An innovative mesh to reduce the incidence of ventral hernia recurrence

Carolina Vanetta MD, Daniel Guerrón MD, David Ruppert PhD, Howard Levinson MD

Introduction

The recommended approach to a clean ventral hernia repair (VHR) is mesh reinforcement, and mesh can be placed as a sublay in the retro-rectus or pre-peritoneal space. Despite the variety of techniques and prosthetic materials, the rate of hernia recurrence is 5-20%.

In VHR, only the concave, elastic, abdominal wall supports the mesh. Large peripheral sutures transfixing the abdominal wall required to maintain mesh placement tend to penetrate and slit the tissue due to abdominal wall tension and may lead to the lateral displacement (i.e. mesh migration, or contraction) of the mesh and hernia recurrence. This suggests there is a flaw in the anchoring mechanism.

Description and method of use

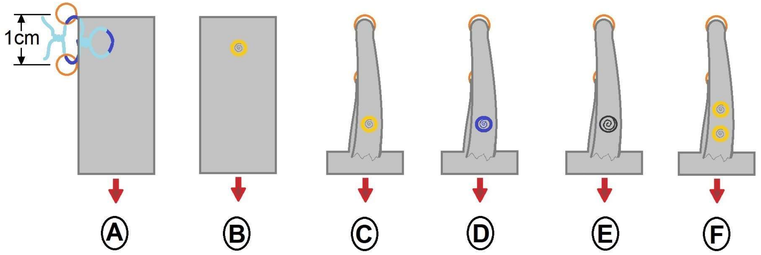
The **T-Line® Hernia Mesh** is a medium-weight, macroporous, polypropylene mesh with 6mm wide integrated mesh extensions on each lateral corner. This mesh is being studied for MIS transabdominal preperitoneal (TAPP) or totally extra peritoneal (TEP) techniques, in which the mesh is placed in the retro-rectal or pre-peritoneal space. After reducing the hernia, the mesh is introduced into the desired space in the abdominal wall, and its center is fixed with a tack to keep it in place. A percutaneous suture grasper is introduced through the skin and used to grab the end of one of the four mesh extensions, pull it into the supra-aponeurotic space and back in again. In this way, a loop of mesh traverses the abdominal wall from inside-out and goes in again. Once inside, the extension is folded back over itself and fixed to the abdominal wall with 1-3 tacks. This is repeated with the other mesh extensions. Additional tacks may be used to stretch and fix the mesh to the abdominal wall.





Preliminary results

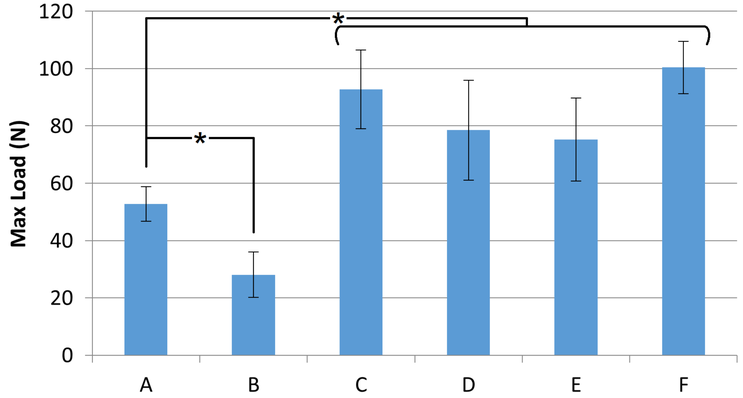
Mechanical testing was conducted by anchoring a commercial polypropylene T-Line Hernia Mesh to the fascia of swine abdominal wall. Seven different anchoring methods were tested: fixation of the mesh to the fascia with suture (A) or single tack (B), fixation of a mesh extension to mesh and fascia with single absorbable (C,D) or non-absorbable tucks (E), and double tucked mesh extension to mesh and fascia with absorbable tacks (F). Specimens were placed on an Instron, tensions were applied at a constant displacement rate until failure, and load-displacement curves recorded. Suture showed to be significantly stronger (88%, P<0.001) than tacking mesh to the fascia. However, all cases in which the mesh extension was tacked through the mesh to the fascia after the fascial bite were significantly stronger than suture (43-76%, P<0.05), and 90% stronger (P<0.001) than suture if double-tacked. There was no statistical difference in the different types of tacks used.



	Max Load (N)	Failure (N)	Stiffness (N/mm)	Ave Stiffness (N/mm)	Elongation (%)
A	52.8±6.1	52.8±6.1	2.41±0.30	1.35±0.28	59.9±9.6
B	28.1±7.9	23.4±7.6	0.97±0.65	1.08±0.34	41.8±16.4
C	92.7±13.7	79.2±16.1	2.71±1.26	2.33±0.47	58.2±6.4
D	78.5±17.4	66.8±12.7	2.97±0.74	2.63±0.54	44.3±3.7
E	75.3±14.5	66.6±16.6	1.85±0.68	2.16±0.28	55.0±14.3
F	100.4±9.2	94.8±13.0	3.22±0.81	2.77±0.22	58.1±6.7

Failure=Peak load prior to 25% or more loss of load; **Stiffness=** measured over 1cm displacement prior to failure; **Ave Stiffness=**prior to failure; **Elongation=**prior to failure.

Max Load Prior to Complete Failure



Conclusions

The T-Line Hernia Mesh was invented to overcome hernia recurrence and this is the first study for a minimally invasive approach. Results showed a 90% increase in anchoring strength when compared to standard practice. Furthermore, introducing mesh extensions into the abdominal wall will likely produce mesh bio-incorporation, further increasing the strength of fixation, and leading to decreased hernia recurrences.

References

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