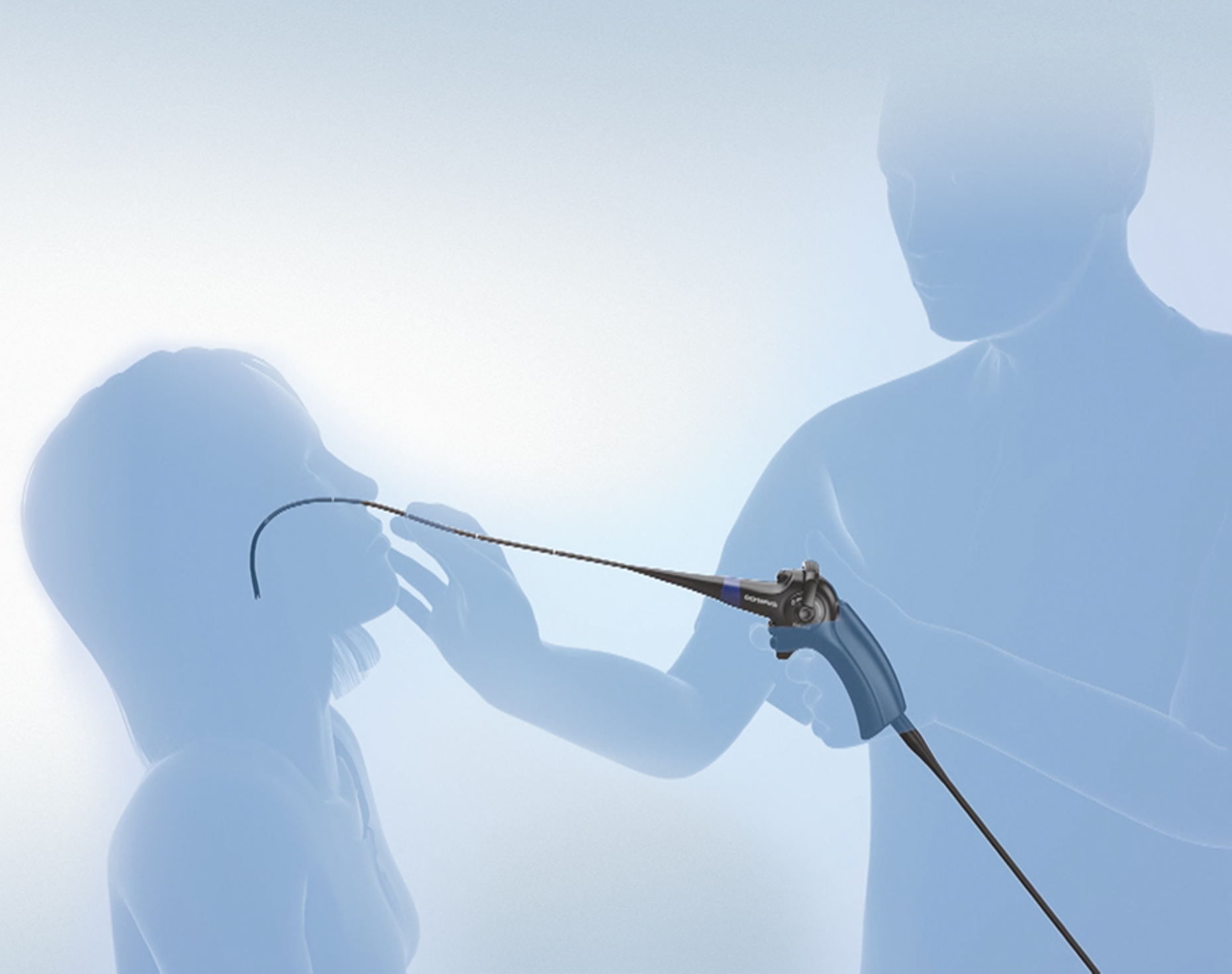


For Healthcare Professionals

# NBI Global Atlas

Conventional White Light Imaging versus Narrow Band Imaging





# CONTENTS

## Taro Sugimoto, MD


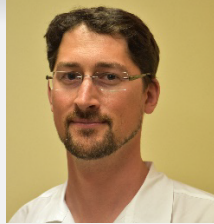




Department of Otolaryngology-Head and Neck Surgery, Tokyo Metropolitan Cancer and Infectious Diseases Center Komagome Hospital, Japan

CONTENTS	Supervisors	Features of NBI	Case study	Movies
----------	-------------	-----------------	------------	--------

### Features of NBI

- NBI Principle
- How NBI works
- Clinical Value
- Economical Value

### Case study

- |   |   |
|---|---|
|  <p>Superficial squamous cell carcinoma in the left piriform sinus</p>                    |  <p>Squamous cell carcinoma in right vocal fold</p>                     |
|  <p>Recurrent superficial cancer in the right piriform sinus after chemoradiotherapy</p> |  <p>Glottic squamous cell carcinoma</p>                                |
|  <p>Superficial cancer in the right piriform sinus</p>                                   |  <p>Anterior Commissure growth- Squamous cell carcinoma Endoscopic</p> |



# Supervisors

CONTENTS

Supervisors

Features of NBI

Case study

Movies

## Kenji Okami, MD PhD

Professor,  
Department of Otolaryngology,  
Tokai University, Japan

## Taro Sugimoto, MD

Department of Otolaryngology-Head and Neck Surgery,  
Tokyo Metropolitan Cancer  
and Infectious Diseases Center Komagome Hospital, Japan

## Ichiro Tateya, MD, PhD

Department of Otolaryngology-Head & Neck Surgery,  
Kyoto University, Japan  
Department of Otolaryngology - Head & Neck Surgery,  
Fujita Health University, Japan

## Petr Lukes, M.D., Ph.D.

Department of Otorhinolaryngology, Head and Neck Surgery  
First Faculty of Medicine  
Charles University  
and University Hospital Motol

## Giorgio Peretti, MD, PhD

Francesco Missale, Andrea Luigi Camillo Carobbio,  
Frank Rikki Canevari  
IRCCS Ospedale Policlinico San Martino, Genoa, Italy  
Department of Otorhinolaryngology – Head and Neck Surgery,  
University of Genoa, Genoa, Italy

## Rakesh Srivastava, MD, PhD

MBBS, MS(ENT), KGMC, UP (India).  
Consultant Laryngologist, Sushrut Institute of Plastic Surgery  
& Super specialty Hospital, Lucknow



# When White Light Is Not Enough

## NBI – The New Standard for Early Cancer Detection

CONTENTS

Supervisors

Features of NBI

Case study

Movies

**NBI allows ENT specialists to diagnose and treat early laryngeal cancer even more precisely and reliably.**

**NBI is also a very accurate technology for follow-up procedures.**

It is clinically proven<sup>1</sup> that by using NBI, doctors are able to detect more suspicious lesions compared to traditional white light (WL), consequently leading to potentially reduced recurrence.<sup>4</sup> In addition, NBI is easy to handle due to filter activation at the push of a button. And it's cost-effective, too: All Olympus Medical imaging systems and videoscopes come with NBI as standard with no additional installations or drugs needed.

