DEVELOPMENT AND STUDY ON MECHANICAL PROPERTIES OF SMALL DIAMETER ARTIFICIAL BLOOD VESSEL BY USING ELECTROSPINNING AND 3D PRINTING

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Abstract

Small-diameter artificial blood vessel is synthesized with a diameter less than or equal to 6 millimeters. This technique has been utilized in coronary artery bypass grafting, in order to treat the coronary artery disease. Currently, the problem from coronary artery disease is still found in common, in addition to aortic aneurysm caused by incompatibility of mechanical properties between artificial blood vessel and local blood vessel in patient body. This research purpose to solve mentioned problems by electrospinning and 3D printing technologies, due to many kinds of material is supported, easily to change any parameter, and low cost. Moreover, the importance of 3D printing is able to determine the patterns of blood vessel as desire for the patient, who got damage in specific part of the blood vessel.

In this research, we tried to develop a novel design for a small-diameter polylactic acid (PLA) vascular graft with 4 mm of inner diameter by comparing the wall with different thickness. The developed small-diameter vascular graft be mechanical testing which are young's modulus, tensile stress, elongation at break, compliance, burst pressure, suture retention, and contact angle for wetting capability that is a important property for cell culture of vascular graft.

Finally, researchers expect to achieve new technical methods and conditions for synthesizing small-diameter artificial blood vessel by two early methods, including artificial blood vessel with proper mechanical properties for utilizing in coronary artery bypass grafting.