

CASE REPORT

Simultaneous Use of Intra-abdominal and Subcutaneous Tissue Expansion in Treatment of Giant Omphalocele: A Case Report

Kendall C. Pitre, BS¹ , Advait Praveen, BS¹, Michael S. Lebhar, MD², Michael W. Morris, MD³, Ian C. Hoppe, MD²

¹ School of Medicine, University of Mississippi Medical Center, ² Plastic and Reconstructive Surgery, University of Mississippi Medical Center, ³ Pediatric Surgery, University of Mississippi Medical Center

Keywords: Case Report, Tissue Expander, Giant Omphalocele, Abdominal Wall Defect, Component Separation

<https://doi.org/10.67225/001c.165653>

Journal of the Mississippi State Medical Association

Vol. 67, Issue 3/4, 2026

Omphalocele is a congenital malformation of the abdominal wall consisting of a protrusion of the abdominal contents at the base of the umbilical cord. These defects often present significant anatomical and physiological challenges for reduction and closure, necessitating careful consideration of closure methods. Tissue expansion has emerged as an alternative technique to restore abdominal domain in omphalocele patients. The authors present a case of a 4-year-old female with a giant omphalocele, where both intra-abdominal and subcutaneous tissue expansion were utilized to restore abdominal domain and expand the soft tissue envelope for skin closure. The simultaneous use of intra-abdominal and subcutaneous tissue expansion represents a safe and effective strategy for achieving primary closure in patients with giant omphalocele.

Introduction

Omphalocele is a congenital anterior abdominal wall defect in which abdominal contents protrude at the base of the umbilical cord into a thin-walled sac.¹ The estimated prevalence is approximately 1-3 per 10,000 live births.¹⁻³ Due to the herniation of viscera during fetal development, effective abdominal and chest domains commonly cannot be established.⁴ Omphaloceles are further characterized by sac size and contents. A giant omphalocele is commonly defined as a defect ≥ 5 cm or one containing at least 50 percent of the liver.⁵

The management of an omphalocele is individualized and influenced by pulmonary hypoplasia and the extent of visceroadominal disproportion.⁶ Traditional approaches for giant omphaloceles involve staged or delayed closure due to the absence of an established abdominal domain. Techniques include silo reduction, elastic dressings, sequential clamping, epithelialization with topical agents, and split-thickness skin grafting over absorbable mesh.^{5,7}

Tissue expansion has been a proposed adjunctive therapy to increase the abdominal domain and enable primary closure for these patients.^{4,6-8} Tissue expanders (TE) have been described in the subcutaneous or intramuscular spaces of the abdominal wall to enlarge skin or muscle flaps prior to closure, with less frequent use of intra-abdominal expanders to gradually increase

abdominal domain.^{7,9} This case report describes the simultaneous use of intra-abdominal and subcutaneous tissue expansion to achieve primary closure.

This study was granted exemption approval by the University of Mississippi Medical Center Institutional Review Board. Written informed consent for publication of all clinical information and images was obtained from the patient's parents.

Case Presentation

A 4-year-old female with hydronephrosis and a giant omphalocele was referred to plastic surgery for evaluation and possible closure. She was born with a prenatally diagnosed omphalocele that ruptured at delivery. During her initial hospitalization after birth, a silo was used to reduce the defect, and lateral skin closure was performed. However, the skin closure dehiscd, and the wound was subsequently allowed to heal by secondary intention without fascial continuity.

After three years of follow-up, the patient presented to her general pediatric surgeon for elective repair of a large ventral defect containing primarily the left hepatic lobe ([Fig. 1](#)). There was presence of epithelialization of the defect without any discomfort or issues with activity or diet. Due to the paucity of healthy skin adjacent to the abdominal wall defect, she was referred to plastic surgery for wound closure with the goal of re-establishing an appropriate abdominal domain. Tissue expansion was offered as a method to increase the soft tissue envelope before hernia repair, enabling the reduction of herniated abdominal contents and primary closure of the fascia and healthy skin edges. Prior to expansion, the abdominal wall defect measured about 7.8 cm transverse diameter and about 12 cm craniocaudal, per the radiologist read on CT abdomen. Two TE (Integra TE Crescent, 5x13 cm, 250 mL capacity) were placed bilaterally in the subcutaneous space along the left and right sides of the omphalocele. A third TE (Integra TE Rectangle, 7x10 cm, 280 mL capacity) was placed in a subfascial, extraperitoneal space inferior to the defect. Blunt dissection was carried onto the thoracic cage where fill ports for each expander were placed ([Fig. 2a](#)). The procedure was well-tolerated, and tissue expansion began three weeks postoperatively.

