

Historic Highlights of Interventional Radiology

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Interventional radiology has a short, but rich history punctuated by the efforts of many individuals to develop minimally invasive treatment as an alternative to conventional surgery.

Interventional radiology developed from diagnostic angiography and from the innovative minds and high technical skills of angiographers. It was fathered by Charles Dotter with his idea that “catheters should replace scalpels.” Dotter initiated interventional radiology with “Transluminal Angioplasty” in January 1964 on a patient scheduled for leg amputation because of a focal arterial obstruction. Dotter used coaxial catheters to successfully dilate the stenosis. The patient stayed on her feet, both of them for two more years. Dotter also successfully treated arterial occlusions and patients with severe claudications often were able to walk the next day.

Alexander Margulis coined the term “interventional” for these new techniques. He stressed the need for special training, technical skill, clinical knowledge, ability to care for patients and close cooperation with surgeons and internists.

Dotter’s ideas inspired inventive angiographers to develop new interventional techniques and tools.

Werner Porstmann from Germany pioneered percutaneous closure of the patent ductus and saved many patients from surgery.

In the USA, Stan Baum and Morey Nusbaum introduced vasoconstrictive treatment of GI bleeding used first for variceal/ later for arterial bleeding.

In 1968, John Doppman was one of the first that used embolization to treat vascular malformations and tumors.

Kurt Amplatz, a great pioneer of cardiac angiography, developed new tools for interventions. These included guidewires, dilators for endourology, foreign body retrieval devices and thrombectomy devices.

Caesar Gianturco, a creative genius, gave interventionalists many tools of their trade. These include occlusive coils, IV filters and expandable stents.

The development of interventional radiology was facilitated and accelerated by strong ties that formed between interventionalists and device manufacturers.

Bill Cook had a close relationship with Charles Dotter and other interventional pioneers and has become a consistent and enduring supporter of interventional radiology.

John Abele nurtured and helped pioneer many new tools, devices and procedures. He has been also very active and supportive of interventional education.

Each interventional procedure has had its developmental highlights and pioneers.

Dotter, Zeitler and Gruntzig were the main pioneers of PTA. When angioplasty fell on hard times in the USA, Eberhart Zeitler helped to spread the technique in Europe. European interventionalists were "Dottering" the diseased arteries. The major revolution in PTA, however, was introduced by the Swiss cardiologist, Andreas Grüntzig in the form of a balloon dilation catheter. The first balloon catheter was for peripheral angioplasty. Refined Grüntzig balloon catheters enabled safe angioplasty of large and small vessels. Many interventionalists helped spread new techniques and soon PTA became the most commonly performed interventional procedure.

Treatment of GI bleeding has a rich history and several pioneers contributed to its development. After introduction of selective vasoconstrictive infusions by Baum, Josef Rösch introduced selective arterial embolization for treatment of massive bleeding in the early 70s. Anders Lundequist attached variceal bleeding with the technique of transhepatic variceal embolization in the mid 70s. Treatment of variceal bleeding improved with the introduction of TIPS, which will be the topic of my noon lecture.

Interventions in the biliary tract were developed by several pioneers. Joachim Burrhenne conceived and mastered the technique of percutaneous removal of retained biliary stones helping many patients avoid surgery. Stan Cope, Anders Lunderquist and Ernie Ring developed special tools and devices for biliary manipulation and drainage. They facilitated these procedures for many interventionalists and their patients. More recently, Plinio Rossi and Hall Coons enriched biliary interventions with their work using biliary stents. Coons attached even the most complex stenoses using multiple stents.

The Minnesota group of Kurt Amplatz, Willi Castaneda and Dave Hunter pioneered percutaneous urologic interventions. They popularized both internal and external nephrostomy drainage, percutaneous stone extraction, and more recently urethral dilation and stenting.

After Doppmans early work, embolization became the method of treating many types of malformations and tumors. Bob White pioneered embolization techniques for pulmonary AVMs. Sid Wallace was one of the first to treat bone and kidney tumors by embolization. His group was also instrumental in using chemoembolization for treatment of disseminated liver metastases. In Japan, Hideo Uchida and Ryusaki Yamada have been very successful with embolization of liver carcinomas. They even have excellent results treating large tumors.

Development of stents began slowly. In 1969, Dotter conceived the idea of expandable stents with an intra-arterial coil spring. But, it took 14 years for the first expandable stents to be introduced. The first stents developed by Dotter and Andrew Craig were made of nitinol. Other types of stents followed soon. Caesar Gianturco introduced. The first stents developed by Dotter and Andrew Craig were made of nitinol. Other types of stents followed soon. Gianturco introduced his self-expandable Z stent. Hans Wallsten introduced a self-expandable mesh stent, Ernst Strecker a knitted tantalum stent and Julio Palmaz his balloon expandable stent. Palmaz also has performed excellent experimental work on the pathophysiology of stent placement and together with John Parodi introduced stent grafts into clinical practice.

There have been many other pioneers that expanded interventional radiology and brought it to the present state of a highly regarded specialty of non-surgical, minimally invasive treatment