

## INTERVENTIONAL RADIOLOGY : CRUISING FROM A GLORIOUS PAST TO A SUCCESSFUL FUTURE

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*“ . . . It should be evident that the vascular catheter can be more than a tool for passive means for diagnostic observations: used with imagination it can become an important surgical instrument.”*

*— Charles T. Dotter at Karlovy, Vary, Czechoslovakia, 1963*

Interventional Radiology was “born in January 16, 1964, when Charles Dotter percutaneously dilated a tight, localized stenosis of the superficial femoral artery in an 82-year-old woman with painful leg ischemia and gangrene who refused leg amputation”<sup>1</sup>. “Interventional diagnostic Radiology”, a term first coined by Dr. Alexander Margulis in 1967<sup>2</sup>, is essentially a Radiology based “patient-care” specialty, focusing on minimally invasive targeted treatments performed under guided imaging.

Since then, Interventional Radiology has offered revolutionary breakthroughs in medical management in a variety of clinical settings and body regions, benefiting numerous patients across the world. By clever, skillful and innovative use of catheters, wires, balloons, coils, glue particles through percutaneous vascular and non vascular access points in the human body, under constant guidance of a variety of radiology and imaging machines like radiography, fluoroscopy, Ultrasonography, CT and rarely MRI, Interventional Radiology has emerged as a valuable specialty, which is much easier on a patient, less expensive than conventional surgery, often allowing successful life-saving operations accessed by simple percutaneous route.

The specialty was shaped in the early to mid-1960s by several pioneers like Forsmann, Sven Ivan Seldinger<sup>3</sup>, Dotter<sup>4,5</sup>, Gianturco<sup>1</sup>. Their brilliant medical innovations augmented by professional passion, visionary foresight and extremely gifted skills, has truly catalyzed this budding specialty into the pristine form, shape and status it has assumed presently in clinical medical practice. Not surprisingly, by virtue of its significant impact on medical practice and its vital role in patient management “Interventional Radiology today is a medical specialty recognized by the American Board of Medical Specialties and the American Medical Association” in the United States.

In the past few years, a flurry of significant advances has beneficially impacted Interventional Radiology. They include

introduction of steerable guidewires; new types of bigger, smaller, stiffer, softer balloons; digital fluoroscopy; newer drugs; better trained radiologists and technologists; and stents and stent-grafts<sup>6</sup>. Consequently today, the procedures done by interventional radiologists are well established and successful, which can be categorized as either vascular or non vascular interventions.

Commonly performed vascular interventions comprise of clot-lysing agents to prevent strokes or heart attacks, opening of clogged arteries in legs or kidneys with balloon angioplasty with or without stent insertion, deployment of stent-grafts for aortic aneurysms, angioplasty and stenting of narrowed and occluded carotid arteries, embolizing blood vessels using occluding materials like coils, gel foam, particles or glue, to stop bleeding or vessels “feeding” a tumor, deploying catheters into large veins for hemodialysis, total parenteral nutrition, cancer treatment or prior to bone-marrow transplantation, “chemoembolization” to treat tumors, treating claudication by balloon angioplasty and/or stenting, dissolving large clots in leg veins with urokinase, and uterine artery embolization for fibroids.

Correspondingly, common non-vascular interventional procedures that are performed include drainage of abdominal, thoracic, neck and pelvic abscesses, inserting feeding gastrostomy tubes, obtaining biopsy tissue percutaneously from almost any organ or tissue in the body, cementing the vertebra by percutaneous vertebroplasty, radiofrequency ablation and cryoablation of tumors, carrying out a transjugular intrahepatic portosystemic shunt in case of chronic liver disease, dilating esophagus and trachea in stenotic lesions and opening of fallopian tubes to treat infertility in females.

While Interventional Radiology is a unique and innovative specialty, few grey areas are present<sup>7,8</sup>. These include a) a constant need for professional training ; b) turf battles and competition from other specialties; c) a growing need for encouraging initial consultation with interventional radiologists; d) incessant evolution and updates of hardware technology; e) challenging legal and professional issues during patient management and f) lack of direct access to

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patients and need for providing total patient care<sup>9</sup>. All these issues are being successfully addressed by experts in Interventional Radiology and by authoritative bodies like Society of Interventional Radiology (SIR), American College of Radiology (ACR) and the American Society of Interventional and Therapeutic NeuroRadiology (ASITN), Indian Society of Vascular and Interventional Radiology (ISVIR), to sustain the desired vision of an exultant future of interventional Radiology<sup>8,9</sup>.

To meet this desired vision in reality, strategic initiatives with a series of transitions have been designed by leading experts in Interventional Radiology to propel Interventional Radiology as a speciality per se, towards unprecedented growth from this point in time to the future<sup>8</sup>. The transitions comprises of “*procedure-oriented to clinically oriented practices ; primarily vascular to diverse practice including vascular; part-time practitioners to full-time specialists; secondary referral recipients to primary referral recipients; no public awareness to high public awareness; preventing competition to tough competitor; waits for referrals to practice builder; part of diagnostic radiology to a unique component of radiology; imaging as incidental to the procedure to imaging as a primary tool for diagnosis, consultation, triage, and procedural guidance*”<sup>8</sup>.

In time ahead, Interventional Radiology is expected to undergo further metamorphosis, an exciting situation that is highlighted by tremendous advances in hardware like drug eluting stents, laser delivery systems, use of robotic interventional guidance systems. Additionally, significant refinements of catheter based pharmacotherapy, therapeutic angiogenesis and myogenesis, catheter based detection devices of plaque vulnerability and plaque composition and catheter-directed gene therapy are all making inroads from research areas into medical practice. It is further expected that specialized centers for minimally invasive treatment, manned by a team of specialists, spearheaded by interventional radiologists will be the next step in evolution.  
11

In distant future, most human diseases will be understood, studied and treated at a fundamental level of molecules, genetics and cellular functions. It is therefore expected that “image guided” gene therapy will gradually come into practice, such as catheter-directed transarterial gene therapy in patients with colon cancer metastasising to liver or transarterial intrahepatic gene therapy for hemophilia (factor IX deficiency) etc. It is expected that image-guided cancer therapies will flourish with increasing use of embolization, chemoembolization, gene therapy, and direct tumor ablation by means of injection, radio frequency, and real-time MR-guided high intensity focused ultrasound<sup>11</sup>.

It is indisputably clear that the Interventional Radiology has

grown strongly over the last few decades as a speciality that has enhanced patient management and greatly improved the quality of patients’ lives. The ongoing professional momentum and unrelenting technological advances will carry it reassuringly into the future, with a far-reaching and sweeping intensity. Evidently this success story has no end. As a final point, this special issue has been compiled underscoring a fundamental theme of “a glorious past and a successful future in Interventional Radiology”. It focuses on a wide range of interventional applications, as clinically experienced and practiced today in a millennial India. Besides, this issue also highlights few notable features like the “pioneers” who shaped Interventional Radiology in yesteryears as well as few neglected but important issues related to ethical practice. And lastly, on behalf of the editorial team, I express my sincere thanks to all authors who have contributed in abundant measure to make this issue a truly special one.

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