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Commentary

Mobility Matters—Rethinking Compression Therapy in Lymphedema and Phlebolymphedema

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Abstract

Lymphedema and phlebolymphedema are increasingly recognized as prevalent chronic conditions that extend beyond traditional cancer-related populations. Although Complete Decongestive Therapy remains the foundation of management, real-world treatment success is often limited by challenges with long-term adherence, particularly when therapies disrupt patients' daily activities. This commentary explores the physiologic relationship between mobility and fluid transport, emphasizing the complementary roles of movement and compression in supporting venous and lymphatic return. Emerging evidence from studies of wearable, non-pneumatic compression technologies suggest that allowing patients to remain active during treatment may improve limb-volume reduction, quality of life, and adherence compared with conventional pneumatic systems. These findings challenge longstanding assumptions regarding immobilization and trunk compression while reinforcing the importance of patient-centered treatment strategies. As the burden of chronic edema continues to grow, clinicians should increasingly consider mobility as an active therapeutic component and prioritize interventions that align with both human physiology and the realities of everyday life.

Keywords: lymphedema; phlebolymphedema; chronic edema; compression therapy; non-pneumatic compression device; mobility; chronic venous insufficiency; patient adherence; complete decongestive therapy; lymphatic dysfunction; quality of life; patient-centered care

Lymphedema is no longer a rare or niche condition encountered only after cancer treatment. Increasingly, clinicians recognize that chronic edema—particularly in patients with advanced chronic venous insufficiency (CVI)—is often a manifestation of lymphatic dysfunction given the parallel nature of the venous and lymphatic systems. Yet despite the prevalence of lymphedema and phlebolymphedema, many patients continue to experience delayed diagnosis and inconsistent treatment [1–9].

For decades, Complete Decongestive Therapy (CDT) has remained the cornerstone of management. Compression, manual lymphatic drainage, exercise, and meticulous skin care continue to represent the standard approach, and appropriately so. However, as clinicians, we must acknowledge an uncomfortable reality: therapies that work under ideal conditions do not always translate into success in everyday life.

Perhaps nowhere is this more apparent than with home compression systems. Traditional pneumatic compression devices have demonstrated efficacy, but they also require patients to interrupt their daily activities and remain immobilized for prolonged periods. In clinical practice, this creates a disconnect between what we prescribe and what patients are realistically willing—or able—to do consistently [10].

Academic Editor: Varsha Gandhi

Received: 26 March 2026
Revised: 14 July 2026
Accepted: 23 July 2026
Published: 25 July 2026

This issue raises an important question. Are disappointing outcomes truly the result of inadequate compression, or are they simply the consequence of therapies that patients struggle to incorporate into their lives?

The physiology of lymphatic and venous return suggests that movement itself is therapeutic. Skeletal muscle contraction, diaphragmatic breathing, and changes in posture all contribute to fluid transport. Immobilization removes these natural mechanisms. Consequently, compression therapy delivered in the absence of movement may unintentionally exclude one of the body's most effective drainage systems [11–19].

This concept becomes particularly important in phlebolymphedema, where venous hypertension and lymphatic overload coexist. In these patients, compression and mobility should not be viewed as separate interventions but rather as complementary components of the same physiologic process [6–9,17–19].

Recent comparative studies evaluating mobility-enabled, non-pneumatic compression technologies have provided intriguing insights. In randomized crossover trials involving both upper- and lower-extremity lymphedema, patients treated with wearable non-pneumatic devices experienced greater limb-volume reduction, higher responder rates, improved quality of life, and substantially better adherence compared with patients using advanced pneumatic systems [20,21].

While volume reduction is important, adherence may represent the most clinically meaningful outcome. A treatment that patients consistently use will almost always outperform one that remains in the closet.

Equally noteworthy is the observation that patients treated without trunk garments did not experience worsening truncal edema. For years, many clinicians have assumed that external trunk compression was essential for proximal lymphatic clearance. Emerging evidence suggests that upright posture, diaphragmatic breathing, and normal physiologic movement may accomplish much of this work naturally [11–19].

These findings challenge some long-standing assumptions in lymphedema management. They also reinforce a broader principle that extends beyond compression therapy itself: successful treatment should align with human physiology and patient behavior rather than requiring patients to adapt their lives around the treatment.

Several practical lessons emerge from this evolving evidence.

First, patients with advanced chronic venous insufficiency and persistent edema should increasingly be viewed through a lymphatic lens. Treating these individuals as having "venous edema alone" risks overlooking an important component of their disease, as well as the interrelationship of the systems [5–9].

Second, adherence should not automatically be interpreted as a patient problem. Frequently, poor adherence reflects a mismatch between therapy design and daily life.

Third, mobility should be considered an active therapeutic component rather than merely an activity permitted between treatments.

Finally, compression technologies that allow patients to remain upright and active may represent more than an incremental improvement. They may signal a broader shift toward patient-centered therapies that integrate rather than interrupt daily living.

None of this diminishes the importance of Complete Decongestive Therapy. Instead, it highlights the opportunity to deliver its principles in ways that are more sustainable over the long term.

As the burden of lymphedema and phlebolymphedema continues to grow, clinicians must move beyond asking whether a therapy can work and begin asking whether patients can realistically live with it. Ultimately, the most effective treatment is not simply the one supported by physiology—it is the one patients can sustain.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: No new data were created or analyzed in this study. Data sharing is not applicable to this article.

Conflicts of Interest: The author declare no conflicts of interest.