All this makes using NBI a safe and reliable way to improve clinical outcomes in patients with suspected cancer in the upper aerodigestive tract – and a unique tool for the patient pathway from diagnosis to follow-up in OR, outpatient clinics and doctors' offices. It is suitable for numerous endoscopy procedures in ENT such as laryngoscopy, larynx, oral cavity, and sinus surgery as well as for procedures in otology.



# When White Light Is Not Enough

## NBI – The New Standard for Early Cancer Detection

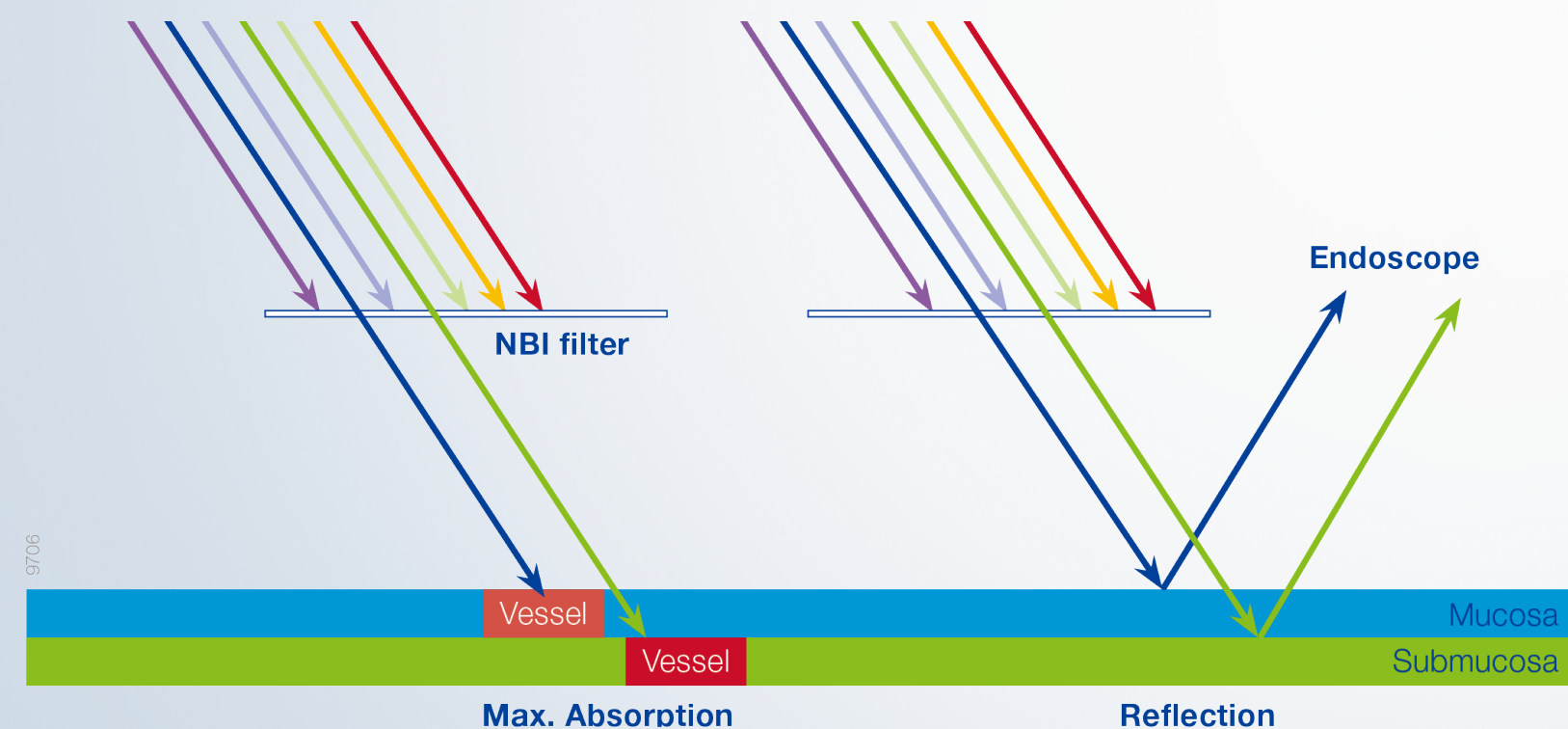
[CONTENTS](#)[Supervisors](#)[Features of NBI](#)[Case study](#)[Movies](#)

“ NBI is a keystone in our daily practice: It is a reliable tool in the study of upper aerodigestive tract malignancies. (September 2018) ”

