

Salvage Total Laryngectomy with Bilateral Deltopectoral Flap Reconstruction for Metastatic (Stage IVC) Laryngeal Carcinoma: A Case Report

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ARTICLE INFO

Keywords:

Deltopectoral flap
Laryngeal carcinoma
Palliative surgery
Salvage therapy
Total laryngectomy

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All authors have reviewed and approved the final version of the manuscript.

<https://doi.org/10.37275/oaijmr.v5i5.781>

ABSTRACT

The management of advanced laryngeal squamous cell carcinoma (SCC) that persists or recurs after definitive chemoradiotherapy presents a significant clinical challenge. This challenge is profoundly amplified in the setting of distant metastatic disease (Stage IVC), where the goals of treatment shift from curative intent to palliation and quality of life preservation. Surgical salvage in this context is controversial and reserved for highly selected cases with severe, unmanageable local symptoms. We present the case of a 58-year-old male, a long-term smoker, with Stage IVC (T3N2cM1) laryngeal SCC, complicated by bone metastases. He initially underwent definitive chemoradiotherapy. Ten months later, he presented with progressive local disease, including a fungating cervical mass and impending airway compromise. A palliative salvage total laryngectomy with bilateral Modified Radical Neck Dissection (MRND) was performed to control severe local symptoms. The extensive pharyngocutaneous defect was reconstructed using bilateral pedicled deltopectoral fasciocutaneous flaps. The final histopathology confirmed viable, moderately differentiated SCC with extensive cartilage invasion and, critically, a positive deep resection margin. The postoperative course was managed successfully, with the patient showing significant improvement in local symptoms and quality of life at short-term follow-up. This case highlights the complex decision-making required for palliative surgery in metastatic head and neck cancer. The discussion focuses on the justification for aggressive local intervention to palliate debilitating symptoms, the rationale for selecting the robust bilateral deltopectoral flap for reconstruction in a hostile, irradiated field, and the profound prognostic implications of a positive surgical margin in the salvage setting. In conclusion, palliative salvage total laryngectomy can be a viable strategy to improve quality of life in selected patients with Stage IVC laryngeal cancer and overwhelming local disease. However, achieving complete oncologic clearance is a formidable challenge, and management must be tailored within a multidisciplinary framework.

1. Introduction

Laryngeal squamous cell carcinoma (SCC) remains a significant global health issue, representing the second most common malignancy of the upper aerodigestive tract.¹ While early-stage disease (Stage I-II) boasts favorable outcomes with single-modality treatment, locally advanced laryngeal cancer (LALC;

Stage III-IV) requires aggressive, multimodal therapy.

Over the past three decades, treatment paradigms for LALC have shifted towards organ preservation protocols, primarily utilizing concurrent chemoradiotherapy (CRT) as the standard of care.² This approach aims to preserve the vital functions of the larynx—respiration, phonation, and swallowing—

without compromising survival outcomes when compared to primary total laryngectomy.³

Despite the success of organ preservation strategies, a substantial portion of patients, estimated between 20% and 40%, experience locoregional failure in the form of persistent or recurrent disease after definitive CRT.⁴ In these circumstances, salvage surgery, most commonly a total laryngectomy, becomes the primary, and often only, potentially curative option.⁵ Salvage surgery in a previously irradiated field is technically demanding and fraught with a significantly higher risk of complications, including wound breakdown, infection, and pharyngocutaneous fistula, which occurs in up to 50% of cases.⁶

The clinical scenario becomes exponentially more complex when locoregional failure is concurrent with distant metastatic disease (Stage IVC).⁷ In this setting, the patient is considered incurable, and the primary treatment goals pivot from cure to palliation, focusing on symptom control, functional preservation, and maximization of quality of life. The role of aggressive surgical intervention, such as a salvage total laryngectomy, is highly controversial for Stage IVC patients.⁸ Such a major operation is typically reserved for a small, carefully selected subset of patients with debilitating and life-threatening local symptoms—such as severe airway obstruction, intractable pain, catastrophic bleeding, or a fungating, infected neck mass—that are refractory to less invasive measures.⁹ The decision to proceed requires a delicate balance between the potential for significant symptom palliation and the substantial morbidity and mortality associated with the procedure.¹⁰

This case report details the multidisciplinary management of a patient with Stage IVC (T3N2cM1) laryngeal SCC with bone metastases who developed progressive, symptomatic locoregional disease after primary CRT. This report aims to illustrate the decision-making process, surgical technique, and

outcomes of palliative salvage surgery. The novelty and educational value of this case lie in its detailed exploration of the justification for such an aggressive palliative intervention in the face of incurable metastatic disease and its focus on a robust, historical reconstructive technique that remains highly relevant for complex defects in compromised patients.

