

Extended voice-sparing surgery in selected pyriform sinus carcinoma: Techniques and outcomes

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ABSTRACT: *Background.* Organ-preservation approaches are frequently favored in the treatment of advanced pyriform sinus carcinoma. In selected cases, use of free flaps allows voice-sparing surgery.

Methods. Thirteen patients underwent conservative extended laryngopharyngectomy. In 11 patients, the resection included the supraglottic larynx, whereas the whole hemilarynx was resected in 2. Reconstruction was achieved with a radial forearm free flap with the palmaris longus tendon. In hemilarynx resection, a costal graft was also used. Functional results were assessed by nasofibroscopy and swallowing videofluoroscopic tests.

Results. At 12 months, no patient was gastrostomy dependent, whereas 1 patient remained tracheostomy dependent. At 1, 3, and 5 years, the

locoregional control was 100%, 100%, and 83%; overall survival was 69.4%, 46.3%, and 30.8%; and disease-specific survival was 81.2%, 54.5%, and 36.4%, respectively.

Conclusions. In selected patients, extended conservative laryngopharyngectomy challenges the oncologic results of organ-preservation protocols and allows a good quality of life. © 2012 Wiley Periodicals, Inc. *Head Neck* 00: 000–000, 2012

KEY WORDS: hypopharynx cancer, pyriform sinus carcinoma, conservative surgery, free flap reconstruction

INTRODUCTION

Despite advances in treatment modalities, pyriform sinus squamous cell carcinoma (SCC) remains associated with poor results, related to the absence of symptoms in early tumors and a high risk of regional metastasis.^{1,2} In selected patients with early lesions, good survival rates have been reported,³ but in patients with advanced-staged disease, 5-year overall survival ranges from 25% to 40%.^{4,5} Therefore, it seems logical to favor larynx-preservation approaches either surgically or nonsurgically without compromising locoregional control and survival.

Conservative surgery is rarely considered for advanced tumors because of either oncologic or functional reasons. Most series of conservative surgery include early tumors.^{6–9} More extensive pyriform lesions are resectable, sparing the larynx, provided with a reconstruction using free flaps.^{10–12} Extended conservative surgery is an organ-preservation concept able to lessen operative morbidity while increasing the chances for a better quality of life. In 1999, we described a technique of extended supraglottic laryngopharyngectomy with free flap reconstruction.¹¹ Since then, extended supraglottic laryngopharyngectomy and wide vertical hemilaryngopharyngectomy, in accord with Urken,¹⁰ are performed for selected tumors.

The goal of this study was to assess the results of extended supraglottic laryngopharyngectomy and vertical hemilaryngopharyngectomy in patients with tumors usually not suitable for a conservative surgery.

PATIENTS AND METHODS

From 1997 to 2010, the medical records of 13 patients who underwent voice-sparing laryngopharyngectomy for pyriform sinus SCC were retrospectively reviewed. Patients were aged from 42 to 76 years (mean, 53 years) (Table 1). The male:female ratio was 2:3. Criteria for patient selection were: (1) no infiltration of the postcricoid region and (2) no extension to the cricoid cartilage. Patient charts were reviewed for history of disease; clinical, radiologic, and pathologic characteristics of lesions; type of surgical reconstruction; delay for retrieval of tracheotomy and feeding tube; complications; and duration of locoregional control. Two patients died postoperatively of medical complications and were excluded for functional and locoregional control assessment. Disease in all patients was staged in accord with the TNM staging system as recommended by the 2002 American Joint Committee on Cancer (AJCC) staging system. Surgery was the primary treatment for 8 patients with stage III or stage IV tumors, whereas 5 patients were operated on as salvage after radiation failure. Six patients were classified as T2, 1 as T3, and 1 as T4, whereas 5 patients with recurrent tumor were classified as rT2. Three patients were classified as N0, where 10 of 13 patients (77%) had clinically invaded lymph nodes: 5 N1, 4 N2, and 1 N3 (Table

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TABLE 1. Patient characteristics and follow-up.

Patient	Age, y	Sex	TNM stage	Surgery	Radiotherapy	Follow-up, mo	Disease status
1	51	F	rT2N2aM0	ESLP	Preop	2	DDM
2	76	M	rT2N2M0	ESLP	Preop	154	DOC
3	57	M	rT2N1M0	ESLP	Preop	21	DOD
4	54	M	T2N2bM0	ESLP	Postop	50	DOD
5	43	M	T2N3M0	ESLP	None	—	POD
6	54	M	T2N2cM0	ESLP	Postop	5	DDM
7	51	F	rT2N1M0	ESLP	Preop	—	POD
8	56	M	T2N1M0	ESLP	Postop	66	DOC
9	51	F	T2N2bM0	ESLP	Postop	16	DOD
10	66	M	T2N1M0	ESLP	Postop	41	DDM
11	63	F	T4N1M0	ESLP	Postop	99	ANED
12	70	M	T3N0M0	VHLP	Postop	132	ANED
13	53	M	rT2N0M0	VHLP	Preop	13	DDM

Abbreviations: F, female; M, male; ESLP, extended supraglottic laryngopharyngectomy; VHLP, vertical hemilaryngo-pharyngectomy; DDM, died of distant metastasis; DOC, died of other cancer; DOD, died of other disease; POD, postoperative death; ANED, alive, no evidence of disease.

