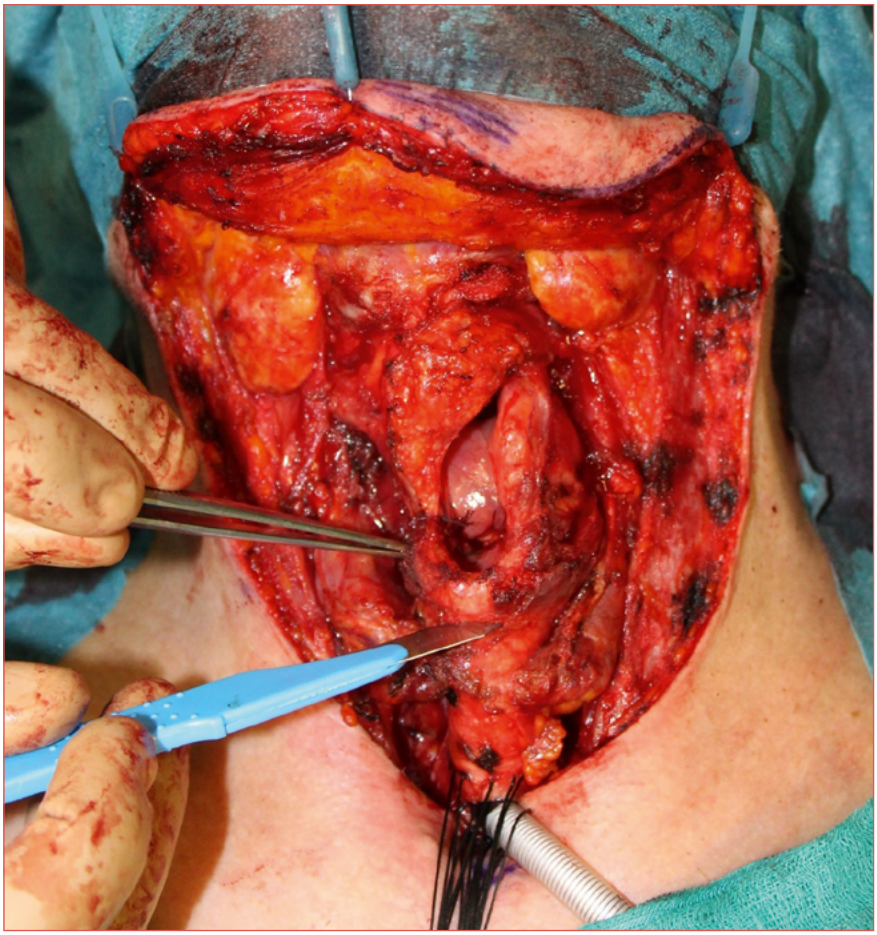
ACTA Otorhinolaryngologica Italica 2026;46(Suppl. 1):S56-S63; doi: 10.14639/0392-100X-suppl.1-46-2026-A2207

Salvage open partial horizontal laryngectomy: a comprehensive systematic review of oncological and functional outcomes

Andy Bertolin[1], Alberto Grassetto[2], Marco Lionello[1], Giuseppe Rizzotto[1], Vincenzo della Peruta[3], Luigi D'Avino[3], Marco de Vincentiis[4], Giovanni Succo[5,6], Giuseppe Tortoriello[3]

[1] Otorhinolaryngology Unit, Vittorio Veneto Hospital, Vittorio Veneto, Italy; [2] Intensive Care Unit, Vittorio Veneto Hospital, Vittorio Veneto, Italy; [3] Otolaryngology Head and Neck Surgery Unit, "V. Monaldi" Hospital, Azienda Ospedaliera Dei Colli, Naples, Italy; [4] Department of Sense Organs, "Sapienza" University of Rome, Rome, Italy; [5] Department of Oncology, University of Turin, Turin, Italy; [6] Otolaryngology - Head and Neck Oncology Unit, Ospedale San Giovanni Bosco, Turin, Italy



Cover figure. Modular OPHL: cricoid ring dissection after frozen sections.

Received: February 24, 2026
Accepted: March 6, 2026

Correspondence
Marco Lionello
E-mail: marco.lionello.84@gmail.com

How to cite this article: Bertolin A, Lionello M, Grassetto A, et al. Salvage open partial horizontal laryngectomy: a comprehensive systematic review of oncological and functional outcomes. Acta Otorhinolaryngol Ital 2026(Suppl. 1);46:S56-S63. https://doi.org/10.14639/0392-100X-suppl.1-46-2026-A2207

Summary

Objective. To evaluate the oncological and functional outcomes of salvage open partial horizontal laryngectomy (OPHL) following failure of transoral laser microsurgery (TOLMS) (chemo)radiotherapy [(C)RT].

Methods. A comprehensive systematic review was conducted, analysing survival rates (overall survival [OS], disease-specific survival [DSS], and local control [LC]), laryngeal preservation, and functional recovery (decannulation and swallowing) in the salvage setting.