2. Case Presentation

Written informed consent was obtained from the patient for the publication of this case report and any accompanying images. A 58-year-old male with a significant 20-year history of smoking presented to our institution's Otolaryngology-Head and Neck Surgery clinic in June 2023. His chief complaint was progressive hoarseness that had been present for one year but had worsened significantly over the preceding two weeks. This was accompanied by dysphagia for solids, dyspnea on mild exertion, and persistent odynophagia. He also reported an unintentional weight loss of 5 kilograms over the past month. He had no other significant medical comorbidities (Table 1).

Two months prior, in April 2023, he had sought evaluation for dyspnea at a regional hospital, where a CT scan revealed a laryngeal mass. A tracheostomy was recommended, but the patient declined and opted for alternative traditional medicine for one month, during which his symptoms worsened. On physical examination at our clinic, the patient was in no acute distress, with stable vital signs. Examination of the neck revealed palpable, firm, bilateral jugulodigastric lymph nodes, the largest measuring approximately 3 cm on the right side. Flexible fiberoptic laryngoscopy (FOL) revealed a large, exophytic, fungating mass occupying the supraglottis, appearing to originate from the right hemilarynx. The tumor obscured the view of the true vocal cords, but the right cord appeared fixed. The mass extended across the midline, significantly narrowing the glottic inlet.

Table 1. Clinical summary on admission.

| Clinical Summary on Admission Patient: 58-Year-Old Male | |
|---|---|
| Anamnesis (Patient History) | <ul style="list-style-type: none"> • Chief Complaint: Progressive hoarseness for 1 year, worsening significantly in the last 2 weeks. • Associated Symptoms: <ul style="list-style-type: none"> • Dysphagia (difficulty swallowing solids) • Dyspnea (shortness of breath on mild exertion) • Odynophagia (painful swallowing) • Unintentional weight loss of 5 kg in the past month |
| Disease & Social History | <ul style="list-style-type: none"> • Timeline: Symptoms began approx. 1 year prior to admission. • Previous Treatment: Visited a regional hospital 2 months prior; declined recommended tracheostomy and pursued traditional medicine for 1 month with worsening symptoms. • Risk Factors: <ul style="list-style-type: none"> • Significant 20-year history of smoking. • Occupational exposure to dust as a project supervisor. • Alcohol consumption denied. |
| Family History | No significant family history of malignancy or chronic diseases reported. |
| Physical Examination | <ul style="list-style-type: none"> • Vital Signs: Stable (BP 120/78 mmHg, HR 80 bpm, RR 18/min, Temp 36°C). • General: Compos mentis, no acute distress. • Head & Neck: <ul style="list-style-type: none"> • Palpable, firm, bilateral jugulodigastric lymph nodes (largest ~3 cm on the right). • Fiberoptic Laryngoscopy (FOL): <ul style="list-style-type: none"> • Large, exophytic, fungating mass in the supraglottis, primarily on the right. • Tumor obscured the view of the true vocal cords. • Right vocal cord appeared fixed. • Significant narrowing of the glottic inlet. |
| Key Laboratory Findings | Pre-Salvage Surgery Bloodwork: <ul style="list-style-type: none"> • White Blood Cell (WBC): 25.99 $\times 10^3/\mu\text{L}$ (High) • Neutrophil % (NE%): 84.10% (High) • Platelets (PLT): 535 $\times 10^3/\mu\text{L}$ (High) • Hemoglobin (HGB): 11.20 g/dL (Low) • Hematocrit (HCT): 36.10% (Low) • Red Blood Cell (RBC): 3.90 $\times 10^6/\mu\text{L}$ (Low) • Neutrophil to Lymphocyte Ratio (NLR): 11.68 (High) • Renal function and electrolytes: Within normal limits. |
| Diagnosis on Admission | <ul style="list-style-type: none"> • Histopathology: Moderately Differentiated Squamous Cell Carcinoma of the Larynx. • Final Staging (AJCC 8th Ed.): Stage IVC (T3N2cM1). • Metastatic Disease: Confirmed Metastatic Bone Disease (MBD) in skull, humeri, pelvis, and femora. |

An initial contrast-enhanced CT scan of the neck confirmed the presence of a large, heterogeneously enhancing soft tissue mass centered in the right supraglottis, measuring approximately 4.5 x 3.8 cm. The mass was seen to invade the paraglottic space, cross the midline, and cause near-total obstruction of the airway at the level of the C4-C5 vertebrae. There was clear evidence of erosion and destruction of the right thyroid cartilage lamina, consistent with T3 disease. Multiple enlarged, necrotic-appearing lymph nodes were identified in levels IIA, IIB, and III bilaterally, consistent with N2c disease. On June 2023, the patient underwent a direct laryngoscopy with biopsy under general anesthesia. An elective tracheostomy was performed concurrently to secure

the airway. Intraoperatively, the tumor was confirmed to be a transglottic lesion, involving the right vocal cord, ventricle, and extending into the immediate subglottis. Histopathological examination of the biopsy specimen revealed an invasive, moderately differentiated squamous cell carcinoma.

