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CASE REPORT
Reconstructive

Repair of Massive Pediatric Abdominal Wall Hernia Using Mesh Suture

Kento Takaya, MD, PhD*
Sofia Aronson, MD†
Kazuo Kishi, MD, PhD*
Michael Boctor, MD‡
Gregory A. Dumanian, MD†
Akira Yamada, MD, PhD§

Summary: Repair of large abdominal wall defects and hernias poses a unique challenge in the pediatric population. Standard suture repair risks hernia recurrence if the suture pulls through the tissue under excessive forces. Traditional planar mesh requires more invasive surgery and may complicate future abdominal surgery in the child's lifetime. Mesh suture repair potentially offers a lower recurrence risk than traditional suture repairs and less invasive surgery than traditional planar mesh placement. Thus far, there are no reports of the use of mesh suture and its outcomes in the pediatric setting. We describe an 8-year-old child with an acquired massive abdominal wall defect who underwent mesh suture repair. *(Plast Reconstr Surg Glob Open 2025;13:e6753; doi: 10.1097/GOX.0000000000006753; Published online 2 May 2025.)*

Abdominal hernia repair aims to achieve durable fascial closure while minimizing complications such as pain, surgical site occurrence, bowel injury, infection, and hernia recurrence. A multitude of surgical techniques have been described, including standard suture repair, suture repair augmented with biologic planar mesh, or absorbable or permanent prosthetic planar mesh, anterior or posterior component separation with minimally invasive techniques, and reconstruction with autologous tissue using grafts.[1] Standard suture repairs obviate the risk of planar mesh, but they pose a risk of cutting the very tissues that they are meant to hold together, termed "suture pull-through" or "cheese-wiring." This occurs when the pressure applied over a small contact area of a material exceeds the ultimate tensile strength of the material. The smaller the contact area, the higher the pressure (measured in force per unit area). This is why a sharpened knife with a smaller contact area cut better than a dull knife with a larger contact area.

*From the *Department of Plastic and Reconstructive Surgery, Keio University School of Medicine, Tokyo, Japan; †Division of Plastic Surgery, Feinberg School of Medicine, Northwestern University, Chicago, IL; ‡Division of Plastic Surgery, Loma Linda University Medical Center, Loma Linda, CA; and §Division of Pediatric Plastic Surgery, Ann & Robert H. Lurie Children's Hospital of Chicago, Feinberg School of Medicine, Northwestern University, Chicago, IL.*

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The risk of hernia recurrence due to suture pull-through is inherent in all standard suture closures. To address this problem, an innovative mesh suture (Duramesh; Mesh Suture, Inc., Chicago, IL) was developed and approved by the US Food and Drug Administration in September 2022.[2] Duramesh is a polyfilament polypropylene suture that increases the suture-tissue contact surface area with 12 or 18 filaments (depending on suture size), thereby reducing pressure at the suture/tissue interface. Mesh suture also allows fibrovascular incorporation of the suture filaments, rendering the early repair twice as strong as standard suture repair at 8 days.[3] However, there are no reports of repair using this new suture in the pediatric setting. We report short-term outcomes in the first pediatric patient with a large abdominal wall defect treated with mesh suture.

CASE PRESENTATION

A previously healthy 8-year-old girl presented to the emergency department with fulminant myocarditis of unclear etiology, requiring extracorporeal membrane oxygenation. Her course was complicated by multiple gastrointestinal hemorrhages treated with embolization and abdominal compartment syndrome requiring decompressive laparotomy. She underwent staged provisional closure with spanning biologic mesh (AlloDerm; AbbVie, Chicago, IL) and eventual split-thickness skin grafting once the mesh was fully incorporated. Her general condition improved, but over the subsequent months, she developed a massive hernia (Fig. 1), as evidenced by the 9-cm defect between her rectus muscles

