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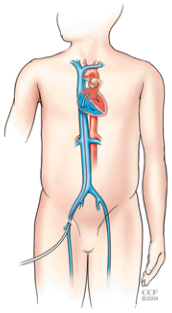
Summary

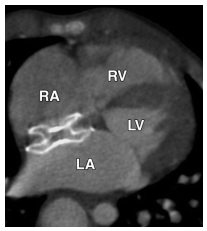
Personal surgical experiences led me to write this Fortnightly paper. Today an amazing 85,000 elective operations are carried each day in the U.S. This means that every person will have at least nine surgeries in a life time. A historical perspective follows the amazing advancements that surgery has gone through in approximately the last three hundred years. Modern surgery, as we know it today, began in the middle of the 18th century where the leading medical schools were in Europe. The introduction of anesthesia in 1844 mercifully changed the agony of surgery. There was so little known, at that time, about the role that bacteria played in the almost routine infections that occurred with any type of surgical procedure. It was Joseph Lister, in 1867, that promoted the use of carbolic acid as an antiseptic, and the importance of washing your hands prior to surgery. Surgical techniques have certainly changed drastically over the years. In the past most of the pain associated with surgery was caused by the surgeon getting access to the problematic area in the body. Today, with the advancement of the most amazing non evasive techniques, post-operative pain in many cases has been drastically decreased and hospital stays have been greatly shortened. The future even brings more exciting possibilities by marrying high-tech imaging machinery to miniature robotic tools. Surgeons may be able to journey into more remote, less accessible regions of the body with perfect surgical precision.

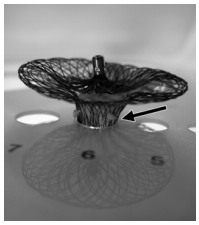
ADVANCEMENTS IN SURGERY & THE DEVELOPMENT OF NON-INVASIVE TECHNIQUES

By: W. Ronald Helbron D.D.S.

Assembly Room A.K. Smiley Public Library







ADVANCEMENTS IN SURGERY & THE DEVELOPMENT OF NON-INVASIVE TECHNIQUES

Fifteen years ago during a routine medical exam my physician suggested that I take antibiotics before having my teeth cleaned because of a heart murmur. I knew that sometimes heart murmurs do not need to be covered prophylactically and one simple way to find out is with a echocardiogram. A couple of weeks later I was hooked up to a machine in the cardiologists office and the tech that was conducting the test became quite excited when he noted what he thought was a hole allowing blood to flow between the two upper chambers of my heart. A subsequent review by the Cardiologist confirmed that I had an Atrial Septal Defect (ASD), about an inch in diameter. Evidently I had this all of my life, and that it would it would need to be repaired with open heart surgery. The good thing was I would not need antibiotics before dental procedures, but I was not happy at all about having my chest cracked open for something that was giving me very few symptoms. I did a little research on my own and consulted with a friend who was a retired Pediatric Cardiologist. He listened to my heart and we discussed the pros and cons of this type of treatment. Because of the possibility of a stroke if nothing

was done, both of us felt something needed to be done, but maybe I could wait because he felt there was a possibility of a less invasive way of handling this coming along in the future.

About five years passed, as I annually had my condition monitored, then I received a call from my friend. Through his connection at UCLA Medical Center he was made aware of a new member of the medical staff that was responsible for the development of a non-evasive procedure to repair a defect such as mine. With in weeks I had an appointment Dr. John Moore and soon afterward had an appointment for the placement of a devise that would repair this problem. On a Thursday morning in January my wife and I along good friend and Fortnightly member Jim Belote entered UCLA Medical Center Hospital. This being a teaching hospital, Jim had come along to watch the whole procedure in the gallery overlooking the operating room.

The Amplatzer implant is a self-expanding double disk made of wire mesh and polyester fabric with a neck of different sizes to correspond to the hole in the septum between the two chambers of the upper heart or atrium.

Here is how it works: The doctor makes a small incision in the groin and threads the delivery system through a major blood vessel into the heart. Inside the heart he determines the size of the hole and subsequently selects an Amplatzer with a proper size neck. The devise in it's collapsed form is transported through the vein and opened leading cap first, then neck (which centers the devise) and then the opposing cap. This expanded wire implant is released from the delivery system and is sandwiches on both sides of the atrial septum therefore blocking the flow of blood through the old opening.

