



Robert Edward Gross



On the wall of his operating room hung a sign, stating, “IF AN OPERATION IS DIFFICULT YOU ARE NOT DOING IT PROPERLY”. This philosophy of perfection characterized the brilliant surgical career of Robert E. Gross, spanning 40 years from 1927 to 1967 at Harvard Medical School, Children’s Hospital, and Peter Bent Brigham Hospital.

Gross burst onto the stage of pediatric surgery world-wide when he successfully ligated a patent ductus arteriosus in a 7-year-old girl, Lorraine Sweeny, on August 26, 1938. He was then Chief Resident in Surgery at Children’s under William E. Ladd the Surgeon in Chief. Gross had carefully planned this bold operation by practicing it in the postmortem room and animal laboratory. He did it when Ladd was on summer vacation. Ladd never forgave Gross for that surgical coup. Gross was certain Ladd would not have allowed him to do it if he had been in town.

The operative note of this first ductus is a classic. In contrast to Gross’s cryptic operative notes for most cases, this was three full pages of graphic prose: *“This gave a beautiful exposure of the base of the heart, aortic arch, and the superior part of the lung root. Palpating finger placed on the heart disclosed an astounding coarse and very strong thrill which was felt over the entire cardiac musculature. A finger running along the aortic arch and the thoracic aorta disclosed that there was practically no thrill over this vessel, but when the finger was put on the pulmonary artery there was a thrill of extreme magnety (word from op note, not in the dictionary). This ductus was approximately one quarter inch in length and was about three-eighths inch in diameter. Its walls were readily collapsible by digital pressure. The walls seem to me to be quite thin and more pliable than I expected they would be. Pressure on the ductus with one finger completely removed the thrill which had been previously felt over the pulmonary artery and the heart. It was interesting to note that the ductus was like the aorta in that it had no palpable thrill, but that all of the thrill was on the pulmonary artery side of this abnormal arterial communication. One must assume, therefore, that the murmur and the thrill are not caused by a rushing of blood against the orifice or walls of the ductus, but rather they are caused by an eddying of currents within the pulmonic artery or else are caused by a forceful stream of blood directed against the pulmonic artery wall opposite*

to the ductus opening. When the stethoscope was placed on the pulmonic artery there was an almost deafening continuous sound like rushing steam, which was accentuated during systole. When the ductus was obliterated all of these murmurs disappeared. This ligature was left on the ductus for a period of three minutes in order to see what effect obliteration might have on the patients general condition. There was no cyanosis of any degree. Blood pressure taken at intervals showed some rise of diastolic pressure and a slight slowing of the pulse as shown on the accompanying anesthesia chart. Therefore, believing that the ductus had not stayed open as a compensatory mechanism for some other cardiac defect it was decided to ligate it permanently. The clamp was taken off and the ductus was ligated with a single #8 braided silk circum-ambient suture. After this tie had been put in place it seemed as if everything was still in the operative field because previously there had been a continual buzz and thrill imparted to the finger through the instruments while working in the area, but now that the tie had been placed all of this buzzing completely disappeared.”

This bold adventure was the opening wedge for surgical correction of congenital cardiac malformations. Lorraine is now age 75. She remains in excellent health. In later reminiscing with her Gross commented that if she had not done well, he would likely be a farmer somewhere in New England. By the time of his retirement, more than 1,400 PDA's had been divided by Gross and his residents.

Gross was born in Baltimore Maryland July 2, 1905. He was the seventh of eight children. His father was a piano maker, whose father had come to Baltimore from Germany in 1856. As a boy Gross was described as quiet and contemplative. While sighting over a finger at a lighthouse in Atlantic City, by closing one eye and then the other, he discovered that he had no vision in one eye. His father gave him a clock to take apart and reassemble, and then another smaller one. This was to train Gross to develop depth perception with only one eye. None of us who trained with Gross knew he had that problem. It was revealed to one of his former chief residents who lost an eye to melanoma. Gross wrote him a letter of encouragement, divulging that he had operated his entire career with just one eye. His congenital cataract was later removed after he retired.

