Hydrophilic Enviornments May Promote Easier Device Delivery

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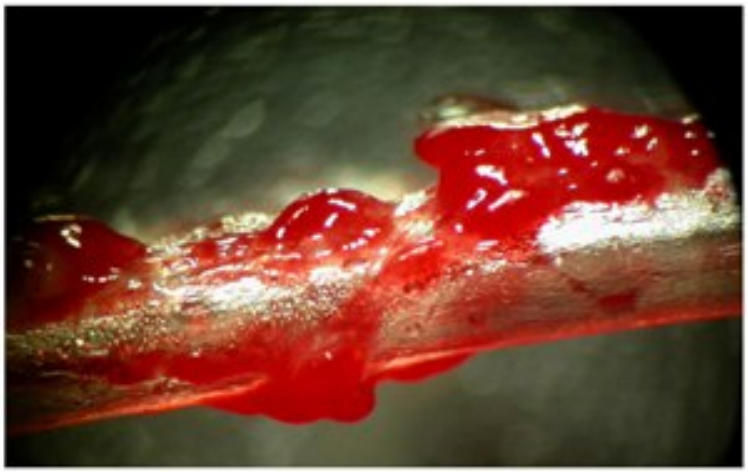
As minimally invasive technologies continue to permeate the healthcare industry, device makers need to ensure that their products make the process as smooth as possible. To this end, one solution offered to the OEMs focusing on device delivery is a hydrophilic coating that helps minimize resistance the catheter could face when traveling through the body.



ComfortCoat hydrophilic coating creates a hemocompatible, antimicrobial surface.

Medical device manufacturers continue to develop products that require minimally invasive surgeries, thereby reducing the risk of open body surgeries. Sometimes, these devices need to be navigated through tortuous, narrow blood vessels and anatomies. When that is the case, a combination of guidewires and catheters can be used.

Guidewires are used to position catheters and other types of hollow tubes (e.g., balloon catheters) within the body. When advancing a catheter over a guidewire and through a blood vessel, physicians can meet natural resistance due to stiction to the vascular inner surface. Maintaining a hydrophilic environment can help alleviate this resistance by enabling the catheter to slide through the wet environment. By definition, hydrophilic surfaces have an affinity to water, thereby attracting water molecules and resulting in a lubricious surface. These characteristics are significant to medical applications because they lessen friction forces within blood vessels, reducing the amount of potential tissue damage and ensuring patient comfort. It makes navigating winding blood vessels easier for

physicians, leading to more accurate device positioning.

The types of devices that are delivered through catheters include bare metal stent grafts and drug-eluting stents. These devices are used for percutaneous coronary interventions and endovascular stent graft placement, such as abdominal aortic aneurysm procedures. Furthermore, the neurovascular field is seeing increased use of catheters to reach vessels and aneurysms within the brain. Advances in medical technology have led to the development of brain stents and aneurysm coils that can be delivered through catheters and put in place without the need for craniotomy. Other catheter device delivery applications include insertion of chest drains and central venous catheters, insertion of PEG tubes, and insertion of the leads for an artificial pacemaker or implantable cardioverter-defibrillator.

Recent news has touted advances in transcatheter heart valves. The development of heart replacement valves that do not require open-heart surgery for implantation is a big step forward in cardiovascular medicine. Due to advanced age or illness, many patients with aortic stenosis (an abnormal narrowing of the aortic valve) are at high risk of dying or being chronically debilitated from open-heart surgery. According to a study by researchers at New York-Presbyterian Columbia, investigators found that 50% of patients whose aortic stenosis was left untreated died within one year.

Transcatheter heart valve systems are made up of a replacement valve, a metal frame, and a balloon catheter, which are all packaged into the size of a pencil's width. Physicians thread the system through a catheter inserted via incision in the patient's groin, then into an artery, and up into the heart. There, the balloon expands to fit the artificial valve into the patient's heart. Snaking a catheter all the way up to the heart through the femoral and iliac arteries covers a fair amount of distance within those blood vessels. Maintaining a hydrophilic environment can help ease the insertion dilator, introducer sheath, and the catheter, which leads to more accurate device implantation and prevents unnecessary tissue damage.

DSM [1] saw a need to create technology that encourages hydrophilic environment for guidewire and catheter insertion and advancement within the body. ComfortCoat coatings are used on catheters, guidewires, and other devices in vascular and urinary applications, where lubricity and water retention are necessary characteristics. In essence, any device small enough to be delivered via catheter can benefit.

Advances in medical devices come in many shapes and sizes and the techniques used to deliver them must remain flexible and keep up with ongoing advances. The tools used to deliver implants, such as stents, stent grafts, and heart valves, can be enhanced with coatings and surface modulations. By making it easier for physicians to move and accurately place devices within the body, costs can be lowered, surgery times can be shortened, and devices can start working to help patients faster.

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