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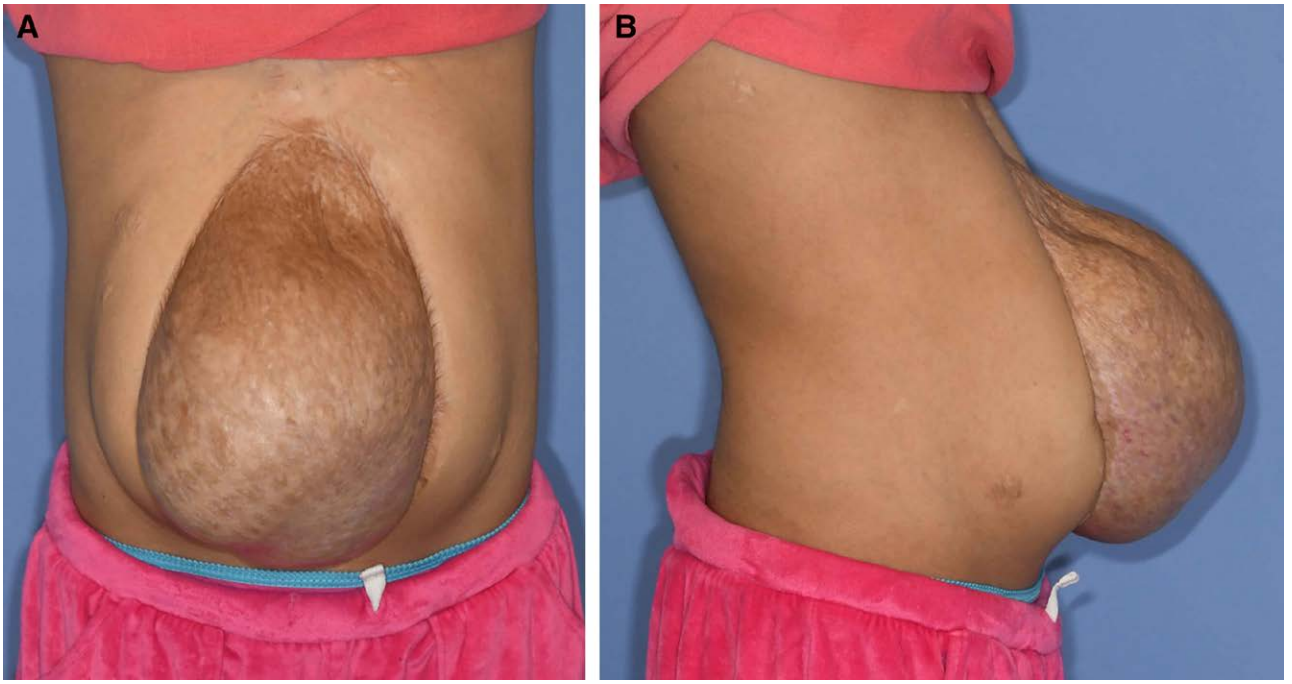

Fig. 1. Preoperative picture. A, Frontal view. B, Lateral view.

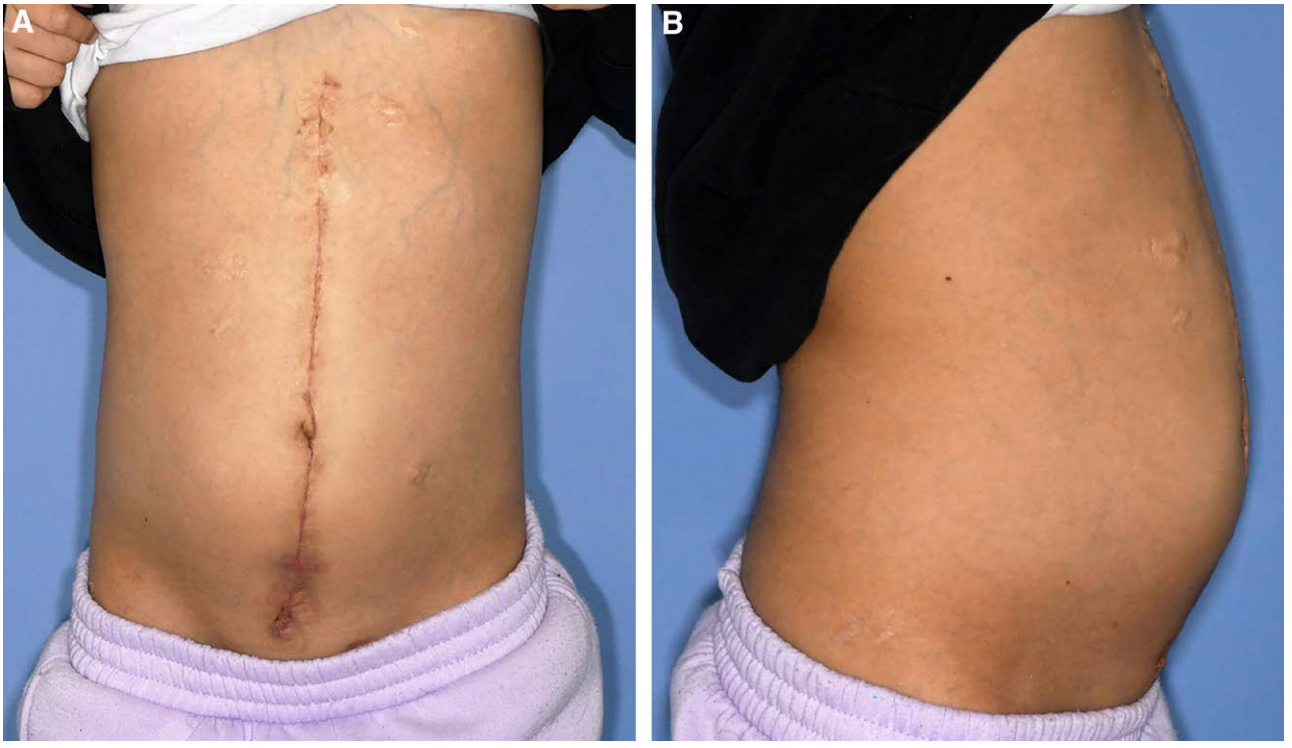

Fig. 2. Three-month postoperative picture. A, Frontal view. B, Lateral view.

