

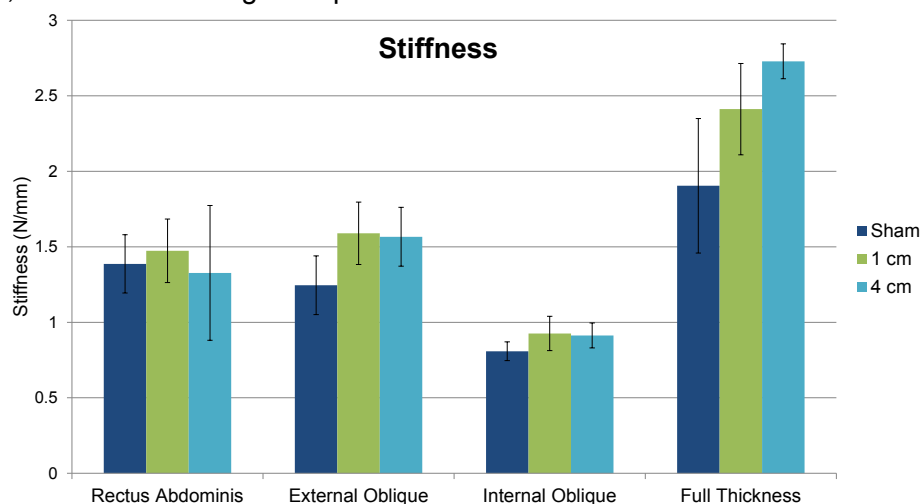
Incisional Hernia Defect Size and Abdominal Wall Compliance

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Objective: Myofascial wound failure results in incisional hernia formation in 11% to 16% of patients undergoing laparotomy resulting in over 200,000 ventral hernia repairs (VHR) annually in the US alone.¹⁻⁴ Recurrent incisional hernia formation is also common; randomized studies demonstrate a recurrence rate of 43% following suture and 24% following mesh repair.⁵ Our overall hypothesis is that after incisional herniation myopathic changes in abdominal wall musculature, causing decreased abdominal wall compliance, are the primary pathogenesis of the high recurrence rate after VHR. The working hypothesis for this study is that this abdominal myopathy is directly proportional to hernia size in a dose-dependent manner.

Methods: Adult Male Sprague-Dawley Rats were randomized to receive either a 1 cm (n=5) or 4 cm (n=5) midline laparotomy incision that was not repaired to produce an incisional hernia defect. Rats in the control (sham) group (n=5) had a skin flap raised without laparotomy. After one month, the external oblique, internal oblique, rectus abdominis muscles, as well as a full thickness abdominal wall section were dissected free for tensiometry, collagen content, and histology. Force extension curves were generated using an Instron tensiometer (model 5542; Instron Corporation, Canton, MA) equipped with a 50-N static load set at a crosshead speed of 10 mm per minute.

Results: Measured tensiometric parameters included Yield Strength, Yield Energy, Elongation Prior to Yield, and Stiffness. Figure 1 presents the tensiometric results for Stiffness (N/mm).



A stepwise increase in Stiffness from the Sham to the 1 cm to the 4 cm groups was observed for the full thickness specimens. Additionally, Rectus Abdominis muscle demonstrated stepwise decreases in Yield Strength, Yield Energy, and Elongation Prior to Yield when comparing the Sham to the 1 cm to the 4 cm groups (data not shown). Histology and collagen content did not correlate directly with the mechanical data.

Conclusions: These data support the concept that the biomechanical pathogenesis of incisional hernia is related to structural and mechanical changes associated with atrophic myopathy. Furthermore, it suggests that these changes develop quickly following herniation but that the changes in, and the interaction between, component muscle groups is complex.

References:

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