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IMPROVED BIOCOMPATIBILITY OF MESHES USED FOR HERNIA, INCONTINENCE AND ORGAN PROLAPSE REPAIR BY PLASMA COATING – RESULTS OF IN VITRO AND IN VIVO STUDIES

Hypothesis / aims of study

The application of alloplastic materials for surgical treatment of female incontinence, hernia and prolapse may lead to severe adverse events. Aim of this project was to optimize alloplastic materials with regard to improved biocompatibility establishing an in vitro and animal model.

Study design, materials and methods

An experimental in vitro approach representing the different cellular components of the pelvic floor and abdominal wall has been developed. Human tissue culture consisting of muscle, endothelial and fascia tissue/cells were separately cultivated and adhesion ability of the respective cultures was tested on different mesh types. Same was done with sheep tissue culture consisting of muscle, endothelial and fascia tissue/cells. Autologous plasma was used to modify the alloplastic materials and to improve tissue compatibility. Currently established mesh types were assessed with regard to the specificity of cell adhesion. Meshes with demonstrated in vitro biocompatibility were then transferred into an animal model
(sheep, n=14). Coated and uncoated versions of every mesh type were implanted into the animals allowing an intra-individual comparison. Criteria for assessment were foreign body reaction, scar formation and inflammatory reaction. Meshes were explanted and assessed after 3 and 6 months.

Results

The in vitro approach could show that meshes coated with autologous plasma show an improved cell adhesion for all three investigated cell types. Biological behaviour of human cells is comparable to cells in the sheep model. When evaluating the different meshes with regard to intensity of cell adhesion we established a ranking order for meshes. We implanted
coated and uncoated versions of three different mesh types with the following in vitro ranking order:

1. Dynamesh CICAT®
2. Ultrapro®
3. TVTo®

into 14 animals allowing an intra-individual comparison. We demonstrated significant less foreign body reaction, scar formation and
inflammatory reaction for the plasma coated material in each type of mesh after 3 month with the following ranking order:

1. Dynamesh-CICAT®
2. Ultrapro®
3. TVTo®

We revealed the same ranking 6 months after implantation.
Interestingly, the in vitro and in vivo rankings are equal.

Interpretation of results

Early and intermediate results from animal experiments support the hypothesis that autologous modification of alloplastic materials by coating with plasma leads to a reduction of inflammatory and foreign body reaction as well as of scar formation (clinically as histopathologically). This may result in improved early integration of the respective material into the different anatomical locations as abdominal wall, pelvic floor and peritoneum.

Concluding message

Coating of alloplastic materials with autologous plasma improves their biocompatibility and may lead to a bettering of the integration process into the patient´s body.

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What were the subjects in the study?	**ANIMAL**
Were guidelines for care and use of laboratory animals followed or ethical committee approval obtained?	**Yes**
Name of ethics committee	**Ethical Committee of the University of Szeged, Hungary**