A full metastatic workup was conducted. A bone survey revealed multiple osteolytic and mixed osteolytic-blastic lesions in the skull, bilateral humeri, pelvis, and bilateral femora, highly suspicious for metastatic bone disease (MBD) (Figure 1). A CT scan of the chest showed no evidence of pulmonary metastases. Abdominal ultrasound was also negative for visceral metastases.



Figure 1. Bone survey. Representative images showing multiple osteolytic lesions in the humerus and pelvis, consistent with metastatic bone disease.

Based on these comprehensive findings, the patient was diagnosed with Stage IVC (T3N2cM1) Squamous Cell Carcinoma of the Larynx. After a multidisciplinary tumor board discussion, the patient was deemed incurable but was considered a candidate for systemic

therapy with palliative intent. He was commenced on a regimen of definitive chemoradiotherapy, completing six cycles of chemotherapy (Carboplatin/Paclitaxel), targeted therapy, and Zoledronic acid for his bone metastases.

Table 2. Management and Follow-up Summary

Patient: 58-Year-Old Male with Stage IVC Laryngeal SCC

| | |
|----------------------------------|--|
| Initial Treatment (Non-Surgical) | <ul style="list-style-type: none"> • Staging: Diagnosed with Stage IVC (T3N2cM1) Laryngeal SCC. • Initial Plan: Palliative-intent definitive chemoradiotherapy (CRT). • Regimen: <ul style="list-style-type: none"> • Completed 6 cycles of Chemotherapy (Carboplatin/Paclitaxel). • Targeted Therapy. • Zoledronic acid for metastatic bone disease. • Outcome: Disease progression after 10 months, with development of a painful, fungating cervical mass. |
| Palliative Salvage Surgery | <ul style="list-style-type: none"> • Indication: Palliation of severe local symptoms (pain, infection, fungating mass) after failure of CRT. • Procedure Performed: <ul style="list-style-type: none"> • Salvage Total Laryngectomy. • Bilateral Modified Radical Neck Dissection (MRND), Type III. • Reconstruction: <ul style="list-style-type: none"> • Creation of a large pharyngocutaneous defect (12×10 cm). • Reconstruction with **Bilateral Pedicled Deltopectoral Fasciocutaneous Flaps**. • Donor sites covered with split-thickness skin grafts. • Surgical Pathology Outcome: <ul style="list-style-type: none"> • Viable, moderately differentiated SCC confirmed. • Lymph nodes negative for malignancy. • Deep resection margin positive for tumor (R1 Resection). |
| Postoperative Management | <ul style="list-style-type: none"> • Initial Care: 24 hours in Intensive Care Unit (ICU), then transferred to ward. • Medications: Broad-spectrum IV antibiotics (Ceftriaxone), analgesics. • Nutrition: Nutritional support via nasogastric tube (NGT). • Wound Care: Close monitoring of flaps and skin grafts; routine wound care. • Hospital Stay: Discharged on postoperative day 14. |
| Follow-up & Outcome | <ul style="list-style-type: none"> • First Follow-up (Post-op Day 19): <ul style="list-style-type: none"> • Surgical sites clean and well-healed. • No signs of infection, fistula, or flap necrosis. • Significant improvement in local symptoms and quality of life reported. • Long-term Plan: <ul style="list-style-type: none"> • Continued management of metastatic disease with systemic therapy. • Regular monitoring for local recurrence given the positive margin status. • Ongoing supportive and palliative care. |

In April 2024, approximately ten months after his initial diagnosis and after completing his course of CRT, the patient presented again to the clinic with significant disease progression. He complained of a painful, enlarging mass on the right side of his neck, which had begun to ulcerate through the skin, producing a foul-smelling discharge. He also experienced increasing headaches.

Clinical examination revealed a large, hard, fixed, and tender mass in the right neck, with a central area of ulceration and necrosis. FOL showed a persistent, bulky tumor within the larynx, with significant edema and pooling of saliva in the hypopharynx, indicating poor swallowing function (Figure 2). His airway

remained dependent on the tracheostomy tube. Pre-operative laboratory tests showed leukocytosis with neutrophilia, thrombocytosis, and mild anemia, indicative of an inflammatory/infectious process associated with the necrotic tumor.

Given the failure of non-surgical management and the development of a painful, fungating, and infected cervical mass causing significant morbidity and a decline in quality of life, the patient was presented again at the multidisciplinary tumor board. The decision was made to offer palliative salvage surgery with the primary goals of removing the symptomatic local disease, controlling the infection and pain, and improving his quality of life.

