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# Then & Now

By Jon Caswell

When President Dwight Eisenhower had a heart attack in September 1955, he got the best cardiac care available – after all, his doctor was Paul Dudley White, a founder of the American Heart Association. Dr. White's prescription – bed rest, heparin and pain medication for his chest pain.

That was pretty much standard procedure at the time, but Dr. White was roundly criticized by his contemporaries for what he did next: he had the president sitting in a chair for a few hours a day after only a month of bed rest. At six weeks he had him walking! In 1955, six months of bed rest was the typical treatment for a heart attack survivor, and surviving the event was by no means guaranteed – mortality rates were high. But Dr. White's "aggressive" treatment proved successful enough that others took notice, and the treatment for myocardial infarction began to change.

And how things have changed – perhaps, the only thing that has remained the same is the disease. In the past 20+ years, treatment for heart disease has undergone a revolution – today doctors can stop a heart attack in its tracks with angioplasty, stents and clot-busting drugs like tPA, graft new vessels onto the heart while it is still beating, repair valves without opening the chest and control irregular heartbeats with tiny devices that provide controlled electrical shocks at exactly the right moment.

To get an idea of some of those changes, *Heartbeat* talked to two physicians at the Northeast Georgia Heart Center outside Atlanta: interventional cardiologist Jeff Marshall and cardiothoracic surgeon Dan Winston. Dr. Marshall is also on the board of the Society for Cardiovascular Angiography and Interventions, whose website www.seconds-count.org contains helpful, patient-oriented information. We also got patient perspectives by interviewing several members of Mended Hearts.

## ANGIOPLASTY AND STENTS

The first heart catheterization was performed at the Cleveland Clinic in the 1960s. That was the beginning of interventional cardiology, which allows doctors to perform heart procedures without opening the chest. Instead, doctors insert a catheter into an artery in the arm or leg and advance it to the heart where a balloon-like device opens the artery. The first balloon angioplasty was performed 30 years ago.

However, doctors soon found that the arteries that had been opened had a propensity to close again. This led to the development of stents to keep the coronary arteries open. "The first stents were bare metal and cumbersome," said Dr. Marshall. "They were stiff and often wouldn't go where they needed to go. And they were prone to re-stenosis, the development of scar tissue inside the metal tube as a result of the 'controlled injury' of the angioplasty." The first flexible stent received FDA approval in 1993.

Today stents are made with much finer mesh and so are much more flexible. They are also coated with medicine to prevent re-stenosis. First approved in 2003, these drug-eluting stents have been effective in reducing the scar-tissue problem from about 30 percent of patients to less than 10 percent. And scientists are continuing to refine the polymers used to bind the drugs to the stents.

Angioplasty and stents have revolutionized cardiology since their introduction. In 1997, 1 million angioplasties were performed. That number had doubled by 2001, making it the most common medical intervention in the world.

"Now we can stop a heart attack in its tracks through balloon angioplasty and placement of a stent," said Dr. Marshall. "We have seen a fall in mortality rates from 30–40 percent to less than five percent. That's an astronomical change."

## BYPASS SURGERY

The first heart revascularization surgery was performed by Arthur Vineburg in 1950. This was not a true bypass operation. "Instead of making a bypass to a coronary artery,

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*– Dr. Jeff Marshall, cardiologist*

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>
> *– Dr. Dan Winston, cardiothoracic surgeon*

he attached a mammary artery directly to the heart muscle," said Dr. Marshall. "It gave people some angina relief because it supplied some extra blood to the heart muscle."

With the development of the heart-lung machine, bypass surgery became more common as surgeons were able to stop the heart while they sewed the grafts onto the coronary arteries. Another major development was the use of blood vessels from the legs, which were harvested by cutting open the patient's leg, sometimes from ankle to groin. This was painful for patients, took a long time to heal and left unsightly scars.

