

Pleuroperitoneal (Denver) Shunt for Recurrent Nonmalignant Breast Seroma in a Metastatic Breast Cancer Patient

Lacey R. Pflibsen, MD*
 Cristine S. Velazco, MD, MS†
 Daniel H. Rhee, MD†
 Lyndsey A. Bryant, PA-C*
 Alyssa B. Chapital, MD, PhD†
 Alanna M. Rebecca, MD, MBA*

Summary: Pleuroperitoneal (Denver) shunts have been used primarily for palliation of refractory malignant and chylous peritoneal and pleural collections.¹⁻⁵ We used a pleuroperitoneal (Denver) shunt for a recurrent, nonmalignant breast seroma in the palliation of metastatic breast cancer as a novel use of this shunt. (*Plast Reconstr Surg Glob Open* 2020;8:e2928; doi: [10.1097/GOX.0000000000002928](https://doi.org/10.1097/GOX.0000000000002928); Published online 23 June 2020.)

Pleuroperitoneal and peritoneovenous Denver-type shunts have been used primarily for palliation of refractory malignant and chylous peritoneal and pleural collections.¹⁻⁵ It is a shunting device that is composed of 2 silastic 15.5-F tubes connected by a compressible 1-way pump, which is positioned subcutaneously over the lower ribs (Fig. 1). Fluid flows spontaneously in a unidirectional fashion when the pressure gradient is >3 mm Hg but can also be manually pumped. Because of the shunt's ability to have both pressure-dependent flow and manual pump flow, it has been used off-label to treat numerous different disease conditions.¹⁻⁷ For this reason, we used a pleuroperitoneal (Denver) shunt for a recurrent, nonmalignant breast seroma in the palliation of metastatic breast cancer as a novel use of this shunt.

CASE

This is a case of a 70-year-old woman with metastatic breast cancer and recurrent, nonmalignant breast seroma. This patient initially underwent lumpectomy and axillary lymph node dissection with adjuvant chemoradiation 30 years ago for right-sided breast cancer. She had a local recurrence 20 years later and underwent mastectomy and reconstruction with right pedicled latissimus flap with an implant.

She transferred her care to our hospital and was found to have sternal involvement consistent with metastatic

breast cancer. She underwent sternectomy, partial resection of the manubrium, and anterior chest wall reconstruction with GORE-TEX mesh (W.L. Gore & Associates, Flagstaff, Ariz.) and methylmethacrylate with adjuvant radiation treatment. Two months after surgery, the patient developed a seroma and nonproductive cough. The seroma was initially treated conservatively with multiple aspirations and external drain placement. Fluid cytology was found to be negative from these aspirations. Interestingly, the patient noticed a temporal relationship, including increasing respiratory symptoms with increasing breast seroma volume and resolution of these symptoms with drainage. External seroma drain placement resolved her symptoms; however, this was cumbersome for the patient, and she expressed a desire for more definitive treatment.

The patient was reimaged, and a computerized tomography scan showed dislodgement of anterior chest wall prosthesis. The patient was taken to the operating room for replacement of anterior chest wall prosthesis, debridement, and capsulectomy, with implant replacement in an attempt to resolve the recurrent seroma as well. Postoperatively, the patient again developed seroma formation and associated respiratory symptoms (Fig. 2). In light of the patient's metastatic disease, chronic cough associated with nonmalignant breast seroma, friable radiated tissue, and continued need to aspirate the collection, a palliative shunt from the breast cavity to the peritoneum was discussed as a possible solution. A minimally invasive surgical approach was planned for use in intra-abdominal placement.

The patient was counseled extensively about the off-label use of the pleuroperitoneal (Denver) shunt, and the patient elected to proceed. The proximal portion of the shunt was placed into the right breast cavity, and a subcutaneous pocket over the lower ribs was developed into the right upper quadrant just below the hypocondrium. Laparoscopic access was obtained into the abdominal cavity, where the distal portion of the shunt was retrieved

From the *Division of Plastic Surgery, Mayo Clinic Arizona, Phoenix, Ariz.; and †Department of Surgery, Mayo Clinic Arizona, Phoenix, Ariz.

Received for publication April 6, 2020; accepted April 30, 2020.