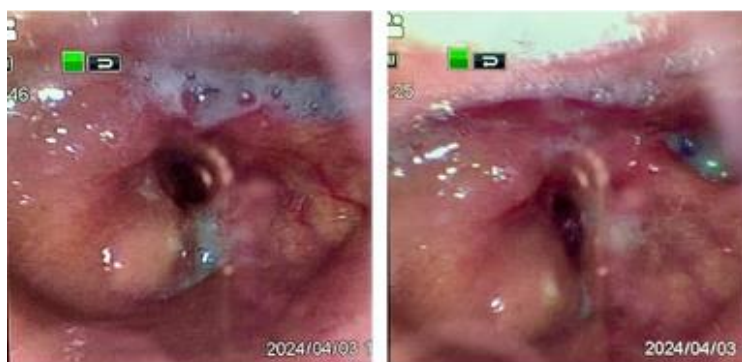


Figure 2. Fiberoptic laryngoscopy pre-salvage (April 2024). Endoscopic view showing a persistent bulky tumor with significant edema and pooling of saliva, indicating progression of disease and poor function.

The patient underwent a salvage total laryngectomy with bilateral Modified Radical Neck Dissection (MRND Type III) and reconstruction with bilateral pedicled deltopectoral fasciocutaneous flaps. The procedure began with a wide U-shaped or "apron" incision, incorporating the existing tracheostomy site and extending superiorly to encompass the fungating skin lesion. Skin flaps were raised superiorly to the level of the hyoid bone and inferiorly to the clavicles. A bilateral MRND (Type III) was performed, preserving the sternocleidomastoid muscle, internal jugular vein, and spinal accessory nerve on both sides, while removing all fibrofatty lymphatic tissue from levels I through V. The larynx was then mobilized. The strap muscles were divided, and the thyroid gland was dissected off the trachea, preserving the parathyroid

glands where possible. The larynx was separated from the hypopharynx, and the entire laryngeal apparatus, including the hyoid bone and cricoid cartilage, was removed *en bloc* with the neck dissection specimens. This resulted in a large pharyngocutaneous defect, measuring approximately 12 x 10 cm, with significant loss of anterior neck skin.

For reconstruction, bilateral deltopectoral fasciocutaneous flaps were harvested. An incision was made inferior to the clavicle on each side, extending laterally over the deltoid region. The flaps, based on the first four internal mammary artery perforators, were raised at the level of the deep pectoral fascia. The flaps, consisting of skin, subcutaneous tissue, and fascia, were then tunneled subcutaneously over the clavicles into the neck defect. One flap was used to

reconstruct the posterior pharyngeal wall and create a neopharynx over a nasogastric tube. The second flap was used to resurface the large anterior neck skin defect. The donor sites on the chest were covered with split-thickness skin grafts harvested from the thigh. A permanent end-tracheostoma was fashioned in the inferior aspect of the incision. The final resected specimen was a large, fungating mass measuring 12 x 10 x 4 cm, which had infiltrated the entire larynx and surrounding soft tissues.

The patient was managed in the Intensive Care Unit for the first 24 hours post-operatively and then transferred to the ward. He was kept on broad-spectrum antibiotics and received nutritional support via a nasogastric tube. The flaps and skin grafts were monitored closely and remained viable throughout his hospital stay. His wounds healed well without evidence of infection, fistula, or flap necrosis. He was discharged on the 14th postoperative day. At his follow-up visit on post-operative day 19, his surgical sites were clean and well-healed.



Figure 3. Postoperative outcome. Clinical photograph at 19 days post-surgery showing well-healed wounds and flaps, with a clean, permanent tracheostoma.

The final histopathological report of the surgical specimen was critical. It confirmed the presence of viable, moderately differentiated squamous cell carcinoma, which was seen to extensively infiltrate the thyroid cartilage and the thyroid gland itself. Lymphovascular and perineural invasion were negative. The lymph nodes from the neck dissection specimens were negative for malignancy. However, the most significant finding was that the deep resection margin contained viable tumor cells, indicating an R1 resection.

3. Discussion

The clinical case presented forces a direct confrontation with the most challenging questions at the intersection of surgical oncology, radiation biology,

and palliative medicine.¹¹ The management of this patient is a microcosm of the immense complexities inherent in treating advanced head and neck squamous cell carcinoma (SCC), particularly in the salvage setting after the failure of primary organ-preservation therapy.¹² To truly appreciate the gravity of the decisions made, we must move beyond a surface-level description of the procedures and delve into the underlying pathophysiology that dictates every step. This discussion will, therefore, provide a detailed elaboration on the three core analytical themes of this case: first, the profound biological justification for pursuing aggressive palliative surgery in the face of incurable metastatic disease; second, the specific pathomechanical rationale for selecting the bilateral deltopectoral flap for reconstruction in a

hostile, irradiated tissue bed; and third, the dire oncologic implications and biological plausibility of the resultant positive surgical margin.