I). Extended supraglottic laryngopharyngectomy was performed in 11 patients, whereas 2 patients underwent a total vertical hemilaryngopharyngectomy.

Surgical procedures

Typically, extended supraglottic laryngopharyngectomy was indicated for tumors of the medial wall of the pyriform sinus extending to the lateral wall, with possible extension to the posterior hypopharyngeal wall without hemilarynx fixation. Vertical hemilaryngopharyngectomy, initially described by Urken,¹⁰ was used in the case of hemilaryngeal fixation or invasion in the apex of the pyriform sinus. Surgical procedures are detailed in the following text.

Exposure.

Extended supraglottic laryngopharyngectomy. After neck dissection, the ipsilateral infrahyoid muscles are transected with the thyrohyoid membrane following the lower border of the hyoid bone, to allow opening through the valleculae. The thyroid cartilage is then transected vertically on the contralateral side of the thyroid notch. Next, a horizontal cut is

made on the ipsilateral side, under the laryngeal prominence, then alongside the lower insertion of the thyrohyoid muscle, preserving from accidental injury of the vocal cords when opening the larynx. Last, a step incision is made on the lateral side, above the lesser horn of the thyroid cartilage, to reach the apex of the pyriform sinus (see Figure 1).

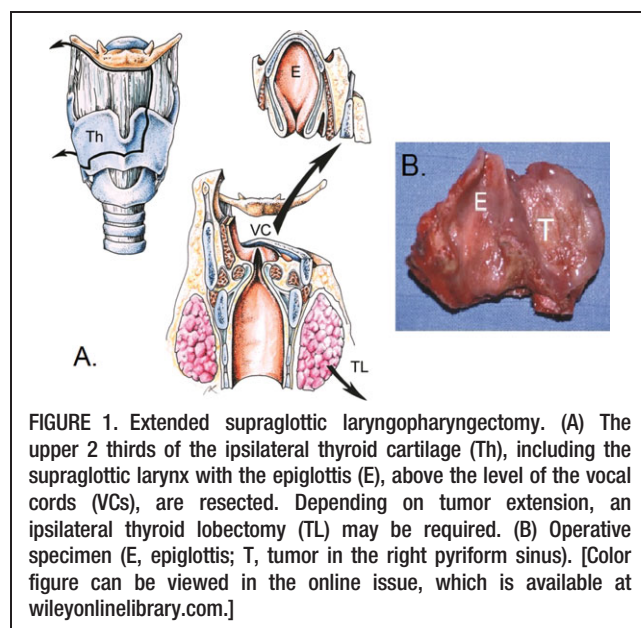
Vertical hemilaryngopharyngectomy. An ipsilateral thyroid lobectomy including pretracheal and paratracheal lymph nodes dissection is resected en bloc with the hemilaryngopharynx, allowing additional hemicricoid cartilage resection. A midline vertical section of the thyroid cartilage is extended through the cricothyroid membrane and the anterior arch of the cricoid cartilage. The lower horizontal section is made under the cartilage.

At this point, a tracheotomy is performed.

Tumor excision. The section of the hyoepiglottic ligament below the hyoid bone allows the resection of the preepiglottic space. An opening into the oropharynx is then performed, through the contralateral vallecula. In extended supraglottic laryngopharyngectomy, the incision is extended inferiorly into the contralateral ventricle and anteriorly through the ventricular mucosa, above the vocal cord. The mucosa above the anterior commissure is transected. Finally, the section is extended to the ipsilateral ventricle. The invaded pyriform sinus is widely exposed, and the excision of the tumor is carried on under visual control. Depending on tumor extension, the posterior pharyngeal wall is transected, to secure a free margin away from the tumor (see Figure 1).

In vertical hemilaryngopharyngectomy, because the apex of the pyriform sinus is resected, an additional resection of ipsilateral vocal cord is necessary and requires an incision extending under the glottic level, including the ipsilateral arytenoid cartilage. The resection requires a midline transection of the cricoid cartilage posteriorly to allow a complete resection of the hemicricoid cartilage. Before the start of the reconstruction, the margins are assessed using multiple frozen sections.

