

Developing congenital heart surgery in India: The travails and triumphs of a pioneer

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ABSTRACT

Professor IM Rao, from All India Institute of Medical Sciences, New Delhi, was a pioneering cardiac surgeon who, against overwhelming odds, developed congenital heart surgery in India. He made many contributions to the evolution of his specialty, spanning more than four decades and three countries. This is a brief report of his professional life and accomplishments.

Keywords: Congenital heart disease, neonatal cardiac surgery, pediatric cardiac surgery

INTRODUCTION

Congenital heart defects (CHDs), the most common form of birth anomalies, affect about 1% of live births according to the American Heart Association. Of the 180,000 children born with CHD each year in India, nearly 60,000–90,000 suffer from critical lesions requiring early intervention.^[1] Congenital and neonatal surgery has become commonplace in the major centers around the world, as well as in India with excellent results.^[1-5] From humble beginnings, the art and science of this complex surgery in India was carried forward on the shoulders of giants in all of its aspects.^[1,2,5,6-10]

Professor IM Rao [Figure 1] from All India Institute of Medical Sciences (AIIMS), New Delhi belonged to this elite, small group. His 25 years in that institution were a tale of tumultuous travails and tribulations but also triumphs in the evolution of congenital and neonatal cardiac surgery. The objective of this report is to document for history his brilliant contributions to the field.

Ivatury Mrityunjaya Rao (IM Rao, as he was called in later professional life, to avoid the tongue-twisting first name) was born in the town of Kakinada in Andhra Pradesh, a coastal state in South India. His father, I. Joga Rao, was a very renowned physician and surgeon in the

district capital town, his reputation often crossing the boundaries of adjacent districts, even states. Under his profound influence of hard work ethic and brilliance, IM Rao blossomed into a very accomplished and bright young man. Most of his success, however, had to do with his brilliant mind and outstanding memory and much less due to hard work! His medical school career in Andhra Medical College (AMC), one of the oldest medical schools in the country, was exemplary. He received many accolades and gold medals and graduated with top honors. In medical school, he had the additional honor of courting and marrying his wife, Dr. Meera, a colleague in AMC. A strong personality, Meera would prove to be a tremendous asset in his life. IM Rao had always known he would be a surgeon, having caught the excitement while watching and at times participating in his father's surgical procedures. He went on to complete with honors his postgraduate studies in AMC, for the degree of Master of Surgery.

The young surgeon happened to stumble on a book called "The Operation," describing a day in the life of Walton Lillihei, the pioneering cardiac surgeon from Minnesota.^[11] He was captivated by the inventions in cross-circulation and open-heart surgery, and he became more and more passionate about cardiac surgery as his

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Figure 1: Prof. Ivatury Mrityunjaya Rao

calling. Lillehei's attempts at open heart surgery with cardiopulmonary bypass, the experiments of Lillehei and his group on cross-circulation in dogs (a big dog serving as an oxygenator for a small dog), the subsequent trial in humans in March of 1954, and the invention of Bubble Oxygenator were inspiring stories for the young surgeon.

IM Rao learned that across the world, in India too, those were heady days for the specialty of cardiothoracic surgery. The 50s and 60s saw many landmark contributions from Indian scientists:^[1-5] Potts-Smith shunt for cyanotic heart disease in 1951, Pericardiectomy for constrictive pericarditis in 1952, and pulmonary valvotomy under inflow occlusion in 1953 by Professor Betts and his team at Vellore; the first successful closed digital mitral valvotomy (1952), repair of coarctation of the aorta in 1953, and closure of a atrial septal defect (ASD) in 1954 under surface-induced hypothermia at the K.E.M. Hospital, Bombay, by Doctor P.K. Sen. 1961 saw K.N. Dastur utilizing a disc oxygenator for ASD closure.

In May 1961, Dr. N. Gopinath of the Christian Medical College (CMC) Hospital, Vellore, closed a ventricular septal defect (VSD) in the first open-heart surgery in India. Dr. Gopinath already had had a distinguished career by then. He was the first Indian to be awarded a postgraduate (Postdoctoral) degree in Thoracic Surgery by the University of Madras – the first university in India to do so. After a fellowship with Dr. Lillehei from 1957 to 1958, he succeeded Dr. Betts in 1960 as the Head of Cardiothoracic unit at CMC.