The cornerstone of modern oncology dictates that for any patient with Stage IVC cancer, characterized by distant metastatic disease, the therapeutic intent is palliative, not curative.¹² The standard of care rightfully shifts to systemic therapies—chemotherapy, immunotherapy, targeted agents—designed to control disease progression, manage symptoms, and prolong survival where possible. The decision to undertake a major surgical resection, such as a total laryngectomy, represents a significant deviation from this paradigm and demands a rigorous, biologically-grounded justification.¹³ In this patient, the justification was not rooted in an attempt to cure, but in a desperate need to address a catastrophic failure of local control that had precipitated a severe palliative crisis.

Following the failure of primary chemoradiotherapy (CRT), the patient developed what is clinically known as a "laryngeal cripple" scenario, a condition profoundly compounded by an exophytic, fungating tumor. This term, while stark, accurately captures the devastating functional collapse. However, to understand the surgical imperative, we must dissect this state into its pathophysiological components. The patient's symptoms were not merely discomforts; they were the external manifestations of a series of uncontrolled, life-threatening biological processes. First, the development of the fungating, malodorous neck wound is a direct consequence of the tumor's aggressive biology. A rapidly proliferating tumor quickly outgrows its nascent, poorly formed blood supply. The core of the tumor becomes hypoxic and then necrotic, creating a nutrient-rich, anaerobic environment that is an ideal breeding ground for colonizing bacteria, particularly anaerobes.¹³ The metabolic byproducts of these bacteria, such as putrescine and cadaverine, produce the characteristic foul odor that is a source of immense psychological distress and social isolation. This necrotic mass becomes a persistent, non-healing wound and a nidus for chronic infection, seeding the patient's system with

inflammatory cytokines and bacterial toxins, leading to a state of chronic systemic inflammation, evidenced by his leukocytosis and constitutional symptoms like weight loss and fatigue.¹⁴ This is not a simple skin infection; it is a localized septic state driven by the tumor itself. Second, the impending airway collapse represents a critical mechanical failure. While the tracheostomy provided a patent airway, it did not address the underlying cause. The sheer bulk of the recurrent tumor, combined with the significant surrounding edema driven by inflammatory mediators and lymphatic obstruction, exerted continuous and increasing pressure on the surrounding structures.¹⁵ This created a constant threat of tracheal compression below the tracheostomy site or hemorrhage into the airway. The patient was living on a precipice, with his ability to breathe entirely dependent on a plastic tube bypassing a collapsing, diseased organ. Third, the severe dysphagia was a result of both mechanical obstruction and neurological dysfunction. The tumor's mass physically blocked the passage of a food bolus, while its infiltration into the pharyngeal constrictor muscles and their innervating nerves paralyzed the coordinated process of swallowing.¹⁵ This led to malnutrition, dehydration, and a high risk of aspiration pneumonia from the constant pooling of saliva and oral secretions in the hypopharynx. Finally, and perhaps most urgently from a surgical standpoint, was the unstated but ever-present risk of catastrophic hemorrhage. As tumors invade surrounding tissues, they induce neoangiogenesis, creating a chaotic network of fragile, abnormal blood vessels. More menacingly, the tumor's leading edge can directly erode into the walls of the great vessels of the neck, particularly the carotid artery. This process, known as vascular erosion, can lead to a "sentinel bleed"—a small, initial hemorrhage—followed by a massive, uncontrollable, and almost universally fatal exsanguination.¹⁶

Viewed through this pathophysiological lens, the decision for a palliative salvage total laryngectomy becomes clear. It was not an attempt to remove all cancer from the body, but a targeted intervention to

resect the entire failing organ system that was the source of pain, sepsis, airway compromise, and the risk of fatal hemorrhage.¹⁷ It was an act of aggressive palliation, aligning with the principle that in carefully selected metastatic patients, controlling the primary symptomatic site can provide the most effective and durable form of relief, dramatically improving their remaining quality of life when systemic therapies cannot contain the local fire. The successful execution of a salvage total laryngectomy is only half the battle; the subsequent reconstruction is paramount to the

patient’s functional recovery and survival. The procedure invariably creates a large, composite pharyngocutaneous defect—a through-and-through hole from the digestive tract to the outside world.¹⁸ Closing this defect in a previously irradiated field is one of the most formidable challenges in reconstructive surgery. The choice of reconstructive technique is therefore not a matter of preference, but a decision based on a deep understanding of radiation biology (Figure 4).