Over the next several weeks, gradual saline inflation was performed. Initial expansion was achieved in the clinic with abdominal TE reaching 135 mL and intra-abdominal expander to 85 mL. After the third visit, the patient was transitioned to anesthesia-assisted expansion due to increased pain and psychosomatic reaction to the filling process. During operative expansion, an additional 35 mL was added to each expander to a total volume of 170 mL in abdominal expanders and 120 mL in the intra-abdominal expander. During this case, the left abdominal expander was noted to have a small area



Figure 1. Preoperative appearance of omphalocele with overlying epithelialization.

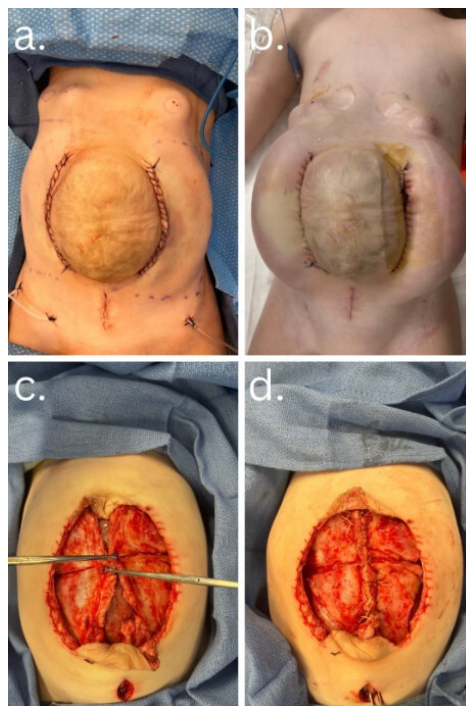


Figure 2. Staged tissue expansion and omphalocele repair. (a) Tissue expander placement at the index procedure (b) Fully expanded abdominal wall after completion of expansion phase. (c) Restoration of abdominal domain after expander removal and component separation. (d) Primary closure of rectus fascia and overlying soft tissue without mesh.

of exposure ([Fig. 2b](#)). Given that sufficient tissue had been expanded for reconstruction, the decision was made to proceed with removal and closure the following day.



Figure 3. Appearance of abdominal closure 1.5 years postoperatively from complex repair.

Operative removal of each TE and port was completed without complications. Pediatric surgery then performed extensive lysis of adhesions and reduction of the omphalocele contents into the abdominal cavity. A standard anterior abdominal wall component separation was performed bilaterally. With the components released, the rectus fascia was primarily closed at the midline over the abdominal contents with 0 vicryl figure of 8 sutures. The overlying abdominal skin flaps were further elevated by releasing the lateral portion of the expander capsules, with additional superior and inferior incisions to facilitate tension-free closure of skin ([Fig. 2c, 2d](#)). Following closure, the patient's bladder pressures, and peak airway pressures remained within normal ranges. The postoperative course was uncomplicated, and the patient's parents report that she is doing well at home with a normal activity level with no restrictions at 1.5 years post-op. No areas of bulging concerning for hernia noted by family or in most recent physical exam documentation ([Fig. 3](#)).

Discussion

Giant omphaloceles pose several challenges that limit the success of traditional repair techniques.^{5,10} Staged silo reduction is commonly used but is limited by the underdevelopment of the abdominal cavity. Similarly, the "paint-and-wait" approach involves using a topical agent to encourage epithelialization but results in a ventral hernia that requires later reconstruction.^{5,10} These methods address the reduction of viscera but not the underdeveloped abdominal cavity.^{5,11} Although component separation

and mesh reinforcement can aid closure, mesh introduces infection risks, and combined anterior and posterior component separation may weaken the abdominal wall.¹²⁻¹⁴

This case was influenced by rupture of the omphalocele at birth, which required early silo reduction and healing by secondary intention, resulting in loss of fascial continuity with subsequent epithelialization. This loss contributed to both limited abdominal domain and insufficient adjacent soft tissue at the time of delayed repair. Tissue expansion offers a way to address both soft-tissue deficiency and inadequate abdominal domain.⁶⁻⁹ While tissue expansion itself is not novel,⁴ the simultaneous use of both intra-abdominal and subcutaneous expanders to address these two constraints concurrently is rarely described in current literature.