Results. Salvage OPHL offers oncological outcomes comparable to total laryngectomy (TL) in strictly selected patients. Meta-analyses report 5-year OS rates of 71-83% and LC around 87%.

Outcomes are significantly superior for post-TOLMS recurrences compared to post-(C)RT failures. In the post-TOLMS setting, organ preservation reaches 95.3%. Conversely, irradiated tissues are prone to higher morbidity, including chronic oedema, chondronecrosis, and pexy rupture. While functional recovery is substantially longer after RT – with decannulation and nasogastric feeding tube removal times often doubling – the final success rate remains high, with over 90% of patients regaining oral feeding and airway patency within one year.

Conclusions. Salvage OPHL is a powerful organ-preservation tool. Success depends on rigorous patient selection, accurate restaging (addressing frequent clinical understaging), and the preservation of at least one functional cricoarytenoid unit. While functionally demanding, it provides a superior quality of life compared to TL by avoiding a permanent tracheostoma and maintaining laryngeal voice.

Keywords: laryngeal cancer, surgery, salvage, open partial horizontal laryngectomy, oncologic outcomes, functional outcomes

Introduction

Laryngeal squamous cell carcinoma (LSCC) remains one of the most common malignancies of the upper aerodigestive tract. Over the last 3 decades, the therapeutic paradigm has shifted significantly toward organ-preservation protocols. For early-stage and selected intermediate-stage lesions, transoral laser microsurgery (TOLMS) and radiotherapy (RT) have become the gold standards. However, a non-negligible percentage of patients experience local recurrence. Historically, the failure of these treatments necessitated total laryngectomy (TL), but open partial horizontal laryngectomies (OPHL) have emerged as a powerful intermediate tool.

RT is a cornerstone of non-surgical organ preservation, yet recurrence rates remain a challenge. Radiorecurrent disease often presents with submucosal multifocal patterns that are clinically underestimated in more than half of cases [1]. Furthermore, previous irradiation induces chronic tissue changes, such as fibrosis and obliterative endarteritis, which complicate surgical salvage.

TOLMS failure occurs in about 10-15% of early-stage cases [2]. Recurrence after TOLMS may be superficial, and easily identifiable during endoscopic follow-up, or deep, and therefore identifiable only late or with radiological imaging. The deep invasion into the paraglottic space or thyroid cartilage may render further endoscopic attempts unsafe. In these instances, OPHL provides the necessary radicality by removing the entire horizontal laryngeal framework while preserving function.

The rationale for OPHL as a salvage technique – specifically Type II (supracricoid) and Type III (supratracheal) – rests on its ability to address the horizontal spread of the tumour while avoiding a permanent tracheostoma. Unlike vertical partial laryngectomies, OPHL offers superior oncological safety in the salvage setting [3].

The biological challenge of salvage surgery lies in the tissue bed altered by previous treatments. Chen et al. highlighted that post-actinic fibrosis and reduced vascularisation not only complicate the surgical dissection, but also impair the precise identification of tumour margins and slow down the functional recovery of swallowing [1].

The management of recurrent LSCC remains a significant challenge. While TL has historically been the gold standard for surgical salvage due to its perceived safety and technical simplicity, conservation laryngeal surgery is increasingly employed to preserve laryngeal function without compromising oncological safety [4,5].

Salvage OPHL *vs* TL: oncological outcomes

The available evidence suggests that in appropriately selected patients the oncological outcomes of partial laryngectomy are comparable to those of TL [5]. Interestingly, some data have shown a higher overall mortality for patients undergoing TL compared to those undergoing a conservative approach, although this may reflect the more advanced stage of disease typically present in the TL group [4]. The risk of local recurrence is a primary concern when opting for partial rather than total resection. Comparative studies showed no significant difference in local or regional recurrence between partial and radical surgery in properly selected patients. Holsinger et al. reported a local recurrence rate of 12.3% for TL and 15.6% for OPHL [4]. Considering laryngeal subsites, Johansen et al. reported that recurrent glottic carcinoma has an overall better prognosis than supraglottic tumours. For glottic carcinoma, surgical salvage (both partial and total) achieved an ultimate success rate of 70% for recurrences. For supraglottic carcinoma, surgical salvage was successful in approximately 48% of patients, with the majority requiring TL *vs* a very small number suitable for partial procedures [6].

The success of conservation surgery is heavily dependent on strict selection criteria and accurate restaging, which is notoriously difficult in post-RT tissues. Absolute contraindications to salvage OPHL include locally advanced recurrent disease with impossibility to spare at least one functional crico-aritenoid unit (CAU) or massive extra-laryngeal tumour spread. Relative contraindications include arytenoid fixation, inter-arytenoid invasion, extensive pre-epiglottic space invasion, and limited extra-laryngeal spread. The age of patients at diagnosis of relapse also has to be considered. Elderly pa-

tients with lower functional reserves should preferably be referred for safer radical surgery. Conversely, younger patients with better rehabilitation prospects may be considered for conservative surgery, given the same recurrence stage.