Reconstruction. The tailoring of the flap, designed with a silicone pattern, requires extreme precision (see Figure 2). The sizes of the defect are carefully checked to avoid



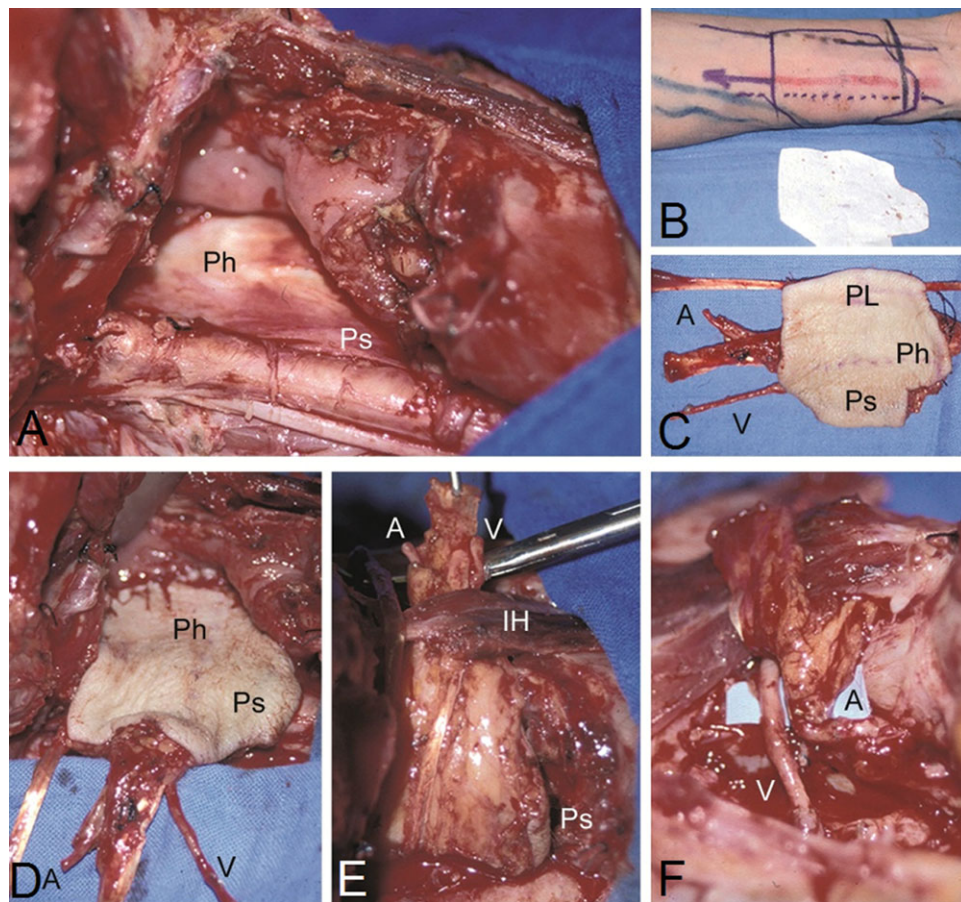


FIGURE 2. Reconstruction after extended supraglottic laryngopharyngectomy. (A) Laryngopharyngeal defect after extended supraglottic laryngopharyngectomy. The resection includes the posterior wall of the hypopharynx (Ph) and the pyriform sinus (Ps). (B) Silicon pattern matching accurately the defect transposed in the forearm donor site. (C) Forearm flap including inadequate positions, the palmaris longus (PL) tendon, and the blood vessels (A, artery; V, vein). (D) Flap transfer into the neck: reconstruction beginning by the posterior hypopharyngeal repair. (E) Anterior laryngeal repair (IH, infrahyoid muscles). (F) Vascular arterial (A) and venous (V) microanastomoses with contralateral neck vessels. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

excess volume leading to airway obstruction. The pattern is then transferred to the forearm, and placed in right position to include the radial artery, the superficial cephalic vein, and, after extended supraglottic laryngopharyngectomy, the palmaris longus tendon. In cases in which the palmaris longus tendon is congenitally absent, it is substituted by a tendinous sling of the brachioradialis muscle. The flap is then placed in the laryngopharyngeal defect. The posterior pharyngeal closure is first performed, followed laterally by the suture to the lower extremity of the pyriform sinus. Next, the inferior border of the flap is sutured on the superior edge of the remaining thyroid cartilage and secured by transcartilaginous stitches. Finally, the anterior laryngeal defect is closed, alongside the vertical edge of the transected thyroid cartilage, and finally sutured with the oropharyngeal mucosa. The upper border of the flap is left free of sutures until the flap is vascularized, to allow control of reperfusion following vascular anastomoses. At this point, the hemi-circumferential lining of the pharyngolaryngeal defect is almost achieved. The vascular anastomoses are carried out with the contralateral neck vessels (see Figure 2). The pharyngolaryngeal defect is finally closed by suturing of

