

# Treatment of Upper Extremity Lymphedema following Chemotherapy and Radiation for Head and Neck Cancer

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**Summary:** In the industrialized world, the most common cause of secondary lymphedema is iatrogenic. The inciting event is generally a combination of lymph node resection, chemotherapy, and radiation therapy. Although a regional nodal dissection is often the primary risk factor, lymphedema can also result from sentinel node dissections, or as in the case presented without any surgical resection. Here, we present a unique case of upper extremity lymphedema resulting from definitive chemoradiation for squamous cell carcinoma of the head and neck. The patient was treated using a combined approach with a lymphaticovenular anastomosis and a free vascularized inguinal lymph node transfer. (*Plast Reconstr Surg Glob Open* 2020;8:e2672; doi: [10.1097/GOX.0000000000002672](https://doi.org/10.1097/GOX.0000000000002672); Published online 25 March 2020.)

In the industrialized Western world, secondary lymphedema most commonly occurs following cancer treatment.<sup>1</sup> The combination of a regional node dissection, chemotherapy, and radiation is a known risk factor predisposing patients to lymphedema.<sup>1</sup> Patients who have undergone lymph node dissection with or without radiation and chemotherapy for breast cancer, gynecologic cancers, or melanoma are at significantly high risk for developing lymphedema.<sup>2-4</sup> In recent times, physiologic operations for treatment of lymphedema have emerged as the gold standard for improving the drainage of fluid from the affected extremity. The lymphaticovenular anastomosis (LVA) and the vascularized lymph node transfer (VLNT) are the 2 most effective options currently available. One creates a shunt from the obstructed lymphatic system allowing fluid to drain into the systemic circulation, whereas the other transfers lymph nodes from one donor site to the extremity plagued with lymphedema allowing for lymphangiogenesis. Here we report a unique case of upper extremity lymphedema resulting from chemoradiation treatment alone for squamous cell carcinoma of the base of tongue.

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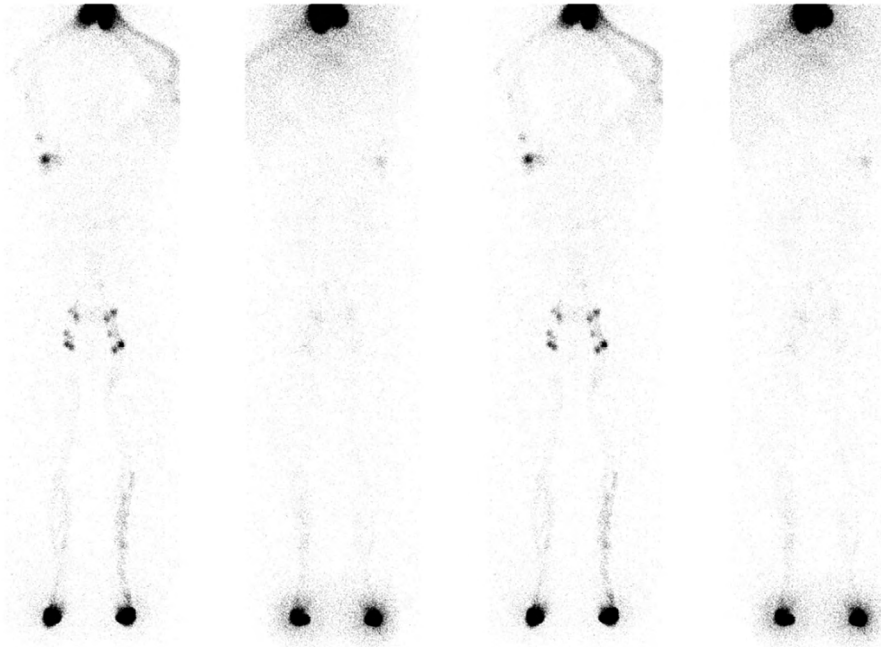
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## CASE REPORT

A 75-year-old man (body mass index = 29.1 kg/m<sup>2</sup>) presented with lymphedema of the left upper extremity which started following definitive chemoradiation therapy for a T3N2c squamous cell carcinoma of the left base of tongue. The patient noted progressive swelling of the dominant left arm approximately 2 months following the end of his treatment. He never suffered from cellulitis of the arm and underwent conservative decongestive therapy. On examination, the left arm was 57.4% larger than the unaffected right arm by perometer measurement without pitting edema but with noticeable fibrosis and woodiness in the forearm. A lymphoscintigraphy showed no tracer uptake in the affected limb (Fig. 1).