Gross attended Baltimore Polytech High School, which years later honored him as one of its most outstanding alumni. From there he went to Carlton College in Minnesota where he majored in chemistry. While in College he married Mary Lou Orr, daughter of a surgeon. He graduated with Phi Beta Kappa honors. He won a scholarship to attend the University of Wisconsin for three years after graduation, but changed his focus of interest when he was given a two-volume set of *The Life of Sir William Osler*, by Harvey Cushing. He then decided to enter medicine at Harvard Medical School. Soon after arriving at Harvard, Gross appeared in the operating room gallery to observe world famous surgeon, and father of American Neurosurgery, Harvey Cushing, who was Chief at the Brigham. Cushing looked up and asked him to identify himself. Gross said he was a medical student, Cushing told him to leave and return when he was a full-fledged doctor! Gross never forgot that humiliation. Throughout his surgical career he was always cordial to the medical students. A month of pediatric surgery with Gross was offered as an elective for fourth year medical students two at a time. That elective was always fully booked. It was close contact with Gross that steered the undersigned toward pediatric surgery.

A letter of recommendation for Gross to Dr. Ladd dated January 30, 1931, by Charles F. McKhann, Professor of Pediatrics, stated, *“Mr. Gross is an interested, eager and accurate student, somewhat above the average, has a pleasant personality and a good appearance. He should make a satisfactory House Officer.”* This lukewarm recommendation surely did not presage what lay in the future for this HMS student who would become one of the surgical greats of the 20th century as well as a role

model for pediatric surgeons the world over. In his class yearbook Gross noted his practice would be in Minneapolis someday, and that he would be starting his first postgraduate year at Children's Hospital. He actually started as a House Officer in Pathology for six months, with S. Burt Wolbach, Pathologist in Chief at the Children's and Brigham. He then had three months in surgery with Ladd. Gross then completed the pathology residency at the Brigham Hospital in 1935. He looked to Dr. Wolbach as his most important mentor. The next four years were spent in surgery, first under Elliot Cutler at the Brigham and then William Ladd at the Children's. He was Chief Resident in Surgery at both. He was a Peters Traveling Fellow in surgery for six months in 1937. He visited the clinic of world famous Ferdinand Sauerbruch in Berlin, just two years before Germany invaded Poland. Part of the fellowship was spent at the University of Edinburgh, where he did a research project concerning the vagus nerves.

Gross taught his trainees that success in academic surgery requires "burning the midnight oil". He certainly did that, completing 19 peer-reviewed papers by the time he finished his residencies. Gross compiled the clinical material which had been cared for by Ladd and others at Children's Hospital and in 1941 a book was published, *Abdominal Surgery of Infancy and Childhood*, by Ladd and Gross. Comparison of this book with other writings by Gross suggests that Gross composed most of the manuscript. Perchance we acquired a copy of that book which was given by Gross to Dr. Wolbach. It bears an inscription which speaks eloquently of Gross' appreciation for the great help he received from Wolbach. The inscription reads,

"Dear Dr. Wolbach-

It is probably true that most books are derived in large measure from the ideas and teachings of friends and tutors which have been gradually and repeatedly impressed upon the mind of an author. No one is more conscious than I of the influence you have exercised in bringing the present volume to its finished form. The good parts of the work have sprung from your admonitions, precepts, and constant help; the weak places are wholly mine.