In April of 1964, Professor Gopinath moved to the AIIMS, even though the facilities were very limited: One shared operation theater and a four-bedded postoperative ward. Professor Gopinath set about improving these conditions and aspiring for a separate cardiac center one day. He made significant advances and was recognized as a great surgeon, a great teacher, and an extraordinary mentor.

It is small wonder that IM Rao chose AIIMS for his M.Ch training in cardiothoracic surgery under Professor Gopinath.

Early Open Heart Surgery (1964–1971) at AIIMS was primitive: Use of reusable large-prime disc oxygenator with a lot of bleeding problems, cumbersome recorders, reusable transducers and 3-way stop-cocks. In 1968, IM Rao and his colleague M. Girinath visited Dr. Stanley John at CMC in Vellore. Professor John had been producing excellent results in mitral valve surgery, VSD, and Tetralogy of Fallot (TOF) and boasted of the largest reported series^[5] with a cohort of 300 adults aged >14 years utilizing the transventricular route. The AIIMS doctors brought back ideas and techniques.

IM Rao finished his training as a Registrar in 1969 and obtained his M.Ch. He then joined the faculty of AIIMS in 1970, a position he would occupy for the next 25 years. IM Rao's passion for pediatric cardiac surgery started to blossom. Conditions were steadily advancing at the AIIMS: initially, Travenol bag, then Ryg bag oxygenators were used for surgery performed on older children and young adults for CHD. IM Rao was enthused and mesmerized by Professor Raj Tandon, a brilliant Pediatric Cardiologist. He also had a partner in Dr. Venugopal, who underwent training abroad with Professor Denton Cooley in Texas and with Dr. Subramanian in Buffalo. The duo made significant advances: switch from Polystan bag to Shiley Bubble Oxygenator, introduction of disposable cannulae with tubing and Bjork-Shiley Valves. There was a gratifying improvement in results.

The next landmark event occurred in 1973. IM Rao went on to work at Green Lane Hospital, Auckland, New Zealand under the legend, Sir Brian Barratt-Boyes, along with his team from AIIMS: Dr. Rajani (Radiology) and Dr. Punnose (Anesthesia). Very few places in the world were doing infant cardiac surgery at this time and Sir Barratt-Boyes had a great team of pediatric cardiologists, radiologists, pathologists, and anesthesiologists. He was a gifted surgeon, a great intellect and was a protégé of Dr. John Kirklin. He was very eminent in all areas of surgery: homograft aortic valves as well as infant cardiac surgery.^[12] IM Rao was one of his seven registrars. Others, of note, were Dr. Roger Mee from Australia (who would feature prominently in IM Rao's career in subsequent years), and Dr. K.M. Cherian from Chennai, India (who would become a legend in his own right in South India). This fellowship cemented IM Rao's passion for congenital and neonatal pediatric cardiac surgery. Declining Sir Boyes's invitation to join his team, he headed back to AIIMS in 1975.

Back in New Delhi, IM Rao found infant cardiac surgery very hard to establish. Referrals were very few, since pediatric cardiologists had a misguided faith in spontaneous closure of congenital lesions. The

Green Lane technique of deep hypothermic circulatory arrest (DHCA) was difficult and cumbersome to reproduce. Politics, as wont to happen in a developing center, was rearing its ugly head. There was very little support for creating a separate pediatric and neonatal cardiac team or pediatric-specific techniques. Adult cardiac surgeons were piling up a large number of coronary operations, but there was very little enthusiasm for developing the same momentum for pediatric conditions. Such was the put-down that an adult CT surgeon was heard to comment: “what a waste of money!” when a pulse oximeter was bought for a pediatric patient! Neither the sick infants nor the postgraduate fellows interested in their surgery were getting any attention.

Other handicaps and obstacles soon became evident: The so-called ICU consisted of 1–2 beds with the surgeon and an anesthesiologist bagging the infants with an Ambu-bag, guessing at the optimal tidal volumes. Arterial blood gasses’ laboratory was a building and an hour away. There were no good volume-cycled ventilators, compressed air and blenders, warmers, or incubators. Ventilation protocols and safe-extubation techniques were nonexistent. There were no inotropes and vasodilators. It was the sheer courage and dedication of the surgeon and his paltry team that kept many infants alive, even when mortality was high.