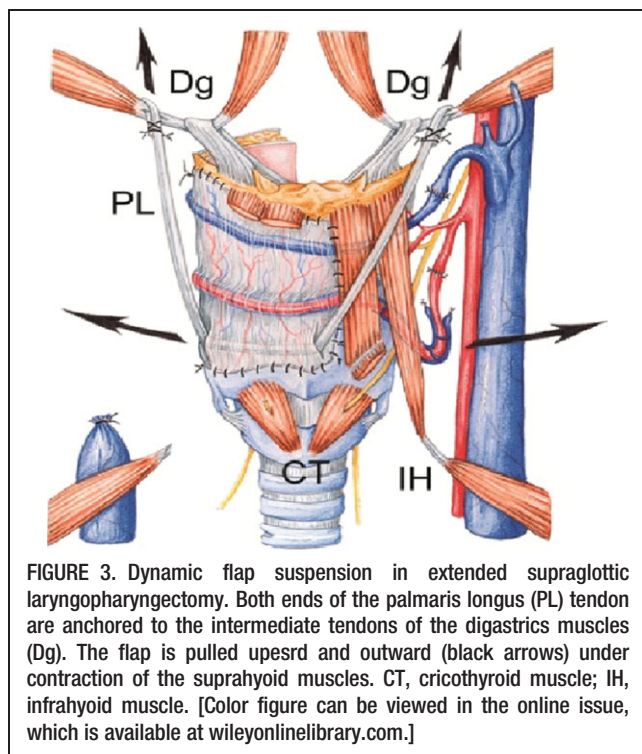
the upper border of the flap on the lower edge of the hyoid bone. The suspension of the palmaris longus tendon on intermediate tendons of the digastric muscles allows additional extrinsic dynamic support (see Figure 3). This active extra tension prevents airway collapse and allows dynamic flap behavior during speech and swallowing.

Reconstruction following wide vertical hemilaryngopharyngectomy requires a cartilage costal graft.¹⁰ The graft is fixed on the remaining hemithyroid and hemicricoid cartilages and should create a bulge at the level of the opposite vocal cord, preventing airway collapse resulting from the hemicricoid cartilage resection. The graft is placed in a subcutaneous pocket created in the forearm flap, at the level of the remaining vocal cord, and next secured anteriorly and posteriorly (see Figure 4). The donor's blood vessels are anastomosed to the ipsilateral neck vessels.

During the immediate postoperative period, the vascularization of the flap is monitored under flexible fiber-optic control.

Postoperative evaluation

The reconstructed laryngopharynx was anatomically evaluated by flexible fiber-optic examination and CT.



During the postoperative period, patients were functionally assessed regarding time of tracheotomy tube ablation and start of oral feeding. The tracheotomy tube was removed when the patient was able to swallow without significant aspiration. Deglutition was assessed and considered as fair when the patient can swallow 1 glass of methylene blue dyed water without significant aspiration. Patients were functionally assessed 6 months and 12 months after surgery respectively. Speech, deglutition, and breathing were consecutively rated in accord with a numeric scale. Normal or preserved function was rated 2, impaired function symptomatic or requiring transient dependence on tracheotomy tube or feeding tube was rated 1, and nonpreserved function with major disorder was rated 0.

Statistical methods

Patient survival curves were estimated using the Kaplan–Meier and product-limit methods. Overall survival (OS) analysis was based on death from any cause. For the calculation of disease-specific survival (DSS), patients were censored if death was not directly related to the pyriform sinus cancer. Survival interval was measured from the date of surgery in the department to last consultation, phone inquiry, or death. Comparisons between survival curves were made using the log-rank test with a significance level based on a value of $p < .05$.

RESULTS

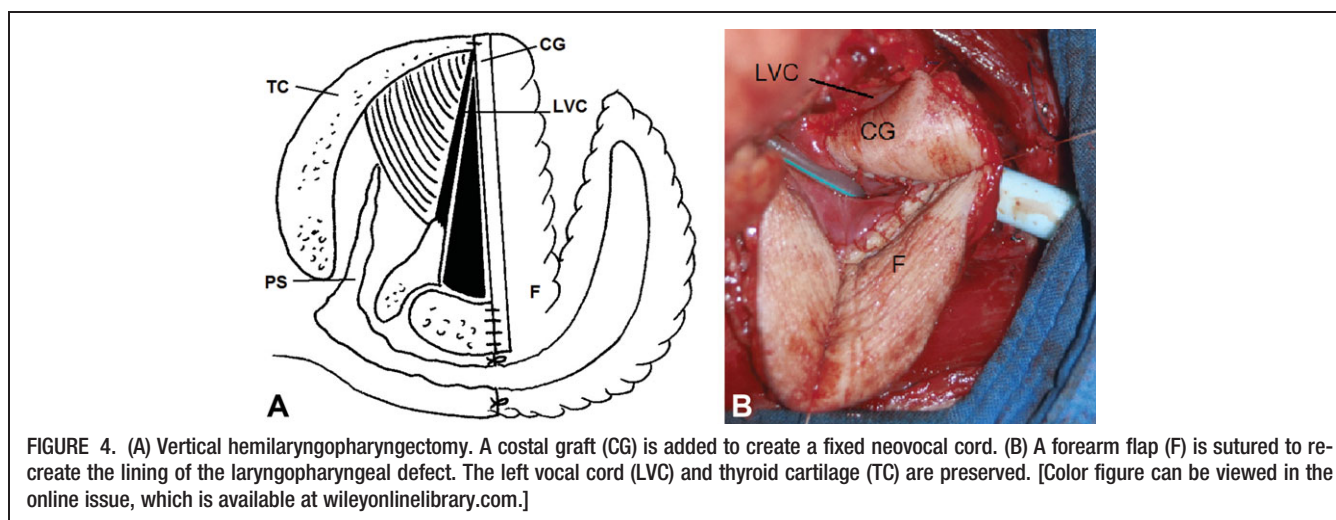
No flap failure or ischemia requiring revision occurred. However, 2 patients required revision surgery for complementary hemostasis and 2 other patients died at day 14 and day 10 postoperatively of medical complications. One patient developed rapidly multiple distant metastases and eventually died 2 months postoperatively. Overall, 3 patients were excluded from anatomic and late functional assessment.

