# Ramesh K. Tripathi, MD

Prof. Tripathi discusses the role of his mentors and the challenges and breakthroughs in his pioneering efforts in the development of endovascular therapy in India.

**Who were some of your mentors in endovascular therapy, and in what way did they shape your perspective and career?**

My earliest spark of interest in endovascular therapy was ignited when I saw Brian R. Hopkinson (Hoppy) in Nottingham perform endovascular aneurysm repair (EVAR) with a homemade device in 1992. I was fascinated but had no formal training in basic endovascular interventions. Because no endografts were available, industry support for training was lacking. Also, the centers where I went on to work as a consultant vascular surgeon in the early 1990s looked upon endovascular interventions as something that only radiologists did.

An invitation to learn EVAR came from Juan Parodi of Buenos Aires in 1996, and I am indebted to Mariano Ferriera of Parodi's group for giving me a sound grounding in EVAR. At that time, aortic endografting was mainly accomplished due to collaborations with radiologists as lead interventionists. I was determined to perform EVAR as the sole proceduralist without needing interventional radiology/cardiology support.

Advanced endovascular fellowships at the University of Cologne in Nuremberg, Germany, made me confident not only with EVAR, but also a whole range of peripheral endovascular interventions. Svante Horsch, Kiriakos Ktenidis, and Dieter Raithel all had an indelible impact on me. On my return from Germany in 1997, I performed India's first EVAR with the Vanguard I device (Boston Scientific Corporation). Gioachino Coppi trained me on the AneuRx and Talent endografts (Medtronic, Inc.) in Modena, Italy, in 2000. I then joined the Perth Endoluminal Group in 2002 and had a great learning period under Michael Lawrence-Brown, Greg Van Schie, Kishore Sieunarine, and David Hartley.

In recent years, I have had the privilege of great friendship with Frank Veith, Martin Malina, Roy Greenberg, Vinay Kumar, Venkatesh Ramaiah, Stephan Haulon, Eric Verhoeven, and Gustavo Oderich, who have enriched my understanding of technique and philosophy of aortic endografting. In the classic poem of the same name by Tennyson, Ulysses describes himself, "I am a part of all that I have met." I guess that applies to me as well!

**How would you describe the penetration of endovascular options with respect to open surgery in India over the last 10 years?**

With the formalization of vascular surgical training programs in India, endovascular therapy is now mainstream for vascular surgeons. In reality, cardiologists and radiologists in our country still perform 80% of endovascular interventions. The reasons are many. First, there are fewer than 300 vascular surgeons for a vast country like India with a population of 1.2 billion. Second, although most vascular teams collaborate with radiologists, they have not been able to achieve independence due to a lack of advancement in their own skills. Finally, cardiologists who control catheterization labs in India deny access to vascular surgeons due to turf issues, resulting in a heavy reliance of vascular surgeons on open surgery.

Despite the challenges, all leading vascular surgeons have adopted endovascular surgery, and more than 10 vascular centers offer high-end procedures for the aortic, carotid, and peripheral anatomies.

**Are there any interventional procedures that have become particularly prevalent? Any that are rarely used compared to uptake in other regions? If so, please briefly give the perceived reasons.**

India is a country of bare-feet walkers ravaged by diabetes in most rural parts. Infrainguinal angioplasty and stenting for limb salvage is our "bread-and-butter" endovascular intervention. Another popular procedure is EVAR. Our center performs EVAR, fenestrated EVAR, branched EVAR, and hybrid repairs for arch, thoracoabdominal, and abdominal aortic aneurysms. Our patients are younger than in Western countries (mean age, 57) and have a severe inflammatory component that makes interventions challenging. The greatest limitation we have is with respect to the costs of performing EVAR. In India, open repair is still a lot cheaper, and convincing patients to undergo EVAR/thoracic EVAR is a constant challenge. Perhaps there is a

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need for a low-cost stent graft for developing countries that will increase the applicability of EVAR even further.

We also see a lot of venous ulceration of lower extremities and perform about 75 iliac vein stentings a year and have the largest experience outside Prof. Seshadri Raju's group in the United States. Finally, we also perform a significant number of endovascular interventions for arteriovenous access salvage and central vein stenosis/occlusion.

**How does device regulation in India compare to what you have learned of regulation in other countries, such as those in Europe, South East Asia, and the United States?**

Device regulation in India is robust and stringent but mired in bureaucracy and red tape. It takes an inordinately long time for products to be licensed and available to physicians. This has spawned a proliferation of surgeon-modified endografts for complex aneurysms. Some device companies, like Gore & Associates, have found the licensing and relicensing process so tedious and drawn out that they have withdrawn their products from the endovascular market.

**Your facility reuses sterilized interventional devices in some cases. In which cases do you usually elect for reused devices, and which types of devices are or are not viable for reuse?**

Interventional device reuse is not new. In a country like India, where 60% of the population lives below a monthly income of $160, medical insurance is out of reach for most. Much of the health care in India is based on out-of-pocket expenses for the patient. Making endovascular and vascular services affordable and available to this underprivileged population requires innovation and thinking out of the box. One way is the reuse of wires, catheters, balloons, retrieved inferior vena cava filters, endovenous laser catheters, etc.

In our institute, regardless of the paying potential of a patient, nobody is denied adequate treatment. Patients who have no means to pay receive reused devices. The key is to have a robust cleaning and sterilization process and infrastructure. We do not resterilize endografts, stents, or Dacron graft–based materials. Each resterilized material comes with a color-coded label of how many times it has been resterilized, as well as the date of sterilization and last date of reuse. No material is resterilized beyond the third run.

**In what ways is your meeting, the Indovasc Symposium, unique among global vascular congresses?**

We launched the Indovasc Symposium in 2012 to bring together vascular and endovascular thought leaders from all over the world to inspire young vascular surgeons and trainees who we believe will learn from the masters and in turn start a chain reaction of research, education, and training in India at an international level.

Our symposium is the only meeting in the Asia-Pacific region for attracting a plethora of top opinion leaders in vascular surgery in the world. We have been called the "VEITH Symposium/Charing Cross" of Asia by many attendees and faculty who have been impressed by the range and comprehensiveness of topics covered, providing a balanced view between open and endovascular surgery.

**What are the current areas of clinical investigation in your practice, and what is the status of your studies?**

At Narayana Institute of Vascular Sciences, we are currently involved in the National AAA Screening Programme in patients with an established diagnosis of coronary heart disease, and approximately 1,500 patients have been screened through this ongoing program.

We have also initiated a study on "Age-dependent and disease-specific biomechanical changes in the aorta in diabetes and hypertension. Dynamic MRA and finite element nonlinear analysis of biomechanical forces in arch and descending aorta."

Other studies include, "Exploring gene expression differences between atherosclerotic and nonatherosclerotic peripheral arteries within a patient to enable discovery of novel targets that mediate development of localized atherosclerotic plaques" and "Role of Inflammatory Mediators (MMP-1, MMP-2, TIMP-2, VEGF, PDGF) in Predicting Healing of Venous Ulcers After Iliac Vein Stenting for CEAP C6 Venous Disease."

Most of the studies have gone from the pilot study stage to full-fledged studies funded by Departments of Science and Biotechnology, and early results of some of them have been presented at international meetings.

We are in an exciting phase of development in vascular research in India, and I am quite looking forward to the involvement in this process by more centers across the country. ■

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