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CASE REPORT
Reconstructive

A Surgical Alternative in the Treatment of Recurrent Diaphragmatic Hernia after Total Gastrectomy

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Summary: Treament of hiatal hernia remains a challenge for surgeons. The techniques for treatment started with cruroplasty, which was later associated with extensive mobilization of the esophagus, with or without fundoplication. Other solutions included the use of synthetic or biological mesh and autologous tissue reinforcement. Despite these therapeutic strategies, the recurrence rate for hiatal hernia is significant, and no existing treatments have had much success in reducing this rate. Total gastrectomy, as in this case, represents an additional challenge because of the absence of gastric tissue, which can buttress the pillars' repair. This case report introduces a novel approach for the treatment of recurrent hiatal hernia, using a pedicled vertical rectus abdominis myocutaneous flap. *(Plast Reconstr Surg Glob Open 2020;8:e3302; doi: 10.1097/GOX.0000000000003302; Published online 21 December 2020.)*

A 69-year-old man presented to our hospital for abdominal pain in the periumbilical region and left flank. The pain expanded to the back and increased in the lateral decubitus position. The patient also suffered from postprandial vomiting, and had a diagnosis of COPD GOLD 3, resulting in effort dyspnea.

This patient underwent a total gastrectomy 10 years ago, and 2 years later, he was treated twice for a hiatal hernia, first with suture of the defect and then with the use of a prosthesis. The surgical history also showed a prosthetic repair of an abdominal wall incisional hernia.

On clinical examination, the patient presented a painful abdomen, mostly in the periumbilical region and left flank, with mild abdominal guarding. Peristalsis was preserved, and vital signs were stable. An abdominal CT scan with contrast showed a massive hiatal hernia with intestinal strangulation (Fig. 1).

The patient's diaphragmatic hernia was treated by a manual reduction and suturing of the esophageal hiatus. Nonabsorbable sutures were used to reduce the diameter of the defect, which did not exceed 2 cm, by gripping the edges of the mesh. Severe strangulation of the intrathoracic portion of the intestine necessitated a segmental intestinal resection.

During the patient's hospital stay, the hernia recurred as a result of a cough and vomiting episode. An abdominal CT scan demonstrated colonic passage with renewed intestinal strangulation. After discussion involving the Plastic Surgery and Visceral Surgery teams, it was decided that the hiatal defect should be filled by using a deepithelialized musculocutaneous flap of the rectus abdominis muscle (VRAM flap), with a superior-based pedicle.

SURGICAL TECHNIQUE

An incision was performed along the abdominal midline from the xyphoid process to the pubis, through the anterior wound to reach the abdominal cavity. The hernia was visualized and then reduced manually. The previous diaphragmatic stitches were still intact, and further reducing the hiatal space would certainly lead to severe dysphagia, confirming the preoperative strategy.

Another cutaneous incision was carried out 4 cm laterally to the linea alba on the left side of the abdomen, parallel to the previous incision, leaving a rectangular paddle. The rectus abdominis muscle was first detached from the pubis, and the inferior epigastric artery was identified and ligated. The paddle was dissected from the pubis to the xyphoid process in a deep plane, at the level of the transversalis fascia. Undermining of the muscle and artery was performed superficially to the transversalis fascia until the upper part of the superior epigastric artery was reached. The flap dimensions were of 26 cm in length and 4 cm in width.

The musculocutaneous flap was deepithelialized and then passed along the esophagus through the esophageal hiatus and placed into the mediastinum without any tension, thus filling the mediastinal cavity completely without compression of the digestive tube. The paddle was finally fixated on the diaphragm at the level of the esophageal hiatus using nonabsorbable sutures (Fig. 2A). To minimize compression, 1-layer closure of the abdominal wall was discontinued in the deep plane in the upper part of the wound (on the flap's path) (Fig. 2B).