Anatomic results

Anatomic results were assessed in 8 patients with extended supraglottic laryngopharyngectomy. Both nasofibroscopy and CT demonstrated an adequate restitution of the pharyngolaryngeal lining and patency (see Figure 5). No collapse of the anterior wall was observed. Furthermore, the tension added by the palmaris longus tendon allowed the creation of a neovestibular fold. An anatomic reconstruction of the supraglottic region was observed due to the nearly natural folding of the fasciocutaneous flap. The patients who underwent vertical hemilaryngopharyngectomy were assessed similarly. In both cases, no collapse of pharyngeal wall was observed. During the first postoperative weeks, glottic edema was present. After 4 months, no more significant edema was reported.

Functional outcomes

In the patients who underwent extended supraglottic laryngopharyngectomy (group 1), the tracheotomy tube was removed, with a median delay of 15 days



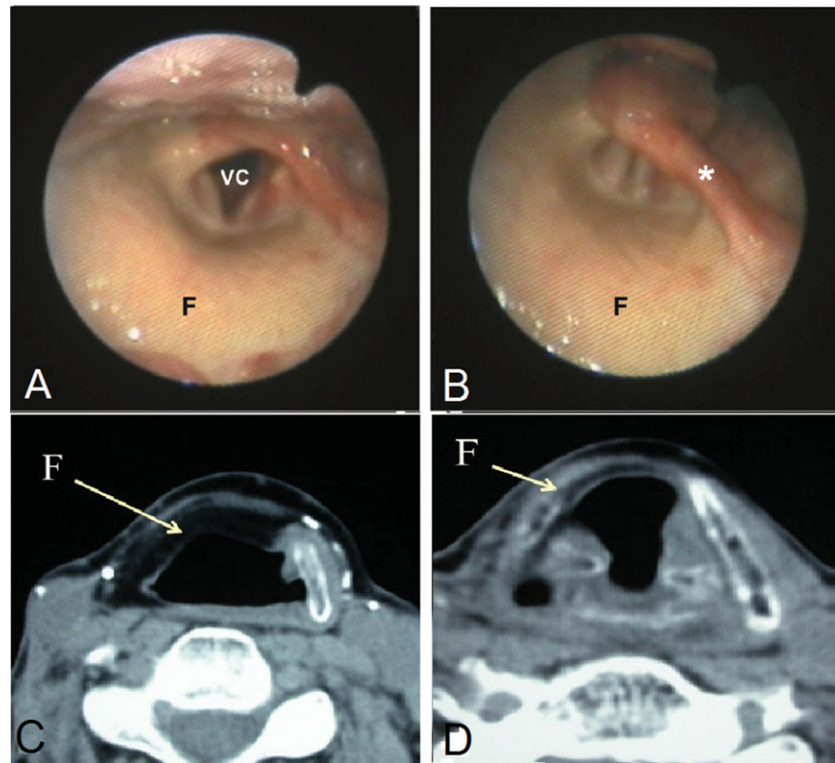


FIGURE 5. (A, B) Fibroscopic views after extended supraglottic laryngopharyngectomy during breathing (A) and phonation (B): dynamic flap (F) suspension inducing posteromedial lowering of the remaining aryepiglottic fold (*) and covering the vocal cords (VCs). (C, D) CT axial views after extended supraglottic laryngopharyngectomy: flap reconstruction just below the hyoid bone (C) and just above the vocal cords (D). [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

postoperatively (range, 10–20 days) and the feeding tube was removed after a median time of 14 days (range, 8–24 days). In the patients who underwent vertical hemilaryngopharyngectomy (group 2), the tracheotomy tube was removed at 1 and 6 months after surgery, respectively, whereas oral feeding was started at day 29 and day 13. Functional evaluation was performed in patients alive 6 months (10/13) and 12 months (9/13) after surgery, respectively. Results are summarized in Table 2. In group 1, a 6-month assessment showed that 3 patients experi-

enced transient postoperative deglutition difficulties, mainly with solid foods. During this period, 2 patients needed temporary percutaneous endoscopic gastrostomy (PEG) supply while the remaining patient required a nasogastric feeding tube during postoperative radiation therapy. A complementary rehabilitation allowed these patients to eat and drink efficiently 6, 9, and 12 months thereafter. At 12 months, 2 patients still complained of dysphagia with solid food. Those patients without symptomatic aspiration on soft food and liquid diet had their

TABLE 2. Functional outcome at 6 and 12 months.