A correct use of imaging techniques such as computed tomography (CT) and magnetic resonance imaging (MRI) is essential to correctly restage the local extension of the disease. Moreover, it is of primary importance to know the stage of the disease prior to primary treatment. Generally, a patient is eligible for salvage OPHL only if the primary lesion was eligible to partial laryngectomy.

Local recurrences are often more advanced than the initial primary tumour. In a cohort study, our group found that half of post-RT recurrences present as rT3 or rT4 lesions. Furthermore, clinical restaging often underestimates the true pathologic extent; many patients clinically staged as rT2 are pathologically found to be pT3 or pT4a upon resection [7].

The literature consistently shows that salvage OPHL does not compromise survival compared to more radical procedures in selected patients. Meta-analyses have shown that, in properly selected recurrent patients, OPHL can still achieve a 2-year local control (LC) rate of approximately 87%, 5-year overall survival (OS) of 71% and a 5-year disease-specific survival (DSS) of 81%, offering an alternative to the functional loss associated with TL [8]. Kim et al. reported a 3-year LC rate of 75.4% [9]. They noted that the risk of local recurrence is significantly higher if the surgical margins are close (< 2 mm) or positive, a finding echoed by Cheraghlou et al. [10].

On 2020, a multicentric study by Bertolin et al. reported even higher outcomes, with a 5-year OS of 83.1% and DSS of 88.5%. The authors attribute these results to strict patient selection (predominantly y-rcT1-2). In a systematic review comparing primary *vs* salvage OPHL Type II, Saraniti et al. found that while primary surgery has naturally better outcomes, the salvage group still maintained a 3-year OS of approximately 75-80%, confirming its validity as a "rescue" procedure [11].

Comparative analysis: salvage OPHL for (C)RT failure *vs* TOLMS failure

Oncological outcomes are significantly better in salvage OPHL for recurrence after TOLMS than in recurrence after (chemo)radiotherapy [(C)RT], as can be appreciated from Tables I and II. This can be justified first of all by the advanced stage of recurrence after (C)RT. Actually, in radiorecurrent patients the tissue oedema and post-RT changes can make early diagnosis of a recurrence difficult. Furthermore, survival of multiple "neoplastic nests" after RT may lead to multifocal or deep recurrence of the disease [21]. On the other hand, the recurrence after TOLMS is more frequently superficial, and therefore identifiable early by endoscopic follow-up, also thanks to the use of mucosal vascularisation enhancement techniques.

In post-TOLMS recurrences, OPHL outcomes are nearly comparable to primary surgery. Crosetti et al. argued that OPHL should be the first choice for salvage after laser failure, as the laryngeal framework remains healthy [19]. In 2020, in a multicentric study on salvage OPHL, our group confirmed that the oncological outcomes for TOLMS recurrences were

Table I. Oncological outcomes of salvage OPHL after radiotherapy failure.

Author, year [type of study]	No. of pts.	Overall survival	Disease-free survival/ recurrence free survival	Local control	Laryngeal preservation
Paleri et al., 2011 [12] [meta-analysis]	560	83.1%	91.2%	86.9% (2-year)	83.9%
De Virgilio et al., 2018 [8] [meta-analysis]	251	79% (5-year)	80% (3-year)	92% (2-year)	85.2%
Pellini et al., 2008 [13] [multicentric]	78	81.8% (5-year)	95.5% (5-year)	Not specified	97.4%
Bertolin et al., 2020 [7] [multicentric]	70	75%	86%	87%	91%
Cheraghlou et al., 2018 [10] [monocentric]	255	64% (5-year)	Not specified	Not specified	Not specified
Holsinger et al., 2006 [4] [monocentric]	32	> 70% (at 5-year)	Not specified	84.4%	Not specified
Sperry et al., 2013 [14] [monocentric]	42	95% (5-year)	Not specified	89% (5-year)	89% (5-year)
Ganly et al., 2006 [15] [monocentric]	21	89% (5-year)	93% (5-year DSS)	95.2%	95.2%
Deganello et al., 2008 [16] [monocentric]	31	60% (5-year)	Not specified	75%	90%
Gigot et al., 2022 [17] [monocentric]	20	50% (5-year)	56% (5-year)	56% (5-year)	50%
Kim et al., 2019 [9] [monocentric]	14	87.5% (5-year)	53.4% (5-year)	Not specified	71.4%
Piazza et al., 2007 [5] [monocentric]	15	Not specified	83% (5-year)	87% (5-year)	83%
Farrag et al., 2007 [18] [monocentric]	10	Not specified	Not specified	100% (median 3y)	90%

Table II. Oncological outcomes of salvage OPHL after TLM failure.