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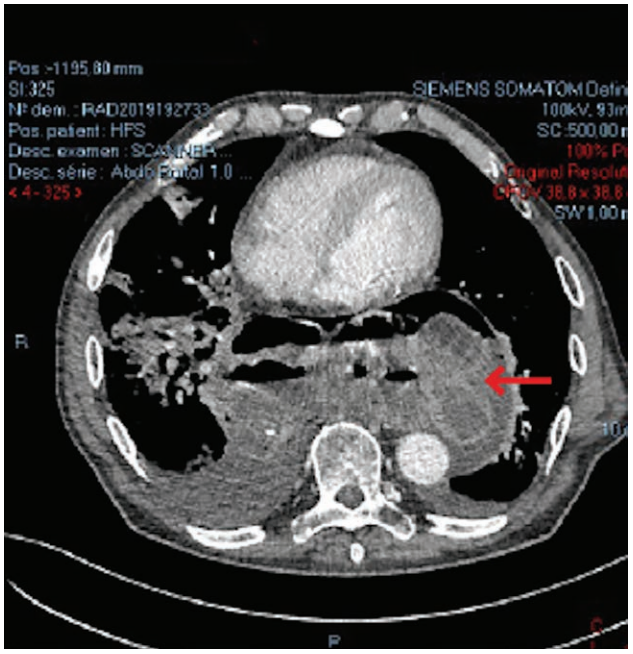

Fig. 1. Preoperative CT scan showing the hiatal hernia (red arrow) at the level of the ninth vertebra.

POSTOPERATIVE CARE

A nasogastric tube was placed to prevent vomiting, and parenteral nutrition was administered for 7 days. Enoxaparin sodium (Clexane) was given once a day, and pain was managed with a standard protocol. Monthly follow-up was scheduled. CT scans at 12 months showed no recurrence of the hiatal hernia and no dysphagia (Fig. 3).

DISCUSSION

Treating recurrence of hiatal hernia has been the focus of many studies in the past 20 years. Recurrence has notably been associated with incomplete reduction of the hernia sac and axial tension in the diaphragmatic muscle.[1] Despite improvements and innovations in surgical approaches, recurrence has remained a challenge.

In their study, Hashemi et al.[2] showed a high recurrence rate (42%) after laparoscopic cruroplasty. This rate may have been explained by difficulty in evaluating the real tension applied on the suture, reduced fibrosis, and lack of precision when dissecting the hernia sac.

Follow-up imaging by Frantzides et al.[3] showed recurrence in 22% of patients treated with cruroplasty alone; with use of a prosthesis, no recurrences occurred, but potentially serious complications such as ulceration, stenosis, erosion, and occlusion of the esophagus were identified. Subsequent fibrosis around the prosthesis may also lead to other complications, such as dysphagia.[3] The use of biological tissues (such as porcine small intestinal submucosa) to treat large defects showed a lower short-term recurrence rate, but the rate increased, reaching 54% at 5 year.[4]

When a human collagen matrix (Allomax; Davol, Inc., Warwick, R.I.) was introduced for repair of hiatal hernias > 5 cm, for patients undergoing reoperation, and for patients with thin or atrophic crural pillars, no erosion or dysphagia was reported at 6 months, but the group undergoing reoperation had a significantly shorter time to failure than the other groups.[5]

In another study of the use of autologous tissues to repair these hernias, Park et al.[6] utilized the falciform ligament of the liver. Their study recorded no recurrences and no important complications.[6]

In our case, the aim was not further reduction of the hiatal diameter; the esophageal hiatus had already been reduced optimally by suturing the defect. However, even with a 2-cm defect, intestinal strangulation occurred twice. The recurrence of this pathology can be explained by several factors. One is the pressure balance between the abdominal and thoracic compartments. This patient suffered from GOLD 3 COPD, causing a chronic cough, which can lead to increased positive abdominal pressure. On the other hand, the thoracic compartment is composed of a large mediastinal sac, creating a negative