We opted to proceed with a combined approach to address the patient's lymphedema. The patient was taken to the operating room, and indocyanine green lymphangiography demonstrated stage 3 lymphedema based on the MD Anderson Staging system.<sup>5</sup> The patient underwent 3 LVAs and an inguinal lymph node transfer based on the superficial circumflex iliac vessels (Figs. 2, 3). The lymph nodes were placed in the volar forearm, and the anastomosis was performed in an end-to-end fashion to the radial artery and a vena comitante (Fig. 3). The patient demonstrated a remarkable improvement and currently no longer wears any compression garment. The volume reduction at 20 months was modest (4%), but there was a marked subjective improvement in terms of tightness and weight reduction. The patient has regained the ability to wear his watch and wedding ring without any daily use of compression garment or other therapies (Fig. 4).

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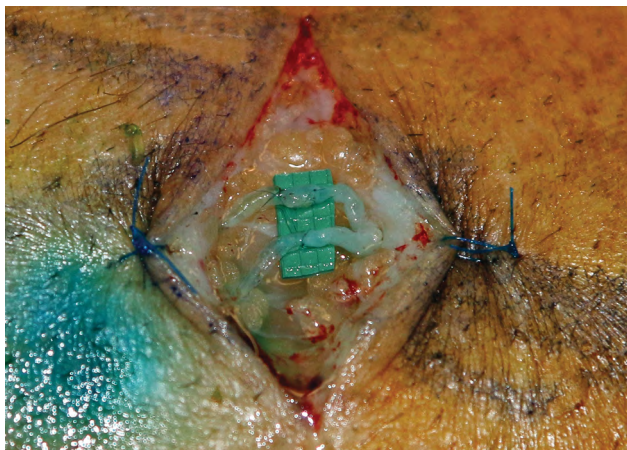
**Fig. 1.** Preoperative lymphatic scan. There is no tracer uptake in the left upper extremity, and no lymph node or lymphatic channels can be visualized in the affected limb.

### DISCUSSION

The surgical treatment for lymphedema has evolved tremendously over time and continues to evolve. Although the concepts were proposed decades ago, advancements in technology, increased understanding of anatomy, and greater experience have proven and confirmed the utility and efficacy of both LVA and VLNT. To our knowledge, this is the first description of upper extremity lymphedema resulting from nonsurgical treatment for head and neck malignancy treated with a combined LVA and VLNT approach.

Studies have confirmed the most common etiology for lymphedema in the United States is secondary to treatment for cancer with the 3 greatest risk factors being a regional lymph node dissection, radiation, and chemotherapy.

However, the case presented demonstrates that the combined chemotherapy and radiation without surgery were sufficient to compromise the lymphatic system draining his left arm. Furthermore, the case also illustrates the existence of the rare anatomic variation where the primary drainage of the arm is through the level 5 lymph nodes of the neck. Just as this represents the only reported case of upper extremity lymphedema resulting from chemoradiation to the neck, this also should raise awareness of the potential risk of iatrogenic lymphedema from harvest of the supraclavicular nodes as a donor site for VLNT.<sup>5-8</sup> Careful precautions, meticulous



**Fig. 2.** Intraoperative image of lymphovenous bypass. Three lymphovenous bypasses were performed on the forearm of the patient; two demonstrated here in a single incision.



**Fig. 3.** Intraoperative image of the vascularized lymph node transfer. An inguinal lymph node transfer based on the superficial circumflex iliac vessels was performed. The lymph nodes were placed in the volar forearm, and the anastomosis was performed in an end-to-end fashion to the radial artery.



**Fig. 4.** Postoperative image of arm 20 months postoperatively. The patient presented with a modest reduction in his upper extremity circumference, but the firmness and swelling of the arm greatly improved with increased softness and decreased sensation of tightness and heaviness. The patient is now able to wear his watch and wedding ring and does not require any compression garments, which resulted in a significant improvement of his quality of life.

dissection, and adequate experience and training are vital to avoiding such catastrophic complications. Although there is only a single case reported of upper extremity lymphedema following a supraclavicular lymph node harvest, it is one that should be discussed with patients.<sup>7,8</sup>

The present case also illustrates an evolution in our approach to supermicrosurgical treatment of lymphedema. We have previously only performed either an LVA or VLNT for the treatment of lymphedema. Based on indocyanine green lymphangiography findings, early-stage lymphedema was addressed using LVA, whereas more advanced stages were treated with VLNT. We have now modified our current algorithm to a combined approach, which we believe provides a synergistic benefit that is superior than either an LVA or VLNT alone.<sup>9</sup> Although the overall objective reduction in volume is marginal, this is commonly seen in patients with lymphedema, and the greater measure for the efficacy of the operation is the improvement in the patient's clinical symptoms and overall quality of life.

## CONCLUSIONS

This is the first report of upper extremity lymphedema following treatment of squamous cell carcinoma of the base of tongue with chemoradiation alone. A combined approach, using both an LVA and VLNT, was not only effective in improving the patient's lymphedema and quality of life, but also suggests that a combined approach may be more effective than either technique alone.

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