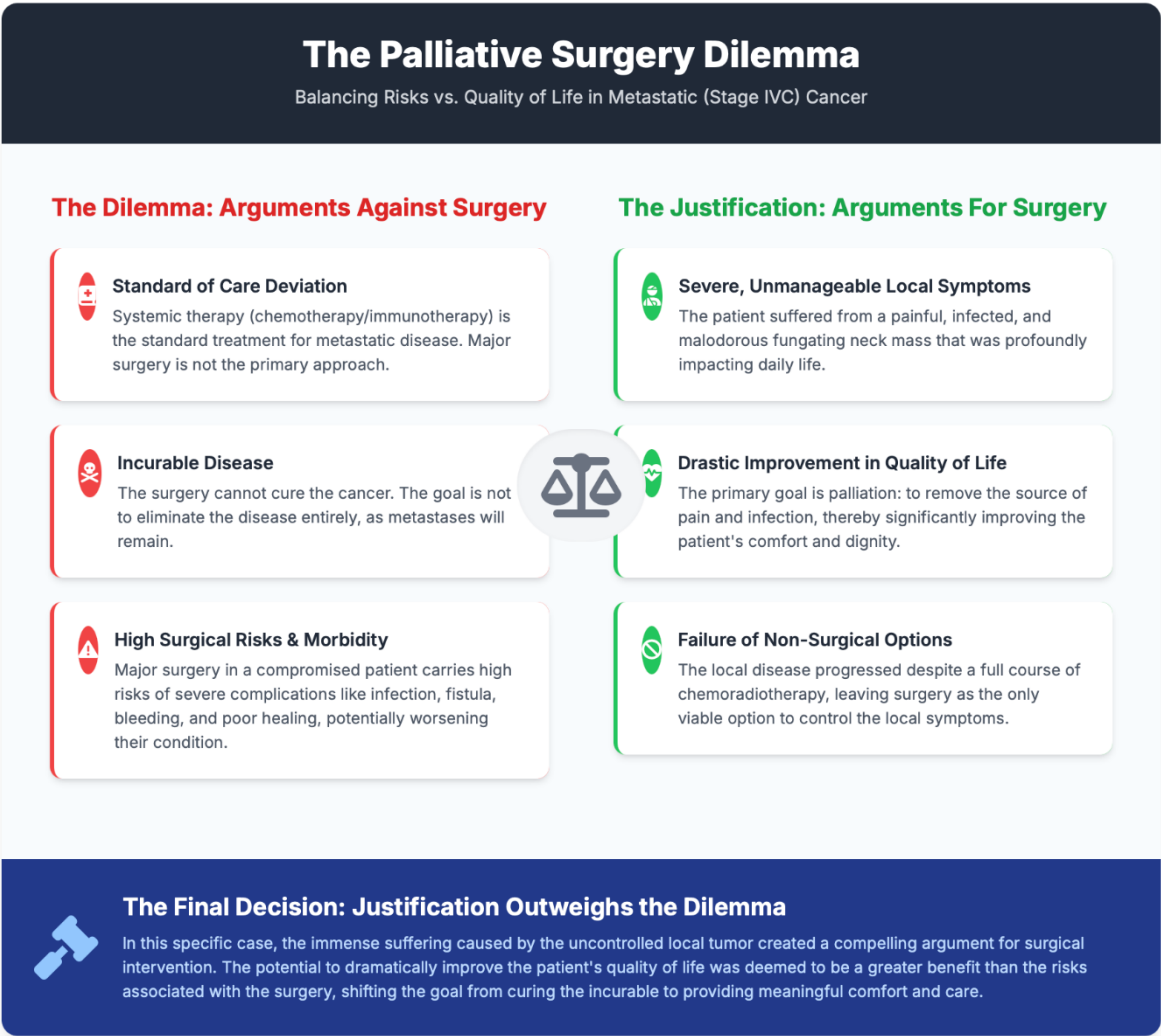


Figure 4. The palliative surgery dilemma.

The core problem is the creation of a "hostile" tissue bed. Therapeutic radiation, while effective at killing cancer cells, inflicts significant collateral damage on

surrounding healthy tissues. At a cellular level, radiation damages the DNA of endothelial cells lining the small blood vessels. This leads to a progressive,

inflammatory condition called obliterative endarteritis, where the lumens of arterioles and capillaries slowly narrow and close off over months and years. This process starves the tissue of oxygen and nutrients. Furthermore, radiation damages fibroblasts, the cells responsible for wound healing, impairing their ability to produce collagen. The cumulative effect is a tissue bed that is hypoxic, hypocellular, and hypovascular—in short, it has a profoundly compromised ability to heal. Attempting to close a defect in this environment with local, irradiated tissue is doomed to fail, leading to wound breakdown and the formation of a pharyngocutaneous fistula.