Author, year [type of study]	No. of pts.	Overall survival	Disease-free survival	Local control	Laryngeal preservation
Crosetti et al., 2025 [19] [monocentric]	66	87.4% (5-year)	85.4% (5-year)	89.4%	95.3%
Lucioni et al., 2015 [2] [monocentric]	17	82%	46.7 months (mean)	82%	70%
Bussu et al., 2015 [20] [monocentric]	15	83% (median)	Not specified	Not specified	Not specified

better than those of patients treated for laryngeal relapse after (C)RT [7]. In the post-TOLMS salvage setting, the LC rate is high. In the study by Crosetti et al., only 10.6% of patients developed a further locoregional recurrence within 5 years of OPHL salvage. Post-TOLMS OPHL allows TL to be avoided in the vast majority of cases (organ preservation up to 95.3% in the largest study by Crosetti et al.) [19].

Indications for elective neck dissection during salvage OPHL

Management of the clinically negative neck (cN0) during salvage surgery for recurrent LSCC following (C)RT remains one of the most debated topics in head and neck surgery. While the primary goal of salvage OPHL is LC and organ preservation, regional lymph node status is a critical determinant of OS. Generally, an elective treatment of the neck is indicated if the risk of occult metastasis exceeds 15-20%. In the salvage setting, the risk is significantly higher for supraglottic recurrences compared to glottic ones. For rT3-rT4 glottic tumours or any recurrent supraglottic tumour, the incidence of occult metastasis often exceeds the 20% threshold, making elective neck dissection (END) strongly recommended [22].

RT can alter lymphatic drainage, but it does not reliably "sterilise" the neck. The available literature suggested that the rate of occult metastasis in cN0 patients undergoing salvage surgery ranges from 7 to 20%, depending on the subsite and the initial T category [22].

The comparison of outcomes between performing an END and simple observation ("watchful waiting") highlights several key points:

1. Regional control: patients who do not undergo END and subsequently develop a regional recurrence (nodal "out-of-field" failure) often face a dismal prognosis. Salvaging the neck after a regional recurrence in a previously irradiated field is significantly more difficult than performing an END during the primary salvage surgery;
2. Survival advantage: while some retrospective data do not show a massive difference in OS between the 2 groups, this is often confounded by selection bias (END being performed on higher-risk patients). However, regional control is consistently higher in patients who receive elective neck treatment;
3. The "upstaging" factor: END provides essential pathological staging. A significant percentage of cN0 patients are pathologically upstaged to pN+. Without END, these patients would be undertreated, missing the opportunity for adjuvant therapies or closer surveillance;
4. Specific outcomes for OPHL: in the context of conservation surgery, END is often performed bilaterally for supraglottic failures and ipsilaterally for glottic failures involving the subglottis or showing impaired vocal cord mobility (rcT2-3).

A common argument against END in the salvage setting is the increased risk of complications, such as pharyngocutaneous fistulas (PCF) and wound healing delays in irradiated tissues. However, modern surgical techniques and the use of vascularised flaps have mitigated these risks, often making the oncological benefit of END outweigh the surgical morbidity [22,23].

Functional recovery after salvage OPHL

Functional success in salvage OPHL refers to the ability of the patient to regain physiological laryngeal functions: breathing, swallowing, and phonation. The failure of these goals potentially leads to the need for a completion TL or long-term dependence on a tracheostomy and/or gastrostomy tube.

The causes of functional failure can be categorised into tissue-related, clinical, and patient-related factors.

Previous RT treatment is the primary factor complicating functional recovery. Irradiation causes fibrosis, scarring, hypovascularisation, loss of pharyngo-laryngeal sensitivity, and chronic oedema. These changes lead to: 1) reduced mobility due to fibrosis that can restrict the movement of the neolarynx and the preserved CAU, which is essential for airway protection during swallowing; 2) irradiated fragile tissues, which are more prone to severe complications such as chondronecrosis and pexy rupture; 3) delayed healing potentially leading to PCF development and postoperative infections.

Surgery-related factors include: 1) the possibility to spare at least one functional CAU (if this cannot be guaranteed, conservative surgery is not feasible); 2) the type of OPHL performed (in Type III OPHL neoglottic stenosis is more frequent than in Type II OPHL); 3) the extent of the resection (i.e. removal of a large portion of the tongue base can make it particularly difficult to recover swallowing and the sphincter function of the neoglottis).

Several acute and late complications directly lead to functional failure. Aspiration pneumonia is the most common reason for functional TL. If severe aspiration becomes chronic and unmanageable, totalisation is performed to protect the lower respiratory tract. Moreover, chronic oedema or fibrosis can lead to persistent stenosis of the airway. It has been reported that roughly 7% of salvage OPHL patients cannot be decannulated due to this issue [2,24].

Ultimately, the success of salvage OPHL depends heavily on the patient's ability to undergo a lengthy and demanding rehabilitation process. Causes for functional failure in this category include:

1. Impaired pulmonary function: patients with moderate to severe chronic obstructive pulmonary disease or poor respiratory reserve may be unable to tolerate even minor aspiration during the re-learning phase of swallowing, leading to recurrent pneumonia;
2. Neurological comorbidities: conditions like Parkinson's disease or other progressive neurological disorders that impair swallowing should be considered as contraindications to the procedure;
3. Age and motivation: advanced age is associated with poorer functional outcomes. Furthermore, an inability or unwillingness to adhere to strict postoperative care and swallowing exercises is a major predictor of failure.