This experience got me got me thinking about the remarkable advances that have taken place in surgery in just a few years. I therefore thought it might be an interesting subject to pursue for this paper.

While most of us don't consider surgery an agreeable subject to think about, it is of a great deal of importance to all of us. An astonishing 85,000 elective operations are carried out in hospitals and clinics each weekday throughout the United States. Emergency cases, particularly at night and on weekends, add to the total. This means that statistically every person will undergo over nine surgical procedures in a lifetime.

Modern surgery as we know it today began in the mid 18th century. You must remember that the first surgeons were barbers and they would tie their blooded bandages outside the shop to dry. (The windblown bandages wrapping around poles gave rise to the traditional barber-pole emblem.) The operating theaters then were pure torture chambers. Onlookers crowded around the table to view the relatively few procedures that were preformed. Medical schools in Scotland in 1750 for example were designed for 200 spectators seated in high tier seats overlooking the operating table. Once the floor had been cleaned of blood , the chamber could be used as a lecture hall, autopsy room or chapel. The young Charles Darwin was so appalled by the blood, screams and violence he experienced while watching a surgery in1825 that he gave up thoughts of going into medicine.

Napoleon Bonaparte suffered for years with bladder stones and spent much of his time during the Battle of Borodino in the Russian Campaign of 1812 dismounted from his horse and leaning against a tree trying to empty his bladder. The clouded judgement that led to an ill and debilitated Napoleon III to declare war on Germany in 1870 was apparently related to the disease. Three years latter the emperor died following an unsuccessful surgical removal. Benjamin Franklin suffered agonies during the last eight years of his life, chose to defer operative intervention and succumbed at age 84 in sustained misery.

Extractions of bladder stones lived up to its horrific reputation. Celsus a non-physician medical writer of ancient Rome, portrayed in detail an enduring technique for "cutting on the gripe," incising through the prostate gland directly into the bladder. The patient lay face-up on the table, ankles and wrists tied together, knees spread and head and body restrained by burly attendants. This "lithotomy position," still used for rectal procedures and in gynecologic and

urologic surgery. allows full access to the perineum, the area between the external genitalia and the anus. The operator inserted a finger in the rectum, felt the bladder, and pushed the stone forward. Quickly, without anesthesia, opening intervening tissues, he removed the hard object with his finger, a hook, or as methods of performing the procedure changed, with scoops or instruments. This procedure was used for centuries before an itinerant French practitioner, Frere Jacques de Beaulieu (the Frere Jacques of nursery-rhyme fame) designed and popularized a less disruptive incision made through the intervening tissues to the side of the midline and away from the prostate and the urethra. With the stone extracted and urine flowing freely from the incision site, the intense bladder spasms the patient had experienced for so long disappeared. If he or she survived without an infection, the fistulous track would close.

In 1840 when this procedure was popular, many times the patient's problems were just beginning. The actual operation must have been beyond agony. The removal of a large stone must have given the patient some since of relief for a short time, but within a few days, he began to sicken again from the inevitable sepsis that the unwashed hands of the surgeon and the inadequately cleaned, incrusted instruments had introduced into the incision. During the last few days of his misery, his doctors tortured him further with blistering enemas, laxatives of senna and rhubarb, administration of opium and aromatic spices. Toward the end of an aggressive session of bloodletting the patient died. His horrible experience was all too common throughout centuries of surgical intervention. Unfortunately, for this patient, just a few years later the medical community would just begin to understand the the role bacteria played in infections and surgical success.

Fortunately, an alternate approach that was first attempted by the ancient Egyptians and has undergone many modifications thereafter involved a crushing device that was inserted through the penis directly into the bladder. The surgeon could then locate the stone by feel, grasp it, then attempt to break it into pieces that could then pulled out or passed by the patient. This approach has, with the advent of fiber optic light source, miniature cameras and ultrasonic devices, allowed todays urologists to see these deposits and break them up with sophisticated high-frequency shock waves transmitted from outside the body.