This is why the importation of healthy, well-vascularized tissue is mandatory. While the pectoralis major myocutaneous (PMMC) flap is often considered the workhorse for this task, the selection of the bilateral deltopectoral fasciocutaneous flap in this case was a nuanced and biologically astute choice.¹⁸ The biological plausibility of this flap's success lies in its unique vascular anatomy. The deltopectoral flap is an axial flap, meaning it is nourished by a dedicated, named arterial system—in this case, the first four perforating branches of the internal mammary artery. The critical advantage is that these source vessels lie deep within the chest, well outside the typical radiation field for laryngeal cancer. Therefore, the flap brings a robust pedicle of healthy, non-irradiated arteries and veins, which then perfuse the paddle of skin and fascia on the chest. In contrast to the bulkier PMMC flap, which includes the entire pectoralis muscle, the deltopectoral flap is thinner and more pliable, consisting only of skin, subcutaneous fat, and the underlying fascia. This allows for a more delicate and precise reconstruction of the neopharynx. Furthermore, by not sacrificing the pectoralis major muscle, it preserves the patient's shoulder function, which is a significant factor in their overall quality of life and ability to perform daily activities.

The alternative, a free tissue transfer, involves disconnecting a flap from a distant site (like the forearm or thigh) and microsurgically re-anastomosing its artery and vein to recipient vessels in the neck.¹⁹

While elegant, this procedure is longer, more complex, and critically dependent on finding healthy, undamaged recipient vessels in the irradiated neck—a significant challenge. Given the palliative intent of the surgery and the patient's overall condition, the deltopectoral flap offered a simpler, faster, and exceptionally reliable solution. It provided a robust, biologically sound method of bringing healthy, well-oxygenated tissue into a hostile, compromised environment, thereby maximizing the chances of successful healing and minimizing the risk of a devastating fistula.

The most sobering and clinically significant outcome of the surgery was the final pathology report: a positive deep resection margin (R1 resection) (Figure 5). This finding, while disappointing, was not entirely surprising given the biological context. It serves as a stark testament to the profound infiltrative nature of recurrent SCC and the limitations of surgery in a post-radiation field. To understand its significance, one must appreciate the pathomechanisms that make achieving a true negative margin so difficult. First is the microscopic reality of infiltrative tumor growth. SCC does not grow as a well-defined, encapsulated sphere. Instead, it advances like an invasive root system, sending out microscopic tentacles and single cells that infiltrate along paths of least resistance, such as nerve sheaths (perineural invasion) and lymphatic channels. This process is driven by complex molecular machinery. Cancer cells downregulate cell-adhesion molecules like E-cadherin, which normally keep them bound together, allowing them to break free.²⁰ They then upregulate enzymes like matrix metalloproteinases (MMPs), which act as molecular scissors, dissolving the extracellular matrix of healthy tissue to clear a path for invasion. This means that the true edge of the tumor is not a clear line but a diffuse, microscopic front that extends far beyond what the surgeon can see or feel. Second, this challenge is massively compounded by post-radiation fibrosis. As described earlier, radiation creates a dense, woody, scar-like tissue that replaces normal soft, pliable structures. This fibrotic tissue is notoriously difficult

to distinguish from an infiltrative tumor, both visually and by palpation during surgery. The normal anatomical planes that guide a surgeon are obliterated. This creates a surgical "fog of war," where the surgeon is forced to navigate through a homogenous, scarred landscape, trying to find an invisible enemy.²¹ The risk of transecting a microscopic tumor extension is exceptionally high. Third, we must consider the aggressive biology of

recurrent tumors. The cancer cells that survive a full course of definitive chemoradiotherapy are, by definition, the most aggressive and resistant clones within the original tumor. They have undergone a brutal process of Darwinian selection. The weaker, more therapy-sensitive cells have been eliminated, leaving behind a population of "super-survivors" that are often enriched with mutations promoting invasion, proliferation, and therapy resistance.