Patient	Surgery	6 mo postop			Phonation		
		Swallowing	Breathing	Phonation	Swallowing	Breathing	Phonation
1	ESLP	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	ESLP	2	2	2	2	2	2
3	ESLP	1	2	2	1	2	2
4	ESLP	2	2	2	2	2	2
5	ESLP	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
6	ESLP	2	2	2	n.a.	n.a.	n.a.
7	ESLP	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
8	ESLP	2	2	2	2	2	2
9	ESLP	2	1	2	2	2	2
10	ESLP	2	2	2	2	2	2
11	ESLP	0	2	1	1	2	1
12	VHLP	1	1	1	2	2	1
13	VHLP	1	2	1	2	1	1

Abbreviations: ESLP, extended supraglottic laryngopharyngectomy; VHLP, vertical hemilaryngopharyngectomy.
Note: Scale: n.a., not assessed; 0, nonpreserved function; 1, impaired function; 2, preserved function.

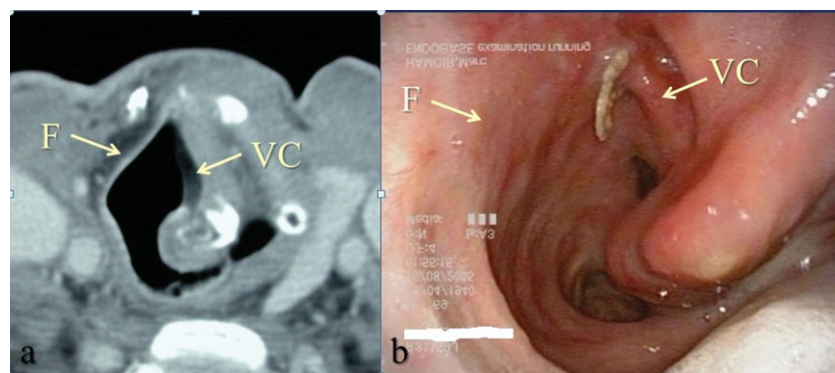


FIGURE 6. CT scan (A) and endoscopic view (B) after a left vertical hemilaryngopharyngectomy. The reconstruction of the laryngopharynx is performed using a folded radial forearm flap (F) supported in the glottis area by a cartilage graft (a suture is visible). The spared right vocal cord (VC) is well identified. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

feeding tubes removed. The dietary regimen of the remaining 7 patients assessed was unrestricted. In group 2, both patients were supplied by a PEG initially. Although after 1 month, they were able to eat and drink without symptomatic aspiration, they needed complementary enteral nutrition through a feeding tube before they become PEG free. PEGs were removed after 10 and 17 months respectively. At 12 months, 1 patient was able to eat and drink normally, whereas the other was able to take soft food and liquids. Deglutition videofluoroscopic tests were performed 6 months after surgery. In group 1, a normal elevation of the larynx during swallowing followed by a nearly unidirectional passage of food into the esophagus was observed. Slight aspiration in the tracheal lumen was noted, without bronchopulmonary complications. Nasofibroscopy demonstrated that patients were able to shorten and elevate their larynx while occluding simultaneously the vocal cords (see Figure 5). In addition, the remaining aryepiglottic fold moved anteromedially, substituting the epiglottic laryngeal occlusion. In group 2, aspiration was more common at 6 months and saliva or barium contrast stasis was observed in both patients, but improved between 6 and 12 months after surgery (Table 2). Nasofibroscopy showed a good integration of the flap (see Figure 6).

During the postoperative course, recovery of normal upper airway breathing was assessed by sealing the opening of the tracheotomy tube continuously for 24 hours before definitive decannulation. At 6 months, in group 1, all patients but 1 recovered normal breathing. One patient who had postoperative radiotherapy presented temporary moderate stridor, caused by an edematous skin flap redundancy over the larynx with spontaneous resolution. In group 2, 1 patient maintained a Hood Stoma Stent (Technical Products of Georgia, Inc., Roswell, GA) during 6 months, used to maintain the patency of a tracheotomy, closed throughout the day but opened during the night. The second patient had normal respiration at 6 months. At 12 months, he complained of dyspnea not caused by upper airway obstruction but due to the occurrence of multiple lung metastases.