Tissue expansion has also not been widely adopted as a primary repair technique for giant omphalocele management due to several limitations. These limitations include the need for multiple procedures, a prolonged treatment course, and higher risk of complications like infection and extrusion.¹⁵ Additionally, heterogeneity in technique makes it difficult to establish standardized protocols. Most reports describe tissue expansion as a salvage strategy after other methods have failed, which may reflect hesitancy to pursue a more complex and resource-intensive approach when simpler alternatives may be available.^{7,10}

In our patient, the use of both subfascial and subcutaneous expanders was intentional, as a single plane alone may not have adequately addressed both constraints, particularly given this patient's significant visceroadominal disproportion and limited surrounding skin. A pre-peritoneal rectangular TE was used to gradually increase intra-abdominal domain to allow safe visceral reduction, while two subcutaneous crescent-shaped TE on the bilateral flanks recruited additional soft tissue for a tension-free skin closure.^{4,16} Tissue expansion also promotes the formation of a fibrous capsule around the expanders, facilitating a more controlled and stable closure, with robust blood supply to the skin.¹⁷ In this case, the soft tissue and fibrous capsule, along with component separation, allowed for successful closure without the need for mesh.

The rate of expansion is further determined clinically based on patient tolerance and physiologic response. Typically, staged, gradual filling is used to avoid rapid increases in intra-abdominal pressure, either weekly or every other week. In our case, expansion was initially performed in clinic and later under anesthesia due to patient discomfort, with careful monitoring throughout. The main concern with intra-abdominal expansion is elevated intra-abdominal pressure and the risk of abdominal compartment syndrome,⁹ which can be minimized by gradual expansion. Patients are closely monitored for signs of abdominal compartment syndrome, including respiratory

difficulties, elevated peak airway pressures, increased bladder pressure, decreased urine output, and abdominal pain/distention. The authors recommend close monitoring of symptoms for abdominal compartment syndrome throughout the expansion process.

Conclusions

While silastic techniques and topical therapy remain common approaches to giant omphaloceles, tissue expansion provides a reliable alternative by enlarging both the abdominal cavity and soft-tissue envelope. When combined with component separation, primary closure is often achievable. This case report supports the use of simultaneous intra-abdominal and extra-abdominal TE as a promising strategy for managing large omphalocele defects.

Submitted: December 02, 2025 CDT. Accepted: May 04, 2026 CDT. Published: July 15, 2026 CDT.

