Absorbable Glycolic Acid / Trimethylene Carbonate synthetic mesh demonstrates superior in-growth and collagen deposition

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PURPOSE

GORE® BIO-A® Tissue Reinforcement is a bio-absorbable synthetic mesh composed of glycolic acid and trimethylene carbonate. The purpose of this study was to compare tissue response to GORE® BIO-A® Tissue Reinforcement versus biologic meshes.

METHODS

Twenty-four GORE® BIO-A® Tissue Reinforcement, ETHICON FLEXHD® Acellular Hydrated Dermis for Hernia Repair, ALLERGAN STRATTICE Reconstructive Tissue Matrix, and MEDTRONIC PERMACOL Surgical Implant meshes were implanted subcutaneously in rabbits and harvested at 7, 14, 30, 60, 90 and 180 days. HE and Hirovici stains were performed. Histology was graded using a semi-quantitative method. Statistical analysis included ANOVA, Chi-square, repeated measures ANOVA and logistic regression using a generalized estimating equation.

RESULTS

Type of mesh and implantation duration were significant predictors of all outcomes ($p<0.0001$). GORE® BIO-A® Tissue Reinforcement exhibited significant increase in cellular in-growth between 7 and 30 days ($p<0.0001$) reaching a max grade of 5.0. Biologics did not demonstrate significant change in in-growth between 7 and 180 days with max grades of 3.3, 2.6 and 1.9 for ETHICON FLEXHD® Acellular Hydrated Dermis for Hernia Repair, ALLERGAN STRATTICE Reconstructive Tissue Matrix, and MEDTRONIC PERMACOL Surgical Implant, respectively (Graph 1, Figure 1).

GORE® BIO-A® Tissue Reinforcement and Permacol exhibited relative increase in blood vessels between 7 and 14 days ($p=0.007$; 0.005) reaching scores of 4.4 and 2.4, with GORE® BIO-A® Tissue Reinforcement having the greatest vascular in-growth ($p<0.0001$). ETHICON FLEXHD® Acellular Hydrated Dermis for Hernia Repair and ALLERGAN STRATTICE Reconstructive Tissue Matrix had max grades of 2.9 and 2.7 with no significant change between 7–180 days.

GORE® BIO-A® Tissue Reinforcement had significantly greater collagen deposition between 7–90 days (Figure 2). Type I collagen was demonstrated in 100% of GORE® BIO-A® Tissue Reinforcement samples at 30 days – significantly earlier than the biologics ($p=0.006$). GORE® BIO-A® Tissue Reinforcement exhibited the least inflammatory infiltrate over time.

Graph 1. Total Cellular In-growth.

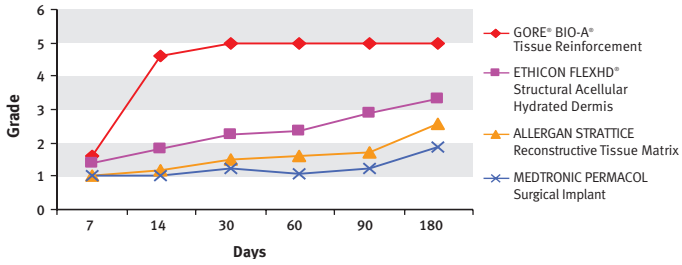

Figure 1. HE Stain showing tissue in-growth at 30 days.

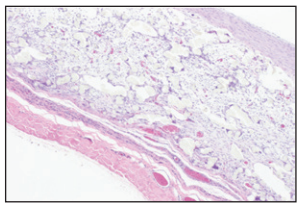

Figure 1A. GORE® BIO-A® Tissue Reinforcement.

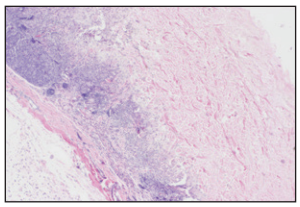

Figure 1B. FLEXHD® Acellular Hydrated Dermis for Hernia Repair.

Figure 2. Hirovici stain showing new collagen deposition (blue) at 30 days.

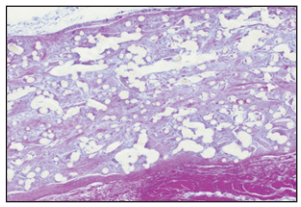

Figure 2A. GORE® BIO-A® Tissue Reinforcement.

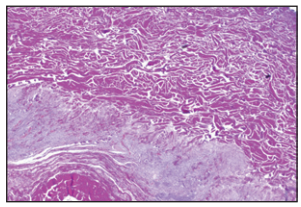

Figure 2B. FLEXHD® Acellular Hydrated Dermis for Hernia Repair.

CONCLUSIONS

GORE® BIO-A® Tissue Reinforcement exhibited higher degree of cellular and vascular in-growth and collagen deposition than three commonly used biologic meshes in a sterile field. The use of a glycolic acid / trimethylene carbonate absorbable mesh results in a favorable tissue response.

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