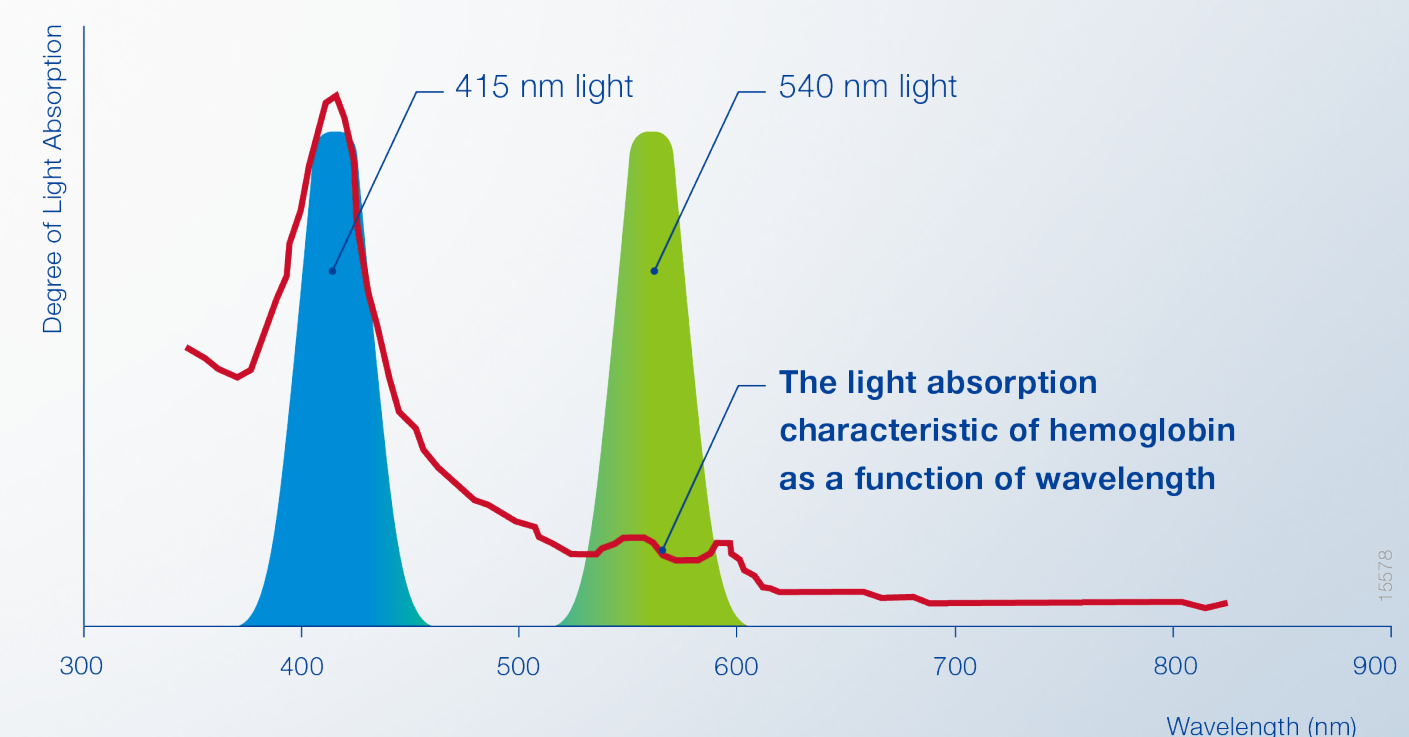
### Prof. Giorgio Peretti

Professor of Otorhinolaryngology, University of Genova's Medical and Postgraduate Schools,  
Director of Otorhinolaryngology, Genova's San Martino University Hospital

## NBI – The Underlying Principle



*NBI light is absorbed by capillaries on the mucosal surface (blue) and veins in the submucosa (green).*



*The amount of light hemoglobin absorbs depends on its wavelength.*



# When White Light Is Not Enough

## NBI – The New Standard for Early Cancer Detection

[CONTENTS](#)[Supervisors](#)[Features of NBI](#)[Case study](#)[Movies](#)

### How NBI Works

Normal white light (WL) contains all colors. When WL hits the surface of a tissue, all colors are absorbed. Thus the image remains with lack of contrast. With NBI this is different.

NBI uses only blue and green light. When blue and green light hit the surface of the tissue, it is highly absorbed by hemoglobin in the blood vessels. While the blue light is absorbed by the capillaries in the mucosa, the green light reaches deeper to the submucosal area, where it is reflected by the blood vessels.

This is why NBI creates a significantly higher contrast between blood vessels and the surrounding tissue than WL. The NBI images therefore have more contrast than WL images.

Since small tumors are often surrounded by many blood vessels, NBI helps to detect these tumors at an early stage and to analyze these areas accordingly. Thus, NBI supports the early and precise optical diagnosis of laryngeal cancer lesions, which as a result allows better treatment and more accurate follow-ups.

Numerous studies highlight the clinical value of NBI, especially with regard to the characterization of suspicious mucosal areas and the detection of cancerous lesions.



# Your Chance to Improve Patient Outcome

## The Clinical Value of NBI for ENT

[CONTENTS](#)[Supervisors](#)[Features of NBI](#)[Case study](#)[Movies](#)

### **NBI is Clinically Proven to Diagnose More Laryngeal Cancer**

Particularly when combined with a high resolution (e.g. HDTV), NBI can provide a more-detailed and higher-contrasted visualization of blood vessels than other endoscopic procedures.<sup>1</sup>

An example from daily clinical practice illustrates this: Before a patient's vocal sound or vocal capabilities deteriorate, NBI can be routinely used to determine early changes in the vocal folds' vessels, which can also be quantitatively and qualitatively classified.

Numerous studies, including a growing number of randomized controlled trials (RCT) and metaanalyses, highlight the clinical value of NBI, especially with regard to the detection of cancer and through examination of suspicious mucosal areas. With high image quality and contrast in full HD or ultra high definition (4K), NBI can better display the edge of surgical margin and thus may reduce the number of biopsies.



# Your Chance to Improve Patient Outcome

## The Clinical Value of NBI for ENT

CONTENTS

Supervisors

Features of NBI

Case study

Movies

“ NBI improves my diagnostic workup and optimizes endoscopy. (September 2018) ”

**Prof. Dr. med. Christoph Arens**

Director, University Hospital Magdeburg, Department of Otolaryngology



**18%** Detects 18% more true-positive laryngeal cancer lesions<sup>1</sup>



**23%** Increases sensitivity by 23% in the identification of laryngeal cancer<sup>2</sup> while maintaining high specificity (96%)



**85%** Reduces 85% of superficial positive margins<sup>3</sup>

Figures compared to white-light endoscopy



# Your Chance to Improve Patient Outcome

## The Economical Value of NBI for ENT

CONTENTS

Supervisors

Features of NBI

Case study

Movies



### How NBI Reduces Overall Costs

NBI offers superior efficacy in the early diagnosis of laryngeal cancer in pre-, intra- and postoperative stages compared to WL endoscopy. As tumors can be detected at an early stage using NBI, potential complications and the time a patient needs to spend in hospital for treatment, follow-up and treatment due to tumor recurrence is potentially less.<sup>4</sup>

NBI comes with Olympus Medical equipment at no additional cost for extra equipment, disposables or drugs. It is a key function of the Olympus endoscopy system and has been shown to provide clinical quality, efficiency gain and cost savings in other indications.<sup>5</sup>

1 Simo et al., European Laryngological Society: ELS recommendations for the follow-up of patients treated for laryngeal cancer. Eur Arch Otorhinolaryngol. 2014 Sep; 271(9): 2469-79. 2 Kraft et al., Value of narrow band imaging in the early diagnosis of laryngeal cancer. 2015 Wiley Periodicals, Inc. Head Neck 38: 15-20, 2016. 3 Garofolo et al., Intraoperative Narrow Band Imaging Better Delineates Superficial Resection Margins During Transoral Laser Microsurgery for Early Glottic Cancer. Ann Otol Rhinol Laryngol. 2015 Apr; 124(4): 294-8. 4 Plaat et al.: Narrow-band imaging in transoral laser surgery for early glottic cancer in relation to clinical outcome. Head Neck. 2017 Jul; 39(7): 1343-1348. doi: 10.1002/hed.24773. Epub 2017 Mar 29. 5 Kang W et al.: Narrow band imaging-assisted transurethral resection reduces the recurrence risk of non-muscle invasive bladder cancer: A systematic review and meta-analysis. Oncotarget. 2017 Apr 4; 8(14): 23880-23890. doi: 10.18632/oncotarget.13054.