Functional outcomes of salvage OPHL

A critical issue may be understanding if the "cost" of preserving the larynx is too high in terms of complications. Piazza et al. found that perioperative OPHL morbidity was not different from that observed after salvage TL [5]. Table III re-

Table III. Incidence of complications in salvage OPHL.

Author, year [type of study]	Total complications	Pharyngo-cutaneous fistula	Aspiration pneumonia	Laryngeal/ neoglottic stenosis	Other major complications (pexy rupture, chondronecrosis, etc.)	Completion total laryngectomy for functional failure
Paleri et al., 2011 [12] [meta-analysis]	15-67%	0-60%	0-15% (up to 25% reported)	5.3% (pooled rate)	Mortality: 0-13%	4.4% (pooled rate for aspiration)
De Virgilio et al., 2018 [8] [meta-analysis]	Not specified	Not specified	6.4%	3.9%	PEG dependency: 3.5%	14.8% (overall TL rate)
Bertolin et al., 2020 [7] [monocentric]	17%	7%	3%	17% (sequelae)	Wound infection: 10%; hemorrhage: 1%	1%
Crosetti et al., 2025 [19] [monocentric]	10.6%	0%	6.1%	6.1%	Sepsis: 1.5%; bleeding: 1.5%	4.7%
Gigot et al., 2022 [17] [monocentric]	Not specified	30%	25%	Not specified	Chondronecrosis: 10%	5%
Kim et al., 2019 [9] [monocentric]	21.4%	0%	21.4%	Not specified	Bleeding (neck): 12.9%	21.4% (ultimate LP: 71.4%)
Pellini et al., 2008 [13] [multicentric]	27% (early)	1.3% (late)	14% (early + late)	7.7% (late edema)	Neck abscess: 6.4%; mortality: 1.3%	2.6% (ultimate LP: 97.4%)
Piazza et al., 2007 [5] [monocentric]	40%	7% (w/ bleeding)	13%	Not specified	Pexy dehiscence: 13%	13% (overall TL rate)
Clark et al., 2005 [25] [monocentric]	50% (major)	Not specified	Not specified	Not specified	Mortality: 33%; pexy rupture: one case	Not specified
Deganello et al., 2008 [16] [monocentric]	16.1%	6.4%	3.2%	Not specified	Major: 9.6%; minor: 6.4%	3.2%
Farrag et al., 2007 [18] [monocentric]	Not specified	0%	4%	Not specified	Ruptured pexy: 4%	4%

LP: laryngeal preservation; PEG: percutaneous endoscopic gastrostomy; TL: total laryngectomy.

Table IV. Functional outcomes of salvage OPHL after radiotherapy failure.

Author, year [type of study]	Decannulation rate	Dysphagia/oral diet success	Aspiration pneumonia
Paleri et al., 2011 [12] [meta-analysis]	95.1%	Satisfactory in 76-87.5%; ~1% permanent feeding tube	4.4%
De Virgilio et al., 2018 [8] [meta-analysis]	92.1%	96.5% recovery; 3.5% feeding tube dependence	6.4%
Bertolin et al., 2020 [7] [monocentric]	93%	7% persistent dysphagia	3%
Pellini et al., 2008 [13] [multicentric]	97.4%	97.4% satisfactory within one year	8.9% (early); 5.1% (late)
Kim et al., 2019 [9] [monocentric]	92.8%	100% return to oral diet	21.4%
Gigot et al., 2022 [17] [monocentric]	93%	80% oral diet restart success	25%
Makeieff et al., 2005 [26] [monocentric]	91%	17.4% major swallowing problems	17.4%
Philippe et al., 2014 [27] [monocentric]	90%	75% oral diet restored	15%
Sperry et al., 2013 [14] [monocentric]	88%	95% feeding tube removal	Not specified for RT group
Laccourreye et al., 1996 [28] [monocentric]	83.3%	50% temporary impairment	8.3%
Spriano et al., 2002 [29] [monocentric]	100%	100% (80% temporary impairment)	20%
Bussu et al., 2015 [20] [monocentric]	100%	Significantly delayed recovery; 10% permanenet feeding tube	~4% (total cohort)

Table V. Functional outcomes of salvage OPHL after laser surgery failure.

Author, year	No. of pts.	Decannulation rate	Dysphagia/swallowing recovery	Aspiration pneumonia
Crosetti et al., 2025 [19]	66	Not specified (6.1% tight stenosis)	4.5% persistent dysphagia; 83.6% LEDFS	6.1%
Kim et al., 2019 [9]	14 (subgroup)	92.8% (mean: 23.3 days)	100% return to oral diet; 25.4 days feeding tube removal	21.4%
Bussu et al., 2015 [20]	15 (surgery only)	100% (median: 13 days)	100% recovery (median, 21 days)	0% (late evaluation)
Lucioni et al., 2015 [2]	17	Not specified	Functional recovery "better than post-RT"	Not specified

LEDFS: Laryngo-oesophageal dysfunction-free survival.

ported a comparative analysis of postoperative complications after salvage OPHL. By a functional point of view, previously irradiated patients experienced higher risk of neoglottic oedema, longer decannulation times, and higher risk of chondronecrosis [7]. Unlike RT, laser failure leaves surrounding tissues (cricoid cartilage, arytenoids, infrahyoid muscles) healthy and well-vascularised. This dramatically reduces the risk of necrosis and dehiscence of the pexy.

