Abdominal Dermis Tensile Strength in Aesthetic and Massive Weight-Loss Patients and Its Role in Ventral Hernia Repair: A Cross-Sectional Study

Guilherme Barreiro, MD; Leandro Totti Cavazzola, PhD

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INTRODUCTION: Skin tissue characteristics have been researched for years, particularly with regard to tissue engineering.[1] Clarifying the biomechanics of abdominal skin could lead to different uses for this tissue such as the ventral repair of hernias in patients with excess skin and incisional hernias. The objectives of this study were to compare the maximum tensile strength of abdominal skin to commercial meshes and to verify whether or not it varies between aesthetic patients and massive weight-loss patients.

MATERIALS AND METHODS: This was an experimental cross-sectional study. Skin samples sized 32x20 mm were taken from 15 abdominoplasties and 10 panniculectomies. The skin specimens were analyzed in vertical and horizontal tensile tests with a device designed for the study. The results were compared between the two groups including their traction directions. Commercial meshes available in Brazil were also tested. The results were analyzed using the Generalized Estimating Equation (GEE), the Winpepi® software for statistical power calculation and Student's t-test. The study was approved by the local ethics committee.

RESULTS: The aesthetic and post-bariatric groups were similar in most baseline characteristics except age, which was 37.2 ± 9.9 years in abdominoplasty patients and 45.9 ± 8.8 in panniculectomy patients ($p = 0.037$). The maximum tensile strength supported vertically by abdominal dermis was (mean ± standard-error) 403.5 ± 27.4N in the abdominoplasty group and 425.9 ± 33.9N in the panniculectomy group. Horizontally, the values were 596.5 ± 32.2N and 612.5 ± 43.9N respectively. The strengths between traction directions were significantly different ($p < 0,001$).There were no differences between the groups with regard to the maximum tensile strength ($p = 0.472$). Considering our sample size, it is possible to affirm that, if a difference between aesthetic and post weight-loss patients exists, it is lesser than 100N ($\beta=0.15$). Tested commercial meshes had the following values: polypropylene 104.6N, low-weight polypropylene 54.4N, polytetrafluorethylene (PTFE) 82.2N, and hydrated porcine small-intestinal submucosa 60.0N.

CONCLUSION: Previous studies were consistent with our results for both the vertical and horizontal dermal forces.[2] In our study, the tensile strength of the tested human abdominal dermis samples, both aesthetic and post-bariatric, were superior to the tested commercial meshes. Therefore, in some selected cases, abdominal dermis could be an alternative tool in abdominal reconstruction during panniculectomies with concomitant hernia repair.[3]

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