Early Use of Novel T-Line® Hernia Mesh with Superior Anchor Strength in a Complex Case

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T-Line Hernia Mesh Background:

Hernia recurrence following ventral hernia repair (VHR) is ≥30% over 10 years.[1] A major source of recurrence is thought to be mesh anchor point failure; suture tearing, or "cheesewiring", through tissue or mesh at the focal point of attachment. Suture cheesewiring can occur at 6 to 14 N/cm, whereas peak abdominal pressures can exceed 32 N/cm when coughing or lifting.[2,3] Achieving mesh fixation that withstands these forces will reduce mesh dehiscence and migration, thus decreasing hernia recurrence.

To overcome this problem and facilitate tension-free repair, the T-Line® Hernia Mesh (**Figure 1**) was developed. It is a moderate-weight, super macroporous (>2.6mm^2), polypropylene mesh with unique integrated mesh extensions located at 2-cm intervals along the lateral borders of the prosthetic. The novel mesh extensions serve to significantly reduce focal anchor point stress by spreading these forces over a larger area. While the T-Line Hernia Mesh achieves ~3X stronger anchoring strength than currently available meshes,[1] the anchoring strength of the mesh extensions should increase further over time as they bioincorporate with adjacent host tissue.

During ventral hernia repair, the T-Line Hernia Mesh is placed over the repair with the mesh extensions sewn into the adjacent fascia. A quick self-locking back-stitch secures the extensions and avoids the need for bulky suture knots. Mesh tension is set by sewing the contralateral extensions into tissue, thereby allowing the surgeon to control how tightly the mesh is stretched across the tissue.

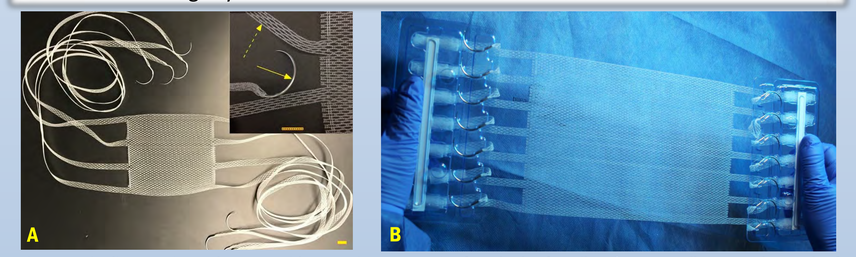

Figure 1. A) T-line Hernia Mesh: 0.5cm wide extensions emanating from body of textile w/ GS21 needles swaged on ends of extensions. Scale bar = 1 cm, ——— = GS-21 needle, and - - → = extension/suture. B) T-line w/ needles and extension packaged in deployment trays. Photo used with permission from Deep Blue Medical Advances, Inc.

Case:

HPI: The patient was a 57-year-old man who presented with a chief complaint of a recurrent ventral hernia with spontaneous bleeding.

PMHx/PSHx: He had a history of hypertension, bipolar disease, pulmonary embolism , obesity (BMI=45) with prior Roux-en-Y gastric bypass , GERD, PTSD, COPD, obstructive sleep apnea, hypothyroidism, venous stasis disease, chronic abdominal pain on methadone, benign prostatic hypertrophy, and homelessness.

The patient's history of the present illness began with his gastric bypass procedure that was complicated by a wound dehiscence after an abdominoplasty, followed by an incisional hernia. He has had hernia repairs with mesh in ~2008, Oct 2017, Aug 2018, Jan 2018, Feb 2018 and Aug 2018.

In 2020, the patient was hospitalized for left lower abdominal pain. He was found on abdominal CT to have an intraperitoneal hematoma extending into his chronic, complex, bilobed ventral hernia plus an associated umbilical hernia containing multiple loops of non-obstructed large and small bowel (**Figure 2**). He was treated conservatively, and his Eliquis anticoagulation discontinued. The patient had abdominal pain 9/10. He managed the pain with methadone. On exam, he had a very large hernia with mild overlying skin changes.

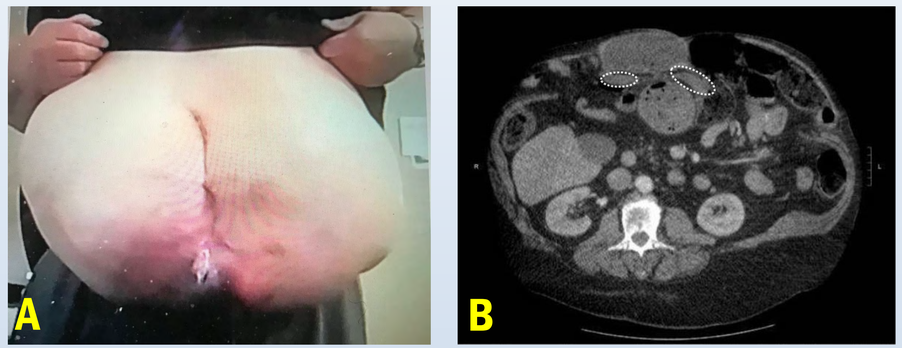

Fig. 2. A) A representative cross-sectional image from the patient's abdominopelvic CT scan demonstrating multiple ventral abdominal wall hernias. The rectus muscles are identified within the white dashed line circles. B) Cheese-wiring of the primary repair.

