

Open Laparoscopic-assisted Repair of Abdominal Wall Hernia and Bulge

Hideharu Nakamura, MD*
Takaya Makiguchi, MD, PhD*
Daisuke Atomura, MD*
Yukie Yamatsu, MD*
Ryuji Katoh, MD†
Hiroomi Ogawa, MD†
Ken Shirabe, MD, PhD †
Satoshi Yokoo, DMD, DMSc*

Summary: Rectus abdominis musculocutaneous (RAM) flaps have numerous uses in the treatment of large defects. However, flap harvesting can result in abdominal wall incisional hernia and bulge, which are challenging problems. Most of these problems occur below the arcuate line abdominal wall. However, there will be differences that are unique to each patient in the area of hernia or bulge. The open approach repair appears to be used most often, but the precise area of hernia and bulge is often not distinguished. This report describes a case that was treated using a new repair method, which had the clear advantage of allowing the precise area of abdominal wall weakness to be recognized. A 53-year-old man underwent left vertical RAM flap for reconstruction after tongue carcinoma resection. Six months after the operation, lower abdominal wall hernia and bulge were observed. Open laparoscopic-assisted repair was performed. Pneumoperitoneum led to distension of the abdominal cavity and outward stretching of the abdominal wall, so that the area of hernia and bulge protruded to a great degree. In this phase, by making the operating room slightly dark, the area became more clearly recognizable. When direct plication of the hernia and bulging area was required, the contralateral component separation technique was performed. This study describes an inventive repair procedure for abdominal wall hernia or bulge after RAM flap, with the combined advantages of open and laparoscopic repair. (*Plast Reconstr Surg Glob Open* 2019;4:e2534; doi: [10.1097/GOX.0000000000002534](https://doi.org/10.1097/GOX.0000000000002534); Published online 31 December 2019.)

Rectus abdominis musculocutaneous (RAM) flaps have numerous uses in the treatment of large defects of the pelvis, breast, head and neck, etc. However, flap harvesting can result in abdominal wall incisional hernia or bulge.¹⁻⁴ Most of these complications occur below the arcuate line abdominal wall hernia or bulge. However, because of the various potential sources of deficiency of rectus muscle and anterior sheath, the precise area of the hernia or bulge cannot always be recognized before or during surgery.

Traditional open repair or laparoscopic repair is considered for the treatment of hernia and bulge.¹⁻⁴ Because open repair can accomplish direct closure and plication of the abdominal wall for the extended range of the hernia or bulge, often with the contralateral component separation method,⁵ the abdominal contour can be more flat.

On the other hand, laparoscopic repair can avoid the risk of injury to the bowel. Furthermore, intraoperative pneumoperitoneum can be performed to assess the area of the hernia and bulge.^{6,7}

This report describes a case of abdominal wall hernia or bulge after RAM flap that was treated with a new repair method that combines the advantages of both open and laparoscopic repair.

CASE PRESENTATION

A left free vertical RAM flap was used successfully to treat the defect resulting from tongue carcinoma resection. The rectus abdominis muscle attached to the anterior layer of the sheath at about 4 cm width was harvested. Horizontal mattress sutures for direct closure were placed on the remaining anterior layer of the sheath, and a mesh synthetic prosthetic device was fixed below the sheath inferior to the arcuate line. Six months after the operation, lower abdominal wall hernia and bulge were observed (Fig. 1). Open laparoscopic-assisted repair was carried out. After incising the scar that resulted from harvesting the

From the *Department of Oral and Maxillofacial Surgery, Plastic Surgery, Gunma University Graduate School of Medicine, Gunma, Japan; and †Department of General Surgical Science, Gunma University Graduate School of Medicine, Gunma, Japan.

Received for publication May 10, 2019; accepted October 3, 2019.

Copyright © 2019 The Authors. Published by Wolters Kluwer Health, Inc. on behalf of The American Society of Plastic Surgeons. This is an open-access article distributed under the terms of the [Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 \(CCBY-NC-ND\)](https://creativecommons.org/licenses/by-nc-nd/4.0/), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

DOI: [10.1097/GOX.0000000000002534](https://doi.org/10.1097/GOX.0000000000002534)

Disclosure: The authors have no financial interest to declare in relation to the content of this article.

Related Digital Media are available in the full-text version of the article on www.PRSGlobalOpen.com



Fig. 1. Lower abdominal wall hernia and bulge. Six months after harvesting a vertical RAM flap, a lower abdominal wall hernia and bulge were observed.

RAM flap, the skin flaps were elevated along with the subcutaneous tissue from the fascia surface. It was extended to beyond the approximate extent of the hernia or bulge.