Despite these odds, over the next 5 years (1975–1980), IM Rao worked diligently to bring modern concepts of perfusion protocols, de-airing and selective coronary perfusion. There was an improvement of results of valve replacements because of safer techniques. Cardioplegia, however, could not be reproduced. Furthermore, difficult to achieve were reusable external heat exchanger and Blood Cardioplegia Delivery, major hypothermia, and circulatory arrest in small infants.

In 1977, IM Rao visited Dr. K.M. Cherian in Chennai (Madras). As noted above, the two were co-fellows in Auckland. On his return to the Railway Hospital in Perambur, Madras, Dr. Cherian and his team of Australians from Sydney performed cases with DHCA and opened up the vista for infant cardiac surgery in India. IM Rao brought further fresh ideas and techniques back to the AIIMS.

A huge calamitous adversity, unfortunately, was awaiting IM Rao. He had just returned from Milwaukee, Wisconsin in 1984, where he spent almost a year as a fellow. Persistent back pain following a bout of pneumonia was labeled “osteochondritis” initially but finally lead to a diagnosis of paraspinal abscess from tuberculosis of the spine in 1986. He underwent surgery, was hospitalized, and was out of his surgical practice for almost a year. He was on bed for 6 months and on anti-tuberculous treatment. Only in early 1987, he recommenced going to the O.T, initially as an observer in a back brace.

Meanwhile, the Cardiac and Neuro Center of AIIMS was finally opened in 1986 with Professor Venugopal at the helm (Professor Gopinath had retired in 1983). A separate pediatric section, however, did not receive any support.

It was June of 1987. Dr. Shrivatsava, a pediatric cardiologist, had a 2-month-old infant with a rhabdomyoma of the heart. She referred the case to IM Rao for surgery. The operation was a remarkable success. IM Rao used it to brilliantly showcase principles of congenital heart surgery^[13] including DHCA and perfusion. Suddenly, the fate of IM Rao and pediatric cardiac surgery at AIIMS was transformed. The pediatric service picked up momentum.

In those pioneering days, IM Rao was fortunate to be joined by Dr. Krishna Iyer as a registrar. Dr. Iyer was brilliant, motivated, hardworking and the two made a highly competent and successful team, becoming the architects of congenital and neonatal cardiac surgery in India. Dr. Iyer would go on to become the most accomplished pediatric cardiac surgeon in India, initiating the first dedicated pediatric cardiac care program in Northern India in 1995 at (now Fortis-Escorts Heart Institute). Joined by other bright registrars such as Drs. Airan, Murthy, and Krishnan, the congenital heart team at the AIIMS, were soon turning out remarkable successes in TOF, early Kreutzer operation for Tricuspid Atresia, and the “Senning” operation for Transposition of Great Arteries (TGA). IM Rao and his team established protocols of infant perfusion: cardioplegia with syringe, limitation of Total Cardiac Arrest (TCA) as regards time allowed for repair leading to direct bicaval cannulation, hypothermia, and low flow bypass using Polystan and Pacifico cannulas (IM Rao had borrowed Pacificos from Dr. Cherian during his visits).

In August and September of 1988, IM Rao visited the Royal Children Hospital, Melbourne, Australia as a visiting Professor for 3 weeks with Roger Mee, his colleague at Green Lane Hospital. The visit gave a good perspective of modern pediatric cardiac surgical practices. There he learned about transatrial repair of TOF and arterial switch operation (ASO) for TGA in a neonate. Dr. Mee was a guide and an inspiration. He would visit IM Rao and his team on several occasions. He would also train Doctors Iyer and Parvathi Iyer from IM Rao’s team.

Doctors Iyer and IM Rao began to see the budding success of CHD surgery at AIIMS. Around the same time, Dr. Rajesh Sharma returned after training at Boston Children’s Hospital, and this further boosted the section.

At this time, transventricular correction of TOF was commonplace. Good results were seen with primary infundibular patches and VSD closure. However, residual defects and difficulties with transannular patch

cases with a high incidence of length of stay following correction were a frequent problem. It was during this period that the TOF repair had a new modification introduced by IM Rao and his associates for the first time in India: the transatrial repair of TOF that he had learned in Melbourne. The improvement in results was impressive.^[14] Spectators of IM Rao's transatrial repair soon hailed it as a "virtuoso performance" (Dr. Paranzan from Italy). Now, IM Rao jokes about it: "We have energetically championed this technique: Like a recent convert, more catholic than the Pope." Transatrial correction of TOF is now the most commonly used technique in India.