The past two decades have seen the development of "off-pump" surgery where the patient's heart is not stopped. "We use a stabilizing device that holds a small portion of the heart and artery immobile while we suture the graft," said Dr. Winston. "The advantages of the off-pump method are that there are fewer cognitive changes after surgery and less blood transfusion."

The way blood vessels are harvested has also changed dramatically. Instead of cutting open the leg, surgeons now take the vessels endoscopically. "Everything is taken out through a little 2-centimeter incision above the knee," said Dr. Winston.

Although there is now interest in using robots to perform heart surgery, it is mostly for single-vessel disease, according to Dr. Winston. "For multi-vessel disease, we are getting very good results with the surgical techniques we've developed over the past 30 years – it's hard to improve on a one-percent mortality rate."

These advances have revolutionized the patient experience: the average hospital stay is down from seven days to four; there is less pain because of better medication; and patients are "fast tracked" now, getting them up and out of bed on the first day after surgery.

## VALVE REPLACEMENT

As long ago as 1400, Leonardo de Vinci described in great detail the anatomy of the aortic and mitral valves. But it wasn't until the 1950s that doctors began to develop surgical treatments for those with valve disease. These included innovations such as the heart-lung machine, the use of bioprosthetic (pig and calf) valves, the development of mechanical valves and the first aortic valve surgery.

From that time until the 1990s, valve repair or replacement always involved a full sternotomy (opening the chest after cutting through the breastbone). Valve surgery also involved lowering the patient's body temperature. Patients often awoke after surgery on a bed of ice because doctors believed raising body temperature too quickly would create problems.

"Now we do the operation with a small incision in the chest," said Dr. Winston. "As a result there is less bleeding, less pain and trauma, a shorter hospital stay and shorter recovery time."

Robotic surgery has been in use since 2001 and represents a major development in valve repair surgery. "In robotic surgery we don't cut through the breastbone, we don't even split the ribs, but make an incision between them," said Dr. Winston. "It also gives us multiple port sites from which to operate."

The same is true of heart port technology, which uses two small incisions, one for a camera and the other for insertion of the surgical instruments. "Both these technologies allow for better valve repair as opposed to replacement," Dr. Winston said.

When a valve does need to be replaced, the types of valves used have not changed much over the decades. Surgeons use either valves from calves or pigs or mechanical valves.

Cardiothoracic surgeons are currently developing ways of repairing heart valves using catheter-based technology.

# ICDs and Pacemakers

As physicians learned how to treat heart attacks through bypass surgery, angioplasty and stents, the new frontier in cardiovascular disease became how to deal with arrhythmias and the sudden cardiac death that may result. In fact, electrophysiology has arisen as a new specialty in cardiovascular medicine. Pacemakers and implantable cardiac defibrillators (ICD) are the tools of the electrophysiologist.

Artificial pacemakers are small computers that emit electrical impulses when the heart rate drops below a certain number, a condition called bradycardia. Pacemaker shocks are mild and rarely produce pain. ICDs are used to treat tachycardia (when the heart rate jumps above 100 beats per minute) as well as fibrillation (when the heart quivers rather than beats effectively). ICDs are programmed to respond to several types of arrhythmic events by delivering different types of electrical impulses. Some of these shocks may be painful but are necessary to restore the heart's normal rhythm.

The first artificial pacemaker was surgically implanted in Sweden in 1958. It failed after three hours. The major limiting factor in the development of pacemakers was the unreliability of their power source. The development of lithium iodide batteries in the 1970s was the advance that allowed pacemakers to proliferate. Water vapor from body fluids was another problem in early pacemakers, but that was overcome by encasing the devices in titanium. In 2005, about 180,000 pacemakers were implanted in the United States.

The development of the ICD began in the 1970s despite considerable skepticism about its potential to solve the problem of fibrillation. In a 1972 *Circulation* article, Bernard Lown, inventor of the external defibrillator, voiced his doubts: "The implantable defibrillator is an imperfect solution in search of a plausible and practical application."

