The Do's and Don'ts of 3D Printed AUP Meniscal Substitutes

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INTRODUCTION

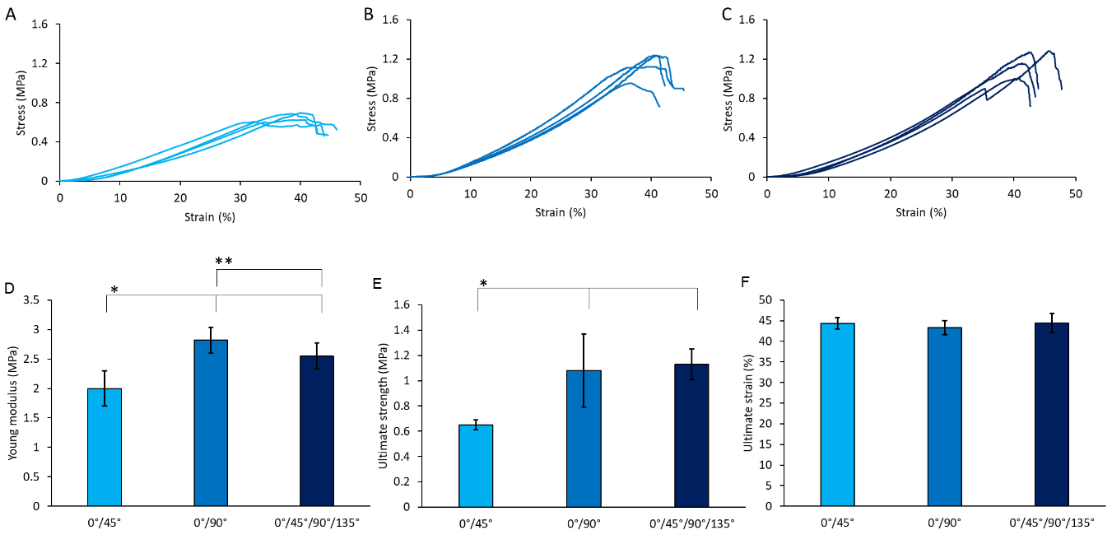
Hydrogels are widely applied in the biomedical field. Several years ago, our laboratory developed a novel type of hydrogel building blocks (the so-called AUP) that elegantly combine (1) biocompatibility, (2) solid state crosslinking behavior, (3) processing capabilities and (4) adaptability of the physico-chemical properties.[1] In the present work, we apply this material as potential meniscal implant.

EXPERIMENTAL METHODS

The AUPs applied in our work were synthesized by reaction of PEG with a molar mass of 1000-8000 g/mol with two equivalents of IPDI, followed by the reaction with two equivalents of a monoacrylated oligo(ethylene glycol) spacer. Starting from these hydrogel building blocks, scaffolds were 3D printed by extrusion of the polymer melts. Scaffolds with varying printing patterns, pore sizes and strut diameters were developed. Scaffold visualisation was realized using optical microscopy and micro-CT analysis. The compressive properties were evaluated on water-swollen AUP scaffolds.

RESULTS AND DISCUSSION

As an example, the effect of the printing pattern on the compressive properties of 3D printed AUP4K scaffolds are shown in the below figure.



CONCLUSION

AUP can be successfully 3D printed and the scaffolds reveal mechanical properties that match those of the human meniscus while not (yet) meeting the required fatigue resistance.

REFERENCE

1. WO2017005613A1, Novel urethane-based materials, derivatives, methods of their preparation and uses.

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