References

1. Rockson, S.G. Lymphedema. *Am. J. Med.* **2001**, *110*, 288–295. [CrossRef] [PubMed]
2. Sleigh, B.C.; Manna, B. Lymphedema. In *StatPearls [Internet]*; StatPearls Publishing: Treasure Island, FL, USA, 2024.
3. Greene, A.K. Epidemiology and Morbidity of Lymphedema. In *Lymphedema: Presentation, Diagnosis, and Treatment*; Greene, A.K., Slavin, S.A., Brorson, H., Eds.; Springer International Publishing: Cham, Switzerland, 2015; pp. 33–44.
4. Roberson, M.L.; Strassle, P.D.; Fasehun, L.O.; Erim, D.O.; Deune, E.G.; Ogunleye, A.A. Financial burden of lymphedema hospitalizations in the United States. *JAMA Oncol.* **2021**, *7*, 630–632. [CrossRef] [PubMed]
5. Dean, S.M.; Valenti, E.; Hock, K.; Leffler, J.; Compston, A.; Abraham, W.T. The clinical characteristics of lower extremity lymphedema in 440 patients. *J. Vasc. Surg. Venous Lymphat. Disord.* **2020**, *8*, 851–859. [CrossRef] [PubMed]
6. Farrow, W. Phlebolymphedema—A common underdiagnosed and undertreated problem in the wound care clinic. *J. Am. Col. Certif. Wound Spec.* **2010**, *2*, 14–23. [CrossRef] [PubMed]
7. Lee, B.B. Phlebolymphedema: Neglected outcome of combined venous and lymphatic insufficiency. *Vasc. Spec. Int.* **2020**, *36*, 1–3. [CrossRef]
8. Singh, A.; Zahra, F. Chronic Venous Insufficiency. In *StatPearls [Internet]*; StatPearls Publishing: Treasure Island, FL, USA, 2024.
9. Ulloa, J.; Cifuentes, S. Phlebolymphedema: An up-to-date review. *Phlebolymphology* **2021**, *28*, 49–60. [CrossRef]
10. Brown, J.C.; Cheville, A.L.; Tchou, J.C.; Harris, S.R.; Schmitz, K.H. Prescription and adherence to lymphedema self-care modalities among women with breast cancer-related lymphedema. *Support. Care Cancer* **2014**, *22*, 135–143. [CrossRef] [PubMed]
11. Rockson, S.G.; Karaca-Mandic, P.; Skoracki, R.; Hock, K.; Nguyen, M.; Shadduck, K.; Gingerich, P.; Campione, E.; Leifer, A.; Armer, J. Clinical evaluation of a novel wearable compression technology in the treatment of lymphedema: An open-label controlled study. *Lymphat. Res. Biol.* **2022**, *20*, 125–132. [CrossRef] [PubMed]
12. Rockson, S.G.; Karaca-Mandic, P.; Nguyen, M.; Shadduck, K.; Gingerich, P.; Campione, E.; Hettrick, H. A non-randomized, open-label study of the safety and effectiveness of a novel non-pneumatic compression device for lower limb lymphedema. *Sci. Rep.* **2022**, *12*, 14005. Erratum in *Sci. Rep.* **2023**, *13*, 911. [CrossRef] [PubMed]
13. Rockson, S.G.; Skoracki, R. Effectiveness of a nonpneumatic active compression device in older adults with breast cancer-related lymphedema: A subanalysis of a randomized crossover trial. *Lymphat. Res. Biol.* **2023**, *21*, 581–584. [CrossRef] [PubMed]
14. Rodrick, J.; Barnhart, H.; Rockson, S.G.; Chen, L.; Wang, Y.; Liu, Z.; Zhang, H.; Li, W.; Xu, J.; Kim, S.; et al. Evaluation of a novel wearable non-pneumatic compression device for the treatment of breast cancer-related lymphedema. *Biomed. Mater. Devices* **2024**, *3*, 112–120. [CrossRef]
15. Rao, A.; Berland, T.; Mullick, A.; Maldonado, T.S.; Blumberg, S.N. A novel non-pneumatic compression device results in reduced foot and ankle swelling in patients with venous and lymphatic edema. *Vascular* **2024**, *32*, 1015–1022.
16. Wright, T.; Scarfino, C.; Baldwin, J.; Barnhart, H.; Doraiswamy, A.; Chen, M.; Davis, R.; Evans, K.; Thompson, P.; White, J.; et al. Real-time visualization of enhanced lymphatic flow when using a non-pneumatic active compression device. *Ann. Case Rep.* **2023**, *8*, 1564.
17. Klose Training. *Anatomy and Physiology of the Lymphatic System Manual*; Klose Training: Boulder, CO, USA, 2022.
18. Van Helden, D.F. The lymphangion: A not so "primitive" heart. *J. Physiol.* **2014**, *592*, 5353–5354. [CrossRef] [PubMed]
19. Zawieja, D.C. Contractile physiology of lymphatics. *Lymphat. Res. Biol.* **2009**, *7*, 87–96. [CrossRef] [PubMed]
20. Rockson, S.G.; Whitworth, P.W.; Cooper, A.; Kania, S.; Karnofel, H.; Nguyen, M.; Shadduck, K.; Gingerich, P.; Armer, J. Safety and effectiveness of a novel non-pneumatic active compression device for treating breast cancer-related lymphedema: A multicenter randomized crossover trial (NILE). *J. Vasc. Surg. Venous Lymphat. Disord.* **2022**, *10*, 1359–1366.e1. [CrossRef] [PubMed]
21. Barfield, M.; Winokur, R.; Berland, T.; Davis, S.; Ralph, V.; Chatham, N.; Rockson, S.; Maldonado, T.S. Results from a comparative study to evaluate the treatment effectiveness of a nonpneumatic compression device versus an advanced pneumatic compression device for lower extremity lymphedema swelling (TEAYS study). *J. Vasc. Surg. Venous Lymphat. Disord.* **2025**, *13*, 101965. [CrossRef] [PubMed]