The problem to overcome was how to design a device that could detect either ventricular fibrillation or ventricular tachycardia. The first ICD was surgically implanted by Dr. Levi Watkins of Johns Hopkins Hospital in 1980. It required a full thoracotomy (surgical opening of the chest) with defibrillator patches applied to the heart. These patches were attached under the skin and through blood vessels to a generator device that was installed in the patient's abdomen.

Today ICDs are much smaller. The generating device is less than three inches long, a half-inch thick and weighs about three ounces. It's inserted in the left chest region, similar to where pacemakers are placed. The leads used to defibrillate are spring or coil electrodes that attach to the heart through blood vessels. Implantation today requires much less invasive surgery, and the devices use a combination of rate, rhythm and morphology discrimination methods to determine if a fast rhythm is normal (e.g., from exercise), or if it is ventricular tachycardia or ventricular fibrillation. In 2005, about 91,000 ICDs were implanted, almost double the 46,000 devices implanted in 2001.

Source: *Sudden Cardiac Arrest Association*

## Scar Envy | charlie rivet

One of the most remarkable advances in just the past 10 years is the improved technique for extracting veins to use as grafts for a bypass operation. After my triple-bypass surgery in 1998, I was left with an ugly scar from the groin to the ankle. It gave me more trouble than the chest wound, and to this day I will not wear a short swimsuit.

These days the patients I visit proudly show me (unsolicited) their beautiful 2-inch scars!

*Charlie Rivet, President, Chapter 38, Houston*

## The Difference 15 Years Makes | judith borbone

In 1992, at age 44, I had quadruple bypass surgery. I was not allowed to go home by myself, so my mother moved in with me for a few months. The pain meds didn't help much and made me sick to my stomach. I was cut from ankle to groin on one leg and ankle to knee on the other to harvest veins. I don't know which was more painful, my chest or my legs!

In January 2007 I had triple-bypass surgery. I was able to go home alone, and I could take care of myself. The pain meds were great; they took care of the pain and caused no side effects. Also, to take veins out of my legs, the surgeon made a small incision at either end and pulled them out. There was some discomfort, but nowhere near as much as in 1994 when they did the long, outside incisions.

*Judith Borbone, Chapter 20, Worcester, Massachusetts*

## 67 Extra Years | milton klein

In January 1983 I had a mitral valve replaced. I was in ICU for four days and in the hospital for three weeks. This was then normal procedure. Although I was a bit uncomfortable, they taught me to use a pillow when I coughed, and that helped. I was quite depressed when I came home. The surgeon sent me a letter that explained the depression was a normal reaction and would go away as I got stronger. It did.

In April 1988, I had another valve replaced. That surgery was much easier. The chest incision was made very close to the first one, so it looks like one large incision. After that procedure, I was in ICU for one day and in the hospital for 10 days and did not experience depression.

These valve problems started when I was 6 years old and had rheumatic fever. The doctor told my mother that I'd be lucky to reach age 16. I am now 83. See how far medicine has come in keeping us alive!

*Milton Klein, Chapter 168, Baltimore, Maryland*

## Better Living through Cardiology | claude ballin


I had a triple bypass in October 1987. The pain was negligible, though I was uncomfortable. Ten days later, as I was leaving the hospital, one of the nurses asked if anyone told me I had to request pain medicine? I had never asked and so never received any. What I did have was itching of the skin where the sewing was done. It was cleared up with ordinary skin ointment. My recovery took about four weeks. After eight weeks we took a cross-country trip, and I was able to lift luggage.

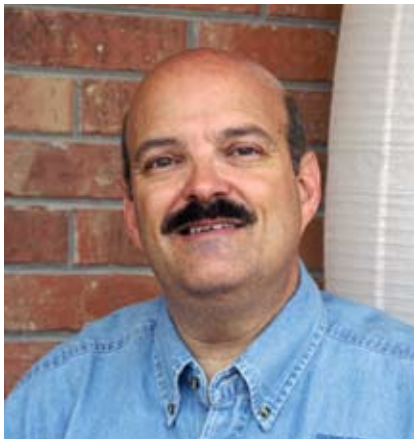
Since 1993 I have followed the Dean Ornish diet – no meat, no fish, no fat plus exercise and meditation (which I do not do). I have started to eat fish again, usually salmon. I walk, ride a bicycle and swim.

