was very happy to keep.

Less becomes more

It’s no surprise that Ray was offered an interventional cardiology procedure instead of surgery. At Providence, and around the country, interventional cardiologists rather than cardiac surgeons treat most heart and vascular conditions.

These procedures are less invasive, safer, cost far less, and allow patients to recover more quickly.

In 2006 at Providence Heart and Vascular Institute – the largest and busiest heart center in Oregon – some 1,500 patients had open-heart surgery at Providence St. Vincent and Providence Portland medical centers, but 4,000 patients underwent interventional cardiology procedures.

Both open-heart surgery and interventional cardiology have made extraordinary advances over time. However, it’s likely that even more heart and vascular procedures will be done with catheters in the future. In fact, Dr. Caulfield predicts there will come a time when nearly every type of cardiovascular procedure can be done by catheterization – including heart valve replacement. As with any medical decision, choosing which procedure is best for a particular patient is the result of carefully weighing symptoms and risk factors. >>>

Choosing between an interventional procedure and open heart surgery is not always clear cut. “I often walk down the hall at my clinic and consult with one of my cardiac surgery partners on a case,” says Providence Heart and Vascular Institute interventional cardiologist Bradley Evans, M.D. “It’s not always obvious if catheterization, surgery or just giving medicine is the best way to go. We have an extraordinary database of information about our cases, and we really want to give patients a realistic prediction of what they can expect from whatever option they choose.”

Fighting plaque

Most of what we call “heart” problems really are blood vessel problems, whether in the heart itself, in the brain, in internal organs, or in the legs or other extremities. The culprit is plaque that slowly builds up inside the walls of arteries until they become so restricted that even a very small blood clot can suddenly cut off circulation.

“Plaque is a waxy, thick substance,” says Dr. Caulfield “It’s made up of cholesterol, lipid deposits, calcium leached from our bones, fat cells and dead cells. If we had it on the outside of our bodies, we’d wash it off immediately.”

Dr. Caulfield describes plaque-filled arteries as very different from normal, healthy arteries. Instead of being rubbery and pink, they are stiff and grayish white – like porcelain pipes. But whatever the cause of arteriosclerosis, the results can be devastating. When blood flow is narrowed, muscles and tissues don’t work as well. Muscles burn or cramp up;



Bradley Evans, M.D., interventional cardiologist (right), walks with Andrew Tsen, M.D., heart surgeon. They are partners at The Oregon Clinic and regularly consult each other on cases and admit patients to Providence Portland Medical Center.

the kidneys, liver and other internal organs can’t keep up; legs and feet swell with fluids; and the brain becomes confused. When blood flow stops completely, muscles die, organs fail, and brain tissue is lost forever.

“My goal with the research program,” explains Dr. Caulfield, “is to look for ways to advance the kind of care we deliver to patients to restore blood flow to patients without surgery. Most of our current research involves coronary arteries.”

Cardiologists work with a fluoroscope

machine (X-rays that run in short real-time bursts, similar to a series of mini videos) to help find the offending plaque. The machine tracks dyes that are injected and flow through the arteries to locate plaque-filled areas. Once identified, cardiologists open the narrowed or blocked arteries with a nudge of the catheter. If the blockage is severe, additional tools such as balloon catheters, spinning drill bits or even lasers are used. Once open, cardiologists often use the catheters to place stents – tiny wire scaffolds that expand to hold open newly unclogged arteries.

Dr. Caulfield and his Providence Heart and Vascular Institute colleagues are national leaders in studying the benefits of drug-eluting stents – containing a coating of a slow-release drug that helps to keep arteries free of new plaque buildup. Stents also can be “bare metal” (no drug coating), and part of the research conducted by Dr. Caulfield and his colleagues is to determine which types of stent work best for which patients.

As with every new approach, proving the ultimate effectiveness of drug-eluting versus bare metal stents may take years. Some early studies have shown a slightly higher incidence of clot formation with drug-eluting stents. However, bare metal stents have a greater tendency to re-stenose (re-narrow) with scar tissue over time.

“The jury is still out on this,” says Dr. Caulfield. “Using anti-clotting medicines usually is necessary for drug-eluting stents, but in some patients that’s inappropriate. So, again, each patient must be evaluated individually.”

Stopping the No. 1 killer

The push to find new and better ways of diagnosing and treating cardiovascular disease is driven by one heart-stopping fact: it kills one out of three Americans and 70 million Americans are struggling with its early symptoms.

“Everyone in our field is asking why,” says Dr. Caulfield. “We know all the major associated risk factors – smoking, being overweight, diabetes, family history, age, stress and all the rest. But the person who can show the mechanisms of how and why artery walls build up plaque will win a Nobel Prize.”

Dr. Caulfield will leave the question of how and why it happens to others. He and his colleagues focus on patients

and the research needed to repair damage – regardless of how it came to be. Dr. Caulfield is ready, with the best available procedures, for the next patient who walks in his door – just as he was ready for a dangerously ill mom named Melissa Ray.

Living life fully

More than a year after Dr. Caulfield slipped the clamshell device into Ray’s heart, she is going strong. She can go days without thinking of the piece of metal that sealed the leak in her heart. But then she’ll remember – as she’s chasing Mason during a game of hide-and-seek – that, not too long ago, she had difficulty even crawling on the floor with him.

The best measurement of Ray’s recovery may be her decision to bring another child into the world. “Before I got my procedure, that would have been out of the question,” Ray concedes. “Marcus and I really want to have another baby. I know I can do that now.”

That is success for Dr. Caulfield – knowing Ray feels safe and ready to live for the future. Through the research advances made by the Providence Heart and Vascular Institute team, Dr. Caulfield wants to give the heart patients of today something cardiologists and technology could not give his grandfather 30 years ago – another chance at life. ■

Advances in medicine are the result of new ideas refined by a rigorous process of clinical research. New treatments must be proven to be both safe and effective through well-regulated clinical research studies before they can be made widely available to patients. At leading centers such as Providence Heart and Vascular Institute, promising clinical research studies are offered to patients who are most likely to benefit from them.

Opening peripheral arteries:

Arteries throughout the body are subject to narrowing or closure (arteriosclerosis) from plaque buildup. A study is now looking at a device to open arteries in the legs that are completely blocked.

Removing plaque particles:

A clinical research study is under way on a tiny device that goes inside blood vessels

Interventional cardiology research studies currently under way at Providence Heart and Vascular Institute

to remove particles that break away from plaque blockages during balloon angioplasty or stent placement. Larger particles could become lodged inside other vessels and block blood flow.

Closure of patent foramen ovale:

Shortly after birth, a major change happens to the circulation of blood to the infant’s heart and lungs. In most newborns, the natural opening between the upper chambers of the heart closes on its own. However, in about 20 percent of cases, that opening (called the foramen ovale) does not close completely. In some people, that will lead to blood clots and even strokes – sometimes years later. This study looks at the effectiveness of treating this condition in adults through insertion of a device by catheter to fully close the foramen ovale.

Drug-coated/drug-eluting stents:

Providence Heart and Vascular Institute is a national leader in clinical research studies of stents – tiny metal scaffolds that are inserted inside arteries during balloon angioplasty. At the institute, studies are evaluating the safety and effectiveness of “drug-eluting” stents (those with a coating of slow-releasing drugs that help keep vessels from reclosing) as well as “bare metal” stents (without a drug coating).

Preventing blood clots:

Several studies are looking at the safety and effectiveness of various anticoagulant drugs to prevent blood clots from forming during and after interventional cardiology procedures. Anticoagulants are used in placing a stent or treating a heart attack.

