Segments of 6F-polyurethane catheters were tested in their native status, after chemical and after mechanical aging" Busch et al (2018).

Abstract:

To enable causal analysis of port catheter failure, this study aimed to develop an experimental setup for uniaxial tensile tests that addresses the specific requirements of highly elastic medical catheters; and to quantify parameters of the catheters' mechanical competence with respect to effects of artificial aging. Segments of 6F-polyurethane catheters were tested in their native status, after chemical and after mechanical aging. Tension experiments were performed with a rate of 220 mm/min until catheter failure. Material behavior was analyzed based on load cell measurements of the universal test system and an additional optical distance registration. The Young's modulus, the ultimate stress and the ultimate strain were determined. Chemical aging significantly decreased Young's modulus (84%; $p = 0.001$) and ultimate stress (83%; $p < 0.001$), whereas mechanical aged samples demonstrated similar results for the Young's modulus ($p = 0.772$) and a non-significant rise of ultimate stress (13%; $p = 0.128$). Ultimate strain did not differ significantly regardless of the pretreatment. The results proof reliability, reproducibility and sensitivity to quantify artificial aging induced variations and also promise to detect deviations in material features caused by long-term clinical usage of catheters.

Reference:

Busch, J.D., Schröder, H., Sellenschloh, K., Adam, G., Ittrich, H. and Huber, G. (2018) Test method for mechanical properties of implantable catheters according to DIN 10555-3. Journal of the Mechanical Behavior of Biomedical Materials. March 22nd. .

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