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Mussel-Inspired Elastic Interpenetrated Network Hydrogel as an Alternative for Anti-Thrombotic Stent Coating Membrane

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Abstract

Coated stents are classified as new generation stents wrapped with a thin polymeric membrane for the treatment of numerous vascular irregularities ranging from aneurysms to vascular leaks. Compared to partially covered and bare metal stents (BMS), fully covered stents promote less tissue granulation and suppress thrombosis, and can be designed to be post-operative retrievable. Fabrication method and material selection play significant roles in coated stent application, due to commercially available coated stents induce some degree restenosis. We have successfully fabricated a non-thrombotic and biocompatible fully coated stent made of a semi-interpenetrating network (IPN) hydrogel composed of acrylic acid (AA), dopamine methacrylamide (DMA), and methyl methacrylate (MMA) terpolymer (P(AA-co-MMA-co-DMA)/PU, incorporated with polyurethane (PU). We utilize a conventional mold casting method to fabricate a uniform covered stent, with the stent struts fully embedded within the hydrogel membrane. Firm polymer-stent bonding was achieved by introducing DMA into the matrix. We characterized the membrane by conducting platelet adhesion/activation studies followed by hemolysis and inflammatory potential evaluation which supports a non-thrombogenicity of the P(AA-co-MMA-co-DMA)/PU semi-IPN hydrogel membrane. The quality of the coated hydrogel membrane was