Copyright © 2020 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.0000000000002928](https://doi.org/10.1097/GOX.0000000000002928)

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

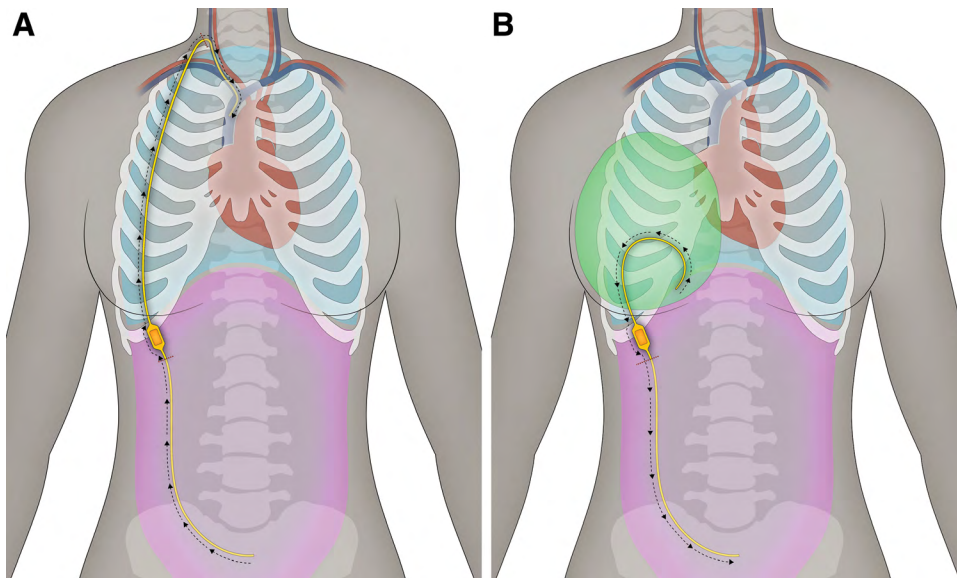


Fig. 1. Illustration of shunt positioning. A, The typical use of peritoneovenous (Denver) shunt with proximal end in the abdomen and distal end in the internal jugular vein. B, Placement of the shunt from the right breast cavity (proximal end) to abdomen (distal end).

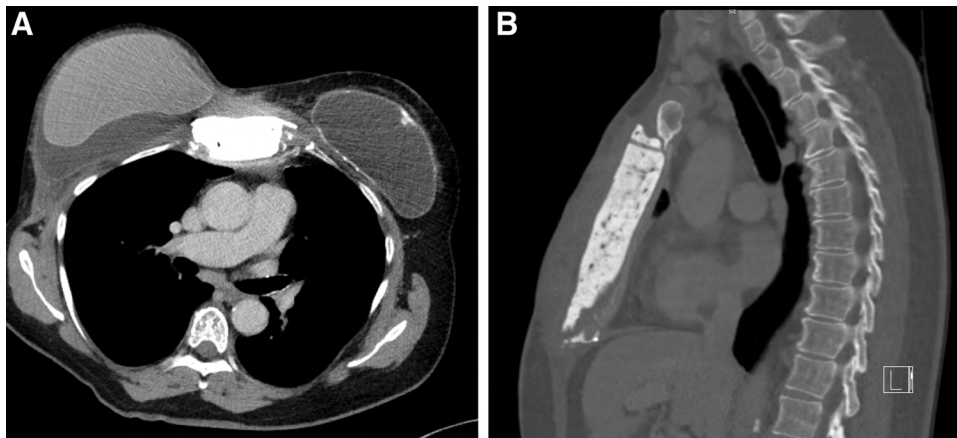


Fig. 2. Preoperative computerized tomographic scan demonstrating seroma and anterior chest wall reconstruction. A, An axial view showing the right breast seroma and the implant. B, A sagittal view of the methylmethacrylate chest wall reconstruction.

from the subcutaneous tunnel created from the right upper quadrant. The drain was then gently placed into the pelvis.

At 9-month follow-up, she had a resolution of her respiratory symptoms and breast seroma. The patient reported manual pumping of the shunt twice daily. Computerized tomography scan and ultrasound demonstrated the resolution of breast seroma.

DISCUSSION

This is a case of off-label use of a pleuroperitoneal (Denver) shunt to palliate a recurrent breast seroma from a thoracic-subcutaneous fistula to the breast implant capsule. The device drains both by pressure gradient and by manual pumping, which makes it useful in the treatment

of this patient. Because of these properties, this shunt was an excellent choice for our patient's particular issue. It allowed gentle drainage of the seroma with the pressure gradient, as well as the ability for the patient to manually pump if she experienced respiratory symptoms. A thorough evaluation of the published literature was reviewed, and to our knowledge, there have been no such cases that reported the use of a pleuroperitoneal (Denver) shunt to treat recurrent breast seroma.

