

## **MODIFIED COLLAGEN MATRIX VERSUS STANDARD POLYPROPYLENE: BIOMECHANICAL FATE AND INFLAMMATORY RESPONSE OVER THE TWO YEARS PERIOD IN A RABBIT ABDOMINAL WALL MODEL FOR FASCIAL RECONSTRUCTION**

### Hypothesis / aims of study

Comparison of the long-term host response and fate of the implant strength up to a two years period in a rabbit model for fascial reconstruction. One biologic and one synthetic material were implanted, the both constructs marketed by American Medical Systems and are currently used in different systems both for treatment of incontinence and pelvic organ prolapse.

### Study design, materials and methods

Full-thickness abdominal wall defects were reconstructed, using "overlay" technique (1), with either monofilament Large Pore Polypropylene mesh (Intepro LPP), or not cross-linked porcine collagen acellular matrix (Intexen LP). The modification of standard Intexen is claimed to promote host tissue infiltration (2). Adult male New Zealand White Rabbits were used and randomly divided in two treatment groups of 18 rabbits each, according to the nature of the implant. The institutional and national guidelines for the care and use of laboratory animals were followed and animal Ethics Committee approved the study. Three implants of the same material per animal and fifty four implants in total per group were used to reach reasonable power. The fourth defect in each animal was repaired with continuous polypropylene suture, serving as internal control group. Two extra rabbits were implanted, giving the total of 38 animals. Three animals per group were sacrificed on day 30, 60, 90, 180, 365 and 730 days to evaluate morphologic and biomechanical properties of explants. On tensiometry we were testing both explants (including implanted material and surrounding tissue with interface between) and implants themselves. Haematoxylin-eosin and Movat staining were used, as well as immunohistochemistry staining with RAM-11, specific antibody for rabbit macrophages.

### Results

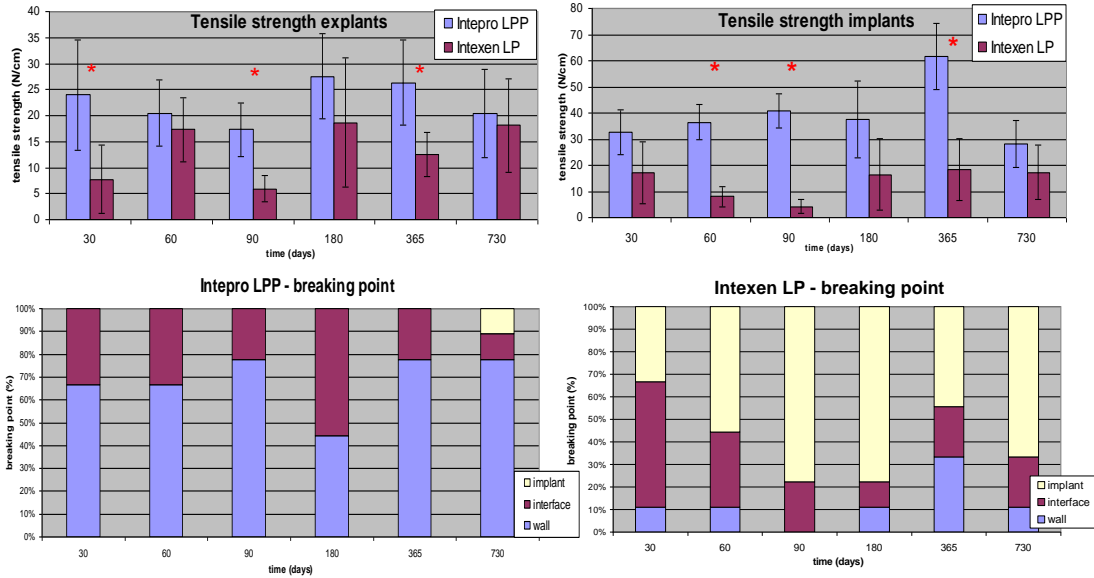
Over the study period two animals, one from each group, did not survive until the time of euthanasia: one from Intexen LP group died after 3 ½ months due to herniation with bowel incarceration at the site of one implantation and one from Intepro LPP group was found dead after one year under unexplained circumstances. In Intepro LPP group no reherniations, no seroma collection, no macroscopically obvious infections at any of given time points were observed. At 90 days five and after 180 days one more herniation of Intexen LP was found. After initial stretching of Intexen LP, both materials ended up with comparable size. At all time points Intepro LPP was thicker than Intexen LP. After 60 days at seven of nine implantation sites very thin collagen layer was still present, bulging, not yet herniating. Adhesion formation was comparable between both groups. Tensile strength of the explants was significantly different at 90 and 365 days after implantation, but not after 180 and 730 days. Inflammatory response was more pronounced around collagen matrix before 90 days, reflected in higher number of polymorphonuclear cells and macrophages. Stronger foreign body reaction was observed over the entire study period in Intepro LPP group. Formation of new vessels at interface was comparable between two groups. Strong foreign body reaction against synthetic material tempered over the time, while initial strong inflammation around collagen matrix disappeared after 90 days. At each time point inflammatory cells were more pronounced around synthetic material.

### Interpretation of results

Standard macroporous polypropylene proved to be a strong construct. Only one failure of synthetic material occurred during the mechanical testing of explants, in two years group, with ultimate strength of almost 13 N/cm. In total seven out of fifty four implanted Intexen LP constructs, real reherniations were observed. At 30 days the explants of Intexen LP were breaking at the still weak interface (tearing point at 8 N/cm). Critical period for failure of the collagen construct was up to 90 days when most of the herniations occurred; at the same time point the material itself was a tearing point for more than two thirds of the explants (< 6 N/cm), while the implants of Intexen LP were reaching barely 4 N/cm. Although at 180 days explants were still tearing in the material, strength of over 18 N/cm was obtained, which was comparable to the implants strength of 16 N/cm at the same time point. Intepro LPP provoked a fibrotic reaction within 30 days. Intexen LP was slowly replaced by thin collagen layer from 180 days on which corresponded with weakening of inflammatory response. Even after 2 years period discrete leftovers of Intexen LP could be identified both macroscopically and microscopically at some sites of implantation.

### Concluding message

One sixth of Intexen LP implanted meshes led to reherniations in in vivo abdominal rabbit model. Intepro LPP was integrated by an increasingly organised fibrotic scar within 60 days while Intexen LP was slowly replaced by thin collagen layer from 180 days on. After 2 years of implantation there were no differences in tensiometric strength between the two different materials.



Legend: (above) \* p < 0,05 Intepro LPP versus Intexen LP; (bellow) p < 0,05 at each time point Intepro LPP versus Intexen LP, except at 365 days.

**References**

1. Am J Obstet Gynecol 2008; 198:94.e1-94.e6.
2. Int Urogynecol J .2006; 17: S34-S38.

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<b>What were the subjects in the study?</b>	ANIMAL
<b>Were guidelines for care and use of laboratory animals followed or ethical committee approval obtained?</b>	Yes
<b>Name of ethics committee</b>	Animal Ethics Committee of KU Leuven