IM Rao and his team continued to record other successes.^[15-20] Neonates with TGA were diagnosed by Echo and referred for ASO by Dr. Srivastava. The first cases were without preoperative BAS. Heparinized fresh blood was used in the prime. While Dr KS Cherian was doing ASO in older Children with VSD, neonatal ASO was only being done by IM Rao in AIIMS. He learned the techniques of Coronary Buttons Trap Door from Roger Mee and Coronary Buttons into Root (Pacifco) with better sutures and blood products.

In 1992, IM Rao got his green card for immigration to the USA. He visited the Mayo Clinic, Columbia-Presbyterian in New York and Boston Children's in 1993. There he received an invitation from the legendary Albert Starr from Portland, Oregon to be a visiting professor. He was thrilled to see the accurate, simple techniques of repair of Dr. Starr, who was equally adept at valve, coronary, and complex neonatal surgery. He also learned the policy of verifying the success of the operation with immediate postoperative, on-table transesophageal ECHO, a practice he would soon popularize as a dictum in congenital cardiac surgery.

Thus ended the first quarter-century of IM Rao's tumultuous journey into congenital and neonatal cardiac surgery.

In the superb story of Roger Mee and his career in neonatal surgery called "Walk on Water" by Mark Ruhlman,^[10] Mee comments on the rigors and personal sacrifice that this career demands: "he (the peds heart surgeon) had to make judgements..... fast and act decisively, and he had to be right." And.... "You can't hide when you're a peds heart surgeon.....Because the stakes are so high, because there is so much at risk, there is no room for dishonesty.....You can't lie to yourself here, because if you lie to yourself, it becomes very obvious. Somebody dies."

Perhaps it was this stress. Perhaps it was the constant and brutal self-assessment and appraisal, with feelings of guilt and inadequacy. Perhaps it was a deep character blemish in a susceptible personality. Perhaps it was a toxic mix

of all of these, magnified by the harrowing demands of complex heart surgery, and the constant struggle with detestably weak administrative support. It will never be clear. What is certain was the toll it took on IM Rao. His near-disastrous episodes of alcohol and nicotine excess threatened to destroy him, his marriage, and his career. Fortunately for him, he was rescued by his passionate love of pediatric cardiac surgery and the incredible support given by his circle of family, especially his wife Meera, his friends, and students. Very reminiscent of a similar but more benign fight: the reported struggle of both Roger Mee and his mentor, Sir Brian Barrett-Boyes with their addiction to smoking.^[10,11]

In his tenure at AIIMS, IM Rao mentored many young surgeons in surgery as well as congenital heart surgery. He would be kind, gracious, accommodating, inspiring, encouraging, and also critical as necessary. All who worked with him called him a true gentleman, a master teacher, and a master craftsman. One commented "when he is operating his hands are conducting an orchestra." He would scrub with juniors and share with them critical parts of the operation and teach the intricacies of his craft. He was always willing to give them a chance to express themselves, at times at his own expense! In return, they admired his style (some called it "swash-buckling") and confidence. They adored his honesty, his humility, friendliness, and mentorship. They loved his guidance and quiet benevolence and empathy to young trainees. Many of them gave him moral and political support, albeit silently, not to upset the powers-to-be. A testament to his mentorship: the majority of his registrars (about 45 during his tenure) became leaders in the specialty of congenital cardiac surgery all over the country and abroad. Prominent examples include Dr. Krishna Iyer; head of the Department of Paediatric and Congenital Heart Surgery, Escorts Heart Institute in New Delhi; Dr. Mohan Reddy, Chief of pediatric cardiac surgery in University of California at San Francisco; Dr. Balram Airan, immediate past Chair of the Department of Cardio Thoracic Surgery at AIIMS; Dr. Anil Kumar Dharmapuram, now at KIMS, Hyderabad.

It was at the behest of one of his mentees, Dr. Nazer that the next chapter in IM Rao's saga with neonatal cardiac surgery sprouted in a different country. IM Rao made a lasting impression on Nazer when he was a fellow at AIIMS. The two spent some time together in Sydney. In 1995, as IM Rao was finishing his visit with Professor Starr, Nazer was the head of the Cardio Thoracic Surgery unit at Al Mafraq hospital in Abu Dhabi, UAE. He invited IM Rao to set up a congenital heart surgery service. Despite some disparaging and maligning remarks from AIIMS "bigwigs," IM Rao succeeded in getting a position as a "locum" for about 3 months with Nazer's help. The "locum" position would last for more than a decade. Nazer would become his friend, guide, and philosopher.