(Fig. 2). Three weeks before definitive abdominal wall reconstruction, she received 100 units of botulinum toxin A per side to improve abdominal wall compliance, and it was confirmed that the ends of the abdominal wall could be brought together easily with 2-finger tension at the midline.[3]

Surgical Procedure

The skin graft was carefully incised and peeled off of a pseudoperitoneal layer and bowel with cautery and sharp dissection. There were 2 areas of dense bowel adhesion to the skin graft, which were sharply cut away. The defect in the abdominal wall after removal of the AlloDerm was 9 cm

wide. A small serosal injury was repaired with interrupted polyglactin sutures. After graft removal, a 1-cm clearance was made to expose the linea alba and a small amount of anterior rectus fascia. (**See figure, Supplemental Digital Content 1**, which displays the defect after dissection of the intestine and removal of the skin grafts, **http://links.lww.com/PRSGO/E8**.) Manual tension was applied to the medial borders of bilateral rectus muscles, confirming the efficacy of botulinum toxin administration and, thus, no need for anterior component releases. The linea alba was closed as a composite layer using a running no. 2 mesh suture, taking 1 cm bites from the cut edge and traveling 8 mm between bites. The wound was sutured from both ends, and the sutures were tied together in the center. (**See figure, Supplemental Digital Content 2**, which displays the wound after suturing by mesh suture is completed, **http://links.lww.com/PRSGO/E9**.) The skin was then closed in layers. At 3 months postoperatively, there was no evidence of hernia recurrence (Fig. 2), and the patient has returned to all activities without restriction. (**See Video [online]**, which displays the surgical sequence of operations.)

DISCUSSION

Reconstruction of the linea alba for abdominal wall defects is the gold standard of care. However, in some cases, particularly when tension is high immediately postoperatively, the reconstruction may fail before scar formation has occurred and stabilized the repair. Plastic surgeons are thus exploring new techniques and devices to reinforce the abdominal wall against early postoperative forces, ensure reliable closure, and prevent hernia recurrence. Mesh suture may serve as a new generation of tissue approximation devices.[4] Mesh suture filaments are shown to assume a flattened oval configuration within tissues orthogonal to the direction of pull, thereby distributing tension at the suture–tissue interface.[5,6] Encouraging data have shown low rates of surgical site infections and surgical site events, offering promise for abdominal wall reconstruction.[7] When using this suture, it is necessary to create the appropriate knot to obtain optimal performance, and the product recommends "tying it at least 4 times in an alternating fashion," and it is recommended that the knot be "pressed" with extra force each time it is tied.[8] Deviations from the intended use of the device may increase the risk of complications, so it is necessary to consider appropriate handling.

Although highly invasive procedures such as fascial reinforcement with planar meshes and component release are often necessary for massive defects,[9,10] they are less suitable for pediatric patients with long remaining life expectancy. Mesh suture achieved excellent short-term closure outcomes in this case, preserving future surgical options should they be necessary, including all surgical adjuncts of tissue releases and mesh placement. No bridges have been burned.

Further case accumulation and long-term follow-up as well as detailed comparisons with existing mesh and suture techniques are necessary to better characterize outcomes of this technique in children. As with any new device, it is imperative that the implementer carefully review instructions for proper use to optimize outcomes.

CONCLUSIONS

We report a pediatric massive abdominal wall defect hernia repair with a novel mesh suture that combines the simplicity of suture repair with the favorable force distribution properties of mesh. This technique offers an attractive alternative to simple suture repair and planar mesh repair of abdominal hernias.

Akira Yamada, MD, PhD
Division of Pediatric Plastic Surgery
Ann & Robert H. Lurie Children's Hospital of Chicago
Feinberg School of Medicine
Northwestern University
Chicago, IL
E-mail: ayamada@luriechildrens.org

DISCLOSURES

Dr. Dumanian has financial interest and is an officer of the Advanced Suture Co. and the Mesh Suture Co. He could potentially benefit from the outcomes of this research. The other authors have no financial interest to declare in relation to the content of this article.

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