As shown in Tables IV and V, some degree of postoperative dysphagia is commonly reported by most of studies, although usually transitory in most cases. The swallowing recovery rate is around 85-92% for OPHLs after (C)RT, and 94-98% after TOLMS. Moreover, aspiration pneumonia rates are 6-12% and < 5%, respectively. The meta-analysis by De Virgilio et al. confirmed that 96.5% of patients eventually regained oral feeding, but the "time to swallow" was prolonged compared with primary procedures [8].

Both aspiration pneumonia rates and PEG/NFT dependance appear satisfactory and significantly lower in case of salvage after TOLMS than after RT (Tabs. IV-V).

Concerning postoperative PCF, De Virgilio et al. reported a rate of 7.2%. Interestingly, this is often lower than the fistula rates reported for salvage TL (which can reach 25-30% in irradiated fields), likely because OPHL involves less extensive pharyngeal reconstruction [8].

Chondronecrosis is another potential complication of salvage OPHL. Several sources mention that the risk of delayed wound infection and subsequent chondronecrosis increases significantly when the prior radiation dose exceeded 65-70 Gy (ranging from 6.6 to 16.6% in the literature). Its occurrence significantly impacts on final decannulation rate and, ultimately, on the need for a completion TL. In some instances, early-stage perichondritis or limited necrosis can be managed with prolonged antibiotic therapy and hyperbaric oxygen therapy [17,28-30].

A specific and potentially lethal complication of salvage OPHL is the rupture of the pexy, which occurs in roughly 1-9% of salvage cases due to tissue fragility.

Neolaryngeal stenosis (postoperative laryngeal obstruction) occurrs in approximately 4 to 17% of patients. While it rarely requires TL, it can significantly delay or prevent definitive decannulation, necessitating secondary laser procedures. Lucioni et al. reported that postoperative laryngeal obstruction occurred in 49 of 446 patients who had OPHL Type II (11%) and in 36 of

105 patients who had OPHL Type III (34%). The authors emphasised the key role of the integrity of the cricoid ring in justifying this finding [31]. In most cases, however, this complication was effectively managed by corrective TOLMS procedures.
Despite the initial delay, the vast majority of patients (over 90% in many series) are able to achieve a full oral diet within the first postoperative year. The number of preserved CAU (one *vs* 2) does not appear to drastically influence ultimate success, although removal of an arytenoid may prolong rehabilitation times.
Ultimately, definitive decannulation rates are satisfactory, ranging from 83 to 100% and from 92 to 100% in salvage OPHL after RT and TOLMs failures, respectively (Tabs. IV-V).
The mean times for decannulation and nasogastric tube removal are often doubled compared to non-irradiated patients. Our group previously reported an overall 92.1% decannulation rate. The median time to remove the tracheostomy tube was 24 days, which is significantly longer than the 10-15 days observed after primary OPHL [7]. However, multicentric studies comparing primary to salvage OPHL have confirmed that, despite a longer recovery period compared to primary surgery, the ultimate organ preservation rate remains high, ranging from 84 to 91% [7,8].

Voice and quality of life considerations

Phonation after OPHL is produced by the vibration of the arytenoid mucosa against the base of the tongue or the epiglottis. The resulting voice is characteristically hoarse (breathy and rough) with reduced maximum phonation time. However, it remains a "laryngeal" voice, which is universally preferred by patients over the oesophageal speech or tracheo-oesophageal prosthesis associated with TL. Despite the hoarseness, speech intelligibility is generally sufficient for daily social interaction, contributing significantly to the patient's sense of "wholeness" [32].
Quality of life (QoL) is the ultimate metric for organ preservation strategies. Comparative studies of OPHL *vs* TL consistently show that patients undergoing successful OPHL report higher QoL scores in domains related to body image, social contact, and communication compared to TL patients. The avoidance of a permanent tracheostoma is the single most important factor in maintaining a high QoL. Even with the challenges of prolonged swallowing rehabilitation, patients perceive the preservation of the natural airway and voice as a superior outcome. After the initial 6-12 months recovery period, QoL scores tend to stabilise, with many patients returning to professional and social activities that would be restricted by a permanent stoma [20,33].