# Your Chance to Improve Patient Outcome

## The Economical Value of NBI for ENT

CONTENTS

Supervisors

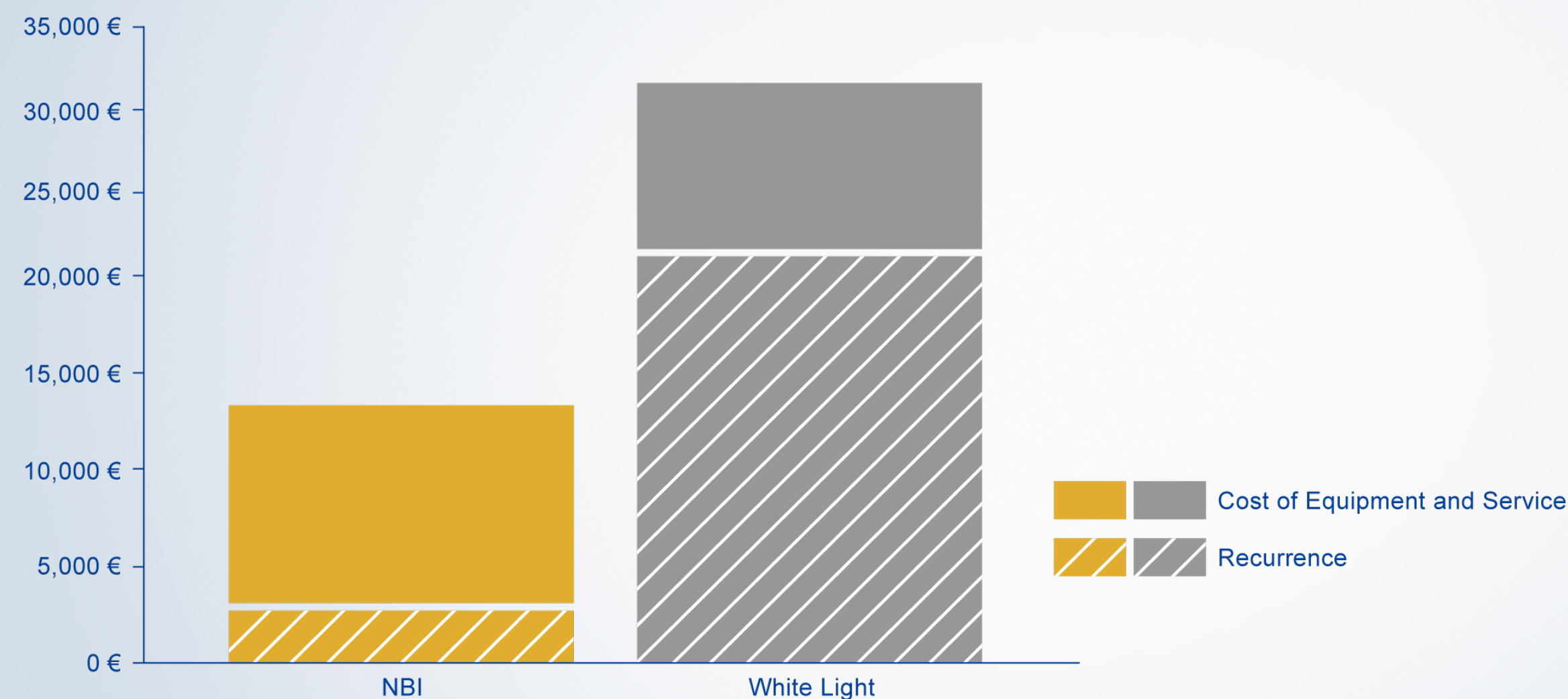
Features of NBI

Case study

Movies

In the following calculation, the Olympus video endoscopy system with NBI (“NBI”) will be compared to a conventional white-light endoscopy system without NBI (“White Light”).

**Total Costs per Year | Example: 50 patients\***



Disclaimer: Costs and savings figures used in the model are for illustrative purposes only and the user's attention is drawn to the fact that outputs from the model are subject to a) the assumptions described within the model and b) the data that the user selects or decides to input into the model.

\* Plaat et al.: Narrow-band imaging in transoral laser surgery for early glottic cancer in relation to clinical outcome. Head Neck. 2017 Jul; 39(7): 1343-1348. doi: 10.1002/hed.24773. Epub 2017 Mar 29.



# Superficial squamous cell carcinoma in the left pyriform sinus

CONTENTS

Supervisors

Features of NBI

Case study

Movies

## Kenji Okami, MD PhD

Professor,  
Department of Otolaryngology,  
Tokai University, Japan

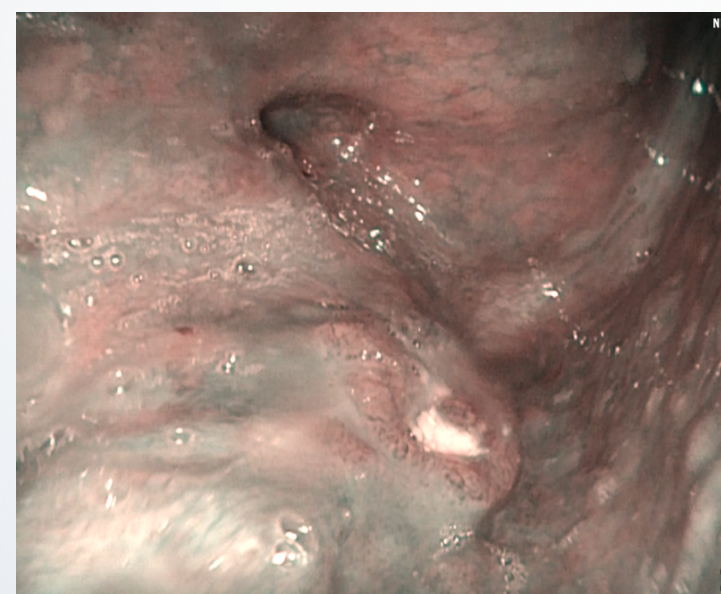


### Endoscopic Finding;

White light image demonstrate a small mucosal nodule in the left pyriform sinus. This is not the specific findings of malignancy. However, NBI image exhibited a well-demarcated brownish area with irregularly scattered vascular proliferation pattern on and around the nodule, which is the specific sign of the superficial cancer of the hypopharynx