Bloodletting, a practice that unfortunately took precedence over surgeons direct experience or actual clinical trials, and was a standard procedure. This was long considered a panacea for all illness and was a standard regimen for many operations. The letting of blood was used to weaken the patient and make him or her less conscious of pain. The origin of this belief is quite obscure and is documented in Egyptian papyrus scrolls. Hippocrates, the Greek Father of Medicine, taught in the fifth century BC that the four humors, (four bodily fluids), were the cause of all disease. Remedies, particularly bleeding, were designed to correct this imbalance.

For early surgeons, one of the few invasive procedures that they could do easily was bloodletting. By 1750 almost three quarters of patients in some large British hospitals were bled routinely and many on a daily basis. During the yellow fever outbreak in Philadelphia in 1793, Benjamin Rush, one of the foremost clinician of his time, was so aggressive with this procedure that he without a doubt shortened many lives. His particular zeal for bloodletting probably influenced those treating George Washington's sore throat six years latter to ensure his demise.

Despite mounting evidence, this tradition has died very slowly in relative modern times. Sir William Osler advocated this treatment in the seventh (1907) edition of the very popular textbook, The Principles of Medicine. A section of the 1948 sixteenth edition still discussed bleeding to treat a variety of conditions that that included pneumonia, emphysema, stroke, pleurisy, peritonitis, delirium, and mumps, although this advise was not included in subsequent editions.

The introduction of anesthesia during the nineteenth century changed surgical operations from unbearable ordeals of terror and unimaginable pain to calm and elective events. The effects of nitrous oxide, otherwise known as "laughing gas" and ether were known as sleep inducers but never as something that could control pain particularly in the early part of the century. In 1844 a dentist from Hartford, Connecticut, Horace Wells, heard a lecture on the effects of inhaling nitrous oxide. Intrigued, Wells convinced a colleague to pull one of his molars under it's influence. When he woke up, Wells remembered nothing of the procedure. A later public demonstration failed when the patient woke up screaming. An ex-partner of Wells, William Morton, moved to Boston, where a chemistry professor convinced him to change from nitrous oxide to ether in his dental practice. Morton used the latter agent on a dog, his

assistant, on himself, and on a patient so successfully that he convinced his friend John Collins MD, a surgeon at Massachusetts General Hospital to use ether on a patient.

One hundred sixty seven years ago, in the operating theater at MGH, one of the greatest moments in medicine occurred, On Oct. 16, 1846, William T.G. Morton, A Boston dentist, using a specially designed glass inhaler that contained an ether soaked sponge, administered the anesthetic to Gilbert Abbot, a printer who had come to the hospital for treatment of a vascular tumor on his jaw. After several minutes, Abbott was rendered unconscious. John Collins Warren, MD, one of the most widely recognized surgeons of the time, then surgically removed the tumor. Upon waking, Abbott informed the curious and skeptical physicians and medical students in the theater that he had experienced no pain.[1]

As Abbott was being carried from the operating theater, Warren turned and faced the incredulous assemblage of onlookers. "Gentlemen, this is no humbug," he said, offering a peculiar, yet powerful, endorsement of the effectiveness of anesthesia in surgery. With these now-famous words, a new era of medicine began.

Even with the wonderful mercy of anesthesia, surgical operations remained potentially deadly. The cause was infection. The scourge of often fatal infections of the uterus that spreads throughout the body after childbirth, stimulated the first formal efforts to control sepsis. Only a few had even had considered the possibility that a surgeon or other the attendant could prevent the spread of contamination among patients by simple measures of hygiene. Oliver Wendell Holmes, who had studied medicine in Paris and was aware of French chemist Louie Pasteur and British physician Joseph Lister's work on bacterial infections. [2] Holmes was one of the lone voices insisting in 1843 that practitioners should not tend to women in labor immediately after they had conducted postmortem examinations on those who had died of infection.