In April 2006 I had three stents inserted. Early the next morning I was awakened by four nurses asking how I felt. "If you would let me sleep I would feel even better," I said. It seems the monitor showed a rapid heartbeat, but I felt nothing. To make a long story short, I received a pacemaker

and defibrillator. That was on a Friday and I went home on Saturday. So far I have never felt it go off, but it has made my life lots better. It is checked in the hospital every three months, though I just received a new device that lets me check it by phone.

*Claude Ballin, Chapter 45, Queens-Nassau, New York*

## Tick, Tick, Tick | larry abramson



In 1959, at age 4, I was diagnosed with a congenital bicuspid aortic valve (the aortic valve is normally a tricuspid). By 1966, I was having symptoms. That December I had a cardiac catheterization, which showed that one side of my valve (where the cusp was missing) was thickening and the valve wasn't opening or closing completely.

In February 1967, I had an aortic commissurotomy (widening the valve opening to allow for more blood flow). I woke up after surgery in CICU lying on a bed of ice, inside an oxygen tent with the oxygen running through ice. The theory back then was that after lowering a person's body temperature for surgery, they needed to bring it back slowly so as not to shock the system. Believe me, lying on ice was much more shocking than raising my body temperature! I was moved to a regular bed and restricted to a liquid diet. The first day I was allowed solid food, my dad snuck in an absolutely wonderful New York pizza!

I was in the hospital for 10 days before I was allowed to return home. I was a bit of a hero at school with that big scar down my chest. It was also great for scaring away the bullies from the next neighborhood! My friends and I told them that I had been in a knife fight and "you should see the other guy!"

Then in 1975 I started having symptoms again. After a third catheterization, it was decided that the time had come for another surgery. In June, I had an aortic valve replacement. Unlike in 1967, my body temperature was brought back up almost immediately and I was allowed to eat anything I wanted. Lying in my room, I heard a ticking sound and looked around for the clock before realizing the ticking was coming from inside me. I found a stethoscope and listened to my chest – tick, tick, tick. No one told me the valve was going to make noise! Sure makes it easy to take my pulse.

While I did have quite a bit of pain, it was made bearable by the wonderful nurses. Allow me to explain: There was a nursing school across the street from the hospital, and the student nurses worked at the hospital for practical experience. So, there I was, 20 years old with a bunch of 20-year-old student nurses taking care of me. Who cared about pain, I was in heaven!

I have been married for 28 years to Michele, who loves the ticking of my valve! I was recently diagnosed with congestive heart failure – about 25–30 percent of my heart muscle is effectively dead. Apparently I had had two silent heart attacks. I'm on medication and feel fine.

*Larry Abramson, Member-at-Large, Olive Branch, Mississippi*

## Getting Her Shopping Done | jill johnson

In my mid-twenties I was diagnosed with a mild case of mitral valve prolapse and had an irregular heartbeat for years. In early 2005, when I was 40 years old, I was in for my annual physical, and my doctor suggested I see a cardiologist because my heartbeat was erratic.

In March 2005 my cardiologist said I would need a mitral valve repair or replacement within two years. However, the problem worsened faster than expected, and five months later I passed out in a Macy's dressing room while trying on swimsuits. A woman in the next room heard a thump and crawled under the door to check on me. Imagine my surprise when I woke up with a man looking down at me. Thank goodness I was still wearing the swimsuit! The paramedics helped me get dressed and on to a stretcher – I'd also sprained my ankle during the fall. The clerk said I could return the suit later, but it was on sale and the only one that fit, so I ended up giving her my credit card from the stretcher! Besides, like most women, I hate shopping for swimsuits and didn't want to start over.