white light

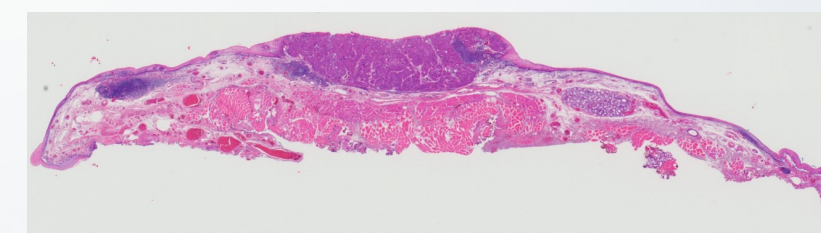


NBI

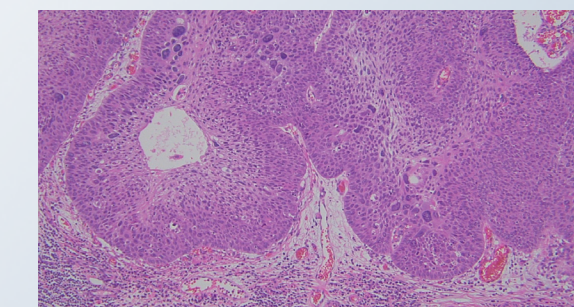
Equipment: OTV-S190, CLV-S190, ENF-VH

### Pathological Finding;

Superficial squamous cell carcinoma with focally invading into the subepithelial layer. There was no muscular invasion. Tumor size was 12 mm in the greatest dimension and 2 mm in the thickness. Both horizontal margin and vertical margin were negative.



Pathological image (macro)



Pathological image (micro)



# Recurrent superficial cancer in the right piriform sinus after chemoradiotherapy

CONTENTS

Supervisors

Features of NBI

Case study

Movies

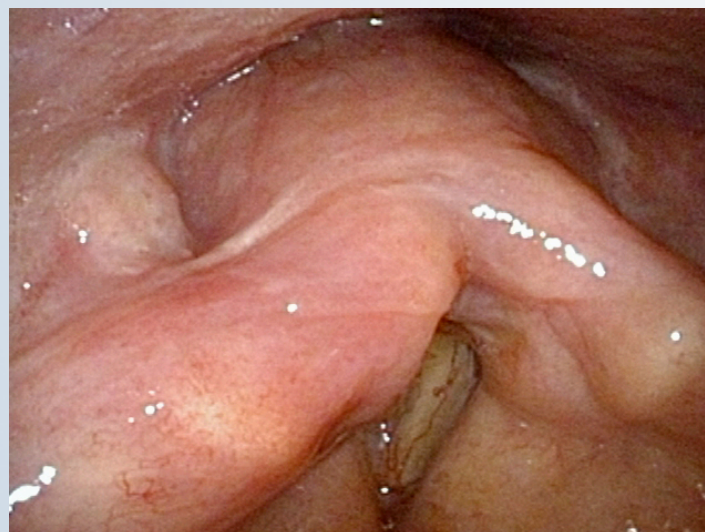
## Taro Sugimoto, MD

Department of Otolaryngology-Head and Neck Surgery, Tokyo Metropolitan Cancer and Infectious Diseases Center Komagome Hospital, Japan



### Endoscopic Finding;

White light image only demonstrates the small and thin protruding whitish lesion in the right piriform sinus. However, NBI image demonstrates branched and slightly dilated vessels on the surface of the tumor after the endoscope is brought close to the lesion. This finding suggests that the cancer invades into the subepithelial layer. Furthermore NBI finding shows the cancer horizontal margin clearly showing the disappearance of the arborescent vascular network at the borderline of the normal part and cancer lesion.



white light



NBI

Equipment: OTV-S190, CLV-S190, ENF-VH

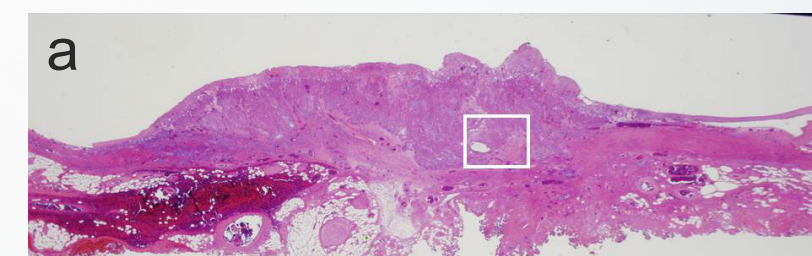
### Pathological Finding;

Figure b is the enlarged view of white quadrangle in figure a and figure c is the enlarged view of white quadrangle in figure b.

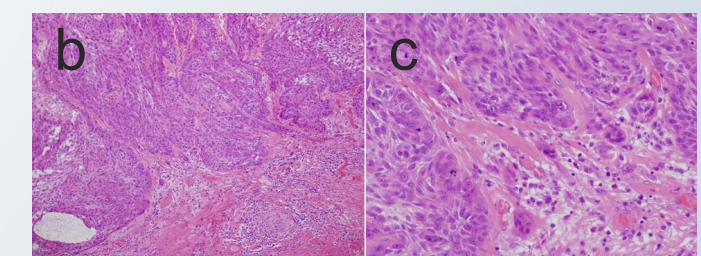
There was the squamous cell carcinoma making cancer nest and invading into the subepithelial layer.

Tumor size was 10mm x 7mm and tumor thickness was 2mm.

Both horizontal margin and vertical margin were negative. No lymphatic, no venous and no perineural invasion existed.



Pathological image (macro)



Pathological image (micro)

### Acknowledgment

Hiroshi Kawachi, Head, Department of Pathology, The Cancer Institute Hospital of JFCR and Yusuke Kiyokawa, Director, Department of Otolaryngology, Japanese Red Cross Musashino Hospital, contributed to this atlas.