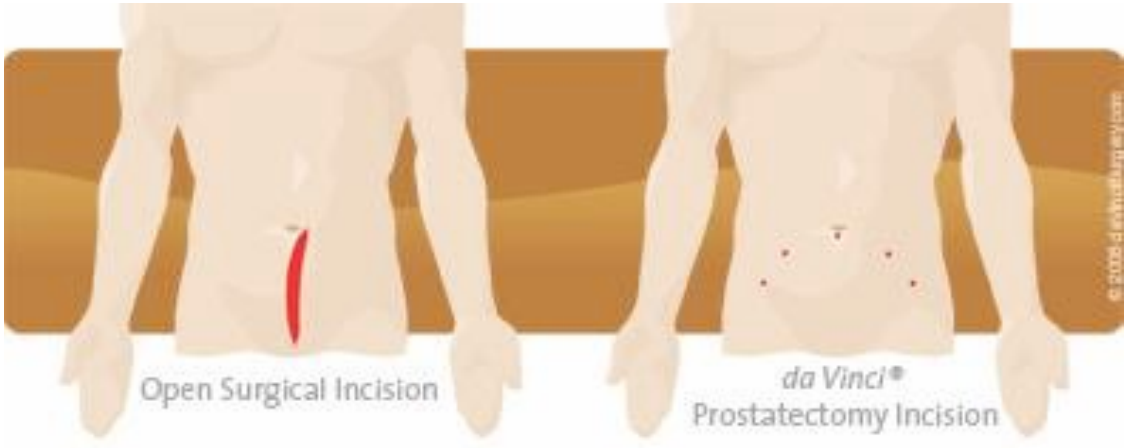
Between 1846 and 1865, anesthesia and the means to control infections were introduced. The combination of these two revolutions in surgical practice quickly opened the way for the introduction of more and more effective operative interventions and treatment.

Over the next one hundred years, phenomenal advances occurred in both medicine and surgery. Development of antibiotics by Lister and others, diagnostic medicine, and the invention of imaging x-ray devices completely changed the practice of medicine. After World War II, equipment, monitoring devices, and anesthesia became increasingly sophisticated and personnel more highly trained.

Today Orthopedic surgeons perform over 300,000 hip replacements each year which has been a significant benefit to the large numbers of patients that have been affected with degenerative hip disease. In the 1950's Orthopedic investigators had devised a prosthetic ball on a metal stem that could be thrust into the bone of the upper thigh. However this devise inevitably loosened because there was no satisfactory means to anchor it. A decade later, a surgeon in Manchester, England began to consider this problem. John Charnley trained as a general surgeon carried out research in a physiology laboratory and spent time learning how to operate a lathe to make small medical apparatuses that could duplicated the anatomy of the hip joint. Testing some new plastics he introduced a new novelty by creating a socket to accept the metal ball devise, and then glued both parts to the appropriate sites of pelvis and femur with a bone cement, methyl methacrylate, that had been introduced to him by a dentist. Introduced in 1962, this procedure has been performed through out the world with ever-improving results and constant advances in technique and materials. This remarkable operation has been so effective and productive that it is now considered on par with coronary bypass surgery in enhancing quality of life.

New, high-tech devices have totally changed the way new physicians are trained today. New imaging systems, for instances, have reached such sophistication in visualizing the human anatomy that operators can now see minute abnormalities that previous practitioners could only dream of. The traditional "exploratory" operation, for instance, in which a surgeon opens the patient with only a tentative diagnosis or guess as to what the patient's problem is, has become a thing of the past. Body parts stand out in exquisite textbook detail. The exactness of these allows radiographers or surgeons to place catheters precisely into remote parts of the body inject drugs or dyes, to dilate constricted vessels of the heart with small mesh cylinders that keep the site open or repair damaged valves or other structures.

The teaching of surgical skills to new surgeons today has undergone a massive transformation. The public today expects their surgeons to be highly trained and competent in the treatment of their conditions. There is probably less time spent in the operating room by the graduating students. Part of this is because of curtailed work hours and an increased focus on minimally invasive techniques, such as laparoscopy. In response to this, the technical training of young surgeons has increasingly relied on simulated technology. In growing numbers medical schools are using amazingly realistic models and mannequins that duplicate the human body. Relatively lifelike tissues and organs help the neophyte resident gain expertise in the manipulation of instruments, stapling, suturing, knot tying, and other basic skills. This departure from previous teaching methods is based on simulation training of airline pilots, in which student learn to cope with all eventualities, both routine and emergent. Similarly the model patient lies in an operating room, exact in every detail. Sitting in another room and viewing the procedure through a window, a technician can control all facets of a given operation electronically. He or she can make the blood pressure decline as with rapid blood loss. The model



patient may stop breathing and need to have a tube inserted into his trachea. He can make red dye squirt from a fresh incision in plasticized skin. Although no models can simulate real situations, much can be learned and the intern will have developed rudimentary skills before he or she approaches the first live patient.