Assisted laparoscopy was performed. Pneumoperitoneum resulted in distension of the abdominal cavity and outward stretching of the abdominal wall, so that the area of the hernia or bulge protruded to a great degree. In this phase, by making the operating room slightly dark, the area became more clearly recognizable (Fig. 2). A surgical marking pen was used to demarcate the hernia or bulge areas. Because the area was large, 105 mm × 145 mm, and the tension for direct closure of the hernia and bulge region had been high, the contralateral component separation method was utilized.⁵ The skin flap was elevated along the middle third of the right side of the abdomen. This extended from the midline incision laterally to the semilunar line. Further incision of the interface between the right rectus abdominis muscle and the right external oblique muscle

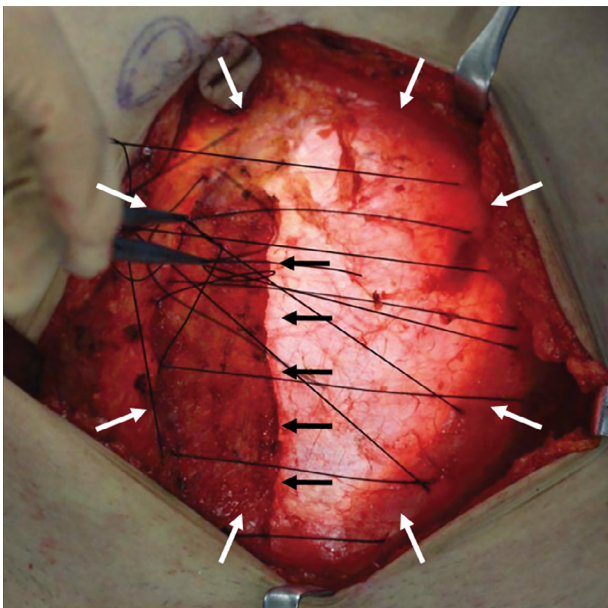


Fig. 2. With pneumoperitoneum and making the operating room slightly dark, the area of hernia and bulge was clearly recognizable (white arrows). Mesh used to reinforce the abdominal wall when the RAM flap was transferred was detected (black arrows) and finally removed.

was made along its entire length. Once the semilunar fascia had been incised, the right external oblique muscle was separated from the right oblique internal muscle extending far laterally along the midaxillary line. These procedures allowed for a low tension abdominal closure between the right rectus abdominis muscle and the left external oblique, internal oblique, and transverse abdominis muscle complex (Fig. 3). Through-and-through horizontal mattress sutures were placed on the intact muscle and fascia outside the area of the hernia and bulge to plicate the tissue together. At this time, the insufflation pressure with carbon dioxide was decreased to plicate more easily. Attention to every stitch was given by the laparoscopic monitor to prevent injury to the intra-abdominal organs during the plication process (See Video [online], which displays pneumoperitoneum results in distension of the area of the hernia and bulge, which protrudes to a greater degree. Laparoscopic repair avoids a risk of injury to the bowel). After primary closure of the hernia and bulge, the mesh synthetic prosthetic device was used as a graft to reinforce the abdominal wall (Fig. 3). Before skin closure, pneumoperitoneum was again increased to make certain that the abdominal wall contour was flat. This procedure was carried out in collaboration with a plastic surgeon

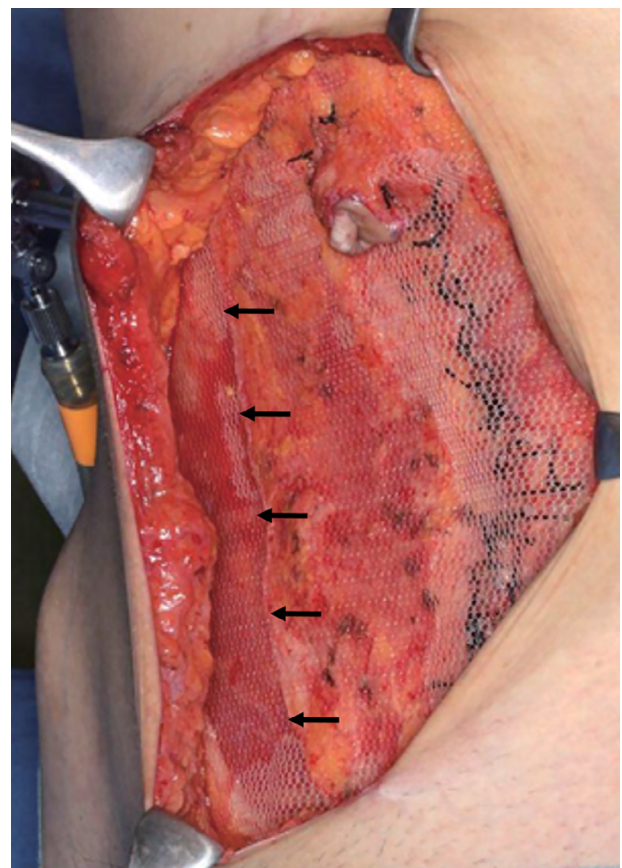


Fig. 3. Contralateral component separation method. Full exposure along the middle third of the left side of the abdomen was achieved using an incision of the interface between the right rectus abdominis muscle and right external oblique muscle along its entire length (arrows). Mesh was used as a graft to reinforce the abdominal wall.