Surgical Treatment:

The patient was found to have a complex ventral hernia with 3 ventral defects, 1 along the left lateral border of the rectus muscle measuring 13 x 21 cm, 1 along the right lateral border of the right rectus muscle measuring 10 x 15 cm, and 1 in the midline measuring 7 x 3 cm (**Figure 3A**). Each of the defects was closed with a running #1 Prolene utilizing 1 cm bites with 1 cm travels. A 30 x 20 cm piece T-Line Mesh was placed as an onlay (**Figure 3B & Figure 4**). Four 19-French channel drains were placed and the wound closed with a series of 3-0 and 2-0 Vicryl sutures and a process of progressive tension suturing to attach the overlying subcutaneous tissue to the underlying fascia. A chronic cutaneous scar that measured 8 x 4 cm was excised and the skin was brought together with a combination of subcutaneous and deep dermal sutures of 3-0 Vicryl, followed by 2-0 nylon vertical mattress sutures.

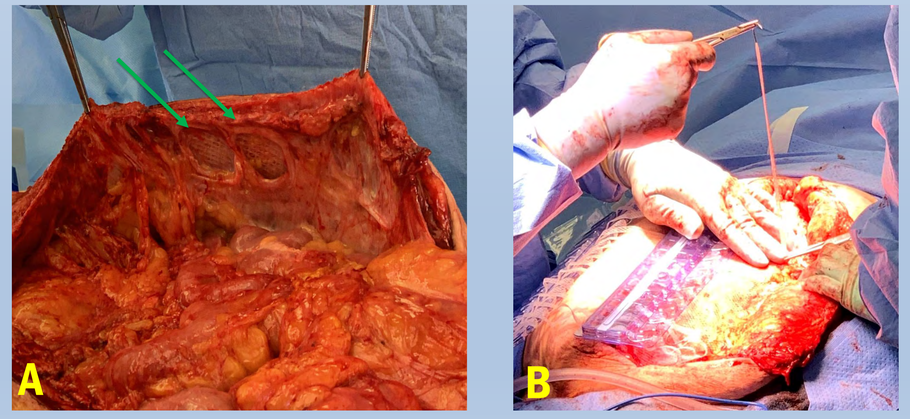

Figure 3. A) Multiple ventral defects (green arrows) from potential cheesewiring of the primary repair. B) Anchoring of T-line® Hernia Mesh with self-locking back-stitch and remaining extensions managed in trays.

Post-operative outcomes: The patient recovered uneventfully without complications.

References:

1. Burger JWA, Luijendijk RW, Hop WCJ, et al. Long-term follow-up of a randomized controlled trial of suture versus mesh repair of incisional hernia. Ann Surg. 2004; 240: 578–583.
2. Ibrahim M, Green J, Everitt J, et al. Soft Tissue Anchoring Performance, Biomechanical Properties, and Tissue Reaction of a Now Hernia Mesh Engineered to Address Hernia Occurrence and Recurrence. J Med Device. 2019; 13(4): 21-29.
3. Pott PP, Schwarz ML, Gundling R, et al. Mechanical properties of mesh materials used for hernia repair and soft tissue augmentation. *PLoS One* 2012; **7**: e46978

Conclusion:

The T-Line Hernia Mesh felt intuitive and the lock-stitch yielded a simple method for solidly anchoring the mesh (**Figure 3B**). The mesh prosthetic was easily cut to size, allowing for additional points to be created using the "extra" mesh extensions that were trimmed. Fixation points were created along the cephalad and caudal edges for anchoring the mesh perimeter to provide further assurance of repair by attaching the extension to the edge of the mesh in a "zip-tie" fashion (**Figure 5**). The mesh knit pattern handled easily and laid flat when anchored in place (**Figure 4**)."

In summary, the T-Line Hernia Mesh provided a novel, easy to use prosthetic for repair of a challenging abdominal wall hernia.

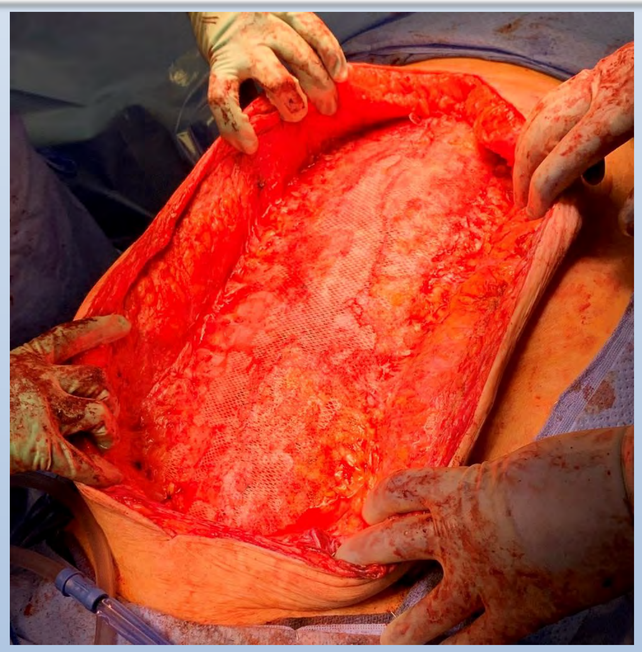

Figure 4. T-Line® Hernia Mesh in onlay position.

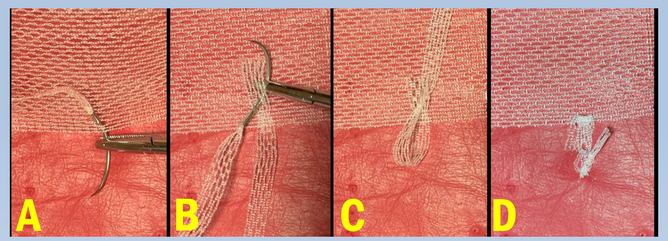

Figure 5. A novel use of a free T-Line® Hernia Mesh extension to create additional anchor points at the cranial and caudal edges of the mesh. A) Take a bite through the edge of the mesh (may include underlaying fascia). B) Pass needle back through a pore near the tail of the extension. C) Pull extension like a zip-tie to sinch down on the mesh body. D) Complete anchor with normal two-bite lock-stitch.

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