Biomedical Engineering: Coronary Artery Disease and the Design Process of Medical Implants and Devices

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Let’s say your loved one has been getting nauseous every day, and they’ve been experiencing heavy pain in their chest and arms for months now. Of course, you go to the doctor, hopefully it’s just some small sickness that a pill off the wall can cure. The doctor informs you that your loved one has coronary artery disease, and that though there are cures, they’re risky and need constant check-ups. The disease has been undetected for years, but you’ll have to wait longer so they can fashion a cure specific to your loved one. As coronary artery disease is the number one killer in adults over the age of 60 in the United States, biomedical engineers are constantly testing different means of replacing and healing the artery, but most available cures require time and repetition. To avoid this, recent studies on copolymers have been extremely prevalent in CAD research. My research surrounds three of the more common copolymers, polycaprolactone (PCL), polyglycolide (PGA), and polylactide (PLA), and assesses the best combination of the three in terms of efficiency, availability, strength, and elasticity. I then designed a basic stent for a vascular artery replacement, made an engineering sketch consisting of surface modifications, as well as a comparison between my design and a native blood vessel, and made an at-home model of the stent. With further research on copolymers and biomaterials that are compatible with the human body, stents for coronary artery replacement can become more accessible and can last longer in vivo, allowing many more patients in need to get treatment as soon as possible, and with less of a necessity for long term treatment and repetition of the surgery.