The source of her chronic nonproductive cough was subjectively associated with the increase in nonmalignant breast seroma formation in the patient. We were unable to definitively prove that her breast seroma communicated with her chest cavity. It is hypothesized that it could be a pleural fluid buildup or even pericardial fluid.⁸ Imaging did not identify the intrathoracic accumulation of fluid

even with significant seroma formation in the breast (Fig. 2). However, the patient noted a temporal relationship, including increasing respiratory symptoms with increasing breast seroma volume and resolution of these symptoms with drainage. With the help of the shunt, she pumps the device when she experiences a cough, which independently improves her symptoms. Important to note is that this patient had a thorough workup with pulmonology for other etiologies, all of which were negative. She has had subsequent imaging that has shown no intrathoracic abnormality.

This patient was extensively counseled about potential metastatic seeding of the abdomen. There have been reports of seeding alongside peritoneovenous shunts and pleuroperitoneal shunts; however, none of these were seen in metastatic breast cancer.⁹ She has been closely followed with Positron emission tomography (PET) scans, with no evidence of intra-abdominal metastatic disease. Before shunt placement, the patient had multiple workups for infectious and neoplastic processes, including cytology for breast implant-associated anaplastic large cell lymphoma.¹⁰ All cytology and pathology have been negative.

Other reconstructive options were considered for this patient, including autologous flap-based reconstruction. The patient had undergone prior abdominoplasty; so an abdominally based free flap was unavailable. An ipsilateral latissimus was used previously for her breast reconstruction. Additionally, contralateral pectoralis turnover flap and rectus flap were not possible as internal mammary perforators were sacrificed during her sternal resection. More distant free flaps were available; however, this patient did not wish to undergo extensive surgery and requested a more immediate and less invasive procedure.

CONCLUSIONS

This is a case of innovative use of a pleuroperitoneal (Denver) shunt for recurrent nonmalignant breast seroma from a likely fistulous formation from thorax to the breast.

We hope this work may serve as a potential alternative for palliative measures for similar patients.

Lacey R. Pflibsen, MD

Division of Plastic Surgery

Mayo Clinic Arizona

5777 E. Mayo Blvd

Phoenix, AZ 85054

E-mail: pflibsen.lacey@mayo.edu

REFERENCES

1. Ghandour E, Carter J, Feola M, et al. Management of hepatic hydrothorax with a peritoneovenous (Denver) shunt. *South Med J*. 1990;83:718–719.
2. Habuka M, Ito T, Yoshizawa Y, et al. Usefulness of a pleuroperitoneal shunt for treatment of refractory pleural effusion in a patient receiving maintenance hemodialysis. *CEN Case Rep*. 2018;7:189–194.
3. Hanlon R, Lee J, Fenton-Lee D, et al. Pleuroperitoneal Denver shunt insertion for the treatment of refractory chylothorax in a patient with tuberous sclerosis complex and lymphangioleiomyomatosis. *Intern Med J*. 2017;47:1463–1464.
4. Huang Y, Gloviczki P, Duncan AA, et al. Management of refractory chylous ascites with peritoneovenous shunts. *J Vasc Surg Venous Lymphat Disord*. 2017;5:538–546.
5. Yarmohammadi H, Brody LA, Erinjeri JP, et al. Therapeutic application of percutaneous peritoneovenous (Denver) shunt in treating chylous ascites in cancer patients. *J Vasc Interv Radiol*. 2016;27:665–673.
6. Khatani V, Isaacson A, Yu H, et al. Interventional radiologic placement of Denver pleuroperitoneal shunt for refractory chylothorax. *J Vasc Interv Radiol*. 2013;24:1073–1074.
7. Pimpalwar A, Iacobas I, Margolin J, et al. Innovative use of Denver shunt in a child with generalized lymphatic anomaly. *J Laparoendosc Adv Surg Tech A*. 2017;27:1091–1094.
8. Ali M, Pham AN, Martinez JM, et al. Use of omental flap for treating cardio-cutaneous fistula after ventricular aneurysm repair. *Ann Thorac Surg*. 2020:S0003-4975(20)30062-X. [E-pub ahead of print].
9. Baeyens I, Berrisford RG. Pleuroperitoneal shunts and tumor seeding. *J Thorac Cardiovasc Surg*. 2001;121:813.
10. Clemens MW, Horwitz SM. NCCN consensus guidelines for the diagnosis and management of breast implant-associated anaplastic large cell lymphoma. *Aesthet Surg J*. 2017;37:285–289.