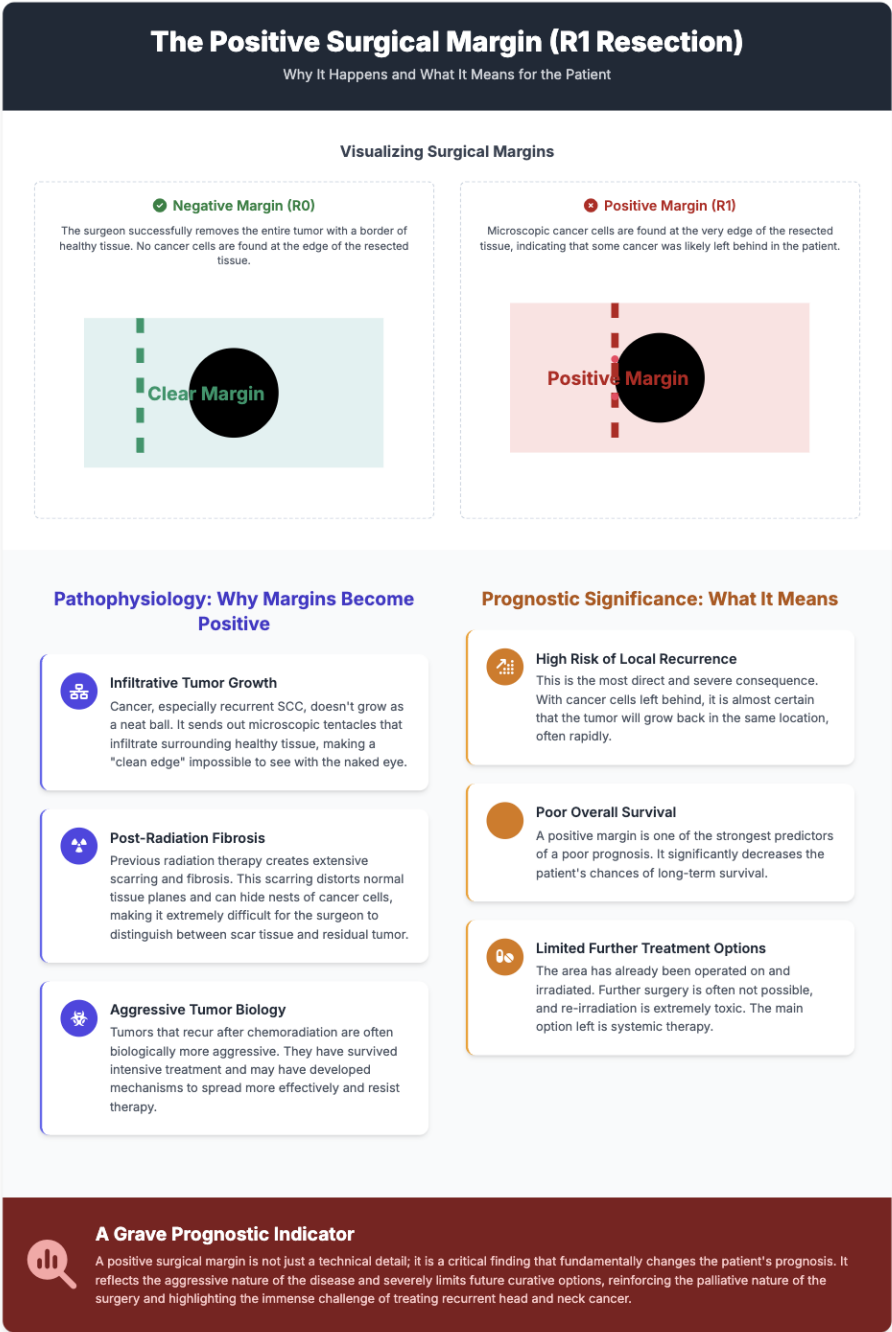


Figure 5. The positive surgical margin (R1 resection).

The prognostic implication of leaving behind even a microscopic amount of these highly aggressive, therapy-resistant cells is dire. A positive margin is the single most powerful predictor of subsequent local recurrence and poor overall survival.²² The immediate palliative goals may have been met, but the presence of residual disease means that local recurrence is a near certainty. The remaining cancer cells act as seeds in the surgically traumatized and poorly vascularized tissue bed, poised to grow into a new, often more aggressive tumor. The therapeutic options at this point are drastically limited. The neck cannot be safely re-irradiated to a curative dose, and further surgery is often impossible. The patient's only remaining recourse is systemic therapy, which now must contend with both the known distant metastases and the inevitable local recurrence. This outcome fundamentally underscores the palliative, rather than curative, nature of the intervention and highlights the absolute necessity for frank, realistic, and compassionate preoperative counseling with patients facing this monumental clinical challenge.

4. Conclusion

This case demonstrates that aggressive palliative surgery, in the form of salvage total laryngectomy and extensive reconstruction, has a role in the management of highly selected patients with incurable, metastatic (Stage IVC) laryngeal cancer who suffer from debilitating locoregional disease refractory to non-surgical therapy. The primary benefit is a significant improvement in quality of life through the effective palliation of severe symptoms. The bilateral deltopectoral flap proved to be an excellent and reliable reconstructive choice for a large composite defect in a hostile, irradiated field. However, the case also powerfully illustrates the formidable challenge of achieving complete oncologic resection in the salvage setting. A positive surgical margin is a common and grave finding, underscoring the aggressive pathophysiology of recurrent SCC and reinforcing the palliative intent of the procedure. Such complex cases demand careful patient selection and nuanced

decision-making within a dedicated multidisciplinary team.

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