If your idea of surgery comes mainly from TV-doctor drama, you'll find this operating suite in one of todays high tech operating rooms a bit disorienting. There's a major surgery in progress---that's what they tell you, anyway---but you can't see the patient. For that matter you can't see the

surgeon. There must be a scalpel wielder here somewhere, but all you can see is people sitting at machines in near darkness. The largest of these machines is a weird contraption in the middle of the room, spider-like arms, shrouded in plastic sleeves and protective drapery. Next to it are several lounge chairs facing a wall of enormous flat-screened monitors. The place looks somewhat like a spaceship control room and the people are wearing 3-D glasses.

Actually, there is a patient lying in the center of the largest machine--which turns out to be a surgical robot. Beneath those drapes, the robot has it's skinny arms buried deep in the patient's abdomen, busily lifting and cutting and cauterizing with it's tiny instrument hands, guided by a man at the far side of the room---his face peering into a console, his hands operating a pair of souped-up joysticks, his stocking feet pressing pedals more in the manner of an organist, that a surgeon. Every move of the robot is visible, in real time, on a shrouded monitor of the operation site in the belly of the sleeping patient, brilliantly lit, magnificently magnified and startling vivid in high def. [3]

The development of this robot evolved out of a U.S. Army-sponsored project in the 1980's to develop a remote controlled laparoscopic robot for battlefield surgery. That project is still only fantasy. But a couple of companies saw commercial applications of this idea and in 1999 the first surgical robots were introduced as the next phase of minimally evasive surgery.

As I mentioned at the beginning of this paper, my interest in non-evasive surgery began because of a personal surgical experience a number of years ago. This was re-enhanced about three years ago when I was diagnosed with prostate cancer. I felt, in a way, fortunate because out of ten biopsies of my prostate, only one came back positive and he might have missed it all together. My Urologist then gave me the choice of five treatment modalities to choose from. Watchful waiting, Surgery, Radiation Therapy (both standard & proton & seeds), Hormone Therapy, and Chemotherapy. I now had to make a choice. Having lost a daughter to cancer, I did not want to just watch this. I also had a good friend who had Proton radiation with a disastrous result. Maybe because of my dental background, I decided just to have this problem gland mechanically removed with surgery, and the non-evasive approach of the Da Vinci system seemed the most appealing. Fortunately, within one week of contacting two friends who had been through this before and had great success with with the same very experienced surgeon, I made an appointment to proceed with treatment. This young urologist was a graduate of Loma

Linda Medical school and had spent five years at City of Hope perfecting his skills with the Da Vinci system and had performed over 1200 of these laparoscopic procedures. With this decision made, I wanted to know a little bit more about what was involved.

Robot-assisted laparoscopic prostatectomy (RALP) is a rapidly evolving technique for the treatment of localized prostate cancer. In a 2009 article* it was stated that in the United States, over 65% of radical prostatectomies are robot-assisted. The data shows the advantage of RALP over the old "gold standard" RRP open radical retro-pubic prostatectomies, which involve a 12inch incision. RALP results with shorter hospital stays, reduced blood loss, decreased pain, and earlier mobilization of the patient. Granted, one can find many differing opinions on the internet supporting both of the above treatment modalities, but recent studies have shown that the robot assisted surgical approach has a much lower rate of positive cancer margins of the excised gland tissue than with the open surgical technique. Positive surgical margins were present in 28.6% of RALP and 57,5% RRP, a statistically significant difference. [4]

Prostate cancer is the most common and the second leading cause of cancer-related death in men in the United States. Fortunately, men diagnosed with this disease have a number of options for treatment, some more aggressive than others. Those seeking a surgical approach can choose between the open direct technique or the less evasive laparoscopic surgery. Granted the Da Vinci approach has a rather long learning curve in order to master this technique. With a well trained Urologist using a robotic-assisted laparoscopic prostatectomy which allows three-dimensional viewing, improved ergonomic efficiency, eliminated hand tremor, and refined dexterity can obtain excellent results. [5]

