Stability of passivated 316L stainless steel oxide films for cardiovascular stents

施俊明

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摘要

Abstract

Passivated 316L stainless steel is used extensively in cardiovascular stents. The degree of chloride ion attack might increase as the oxide film on the implant degrades from exposure to physiological fluid. Stability of 316L stainless steel stent is a function of the concentration of hydrated and hydrolyated oxide concentration inside the passivated film. A high concentration of hydrated and hydrolyated oxide inside the passivated oxide film is required to maintain the integrity of the passivated oxide film, reduce the chance of chloride ion attack, and prevent any possible leaching of positively charged ions into the surrounding tissue that accelerate the inflammatory process. Leaching of metallic ions from corroded implant surface into surrounding tissue was confirmed by the X-ray mapping technique. The degree of thrombi weight percentage [W_(ao): (2.1 +- 0.9) percent; W_(ep): (12.5 +- 4.9) percent, $p < 0.01$] between the amorphous oxide (AO) and the electropolishing (EP) treatment groups was statistically significant in ex-vivo extracorporeal thrombosis experiment of mongrel dog. The thickness of neointima (T_(ao): 100 +- 20 mu m; T_(ep): 500 +- 150 mu m, $p < 0.01$) and the area ratio of intimal response at 4 weeks (AR_(ao): 0.62 +- 0.22; AR_(ep): 1.15 +- 0.42, $p < 0.001$) on the implanted iliac stents of New Zealand rabbit could be a function of the oxide properties.