Failure of small diameter synthetic vascular bypass grafts

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Abstract

Atherosclerosis is a disease in which plaque accumulates on the inner wall of blood vessels and restricts the blood flow to muscles and organs. One of the procedures available to restore normal blood flow is vascular bypass surgery, in which an autogenic vessel or prosthetic tube is used to reroute the bloodstream around the occlusion. Small diameter grafts (< 6 mm) are especially important because these are used to bypass the coronary arteries, the most common site for vascular bypass. While autograft vessels have shown success in replacing these arteries, prosthetic grafts have demonstrated unacceptably low patency rates that have been attributed to compliance mismatch and thrombogenic luminal surfaces. This paper explores the structure-property relationships that determine why current prosthetic materials such as Dacron® and Teflon® have been unsuccessful as small diameter arterial bypass grafts and why new research in biologically derived materials and tissue engineered vessels may soon provide a solution that will eliminate the need for autologous vessels.