Finally, all the patients assessed regained the ability to speak, with an average of 1 month after surgery. In group 1, the results of patient- and clinician-based speech assessment at 6 and 12 months were considered as good in all but 1 patient, where tumor extension required total

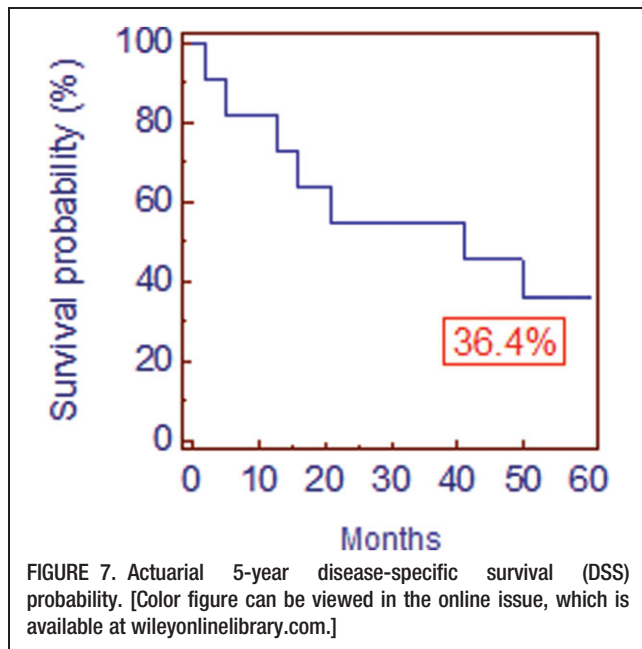
arytenoidectomy. Fiber-optic nasal endoscopy showed the functional integrity of the glottic region. The 2 patients operated with vertical hemilaryngopharyngectomy regained the ability to speak with good intelligibility. Although voice characteristics were modified because those patients had a neovocal cord made of a radial forearm skin wrapped cartilage graft, the patients were satisfied. They did not consider that they had speaking difficulties restricting their personal and social life and phone conversation was possible.

Oncologic results

Five patients were treated by postoperative radiotherapy because of multiple lymph node metastasis ($n = 4$) or close margins ($n = 1$). Eleven patients were assessed, because 2 patients died postoperatively. The follow-up time was 54 months on average and 42 months in median (range, 2–154 months). Locoregional recurrence with distant metastasis occurred in 1 patient who died after palliative treatment. Three other patients, with locoregionally controlled disease, died of distant metastases. Two patients died of a second primary cancer (rectal carcinoma and bladder carcinoma) and 3 patients died of a nononcologic cause. In the last follow-up, 2 patients were still alive, with no evidence of disease. The 1-, 3-, and 5-year locoregional control rates were 100%, 100%, and 83%, respectively. The 1-, 3-, and 5-year OS rates were 69.4%, 46.3%, and 30.8%, respectively. The 1-, 3-, and 5-year DSS rates were 81.2%, 54.5%, and 36.4%, respectively (see Figure 7). The 5-year DSS of patients treated by primary surgery was 37.5%, whereas it was only 20% in patients who had surgery as salvage ($p = ns$). Overall, the 5-year distant metastasis rate was 39% (see Figure 8) and was higher in the group of patients who had salvage surgery than that in the group of patients with primary surgery, 31% versus 50% ($p = ns$).

DISCUSSION

Conservative surgery is infrequently considered to be suitable in pyriform sinus carcinoma because of either oncologic reasons or patient factors such as inadequate pulmonary reserve and postoperative swallowing disorders.^{13,14} Only small tumors confined to the lateral wall



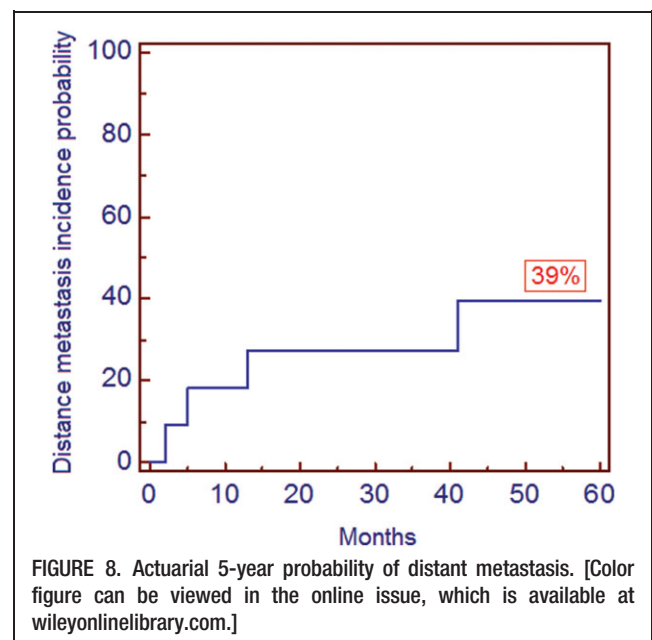
of the pyriform sinus are amenable to conservative partial pharyngectomy.¹⁵ The technique of partial supraglottic laryngopharyngectomy, described by Ogura et al,¹⁶ is indicated for early tumors preserving vocal cord mobility, limited to the medial wall of the pyriform sinus with possible extension to the aryepiglottic fold. Supracricoid hemilaryngopharyngectomy has been performed for tumors involving the aryepiglottic fold, and the medial and anterior wall of the pyriform sinus.^{17,18} Contraindications are invasion of the apex or postcricoid region, invasion of the posterior hypopharyngeal wall, and fixation of the ipsilateral vocal cord.⁶ Favorable oncologic results and functional results comparable to or better than those obtained with exclusive radiation therapy have been reported.^{6-9,16-21} High rates of local control and laryngeal preservation have been reported in a series where almost all patients had induction chemotherapy and 50% of them had postoperative radiotherapy.²²