After some tests at the hospital, my cardiologist told me that my heart function had diminished to the point where I needed surgery right away. Thankfully, he had already discussed my case with an excellent surgeon, who specialized in minimally invasive mitral valve surgeries. He

repaired my valve two days later on September 1, 2005.

I was in the hospital for five days. I didn't feel much pain because of the morphine epidural and the painkillers, but it was difficult to get around. I had a lot of bandages across my chest and tubes sticking out of me, plus I had to wear a boot for the sprain. I hobbled around the cardiac floor, walking a little further each time.

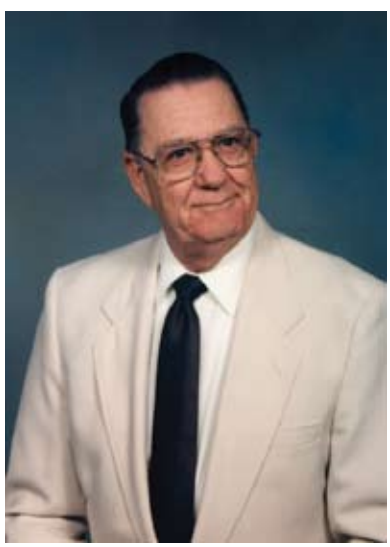
With the minimally invasive procedure, I only had the main incision under my right breast and a few small holes left by various tubes and a camera. There was an incision from the heart-lung machine at the top of my leg.

The first week home was very painful. My chest hurt and my incisions were uncomfortable when my clothes touched them. The boot made it difficult to get around. My husband Jeff worked from home and helped me out of bed and to bathe. By week 2, I was walking outside, and by the end of week 3 I was walking without the boot. In October I worked my way up to hour-long walks and finally got back on my elliptical trainer. My physicians told me to plan on a 6–8 week recovery, and they were right.

In December, my husband and I met friends in Mexico. We'd been planning the trip for months, which was why I was trying on swimsuits at Macy's in the first place. I wore the suit I'd purchased from the stretcher, and my scars were so well-hidden that it was difficult to tell I'd even had surgery. In fact, two years later I was in for an echocardiogram, and the technician said my file indicated I'd had a valve repair but she didn't see any scars. I had to show her where they were.

*Jill Johnson, Chapter 30, Lewisville, Texas*

## Still a Citizen of the Earth | wayne a. lawson



In September 1984, I had a heart attack while in the hospital in Joplin, Missouri. The next day I had a quadruple bypass. I spent two and a half days in CVICU. A week later I went home, the proud owner of a 12-inch "zipper" and four smaller ones in my leg.

At home I noticed when I turned a certain way something would shift in my sternum. Later I found out that was where my sternum had been wired together. During that first year I made several trips to the hospital because of chest pain similar to my heart attack, but no problems were found. While discussing this with my GP, he asked me to call him the next time it happened. I did, and he asked me to come to his office the next day. He gave me arthritis medicine to take when I felt the pain. Turned out my problem was the same as anyone who has suffered a broken bone – discomfort when a storm front approaches.

When I asked my cardiologist how long the grafts would last, he said about five years. After five years I asked again, and he said they had found they would last about 10 years. After 10 years I asked again, and he said, "They last just as long as they last!"

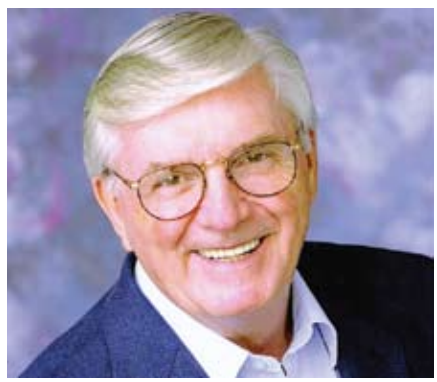
About 10 years after my surgery, I went to the hospital with discomfort in my chest. Catheterization showed two grafts had blockages, and they wanted to put stents in them. I received three stents. While they were doing this, they discovered my heart had formed two new capillaries and the two grafts that were not needed had disappeared.

