

# Impact of Chemoradiation After Supra- or Infrahyoid Cancer on Aerodynamic, Subjective, and Objective Voice Assessments: A Multicenter Prospective Study

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**Summary: Objectives.** The study aimed to investigate the impact of chemoradiotherapy (CRT) on speech and voice quality according to the anatomic localization of the head and neck cancer.

**Methods.** Thirty-four patients treated by CRT for advanced suprahoid (N = 17) or infrahyoid (N = 17) cancer were assessed for speech function, videolaryngostroboscopy, Voice Handicap Index, blinded Grade, Roughness, Breathiness, Asthenia, Strain, and Instability, acoustic measurements, and aerodynamic measurements. Quality of life was evaluated using the European Organization for Research and Treatment of Cancer Head and Neck 35 (EORTC QLQ-H&N35) questionnaire.

**Results.** Patients treated for an infrahyoid tumor presented more severe values of Voice Handicap Index items, dysphonia, breathiness, asthenia, and some acoustic cues (Voice Turbulence Index, Soft Phonation Index, degree of unvoiced segments, and number of unvoiced segments) than patients treated for a suprahoid tumor. The EORTC QLQ-H&N35 communication item was better in the suprahoid patient group.

**Conclusions.** Voice quality impairments associated with CRT are more severe in patients treated for advanced infrahyoid cancer, suggesting the need to develop specific posttherapy management of the dysphonia according to the tumor anatomical localization.

**Key Words:** Chemoradiation–Head–Neck–Cancer–Voice.

## INTRODUCTION

Head and neck cancers and their treatments lead to a high risk of comorbidities, which negatively impact the quality of life of patients.<sup>1</sup> Among the conservative treatments, concomitant chemoradiotherapy (CRT) is increasingly used and currently considered as a standard in patients with advanced head and neck squamous cell carcinomas.<sup>2</sup> Indeed, CRT provides better results in terms of locoregional control, disease-free survival, and overall survival rate compared with alternative approaches, such as chemoradiotherapy induction followed by radiotherapy.<sup>3</sup> Over the short, middle, and long terms, CRT affects swallowing, speech, and voice by acute and chronic toxicities to the tissues.<sup>4,5</sup> To date, only a few studies have suggested that the development of these impairments depended on the anatomic localization of the primary tumor<sup>1,6</sup> as a majority of studies have considered all anatomic sites as similarly responsible for these impairments.<sup>7</sup> The ability to clearly distinguish some potential complications according to the anatomic localization could also have an impact on both the prevention and the management of these complications. Thus, we could imagine that patients treated for an infrahyoid cancer

could substantially have more voice complication than those treated for a suprahoid cancer who could have more speech complications.

The aim of this cross-sectional study was to investigate the impact of CRT on the voice quality and speech of patients treated at least 9 months prior according to the anatomic localization of the primary tumor (infrahyoid vs suprahoid).

## MATERIALS AND METHODS

### Subject characteristics

From September 2013 to July 2016, we prospectively recruited at the otolaryngology departments of EpiCURA Baudour, Hornu, and Ath hospitals 34 patients who were recently treated for an advanced upper aerodigestive tract cancer using CRT (accepted study protocol ref. 2015/99-B707201524621). From the selected patients, 17 patients were treated for an infrahyoid cancer (laryngeal or hypopharyngeal) and 17 patients were treated for a suprahoid cancer (oropharyngeal or oral cavity). The patients had undergone and finished CRT since at least 9 months. The patients were considered as cured after the CRT and they had no tracheotomy. The characteristics of the patient groups, including chemotherapy, radiotherapy, tumor features, anatomic groups and subgroups, and smoking, or alcohol consumption, are available in Table 1.

Four patients with glottic (N = 1), medial pharyngeal wall (N = 1), and supraglottic cancers (N = 2) had an immobility of one vocal fold. Patients with tumor double localization were excluded. The groups were comparable in terms of sex ratio, age, body mass index (BMI), time since completing CRT, tobacco and alcohol use, and chronic obstructive pulmonary disease, tumor, and CRT features (tumor, node, metastasis [TNM] grade, drug, and intensity-modulated radiation schemes).

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**TABLE 1.**  
**Patient Characteristics**

Clinical Features	Units	Infrahyoid (N = 17)	Suprahyoid (N = 17)	Total (N = 34)
Sex	M/F	13/4	15/2	28/6
Age	Years	60.13 ± 3.39	55.71 ± 2.53	58.41
BMI	kg/m <sup>2</sup>	21.77 ± 1.80	21.74 ± 0.74	21.98
Time since the CRT end	Month	27.29 ± 5.55	28.18 ± 3.98	27.82
Tobacco history	PY	35.00 ± 13.29	33.79 ± 6.23	38.67
Tobacco consumption	Pd	0.07 ± 0.05	0.50 ± 0.19	1.05
COPD		6	6	12
Alcohol history	U/d	12.25 ± 3.90	12.71 ± 4.22	12.87
Alcohol consumption	U/d	0.29 ± 0.21	3.00 ± 1.25	1.53
<b>Tumor localization</b>				
Larynx	–	7	–	20.59%
Subglottic		0		
Glottic		1		
Supraglottic		6		
Hypopharynx	–	10	–	29.41%
Pyriform sinus		7		
Posterior pharyngeal wall		1		
Medial pharyngeal wall		2		
Oral	–	–	4	11.76%
Oral floor ± lateral tongue			3	
Lateral tongue			1	
Oropharynx	–	–	13	38.24%
Tongue basis			6	
Pharyngeal tonsil			5	
Posterior wall/soft palate			2	
<b>TNM</b>				
Missed	–	0	2	
T1N2	–	0	1	
T2N0	–	1	0	
T2N1	–	0	1	
T2N2	–	4	4	
T3N0	–	4	1	
T3N1	–	0	0	
T3N2	–	4	4	
T4N0	–	0	1	
T4N1	–	0	0	
T4N2	–	4	3	
T4N3	–	0	0	
<b>Grade</b>				
Few differentiated	–	1	2	
Moderately differentiated	–	7	5	
Well differentiated	–	6	5	
Imprecise	–	3	4	
<b>Chemotherapy</b>				
CDDP	–	14	15	
Carboplatin	–	1	1	
Erbix	–	1	0	
Imprecise	–	1	1	
<b>IMRT</b>				
70	Gy	16	14	
>70	Gy	0	1	
<70	Gy	0	0	
Imprecise	–	1	2	

*Abbreviations:* BMI, body mass index; CDDP, cis-diaminedichloroplatinum; COPD, chronic obstructive pulmonary disease; CRT, chemoradiotherapy; F, Female; Gy, Gray; IMRT, intensity-modulated radiation therapy; kg, kilogram; M, male; N, number; Pd, pack daily; PY, pack year; TNM, tumor, node, metastasis; U/d, unit daily.

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