

FROM PALM LEAVES TO THERMOPLASTIC POLYURETHANES – THE HISTORY OF VASCULAR CATHETER DEVELOPMENT AND USE



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Introduction:

Vascular catheterization procedures are performed on millions of patients in the United States annually. Diagnostic and therapeutic, these procedures allow for the treatment of diseased vessels, resolving occlusions and delivering clot-dissolving medications. The use of catheters, however, is no new phenomenon; its history dates back to thousands of years.

Methods:

This presentation discusses a literature review of the history of vascular catheterization development and use.



Figure 1: Depiction of catheters made of materials such as palm leaves and reeds dating back as early as 3000 B.C.



Figure 2: Bronze Roman catheters, 1st century A.D.

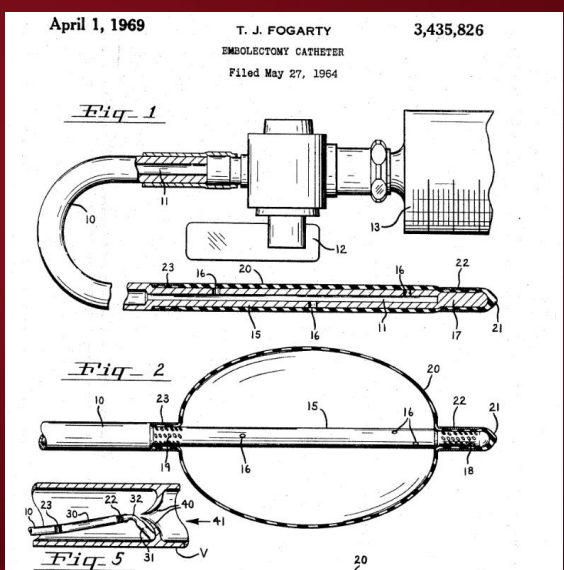


Figure 3: Portion of Fogarty's 1969 patent for embolectomy catheters

Results:

Ancient Egyptians, Greeks, and Romans used tubes from palm leaves and hollow reeds to study cardiovascular system function on human cadavers. In the 17th century, English anatomist Sir Christopher Wren fashioned a goose quill cannula, found to be capable of penetrating the veins of canines. 18th century English physiologist Stephen Hales used a brass pipe cannula to perform the first central vein catheterization on a horse to study hemodynamics. In the 19th century, French physiologist Claude Bernard attempted the first carotid artery cannulation on a horse using a mercury-based thermometer. In 1929, the first right heart catheterization in a human was performed by German physician Werner Forssmann on himself. In 1963, American surgeon Thomas Fogarty developed a balloon embolectomy catheter later called the Fogarty catheter for embolectomies. Charles Dotter, an American vascular radiologist, performed the first transluminal angioplasty in 1963, using a rigid woven fiberglass sheath. In 1974, German cardiologist Andreas Grüntzig developed a more refined angioplasty catheter with advice from chemist Heinrich Hopff, constructing single-lumen polyvinyl chloride (PVC) balloon catheters with better rigidity than before. Vascular catheter materials have continued to evolve, now including heparin coating, antibiotic-impregnation, and Silvadene incorporation. Today, PVCs have mostly been replaced by thermoplastic polyurethanes and polyamides, which have a lower chance of bacterial colonization and do not contain phthalate plasticizers, which are known to be endocrine disrupters.

Conclusion:

Vascular catheterization is commonly used for intravenous access, arterial blood monitoring, central access, treatment of stenosis and occlusion, and a host of other procedures. However, these innovations would not have been possible without a diverse and rich history of development, which spans several centuries of practice and invention.