With respect and with many thanks,

Sincerely,

Bob

July 1941"

Another favorite quote of Gross was that, "A surgeon in an academic department must pull a new rabbit out of the hat every few years". Surrounded, as he was by many unsolved problems he had studied in the department of pathology, Gross pulled out a lot of rabbits. In 1945 he successfully treated an infant with respiratory distress who had a double aortic arch compressing the trachea and esophagus. He had studied this anomaly at a post mortem he had performed in 1931. Since his early papers on this subject, little has been added in the surgical literature to his cataloguing and describing repair of these anomalies. He described treating newborn infants with large omphaloceles by temporary coverage of the protruding viscera by skin only, to be followed later by definitive repair of the huge ventral hernia. He first repaired a neonatal diaphragmatic hernia. Working in the animal laboratory in the Carnegie Building at Children's, initially financed mainly by his own earnings, aortic homografting was developed. Although Clarence Crafoord in Stockholm was first to report two cases of successful excision of coarctation of the aorta in 1944, Gross soon followed in 1945 with a successful case in Boston. He was the first to successfully graft a human aorta in cases of coarctation, which were too long to excise and perform end-

to-end anastomosis of the aorta. These grafts were human aortas, taken at postmortem, freeze dried, and sterilized in a cyclotron at MIT. Certainly Gross was a key figure in the introduction of modern vascular surgery, before aortic prosthetic materials were developed. (Treatment of abdominal aortic aneurysms in 1950 at the MGH, where one of us was on a surgical rotation, consisted of coiling 400 feet of silver wire into the aneurysm to encourage clot to form, as a deterrent to rupture!)

Gross listened to various suggestions at the operating table when a problem presented. He frequently told about his first meeting with Helen Taussig, head of pediatric cardiology at Johns Hopkins Hospital. Taussig suggested making an artificial patent ductus arteriosus, connecting the pulmonary artery to the aorta as a palliative procedure for blue babies who lacked pulmonary artery blood flow. Gross dismissed that idea. Taussig then presented it once again to Alfred Blalock at Hopkins. He too had not paid much attention to Taussig previously when she suggested it. With the expert participation of his laboratory technician, Vivian Thomas, the Blalock-Taussig shunt was developed and Hopkins was soon the center for "blue baby surgery". Gross related many times those events as a lesson to young surgeons to listen to others around them

In 1945, William E. Ladd retired from surgery. Ladd strongly opposed the appointment of Gross to succeed him. Franc Ingraham, Chief of Neurosurgery, was the interim Surgeon in Chief for two years. In the words of Dr. Edward D. Churchill, Chairman of the ad hoc committee, "*We could not deny Bob the job, because of his great accomplishments*". Gross was appointed as the Ladd Professor and Surgeon in Chief, in 1947.

In 1953 Gross published his classic book, *The Surgery of Infancy and Childhood*, a one-author book of exactly 1,000 pages. It was often referred to as "the green bible", was published in four languages, and sold over 40,000 copies. This book is still sought eagerly by surgeons perusing the old bookseller booths at the American College of Surgeons. The book was dedicated to S. Burt Wolbach, who died the following year. The dedication reads:

To

DR. S. BURT WOLBACH

PATHOLOGIST, INVESTIGATOR, TEACHER, AND FRIEND

this book is respectfully and affectionately dedicated

We acquired recently the original copy given to Dr. Wolbach by Dr. Gross. On the flyleaf is written

"Dear Uncle Burt-

With this book comes my deepest thanks for all you have done in so many ways

Devotedly, Bob"

One important chapter for this book was inadvertently omitted, that on sacrococcygeal teratoma. This omission came to light when Gross had a telephone call from a surgeon faced by a neonate with that problem. When Gross said, "Look in my book", the reply was, "I did and could not find anything about

that”.’ The manuscript of that chapter had fallen from the radiator in Gross’s office and was wedged between the radiator and the wall!

During his tenure, Gross inspired many to enter the field of pediatric surgery which was in its infancy when he began. Many of his trainees went forth to found programs in pediatric surgery at other universities, beginning with William Clatworthy, Jr., at the Children’s Hospital in Columbus Ohio in 1947. Of the 24 training programs extant in pediatric surgery at the time of his demise, 8 were headed by surgeons trained by Gross, and 12 by a “second generation Gross trainee”, i.e. a surgeon trained by one of Gross’ pupils. This remarkable academic legacy, which 20 of 24 programs attested, reflected his great impact on surgical education and care of children.