REFERENCES

1. Marshall J, Salemi JL, Tanner JP, et al. Prevalence, Correlates, and Outcomes of Omphalocele in the United States, 1995-2005. *Obstet Gynecol.* 2015;126(2):284-293. doi:[10.1097/AOG.0000000000000920](https://doi.org/10.1097/AOG.0000000000000920)
2. Nembhard WN, Bergman JEH, Politis MD, et al. A multi-country study of prevalence and early childhood mortality among children with omphalocele. *Birth Defects Res.* 2020;112(20):1787-1801. doi:[10.1002/bdr2.1822](https://doi.org/10.1002/bdr2.1822)
3. Fogelström A, Caldeman C, Oddsberg J, Löf Granström A, Mesas Burgos C. Omphalocele: national current birth prevalence and survival. *Pediatr Surg Int.* 2021;37(11):1515-1520. doi:[10.1007/s00383-021-04978-z](https://doi.org/10.1007/s00383-021-04978-z)
4. Bax NM, van der Zee DC, Pull ter Gunne AJ, Rövekamp MH. Treatment of giant omphalocele by enlargement of the abdominal cavity with a tissue expander. *J Pediatr Surg.* 1993;28(9):1181-1184. doi:[10.1016/0022-3468\(93\)90160-m](https://doi.org/10.1016/0022-3468(93)90160-m)
5. Gamba P, Midrio P. Abdominal wall defects: prenatal diagnosis, newborn management, and long-term outcomes. *Semin Pediatr Surg.* 2014;23(5):283-290. doi:[10.1053/j.sempedsurg.2014.09.009](https://doi.org/10.1053/j.sempedsurg.2014.09.009)
6. Alexander W, Nightingale M, Penington A, Coombs C. A Systematic Review of Intra-abdominal Tissue Expansion for the Treatment of Exomphalos Major and a Case Report Describing a Refinement of the Technique. *Ann Plast Surg.* 2021;87(5):e107-e112. doi:[10.1097/SAP.00000000000002740](https://doi.org/10.1097/SAP.00000000000002740)
7. Martin AE, Khan A, Kim DS, Muratore CS, Luks FI. The use of intraabdominal tissue expanders as a primary strategy for closure of giant omphaloceles. *J Pediatr Surg.* 2009;44(1):178-182. doi:[10.1016/j.jpedsurg.2008.10.031](https://doi.org/10.1016/j.jpedsurg.2008.10.031)
8. Foglia R, Kane A, Becker D, Asz-Sigall J, Mychaliska G. Management of giant omphalocele with rapid creation of abdominal domain. *J Pediatr Surg.* 2006;41(4):704-709. doi:[10.1016/j.jpedsurg.2005.12.013](https://doi.org/10.1016/j.jpedsurg.2005.12.013)
9. De Ugarte DA, Asch MJ, Hedrick MH, Atkinson JB. The use of tissue expanders in the closure of a giant omphalocele. *J Pediatr Surg.* 2004;39(4):613-615. doi:[10.1016/j.jpedsurg.2003.12.022](https://doi.org/10.1016/j.jpedsurg.2003.12.022)
10. Adetayo OA, Aka AA, Ray AO. The use of intra-abdominal tissue expansion for the management of giant omphaloceles: review of literature and a case report. *Ann Plast Surg.* 2012;69(1):104-108. doi:[10.1097/SAP.0b013e31822128f5](https://doi.org/10.1097/SAP.0b013e31822128f5)
11. Clifton MS, Heiss KF, Keating JJ, Mackay G, Ricketts RR. Use of tissue expanders in the repair of complex abdominal wall defects. *J Pediatr Surg.* 2011;46(2):372-377. doi:[10.1016/j.jpedsurg.2010.11.020](https://doi.org/10.1016/j.jpedsurg.2010.11.020)
12. Majumder A, Martin-Del-Campo LA, Miller HJ, Podolsky D, Soltanian H, Novitsky YW. Evaluation of anterior versus posterior component separation for hernia repair in a cadaveric model. *Surg Endosc.* 2020;34(6):2682-2689. doi:[10.1007/s00464-019-07046-9](https://doi.org/10.1007/s00464-019-07046-9)
13. Petro CC, Melland-Smith M. Open Complex Abdominal Wall Reconstruction. *Surg Clin North Am.* 2023;103(5):961-976. doi:[10.1016/j.suc.2023.04.006](https://doi.org/10.1016/j.suc.2023.04.006)
14. Bawazir OA, Wong A, Sigalet DL. Absorbable mesh and skin flaps or grafts in the management of ruptured giant omphalocele. *J Pediatr Surg.* 2003;38(5):725-728. doi:[10.1016/j.jpedsurg.2003.50193](https://doi.org/10.1016/j.jpedsurg.2003.50193)

15. Segal RM, Wong A, Zaldana-Flynn M, et al. Tissue Expander-Assisted Component Separation for Pediatric Abdominal Wall Reconstruction. *Annals of Plastic Surgery*. 2022;88(4):S320. doi:[10.1097/SAP.0000000000003138](https://doi.org/10.1097/SAP.0000000000003138)
16. Paletta CE, Huang DB, Dehghan K, Kelly C. The use of tissue expanders in staged abdominal wall reconstruction. *Ann Plast Surg*. 1999;42(3):259-265. doi:[10.1097/0000637-199903000-00006](https://doi.org/10.1097/0000637-199903000-00006)
17. Verlende P, Zoltie N. A new surgical approach to exomphalos. *Br J Plast Surg*. 1990;43(2):241-243. doi:[10.1016/0007-1226\(90\)90169-z](https://doi.org/10.1016/0007-1226(90)90169-z)