About four years later I again went to the hospital with chest discomfort. They found that two of the stents were blocked and put smaller stents into them. They also put a radioactive pill inside the new stents (brachytherapy) to sterilize them and keep scar tissue and plaque from rebuilding.

I was 54 years old at the time of my first procedure and am now 79. Without these procedures I am sure I would no longer be a citizen of this earth. I can do almost anything I care to, including bird hunting and fishing – you know, the finer things in life.

*Wayne A. Lawson, Midwest Regional Director, Joplin, Missouri*

## A Walking Time Bomb | bill mccord



I have had two bypass surgeries 10 years apart. My first, in 1987, was quite scary. I have family history of heart disease on my mother's side. When I went for my annual physical, they saw something in my EKG and told me to see my doctor when I went home. He sent me to a cardiologist who did a catheterization and found the blockages. The doctor said I was a walking time bomb. I was in the hospital for about 10 days. The worst part was when they took the tube out of my chest. I never tell the patients I visit about that.

My second surgery was 10 years later when I was 65. I had some symptoms that time – pain in my left arm and some numbness in my left hand. The second time was easier. The pain level was much less. My first incision ran from my ankle to my inner thigh; the second time they did three small incisions on my other leg. Even the tube removal was easier. They had me up and walking the second time much more quickly, and I was in the hospital only about six days.

*Bill McCord, Chapter 298, Leesburg, Florida*

## Hoping the Second Time's the Charm | john amidon

Back in 1978, when I was 38, I was a four-pack-a-day smoker and had a severe attack. Three main arteries were blocked – two were 100 percent and the third was 90. As a result, I had a triple bypass using a heart-lung machine. They took the grafts from my left leg, opening it up from ankle to groin; the stitches and staples they used to close the wound caused me severe pain. I spent two and a half days in CICU and a total of eight days in the hospital. I returned to work half days five and a half weeks later. All my coronary functions were at 100 percent. Within three months I was jogging. I quit smoking, and over the next nine years I ran in nine marathons.

By 2006, all the original grafts had collapsed and I had to have a quadruple bypass. They took two grafts from my left leg with a 2-inch incision; the two other grafts were from a mammary artery. The operation was off-pump, and the incisions were closed with hi-tech super glue. I only had moderate pain. I spent one day in CICU and five days in the hospital. Within two days I was walking, and that is my main exercise now, plus swimming when the weather warms up. I went back to work in three weeks.

Although the second procedure was much easier than the first because of the improved technology and knowing what to expect, I don't want to do this a third time. As I told the surgeon as they took me in, "Doc, if you get me 28 years on this set of grafts, I think I'll be fine."

*John Amidon, Chapter 68, Phoenix, Arizona*

# Historical Hearts

## October–December 2008

### 35 years

Atlanta, GA • Chapter 81 • Mid-Atlantic Region

### 30 years

Circle City, IN • Chapter 78 • Central Region

Ohio Valley, Steubenville, OH • Chapter 87 • Central Region

### 25 years

Sudbury, Ontario, Canada • Chapter 154 • Northeast Region

Hollywood Memorial, FL • Chapter 161 • Southern Region

### 20 years

St. Mary's Medical Center Mended Hearts, Jefferson City, MO • Chapter 204 • Midwest Region

Good Samaritan, Downers Grove, IL • Chapter 205 • Midwest Region

Palm Beach Co., FL • Chapter 206 • Southern Region

### 15 years

NW Community Hospital of Arlington Heights, IL • Chapter 248 • Midwest Region

Chippewa Valley, Eau Claire, WI • Chapter 249 • Midwest Region

### 10 years

Lakewood, CA • Chapter 149 • Western Region

Providence Hospital Mended Hearts, Columbia, SC • Chapter 189 • Mid-Atlantic Region

### 5 years

Rock River Valley Mended Hearts, Rockford, IL • Chapter 317 • Midwest Region

Austin, TX • Chapter 318 • Southwest Region