Gross received many important honors. He was the first president of the American Pediatric Surgical Association founded in 1970. He was president of the American Thoracic Association. Institutions which awarded him honorary degrees included Carlton College, Louvain University in Belgium, Turin University in Italy, Suffolk University in Boston, and Harvard University. He received 26 medals, which reflected his great contributions. Included was the Gold Medal for Distinguished Service by the American Surgical Association, given only three times previously in 93 years. He was given the Albert Lasker Award twice, the only individual so honored. He received the Denis Browne Medal of the British Association of Pediatric Surgeons, the William E. Ladd Medal of the American Academy of Pediatrics, the Bigelow Medal of the Boston Surgical Society, and the Sheen Award of the American Medical Association. The HMS chapter of Alpha Omega Alpha conferred membership on Gross a decade after graduation to honor his outstanding contributions. Despite these singular honors, Gross modestly attributed his success to being at the right place at the right time, and recognizing opportunities as they presented. In addition to being an innovator, an inspiring teacher, and a lucid writer, he was a master technician at the operating table. Décor was quiet, and conversation was kept to a minimum. Displeasure in the OR was signaled by a gentle tapping of his foot accompanied by an icy stare!

His appearance was impeccable, and he expected the same of his residents. A fresh hair cut every Friday afternoon was the rule. Soiled shoes, rumpled whites, or unshorn hair would invite a cryptic note from “The Chief” to correct the problem. He eschewed publicity, although his world wide prominence sometimes made the spotlight inevitable. Although Gross had spawned many new ideas as a resident, and young staff surgeon, his own department was run in a no nonsense fashion with expectation that the chief’s way was the correct way, and variations were discouraged. Paradoxically, he applauded those innovations produced by his trainees who had moved on to other locations.

Gross authored 240 peer reviewed articles in his career. His first two books were beautifully illustrated by his personal artist of two decades, Edith Piotti. A third book in 1970 entitled “An Atlas of Children’s Surgery” was illustrated by Mr. Jan Cirulis. Each of these books remains a masterpiece.

Although Gross had led the first effort in the quest to repair congenital cardiac defects, many others joined the race. In 1953 Dr. C Walton Lillehei in Minneapolis demonstrated repair of complex intracardiac defects such as tetralogy of Fallot, using cross circulation between a parent and child to allow working inside the heart for enough time to do this. After nearly 50 such procedures with remarkably good results, Lillehei and colleagues progressed to modern cardiac surgery using a mechanical pump oxygenator. The field burgeoned. Use of hyperbaric chamber oxygenation, brief inflow occlusion, and other less definitive methods were soon discarded. In 1967 the hospital trustees created a new hospital division called the Interdisciplinary Cardiovascular Center for Children, under the

leadership of Dr. Gross. Simultaneously the Julia Dykman Andrus Chair of Pediatric Surgery was established. Dr. Judah Folkman was appointed to the Chair and was made Surgeon in Chief.

Gross retired in 1972 and settled in Brattleboro Vermont. He still kept abreast of the literature and on occasion would surprise a former pupil with a letter in his own hand, making nice comments about a paper published by a protégé.

In 1985 on the occasion of his 80th birthday a Festschrift was held at HMS in honor of Dr. Gross. Dean Daniel Tosteson announced the establishment of the Robert E. Gross Chair in Surgery, with Dr. W. Hardy Hendren, Chief of Surgery since 1982, as its first incumbent. Gross indicated later that this dinner was to be his memorial service--- one he had lived to enjoy! His health declined over the next three years. He died from Alzheimer's disease in the Nuffield House in Plymouth, MA, on October 11, 1988, at age 83 years. His wife, Mary Lou, predeceased him in the same facility two years before. He is survived by his two daughters, Marcie Moore and Edith Smith.

Children the world over benefitted from the many contributions of this great surgeon, scholar, and teacher. His influence in surgery will long continue through the hands and minds of his many pupils.

W. Hardy Hendren, M.D., *Chairperson*
M. Judah Folkman, M.D.