Conclusions

An adequate selection of the patient eligible for salvage OPHL is of crucial importance for the oncological and functional success of the procedure. Studies agree that salvage OPHL offers survival and local control rates comparable to TL in properly selected cases, with the advantage of organ preservation. Regarding neck management, in y-rcT1-2 of the glottis a wait-and-see neck observation policy is considered reasonable, while END is recommended for supraglottic recurrences or advanced laryngeal tumours (y-rcT3-4) due to the significant risk of occult metastases.
Salvage surgery after (C)RT is associated with a higher risk of complications than primary surgery, particularly aspiration pneumonia, neolaryngeal stenosis, and delayed wound healing. It is understood that salvage OPHL for relapse after (C)RT are burdened by worse functional outcomes compared to salvage OPHL after TOLMS. However, most patients achieve decannulation and oral feeding within one year. The patients undergoing salvage OPHL should be warned and counseled for a substantially longer rehabilitation and the possibility of chronic micro-aspiration.
Salvage OPHL is a functionally demanding but rewarding procedure. While previous treatments can complicate the healing process, resulting in longer recovery times for swallowing and decannulation, the long-term functional results and QoL are significantly superior to the alternative of TL.

Conflict of interest statement

The authors declare no conflict of interest.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author contributions

AB: study design and revision; ML study design, writing, editing; AG: data collection; VdeP: revision; LD'A: revision; MdeV: revision; GS: revision; GT: revision.

Ethical consideration

Not applicable.

References

1 Chen MM, Holsinger FC, Laccourreye O. Salvage conservation laryngeal surgery after radiation therapy failure. Otolaryngol Clin North Am 2015;48:667-675. https://doi.org/10.1016/j.otc.2015.04.011

2 Lucioni M, Bertolin A, Lionello M, et al. Open partial horizontal laryngectomy for salvage after failure of CO_2 laser-assisted surgery

for glottic carcinoma. Eur Arch Otorhinolaryngol 2016;273:169-175. https://doi.org/10.1007/s00405-015-3734-2

[3] Succo G, Peretti G, Piazza C, et al. Open partial horizontal laryngectomies: a proposal for classification by the working committee on nomenclature of the European Laryngological Society. Eur Arch Otorhinolaryngol 2014;271:2489-2496. https://doi.org/10.1007/s00405-014-3024-4

[4] Holsinger FC, Funk E, Roberts DB, et al. Conservation laryngeal surgery versus total laryngectomy for radiation failure in laryngeal cancer. Head Neck 2006;28:779-784. https://doi.org/10.1002/hed.20415

[5] Piazza C, Peretti G, Cattaneo A, et al. Salvage surgery after radiotherapy for laryngeal cancer: from endoscopic resections to open-neck partial and total laryngectomies. Arch Otolaryngol Head Neck Surg 2007;133:1037-1043. https://doi.org/10.1001/archotol.133.10.1037

[6] Johansen LV, Grau C, Overgaard J. Glottic carcinoma-patterns of failure and salvage treatment after curative radiotherapy in 861 consecutive patients. Radiother Oncol 2002;63:257-267. https://doi.org/10.1016/s0167-8140(02)00118-4

[7] Bertolin A, Lionello M, Ghizzo M, et al. Salvage open partial horizontal laryngectomy after failed radiotherapy: a multicentric study. Laryngoscope 2020;130:431-436. https://doi.org/10.1002/lary.27959

[8] De Virgilio A, Pellini R, Mercante G, et al. Supracricoid partial laryngectomy for radiorecurrent laryngeal cancer: a systematic review of the literature and meta-analysis. Eur Arch Otorhinolaryngol 2018;275:1671-1680. https://doi.org/10.1007/s00405-018-4986-4

[9] Kim JH, Kim WS, Koh YW, et al. Oncologic and functional outcomes of salvage supracricoid partial laryngectomy. Acta Otolaryngol 2018;138:1117-1122. https://doi.org/10.1080/00016489.2018.1506154

[10] Cheraghlou S, Kuo P, Mehra S, et al. Salvage surgery after radiation failure in T1/T2 larynx cancer: outcomes following total versus conservation surgery. Otolaryngol Head Neck Surg 2018;158:497-504. https://doi.org/10.1177/0194599817742596

[11] Saraniti C, Verro B, Ciodaro F, et al. Oncological outcomes of primary vs. salvage OPHL type II: a systematic review. Int J Environ Res Public Health 2022;19:1837. https://doi.org/10.3390/ijerph19031837

[12] Paleri V, Thomas L, Basavaiah N, et al. Oncologic outcomes of open conservation laryngectomy for radiorecurrent laryngeal carcinoma: a systematic review and meta-analysis of English-language literature. Cancer 2011;117:2668-2676. https://doi.org/10.1002/cncr.25831

[13] Pellini R, Pichi B, Ruscito P, et al. Supracricoid partial laryngectomies after radiation failure: a multi-institutional series. Head Neck 2008;30:372-379. https://doi.org/10.1002/hed.20709

[14] Sperry SM, Rassekh CH, Laccourreye O, et al. Supracricoid partial laryngectomy for primary and recurrent laryngeal cancer. JAMA Otolaryngol Head Neck Surg 2013;139:1226-1235. https://doi.org/10.1001/jamaoto.2013.4990