NEONATAL SURGERY IN UAE (1995–2007)

UAE has a population of about 3 million and was blessed with an excellent infrastructure and health care. Infants born with heart defects were referred to Al Mafraq Hospital in Abu Dhabi for diagnosis and treatment. The transport facilities for the neonate were excellent. The neonatal unit was set up by Professor Brom and headed by Dr. Sadhegatian. IM Rao and his team had a chance to see every infant with CHD and the team of cardiologists and surgeons would conjointly plan the treatment.

Soon after his arrival, IM Rao gained the confidence of the Arabic administrators by his professional attitude and pleasant personality. Recognizing the fatal nature of mistakes, IM Rao concentrated on the minutest details: transport, anesthesia, diagnosis, perfusion, suture materials, etc., The operative steps were set in stone with no deviation from the established routine. Besides Nazer, IM Rao had good support from the pediatric cardiology team headed by Prof. Venkitachalam and Dr. Suresh Kumar. The anesthesia team, consisting of Drs. Dhir, Saxenna, and Sivan, was strong and excellent. Dr. Anil Kumar Dharmapuram, a former fellow of IM Rao at AIIMS, was a personal and professional friend, besides being a partner. A new era of neonatal pediatric cardiac surgery was born in the UAE with this able team.

Reproducible surgical techniques learned from other countries were soon planted at Mafraq. New concepts of ameliorating bypass tissue reaction by using Trasylol, improved perfusion methods, CO₂ in pump, superior cardioplegia techniques, use of phenoxybenzamine, etc., were standardized. The multinational team of Mafraq unit started to produce large series of CHD operations with ever-improving results. Mortality rates for high-risk procedures came steadily down. As an example, the second set of fifty patients with ASO had successful correction with zero mortality. In a short time, Mafraq became widely popular in the UAE as the go-to place for neonatal, pediatric, and adult cardiac surgery from near-by middle-east countries. IM Rao recollects one eventful week when they did ASO on three infants of different nationalities successfully. The unit at Mafraq was regularly attracting international dignitaries in congenital heart surgery: professors Gopinath (AIIMS), Lacour-Gayet (Paris), Sabiston (Duke University), Loop (Cleveland Clinic), de Leval (GOS, London), Iyer (Fortis, New Delhi), and Airan (AIIMS). Everyone was stunned at the quality of the work of the pediatric cardiac surgery team. In view of the excellent work and results, the General Authority of Health Services appreciated the Department by giving the first Sheikh Hamdan award for clinical excellence in the year 2003. The long-eluded sense of personal achievement and happiness was finally in IM Rao's grasp.

One of the pioneers and stalwarts of cardiothoracic surgery in India was Dr. C.S. Sadasivan.^[21] He was from AMC, the same medical school that IM Rao attended. A brilliant scholar, he had training abroad from great pioneers such as Sir. Russel Brock, Andrew Logan, Professors Crawford, and Dubost. Dr. Sadasivan was passionate about making India self-sufficient in all aspects of cardiothoracic surgery. He received many accolades and honors, one of them the Padma Shri in 1969, one of the highest honors in India. In his honor, The Indian Association for Thoracic and Cardio-Vascular Surgery (IATCVS) had initiated an annual Sadasivan memorial oration at its annual meeting in 1981. The first orator was none other than IM Rao's mentor Professor Gopinath. Many past presidents of the association were Sadasivan orators.

The call came in 2002. IM Rao was invited to give the Sadasivan oration in the annual conference of the Society in 2003, the highest honor given out by the Association: a sweet vindication of his success in establishing congenital cardiac surgery. As is repeated in history so often, he had to go out of his own country to get due recognition. In February 2003, IM Rao delivered the Sadasivan oration. His topic: "Challenge of the Neonate: A Cardiac Surgeon's perspective." In his talk, he reviewed common congenital cardiac deformities, their surgical correction, principles of DHCA, protocols of perfusion, maintenance of homeostasis, and the science of cardioplegia. He emphasized intra- and post-operative care, metabolic support of the infant, and abatement of inflammatory response to the "plege" and surgery. He elegantly described the ASO ("conceptually the most brilliant and 'simple' operation") and detailed the process of coronary transfer ("Good thing the coronaries are the sensible ones," in the words of Mee). He backed up his theoretical concepts with his results from Mafraq (1997–2002). He then went on to demonstrate his technique by showing a video of ASO in TGA IVS in a 20-day neonate. It was a masterful presentation, according to some of his peers in the audience. So was his summation quote from W. J. Potts: *A Neonate's Prayer: "Give me good oxygenation and do good repair, I will surprise you how well and how quickly I heal!"*