# Superficial cancer in the right piriform sinus

CONTENTS

Supervisors

Features of NBI

Case study

Movies

## Ichiro Tateya, MD, PhD

Department of Otolaryngology-Head & Neck Surgery, Kyoto University, Japan  
Department of Otolaryngology - Head & Neck Surgery, Fujita Health University, Japan



### Endoscopic Finding;

NBI image demonstrates a well-demarcated brownish area with irregularly scattered brown dots in the right piriform sinus, which is hardly detectable on the white light image. The lesion is entirely flat in the most region and is slightly depressed in the lower part of the image. These findings suggest a superficial hypopharyngeal cancer in the right piriform sinus.



white light

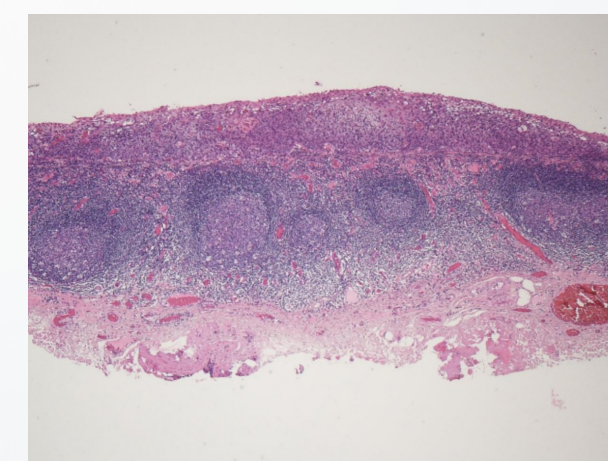


NBI

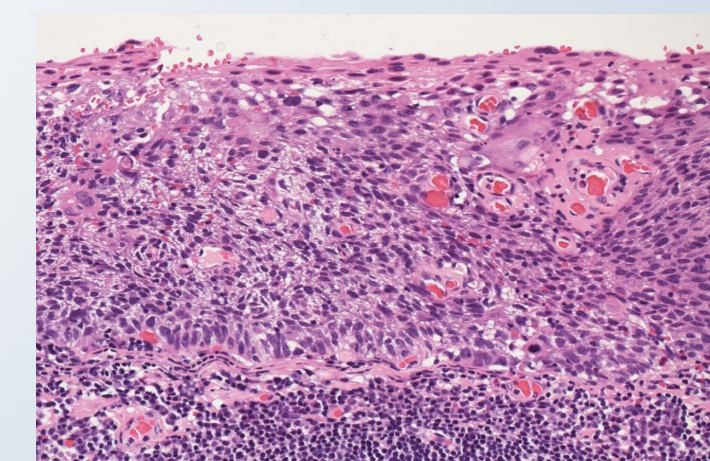
Equipment: OTV-S190, CLV-S190, ENF-VH

### Pathological Finding;

Squamous cell carcinoma in situ with no apparent subepithelial invasion. Tumor size was 1.7cm in the greatest dimension and is 0.3cm in its thickness. Both horizontal margin (3mm) and vertical margin (0.9mm) was negative.



Pathological image (macro)



Pathological image (micro)



# Squamous cell carcinoma in right vocal fold

CONTENTS

Supervisors

Features of NBI

Case study

Movies

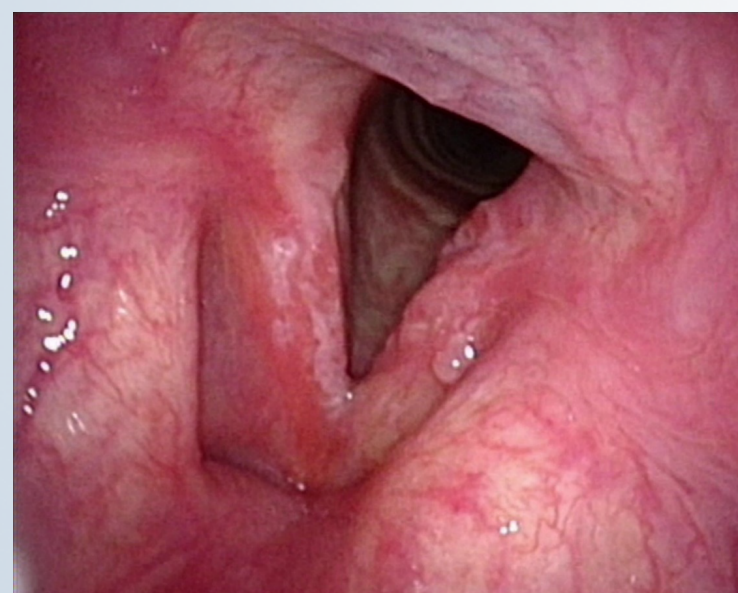
## Petr Lukes, M.D., Ph.D.

Department of Otorhinolaryngology, Head and Neck Surgery  
First Faculty of Medicine  
Charles University  
and University Hospital Motol

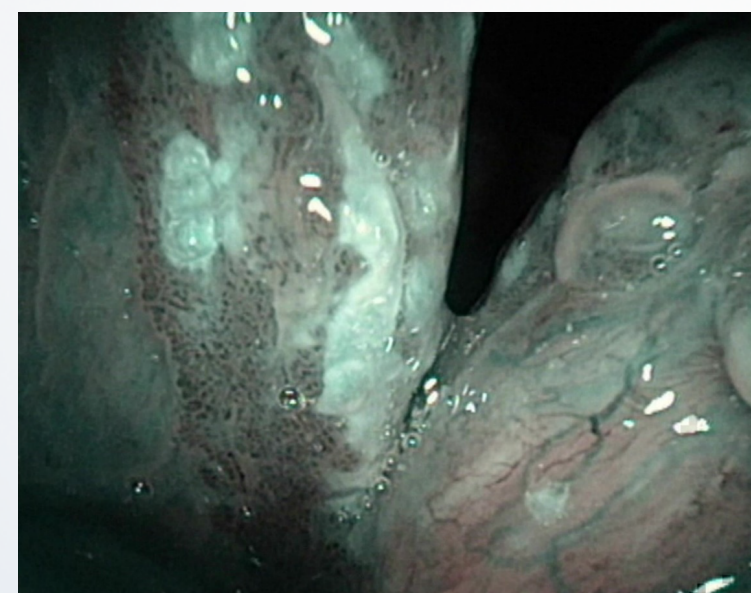


### Endoscopic Finding;

Flexible video endoscopy with NBI- lesions visible on both vocal folds. Rough surface and reddening visible in white light image. Clearly visible margins of the lesion and pathological vascularization in NBI image.