More extensive pyriform lesions are resectable, sparing the larynx, provided that reconstruction was achieved using free flaps.^{3,10-12} We report the long-term results of 2 surgical techniques performed in a selected series of patients with pyriform sinus carcinoma with, as main objective, locoregional control and functional laryngeal preservation. All these patients presented with locoregionally advanced or recurrent tumors, typically noneligible for conservation surgery. Extended supraglottic laryngopharyngectomy is derived from Ogura's original technique,¹⁶ whereas vertical hemilaryngopharyngectomy is derived from Urken's technique.¹⁰ Both interventions create a major laryngopharyngeal defect. The radial forearm flap is considered as the most versatile tissue to restore the endoluminal lining. The first issue remains the tailoring of the flap to match precisely in the dimensions of the defect. The second issue is to prevent airway obstruction and aspiration. In extended supraglottic laryngopharyngectomy, a dynamic endolaryngeal plicature is obtained by stretching the palmaris longus tendon between the intermediate tendons of the digastric muscles. This

active extra tension prevents laryngeal airway collapse, and allows potential dynamic flap behavior during speech and swallowing. In vertical hemilaryngopharyngectomy, a cartilage graft is used to restore laryngeal infrastructure in addition to the flap reconstruction, preventing airway collapse resulting from the hemicricoid cartilage resection. Because a whole hemilarynx and a recurrent laryngeal nerve are resected, laryngeal function recovery requires more time than that after extended supraglottic laryngopharyngectomy.

Although our series is limited because of a strict selection of patients, the number of patients included is comparable to recent publications reporting results on conservative surgery in advanced hypopharyngeal SCC.²³⁻²⁵ During the last decade, we observed a progressive change to organ-preservation strategies. Certain studies suggest that chemotherapy used as induction before radiotherapy is effective in advanced hypopharyngeal SCC while avoiding total laryngectomy in the majority of patients.²⁶ Currently, chemoradiotherapy represents the standard of care in locally advanced head and neck SCC^{27,28} but is associated with an increase in acute and late toxicity.^{27,29} In this respect, conservative surgery is a valuable option of the organ-preservation approach. Extended supraglottic laryngopharyngectomy and vertical hemilaryngopharyngectomy are associated with a major benefit on the quality of life when compared with total laryngopharyngectomy. However, these techniques must be oncologically sound before they can be accepted as appropriate alternative treatment options. In our series, the 5-year DSS rate seems quite low, but challenges survival rates obtained by more aggressive surgery and organ-preservation protocols combining chemotherapy and radiotherapy.^{4,5,25,29,30} Better DSS rates have been reported in series including less advanced tumors and in series with a shorter follow-up time and excluding patients operated after radiation failures.^{3,23-25}

Locoregional control is of crucial importance in patients with hypopharynx SCC. In our series, the 5-year locoregional control of 83% compares with rates reported in



previous studies including less advanced tumors.^{3,18,23,24,32} A significant rate of 35% of locoregional failures was reported in a series including around 40% of T3–T4.²⁵

The DSS of patients who had primary surgery is better than that of patients who had salvage surgery, although the difference was not statistically significant, most probably due to our limited case series. This trend is explained by a higher 5-year distant metastasis rate in the group of salvage surgery. Overall, the 5-year distant metastasis rate around 40% is in accord with the literature.³³ Among patients locoregionally controlled, a 23% rate of distant failure has been reported.^{34,35} Recent use of ¹⁸F-fluorodeoxyglucose positron-emission tomography (FDG–PET) in the follow-up detects more distant metastases than does conventional imaging.³⁶

In the reported series, 2 patients died of a second primary cancer, not located in the upper aerodigestive tract. Second primary cancers occur frequently in those patients and are often fatal.³⁷ Our results confirm that the prognosis of those patients is mostly dependent on the occurrence of distance metastasis and second primary tumors. The small number of patients included in our study makes it difficult to compare the survival rate between subgroups.

CONCLUSION

The prognosis for patients with pyriform sinus cancer remains poor because it is mostly dependent on the occurrence of distant metastasis and second primary tumors. Consequently, high locoregional control and good quality of life are paramount. The surgical techniques developed in this study achieved those objectives. Although the small number of our series is a clear weakness, the results obtained are promising. Continued improvements in conservative surgical techniques allow the potential for further surgical resection to be performed with less swallowing morbidity.

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