

Nanofiber Covered Stent (NCS) for Vascular Diseases

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Introduction: A covered stent is one whose length and circumference is enclosed with a membrane or fabric like material. Current covered stents have been used in the treatment of failed saphenous vein grafts in coronary bypass and coronary artery perforations. Covered stents have also been proposed in treating brain aneurysm. However, none of these applications showed satisfactory results. The deficiencies of the covered stents are 1) Large wall thickness 2) Rigidity 3) Non-biodegradable polymer with poor endothelialization. **Materials and methods:** Aligned poly(L-lactide-co-epsilon-caprolactone) [P(LLA-CL)] nanofiber was longitudinally deposited on to a bare metal stent (BMS) by a patent

pending electrospinning technique. The NCS were deployed following the instruction to evaluate the expandability. Biocompatibility of the nanofiber was characterized by cell culture, degradation and drug eluting study. Results: The cell viability of Porcine smooth muscle cells (PSMC) on the nanofiber was initially low but caught up after 2 weeks. SEM images showed 100% of cell confluence on the nanofiber after 2 months. Significant amount of ECM protein was detected on P(LLA-CL) nanofiber (0.07 mg/cm² at day 70). Complete degradation of P(LLA-CL) is expected within 6 months. Paclitaxel released from drug loaded nanofiber was shown to inhibit PSMC growth but kill Hela cells. NCS was successfully fabricated and deployed without tearing the nanofiber. **Conclusions:** NCS was successfully fabricated. P(LLA-CL) was chosen for the “cover” with proved superiorities on biocompatibility, cell viability, degradability and drug loading capacity. Future work will be animal study to prove that NCS can reduce in-stent restenosis and promote endothelialization.