[15] Ganly I, Patel SG, Matsuo J, et al. Results of surgical salvage after failure of definitive radiation therapy for early-stage squamous cell carcinoma of the glottic larynx. Arch Otolaryngol Head Neck Surg 2006;132:59-66. https://doi.org/10.1001/archotol.132.1.59

[16] Deganello A, Gallo O, De Cesare JM, et al. Supracricoid partial laryngectomy as salvage surgery for radiation therapy failure. Head Neck 2008;30:1064-1071. https://doi.org/10.1002/hed.20837

[17] Gigot M, Digonnet A, Rodriguez A, et al. Salvage partial laryngectomy after failed radiotherapy: oncological and functional outcomes. J Clin Med 2022;11:5411. https://doi.org/10.3390/jcm11185411

[18] Farrag TY, Koch WM, Cummings CW, et al. Supracricoid laryngectomy outcomes: the Johns Hopkins experience. Laryngoscope 2007;117:129-132. https://doi.org/10.1097/01.mlg.0000247660.47625.02

[19] Crosetti E, Borello A, Bertolin A, et al. Open partial horizontal laryngectomy as a conservative salvage treatment for laser-recurrent laryngeal cancer: a multi-institutional series. Curr Oncol 2024;32:12. https://doi.org/10.3390/curroncol32010012

[20] Bussu F, Galli J, Valenza V, et al. Evaluation of swallowing function after supracricoid laryngectomy as a primary or salvage procedure. Dysphagia 2015;30:686-694. https://doi.org/10.1007/s00455-015-9645-y

[21] Brandenburg JH, Condon KG, Frank TW. Coronal sections of larynges from radiation-therapy failures: a clinical-pathologic study. Otolaryngol Head Neck Surg 1986;95:213-218.

[22] Sanabria A, Silver CE, Olsen KD, et al. Is elective neck dissection indicated during salvage surgery for head and neck squamous cell carcinoma? Eur Arch Otorhinolaryngol 2014;271:3111-3119. https://doi.org/10.1007/s00405-014-2893-x

[23] Pellitteri PK, Ferlito A, Rinaldo A, et al. Planned neck dissection following chemoradiotherapy for advanced head and neck cancer: is it necessary for all? Head Neck 2006;28:166-175. https://doi.org/10.1002/hed.20302

[24] Rizzotto G, Crosetti E, Lucioni M, et al. Subtotal laryngectomy: outcomes of 469 patients and proposal of a comprehensive and simplified classification of surgical procedures. Eur Arch Otorhinolaryngol 2012;269:1635-1646. https://doi.org/10.1007/s00405-012-1928-4

[25] Clark J, Morgan G, Veness M, et al. Salvage with supracricoid partial laryngectomy after radiation failure. ANZ J Surg 2005;75:958-962. https://doi.org/10.1111/j.1445-2197.2005.03587.x

[26] Makeieff M, Venegoni D, Mercante G, et al. Supracricoid partial laryngectomies after failure of radiation therapy. Laryngoscope 2005;115:353-357. https://doi.org/10.1097/01.mlg.0000154751.86431.41

[27] Philippe Y, Espitalier F, Durand N, et al. Partial laryngectomy as salvage surgery after radiotherapy: oncological and functional outcomes and impact on quality of life. A retrospective study of 20 cases. Eur Ann Otorhinolaryngol Head Neck Dis 2014;131:15-19. https://doi.org/10.1016/j.anorl.2012.11.008

[28] Laccourreye O, Weinstein G, Naudo P, et al. Supracricoid partial laryngectomy after failed laryngeal radiation therapy. Laryngoscope 1996;106:495-498. https://doi.org/10.1097/00005537-199604000-00019

[29] Spriano G, Pellini R, Romano G, et al. Supracricoid partial laryngectomy as salvage surgery after radiation failure. Head Neck 2002;24:759-765. https://doi.org/10.1002/hed.10117

[30] Marchese-Ragona R, Marioni G, Chiarello G, et al. Supracricoid laryngectomy with cricohyoidopexy for recurrence of early-stage glottic carcinoma after irradiation. Long-term oncological and functional results. Acta Otolaryngol 2005;125:91-95. https://doi.org/10.1080/00016480410017927

[31] Lucioni M, Bertolin A, Lionello M, et al. Transoral laser microsurgery for managing laryngeal stenosis after reconstructive partial laryngectomies. Laryngoscope 2017;127:359-365. https://doi.org/10.1002/lary.26056

[32] Rodrigo JP, Coca-Pelaz A, Suárez C. The current role of partial surgery as a strategy for functional preservation in laryngeal carcinoma. Acta Otorrinolaringol Esp 2011;62:231-238. https://doi.org/10.1016/j.otorri.2010.06.002

[33] Akbas Y, Demireller A. Oncologic and functional results of supracricoid partial laryngectomy with cricohyoidopexy. Otolaryngol Head Neck Surg 2005;132:783-787. https://doi.org/10.1016/j.otohns.2005.01.030