Important contributions of the Mafraq group continued.^[22-25] In 2002, Drs. Anil Kumar Dharmapuram and IM Rao pioneered single-patch technique of A-V canal septal defect in 15 infants.^[24] In 2003, they reported on 48 consecutive neonates who underwent systemic to pulmonary arterial shunts for cyanosis with reduced pulmonary blood flow, concluding that these shunts in neonates are a gratifying and reasonably safe surgical procedure, before eventual univentricular/biventricular repair.^[25]

By 2007, the political winds whipped up again and for their own reasons, the Ministry of Health at Abu Dhabi decided to close the cardiac surgery services. It was time for IM Rao to go home, but not before he showed everyone what a team effort can accomplish “with a li’lle help from friends.” He inspired and showed his colleagues and peers how to lead. Nazer proudly and fondly reflects on the great privilege they all had shared: providing totally free cardiac surgical services of very high quality to all nationalities in the world, a privilege not many surgeons can boast of.

“No place for prima donnas!” and “Come on Man! This is not rocket science!” were IM Rao’s famous words. He left Abu Dhabi in 2008, but not before he had survived a coronary artery blockage that required angioplasty by one of his own teammates.

HYDERABAD, INDIA (JUNE 2008)

IM Rao returned to Hyderabad in his own state of Andhra Pradesh as the Dean (Academic and Research) in Innova Children’s Heart Hospital. He was with his former fellows Doctors Anil Kumar and S. Murthy, enjoying his position as a consultant for congenital heart surgery.

In Andhra Pradesh, the State Government had set up the Aarogyasri Health Care Trust under the chairmanship of the Chief Minister. The beneficiaries of the scheme were the members of below poverty line families with the goal to improve their access to quality medical care, through an identified network of health-care providers. The scheme had a phenomenal impact and Innova Hospital piled up huge numbers of cases under the scheme. The experience also signified the large prevalence of CHD lesions in the population.

IM Rao’s keynote address: “In search of Mentors in a land of over billion people” at the 12th Annual Conference of the Paediatric Cardiac Society of India in 2010 at Mumbai was a well-received oration, replete with quotations from Hindu Sanskrit literature. In April 2013, he moved on to become the Clinical Director of pediatric cardiac services, KIMS Hospitals, Secunderabad. His retirement was not uneventful. He had a CABG performed in 2008 at Mumbai by one of his students and had several hospitalizations for other health issues. Despite his illness, he and his colleagues made several contributions to the surgical literature on CHD.^[26-32] The success of his fellows was a source of great delight and pride to him.

In 2010, the IATCVS bestowed on him the great honor of “Life-time achievement” award, a sweet complement to his 2005 “Lifetime achievement” awarded by the Paediatric Cardiac Society of India: a long-deserved acknowledgment of his important contributions to neonatal cardiac surgery. He was recognized as a giant in his specialty. His career spanning more than four decades

and extending to multiple countries and his pioneering contributions, against all odds, towards the development of pediatric cardiac surgery graced him with the title of: “A Father of Paediatric Cardiac Surgery in India.”

Finally at peace with himself, IM Rao humbly reminisces often about his career with amazement and gratitude. He often quotes his greatest hero, Walton Lillehei: “Some see things as they are and ask why change? Others dream of things that never were and ask why not? Change comes because someone somewhere has the courage of conviction-no matter how foolish.”

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Nil.

Conflict of interest

This is a story about my eldest brother and his many contributions to the evolution of neonatal cardiac surgery in India and the Middle East. He was a real pioneer and a great inspiration to his students and fellows. We spent time together in AMC and AIIMS and I had first-hand information on that part of his life. Beyond that, I relied on his own accounts and my conversations with many of his peers and students. I made a sincere attempt to present factual information. I cannot be absolutely certain, however, that an occasional personal perspective did not creep in.

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