white light



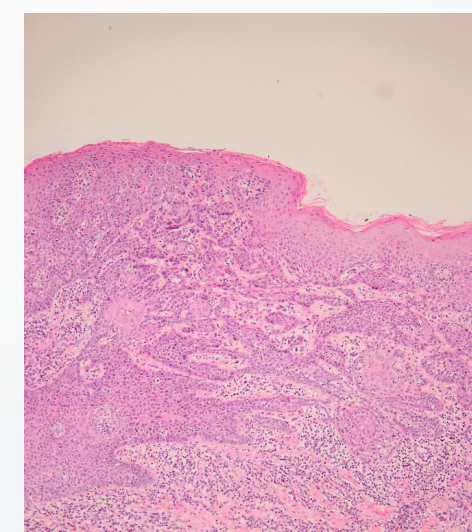
NBI

Equipment: OTV-S190, CLV-S190, ENF-VH

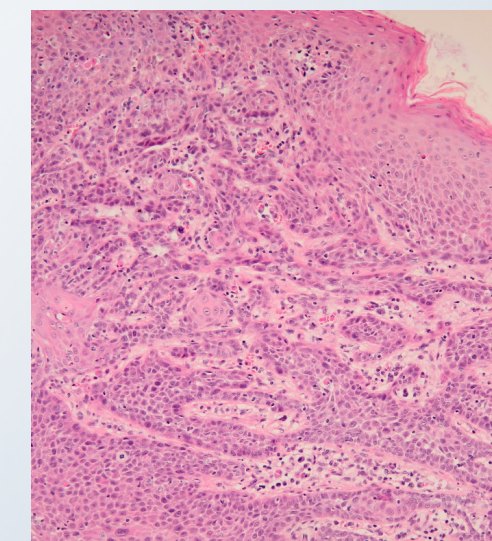
### Pathological Finding;

Right vocal fold: severe dysplasia in the margins of the lesion with well-differentiated spinocellular cancer in the centre of the lesion.

Left vocal fold: severe dysplasia



Pathological image (macro)



Pathological image (micro)



# Glottic squamous cell carcinoma

CONTENTS

Supervisors

Features of NBI

Case study

Movies

## Giorgio Peretti, MD, PhD

Francesco Missale, Andrea Luigi Camillo Carobbio, Frank Rikki Canevari

IRCCS Ospedale Policlinico San Martino, Genoa, Italy

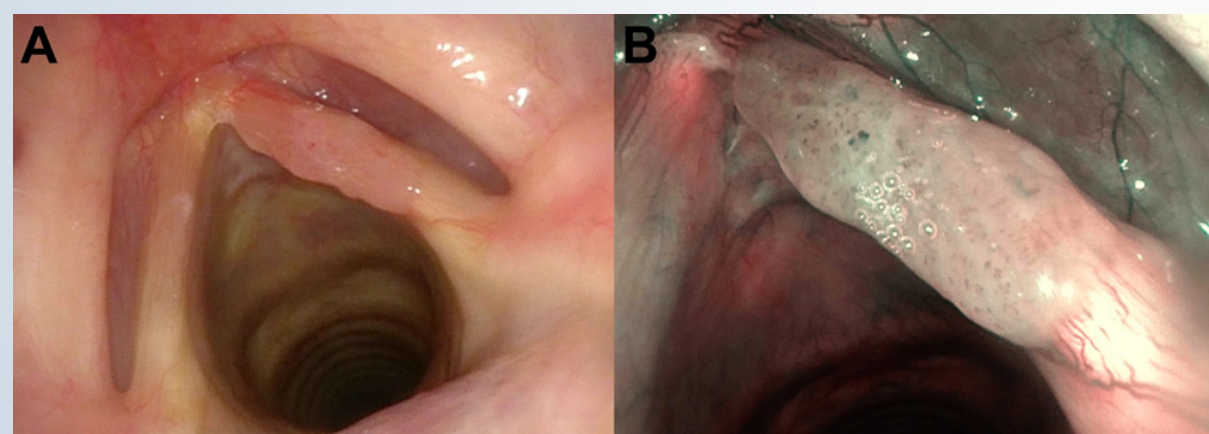
Department of Otorhinolaryngology – Head and Neck Surgery, University of Genoa, Genoa, Italy



### Endoscopic Finding;

The examination of the glottis in white light (A) revealed an erythroplakia involving the right vocal cord. In NBI observation (B), some atypical perpendicular vascular abnormalities in terms of “dark spots”, clearly observed inside the lesion, raised the suspect of hiding at least a dysplastic transformation. The superficial margins of the lesion were better defined with the use of NBI, not involving the commissures, the ventricle and the subglottis. Vocal cords were mobile, and at the laryngostroboscopy a reduced amplitude of the mucosal wave on the right side was present.

The clinical staging is: cT1a glottic lesion of the right vocal cord.



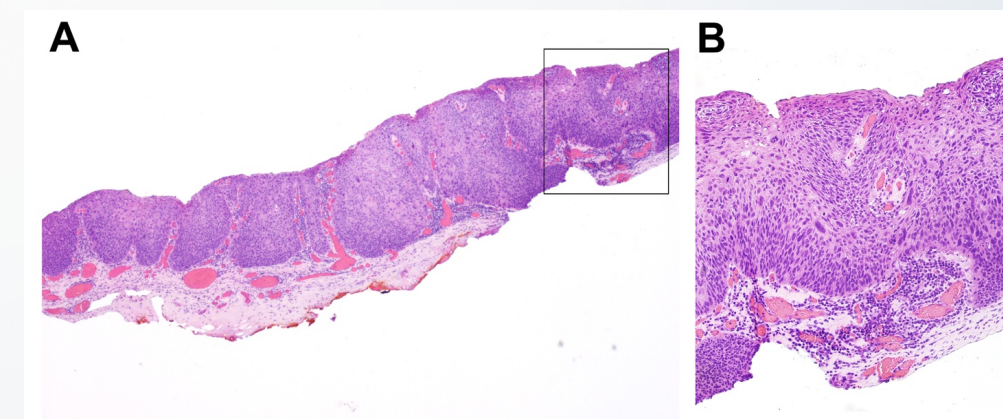
white light

NBI

Equipment: OTV-S190, CLV-S190, ENF-VH

### Pathological Finding;

H&E view of the specimen (magnification 4x, A and 10x, B), obtained by an excisional biopsy, in term of subligamental cordectomy, by transoral CO2 laser microsurgery. The pathologic diagnosis is a well-moderate differentiated invasive squamous cell carcinoma; the depth of infiltration is 0.22 mm and all margins are clear of neoplasia. No risk factors, as perineural invasion or lymphovascular invasion, are observed. The final pathological staging is confirmed to be a glottic SCC pT1a R0.



