A Propensity Matched Analysis of 58,889 Patients Comparing ADM to Synthetic Mesh Surgical Site Outcomes in Ventral Hernia Repair

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Introduction: Strong evidence supports the use of reinforced mesh in ventral hernia reconstructions.[1] Although the use of synthetic, permanent materials are considered the gold standard in uncomplicated cases, significant controversy exists regarding the choice of mesh material in high risk patients. Recent Ventral Hernia Working Group (VHWG) guidelines recommend against the use of permanent synthetic repair materials in patients with clean-contaminated, contaminated, or dirty wounds (Grades 3 and 4), and noted an apparent increased risk of permanent synthetic repair materials in patients with preoperative predictors of surgical site complications (Grade 2).[2] In such cases biologic repair materials may potentially be advantageous, although the quality of evidence supporting these claims varies considerably. This study compares surgical site outcomes between synthetic and acellular dermal matrix (ADM) mesh repairs, with sub-group analyses stratified by the VHWG grading system.

Materials and Methods: Patients undergoing reinforced open ventral hernia repairs were identified from the National Surgical Quality Improvement Program (NSQIP) dataset and categorized by mesh material into synthetic or ADM cohorts. Sub-group analyses examined outcomes between synthetic and ADM repairs for each VHWG grade. Propensity score matching was performed for each sub-group in order to control for pre-operative differences between synthetic and ADM repairs. Multivariate logistic regression analyses were used to compare outcomes while controlling for potential confounding variables.

Results: A total of 58,889 patients met inclusion criteria, 954 (1.62%) of which underwent repairs reinforced with biologic mesh materials. Patients undergoing ADM repair exhibited a higher degree of preoperative comorbidities and higher wound classifications. Following propensity score matching, biologic mesh materials were independently associated with an increased likelihood for surgical site complications (p=0.049). Subgroup analysis demonstrated the choice of graft material did not exert a significant independent effect on surgical site occurrences regardless of VHWG grade (Tables 1 & 2).

Table 1. Multivariate Logistic Regression Examining Effect of Biologic Mesh on the Risk for Surgical Site Complications Based on the Ventral Hernia Working Group (VHWG) Grading System

	Odds Ratio	95% Confidence Interval	*p*-value
Overall	1.31	1.01-1.71	0.049*
VHWG 2†	1.20	0.78-1.85	0.411
VHWG 3 & 4‡	1.28	0.76-2.14	0.350
VHWG 4¶	0.72	0.50-1.04	0.079

*Denotes statistical significance <0.05
Permanent Prosthetic Mesh serves as the reference group
†Includes high risk patients with comorbid conditions including smoking, obesity, diabetes, and COPD
‡ Includes patients with clean-contaminated, contaminated, dirty, and open surgical sites
¶ Includes patients with contaminated and dirty surgical sites

Table 2. Multivariate Logistic Regression Examining Effect of Biologic Mesh on the Risk for Surgical Site Infections Based on the Ventral Hernia Working Group (VHWG) Grading System

	Odds Ratio	95% Confidence Interval	*p*-value
Overall	1.29	0.98-1.69	0.069
VHWG 2†	1.20	0.78-1.87	0.406
VHWG 3 & 4‡	1.26	0.74-2.12	0.392
VHWG 4¶	0.74	0.51-1.08	0.116

*Denotes statistical significance <0.05

Permanent Prosthetic Mesh serves as the reference group

†Includes high risk patients with comorbid conditions including smoking, obesity, diabetes, and COPD

‡ Includes patients with clean-contaminated, contaminated, dirty, and open surgical sites

¶ Includes patients with contaminated and dirty surgical sites

Conclusions: Significant deviations from VHWG guidelines were noted with synthetic mesh frequently used in both compromised surgical fields and in high risk patients. Interestingly, the use of biologic mesh does not exert a protective effect on infectious complications to the surgical site when used in VHWG grade 2, 3, or 4 patients. Given the significant costs and higher rates of hernia recurrence associated with biologic mesh materials, recommendations advocating the use of these materials in cases at high risk for infectious sequela should be investigated further.

References:

1. Ko, J.H., et al., Soft polypropylene mesh, but not cadaveric dermis, significantly improves outcomes in midline hernia repairs using the components separation technique. Plast Reconstr Surg, 2009. 124(3): p. 836-47.

2. Breuing, K., et al., Incisional ventral hernias: review of the literature and recommendations regarding the grading and technique of repair. Surgery, 2010. 148(3): p. 544-58.