

Case Study of **NBI** (Specific Wavelength Light) **Endoscopy**

This NBI Atlas has been designed based on the findings and kind help of the following experts.

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NBI

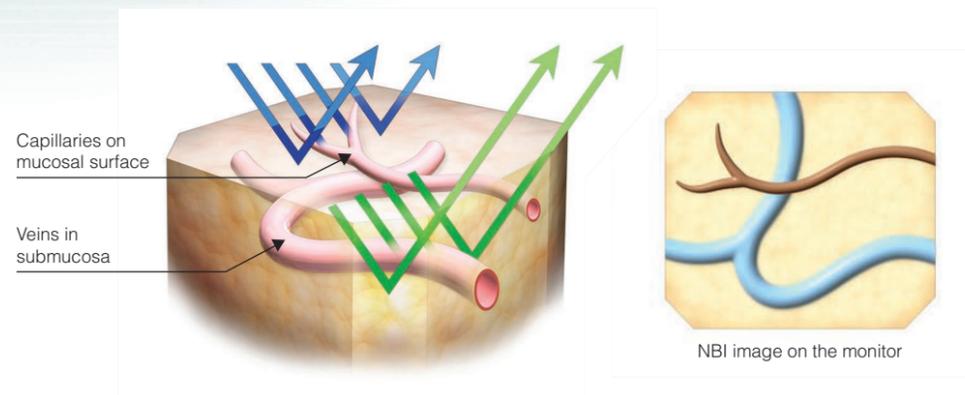
Narrow Band Imaging

NBI

Narrow Band Imaging

Narrow Band Imaging™

NBI is an optical image enhancement technology that enhances the visibility of vessels and other tissue on the mucosal surface. Narrow-band illumination, which is strongly absorbed by hemoglobin and penetrates only the surface of tissues, is ideal for enhancing the contrast between the two. As a result, under narrow-band illumination, capillaries on the mucosal surface are displayed in brown on the monitor, and veins in the submucosa are displayed in cyan.



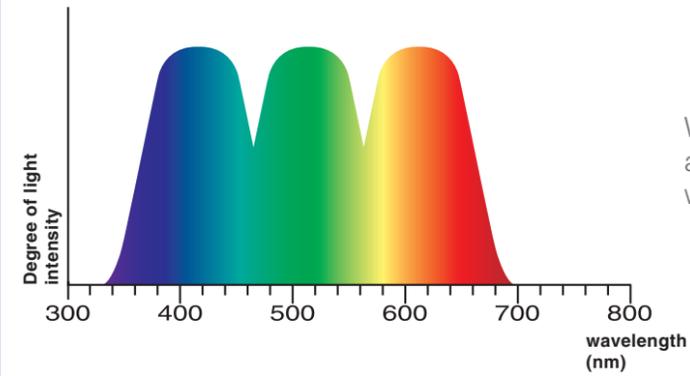
Conventional image



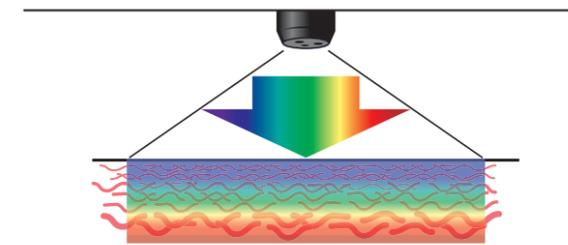
NBI image



Conventional White Light

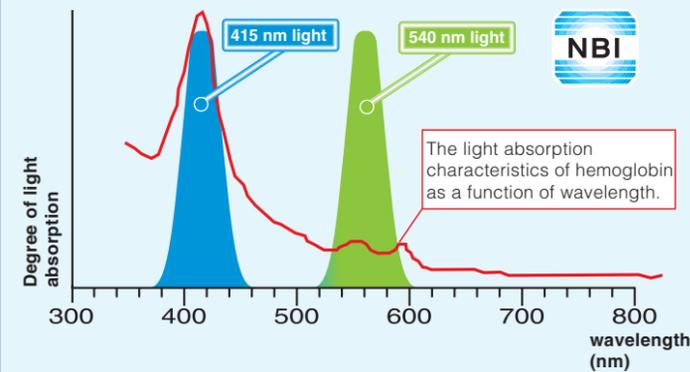


White light is composed of an equal mixture of RGB wavelengths.