Pathological image (4x)

Pathological image (10x)



# Anterior Commissure growth- Squamous cell carcinoma

CONTENTS

Supervisors

Features of NBI

Case study

Movies

## Rakesh Srivastava, MD, PhD

MBBS, MS(ENT), KGMC, UP (India).  
Consultant Laryngologist, Sushrut Institute of Plastic Surgery  
& Super specialty Hospital, Lucknow



### Endoscopic Finding;

NBI demonstrate proliferative growth near anterior commissure and supracommissural area with well defined brownish dots indicative of squamous cell carcinoma. Advanced meandering and dilated end capillaries, few dot like vessel loops.



white light

Equipment: CV-170, ENF-VH

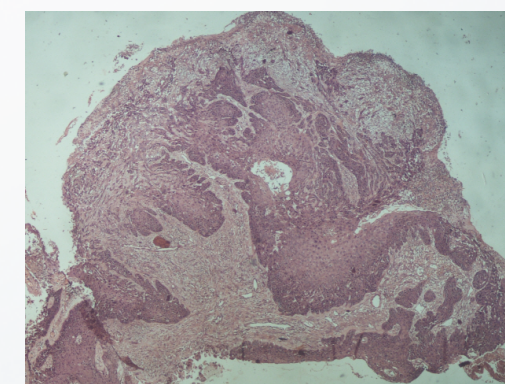


NBI

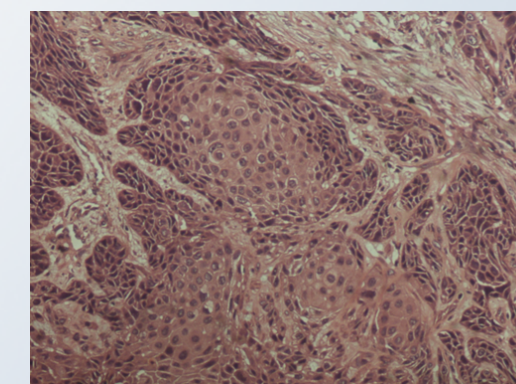
### Pathological Finding;

Histopathology shows stratified squamous cells displaying pseudo-epitheliomatous hyperplasia in large part with significant dyskeratosis and anisonucleosis with hyperchromasia. Subepithelial zone infiltrated by irregular nest and cord and sheets of atypically proliferated squamous cells. The cells show anisonucleosis with loss in nuclear orientation.

Conclusion- Anterior Commissure growth- Squamous cell carcinoma.



Pathological image (macro)



Pathological image (micro)



# Movies

CONTENTS

Supervisors

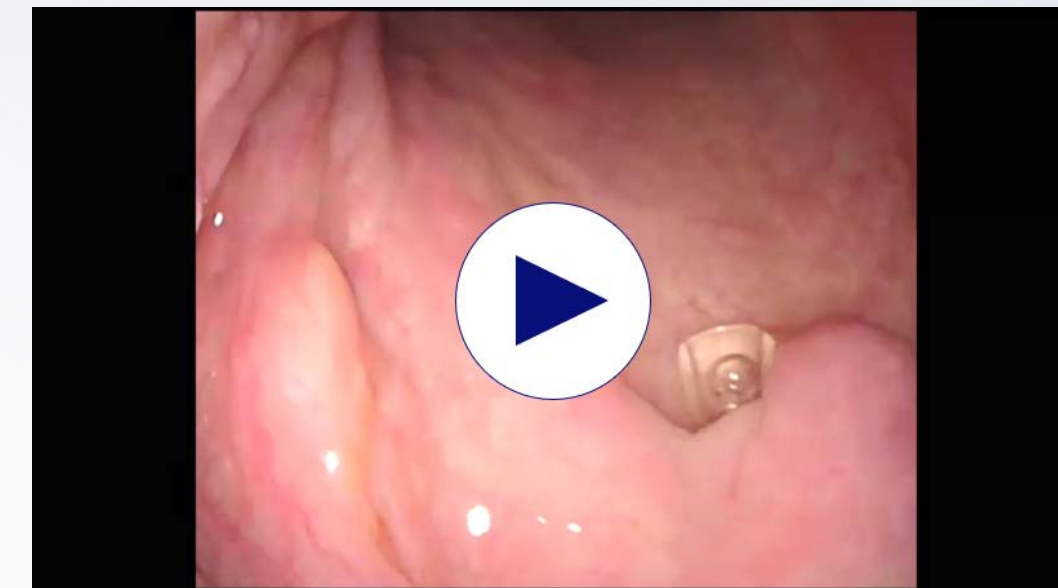
Features of NBI

Case study

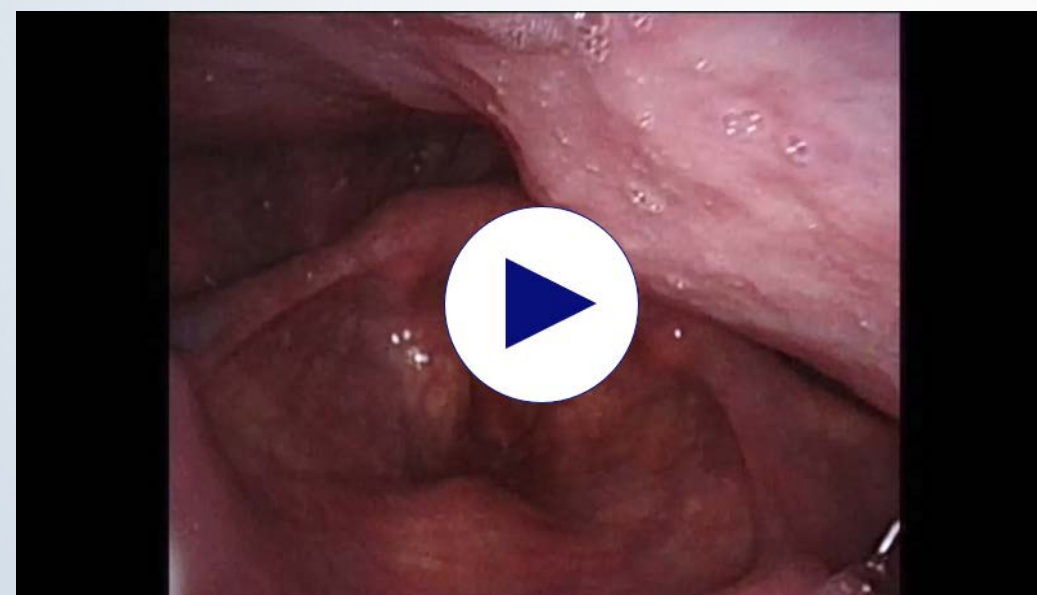
Movies



Kenji Okami. MD PhD



Ichiro Tateya, MD, PhD



Petr Lukes, M.D., Ph.D.



Rakesh Srivastava, MD, PhD