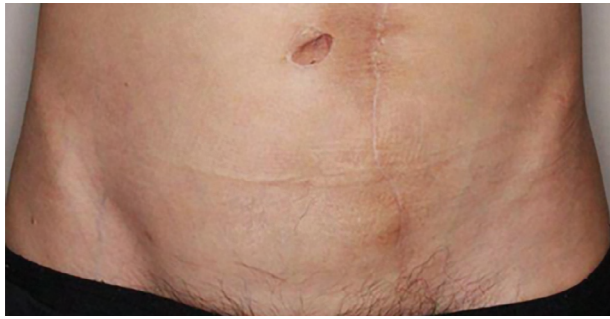


Fig. 4. Postoperative outcome. One year later, there was no sign of recurrence of the hernia and bulge.

and a gastroenterological surgeon. One year later, there was no sign of recurrence of the hernia or bulge (Fig. 4).

DISCUSSION

Abdominal hernia and bulge are challenging problems associated with RAM harvesting.¹⁻⁴ The open approach repair appears to be used most often. There are several sources of difficulty in open repair. One reason is that the precise area of the hernia and bulge sometimes cannot be recognized before or during surgery, and the risk of injury to the bowel is undeniable. Furthermore, this approach is associated with a high incidence of recurrence.

Conversely, our inventive open laparoscopic-assisted method has the advantage that under pneumoperitoneum and by making the operating room slightly dark, the precise area of the hernia or bulge can be clearly recognized. This procedure refers to the technique used in abdominoplasty of Prune belly syndrome patients, in which abdominal laxity is 1 component.^{6,7} We added the inventive manner to the technique to more clearly distinguish the hernia and bulge region. Furthermore, we were also able to avoid bowel injury because of direct visualization with laparoscopy.^{3,4,6,7} In addition, in combination with the contralateral component separation method, a low tension abdominal closure and plication could be achieved.⁵ This may aid in reducing the incidence of recurrence.

Laparoscopic repair alone, without open repair, may be an alternative option that could have some benefits, such as shorter hospitalization and decreased pain.^{3,4} However, because it is often the case that the extent of the hernia and bulge after RAM flap is large, the mesh is only placed over the defect overlap at all sides of the hernia or bulge region, without direct closure or plication. Thus, it often tends to develop swelling to some extent in the abdomen although the bulge or hernia could be improved compared with preoperative state.

Our procedure of open hernia or bulge repair assisted by laparoscopy utilizes the advantages of both procedures. In a case in which the hernia orifice is clearly distinguishable, there may be no need to use laparoscopy for the treatment of the intestinal injury. However, sometimes hernia and bulge occur gradually from intact fascia, and a clear-cut border between the hernia and bulge and intact fascia cannot be recognized. In such a case, pneumoperitoneum reproduces abdominal pressure and results in extension of the abdominal cavity, so that the area of hernia and bulge can be recognized clearly. In the current case, we were able to use this method for the treatment of abdominal hernia and bulge resulting from RAM harvest.

CONCLUSION

A case of abdominal wall hernia or bulge after harvesting the RAM flap was treated using a new method that combines the advantages of open and laparoscopic repair.

Hideharu Nakamura, MD

Department of Oral and Maxillofacial Surgery
Gunma University Graduate School of Medicine
3-39-22, Showa-machi, Maebashi,
Gunma 371-8511, Japan
E-mail: hidemoku0211@gmail.com

REFERENCES

1. Mennie JC, Mohanna PN, O'Donoghue JM, et al. Donor-site hernia repair in abdominal flap breast reconstruction: a population-based cohort study of 7929 patients. *Plast Reconstr Surg.* 2015;136:1-9.
2. Knox AD, Ho AL, Leung L, et al. Comparison of outcomes following autologous breast reconstruction using the DIEP and pedicled TRAM flaps: a 12-year clinical retrospective study and literature review. *Plast Reconstr Surg.* 2016;138:16-28.
3. Jansen DA, Murphy MR, Aliabadi-Wahle S, et al. Laparoscopic incisional hernia repair after transverse rectus abdominis myocutaneous flap reconstruction. *Plast Reconstr Surg.* 1998;102:1623-1625.
4. Shaw RB Jr, Curet MJ, Kahn DM. Laparoscopic repair for recurrent abdominal wall hernia after TRAM flap breast reconstruction: case report of 2 patients. *Ann Plast Surg.* 2006;56:447-450.
5. Espinosa-de-Los-Monteros A, Arista-de la Torre L, Vergara-Fernandez O, et al. Contralateral component separation technique for abdominal wall closure in patients undergoing vertical rectus abdominis myocutaneous flap transposition for pelvic exenteration reconstruction. *Ann Plast Surg.* 2016;77:90-92.
6. Fishman AI, Franco I. Laparoscopic-assisted surgical reconstruction of a rare congenital abdominal wall defect in two children misdiagnosed with prune-belly syndrome. *J Pediatr Urol.* 2013;9:448-452.
7. Smith EA, Srinivasan A, Scherz HC, et al. Abdominoplasty in prune belly syndrome: modifications in Monfort technique to address variable patterns of abdominal wall weakness. *J Pediatr Urol.* 2017;13:502.e1-502.e6.