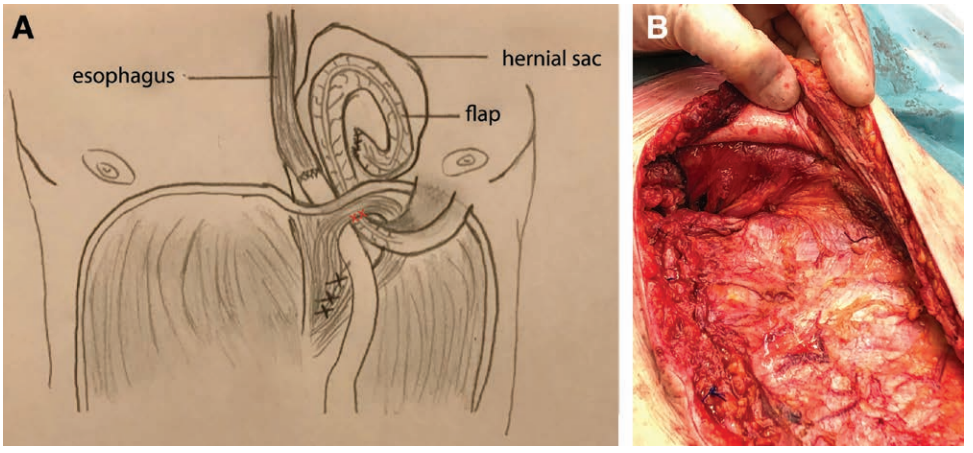

Fig. 2. Placement of the VRAM flap. A, Surgical drawing showing the flap's insertion into the mediastinum, its fixation to the diaphragm (red crosses), and the previous cruroplasty sutures (black crosses). B, Positioning of the VRAM flap in the esophageal hiatus.

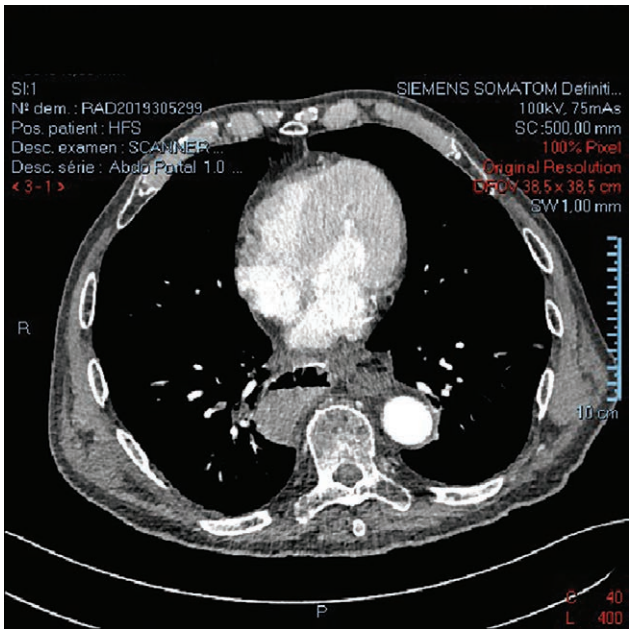

Fig. 3. CT scan 12 months after surgery, showing no recurrence of the hiatal hernia at the level of the ninth vertebra.

pressure that attracts the abdominal contents. This unbalanced distribution of pressures pulls the intestines toward the thoracic compartment. In this case, the absence of the stomach and omentum is crucial. Fundoplication was not feasible, preventing repair by tissue interposition or buttressing of the diaphragmatic pillars.[1]

The purpose of using the VRAM flap was to fill the remaining hiatal passage in contact with the esophagus, but without tension and compression, avoiding common complications caused by mesh prostheses, such as erosions.[3] Above all, the aim was to fill the mediastinal sac, preventing digestive organs from herniating into the thoracic compartment. As shown in Figure 3, no recurrence of the massive hernia occurred in 12 months.

Many guidelines on the management of hiatal hernias have been published in the litterature,[1,7] but there has been no clear indication for the use of local flaps to treat recurrences. Local flaps (especially TRAM flaps[8]) have been described for the treatment of diaphragmatic defects,[8–13] but none were used to treat hiatal hernias, placing the flap in the mediastinal compartment. To our knowledge, this is the first description in the literature of a VRAM flap used to treat recurrent hiatal hernias.

As an autologous tissue, this flap brings a certain safety to the repair. Because it is not considered a foreign body, the risk of infection is reduced, and the decreased inflammatory response lowers the risk of postoperative dysphagia.[3] A well-known pitfall of the use of a VRAM flap, however, is the risk of postoperative eventration.[14] In this case, the patient had a sublay abdominal prosthesis, which may have prevented this complication. Harvesting of this musculocutaneous flap is also invasive, leaving a wide abdominal scar; so this approach is more painful and requires longer postoperative management than a laparoscopic approach.

CONCLUSION

Because no existing treatments have shown long-term efficacy in treating recurrent hiatal hernias, the VRAM flap could be an interesting alternative, especially after total gastrectomy and omentum resection.

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