

Separation of Parts Reduces Stiffness and Increases Compliance of the Abdominal Wall in a Rat Model of Chronic Ventral Hernia

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Objective: Division of the tendon of insertion of the external oblique (EO) muscle, also called "separation of parts" (SOP), is often performed as an adjunct to ventral hernia repair (VHR). SOP has been most commonly conceptualized as a "relaxing" maneuver to allow tissue movement and approximation of the abdominal myofascia in the midline. We hypothesize that SOP increases abdominal wall compliance, counteracting the mechanical changes resulting from a chronic midline ventral hernia.

Methods: Midline incisional hernias were created in rats and allowed to mature for 7 days or for 30 days; un-operated animals served as controls. For each rat, the abdominal wall was then harvested, divided in half at the linea alba, and one side was subjected to SOP while the EO tendon on the other side was left intact. Each hemi-abdomen was then divided into two samples and the passive mechanical properties were determined using an Instron tensiometer (model 5542; Instron Corporation, Canton, MA) equipped with a 50-N static load set at a crosshead speed of 10mm per minute.

Results: In animals with hernias, we observed mechanical changes in the unreleased abdominal wall that included decreased elongation at yield and decreased yield strength (data not). Release of the EO tendon significantly decreased abdominal wall stiffness in both control and hernia animals.

Conclusion: These data support our hypothesis that ventral herniation results in significant changes in the mechanical properties of the abdominal wall. SOP decreases stiffness and increases compliance of the abdominal wall and this effect is preserved despite hernia-induced abdominal wall myopathy. SOP therefore aids in VHR by specifically counteracting the unfavorable mechanical changes that occur in the abdominal wall after ventral herniation.

Stiffness (N/mm)		
	EO Intact	EO Released
Un-operated controls	2.2 (0.20)	1.4 (0.09)**
Midline abdominal hernia – 7 days	2.1 (0.24)	1.6 (0.16)**
Midline abdominal hernia – 30 days	1.15 (.11)*	1.13 (.14)**

Mean (SEM); * $p < 0.05$ vs. un-operated controls; ** $p < 0.05$ for released vs unreleased in each group; N = 26 measurements for un-operated controls; N=14 measurements for midline abdominal hernia at 7 days; N=12 measurements for midline abdominal hernia at 30 days.