Fortunately, at Hoag Memorial they had a very well organized pre-surgery preparatory program for the patient in which each individual was throughly

coached by a knowledgeable oncological nurse on what to expect, and how to handle the catheter and bag that I would need for about a week. The day of the surgery I was wheeled into a pre surgery room around noon and was met by my Urologist and the Anesthesiologist, a young Stanford grad, who reassured me that because of the advances in pharmacology, the very safe general anesthesia he would be using would not give any lasting side effects, and as a side-line these drugs have drastically reduced the malpractice premium he pays. After the administration of a premed the next thing I knew I was waking up and felt remarkably alert. A few minutes latter my surgeon came in to tell me that he felt the procedure went quite well and that I could get out of bed, if I felt like it, around 9:00 pm and also if I felt good enough and could latter on walk around the upper floor of the hospital wing and I might be able to go home tomorrow. I was then wheeled to my room which had a fantastic view of Newport harbor and a comfortable bed for my wife, Nikki. During the evening I was able to preform those given tasks and after meeting with my urological surgeon in the morning ,where he gave me the good news that he was quite confident that the entire tumor had been removed and there were no metastasis, I was dismissed at 10:30 am.

I feel very fortunate to have had such good success with this procedure, with no major problems with incontinence or sexual function at this date and only six barely visible less than one inch scars to show for it. To top this off all of my PSA tests since this experience have come back less than "0.1". I know that not everyone has outcomes like this and that maybe other treatment modalities might have been just as successful, but for me I think I chose the proper approach.

Beyond the prostate, robot-assisted laparoscopy is being applied in all regions of the abdomen, from gall bladders to hysterectomies, from hernia repairs to liver resections. The abdomen is wonderful place to be a robot because the surgeon can inflate the area with carbon dioxide and then light the location like a film studio. But in even tighter places cardiac surgeons, thoracic, orthopedic surgeons, - even neurosurgeons---are joy-sticking their way through operations on hearts, throats, joints, and brains.

Other robotic advances offer tantalizing glimpses of a mechanized medical future. By marrying high-tech imaging machinery to robotic tools, surgeons may journey into even more remote, less accessible regions of the body with perfect surgical precision. Perhaps one day there will be no need for a human

surgeon. Researchers in artificial intelligence are working to design computers able to learn surgical techniques and then apply those patterns to steer robots through common operations. If you add wireless technology, and maybe remote robots in underdeveloped parts of the world will perform surgery far from the humans or supercomputers controlling them. One thing many of us wonder about is what happens if there's a power failure or the machine malfunctions? But a few years ago, doctors in New York guided a robot in France through a simple gall bladder procedure with excellent results.

The amazing changes in surgery and medical care we have seen and those advances that we can only dream of are certainly exciting to all of us. But because of the problematic uncertainties of our government's recent aggressive involvement in medical care it will difficult to predict what the future will hold. One can only hope that future advances, fueled by the public's expectations will stimulate our future medical care system to provide the best, quality and treatment facilities in the world, along with new and more advanced non-evasive surgical procedures that will improve the outcome of treatment and speed of our recovery.

BIOGRAPHY

W. Ronald Helbron was born in San Bernardino, California in 1938. He moved to Redlands in 1944 when his father Bill and fellow Fortnightly member Steve Stockton's father Karp opened Stockton-Helbron Sporting Goods. In 1956 he graduated from Redlands High School and San Bernardino Valley College in 1958. He attended the University of Southern California where he was a member of Alpha Tau Omega social fraternity, and Delta Sigma Delta dental fraternity. In 1963 he graduated from the U.S.C. School of Dentistry and married his wife Nikki. Ron then joined the U.S. army and became a captain in the Army Dental Corp., stationed in Stuttgart, Germany from 1963 to 1965. He has been a practicing dentist in Redlands from 1966 to the present.

Ron has been involved with a number of community organizations over the years. some of them include: member and past board member of Redlands Rotary for 47 years, a past board member of the Friends of Prospect Park,

Redlands Y.M.C.A. (past board member and President 1994-1996), present board member - Kimberley Shirk Association, Assistance League of Redlands (volunteer dentist for 10 years and presently on the Dental Advisory Committee).

Ron has been married to Nikki for 50 years and they have two daughters, Karyn Kasvin, Kristine West and 9 grandchildren.

KEYWORDS

Atrial Septal Defect, Amplatzer, Bloodletting, Nitrous Oxide, Robot-assisted Radical Prostatectomy, DaVinci

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