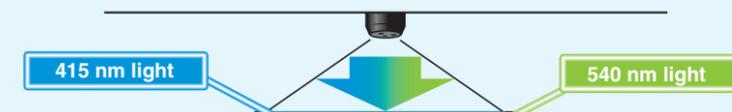
Short wavelengths have shallow penetration characteristics whereas long wavelengths penetrate deeper into the mucosa.

NBI (Narrow Band Imaging™)



The light absorption characteristics of hemoglobin as a function of wavelength.

The narrowband light is composed of two specific bands that are strongly absorbed by hemoglobin.



Short wavelengths penetrate only the superficial layers of the mucosa.
 → Absorbed by capillary vessels in the surface layer of mucosa.

Longer wavelengths penetrate deeper compared to 415 nm light.
 → Absorbed by blood vessels such as veins, which are located deeper than capillary vessels in the surface layer of the mucosa.

What is NBI? 2

Hypopharyngeal Intraepithelial Carcinoma (Right Pyriform Sinus) 5

Oropharyngeal Cancer (Left Tongue Base) 6

Epipharyngeal Intraepithelial Carcinoma (Soft Palate Upper Surface) 7

Oropharyngeal Papilloma (Left Epiglottic Vallecula) 8

Lymphoid Follicles in the Hypopharynx (Left Pyriform Sinus) 9

Laryngeal Cancer (Right Vocal Cord) 10

Laryngeal Cancer (Right Vocal Cord) and Vocal Cord Dysplasia (Left Vocal Cord) 11

Laryngeal Cancer (Left Vocal Cord) 12

Acute Laryngitis (Left Vocal Cord) 13

Normal Eardrum 14

Eardrum during Crying 14

Acute Otitis Media (Bullae in Eardrum) 15

Acute Otitis Media (Fluid Retention in Eardrum) 16

Acute Otitis Media (Eardrum Bulging) 16

Acute Otitis Media (Eardrum Thickening) 17

The Change Caused by 1:5000 Epinephrine Spraying 18

Right Epistaxis (Thrombocytopenia) 18

Right Epistaxis (Hypertensive Epistaxis) 19

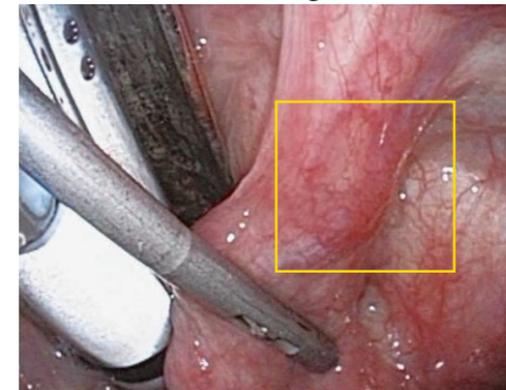
Right Epistaxis (Hypertensive Epistaxis) 19

Supervisors' Note 20

Hypopharyngeal Intraepithelial Carcinoma (Right Pyriform Sinus) Aged 77, male

general anesthesia

▼white light



▼NBI

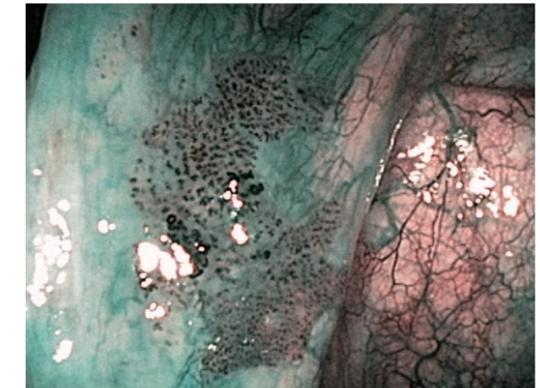


close-focus view

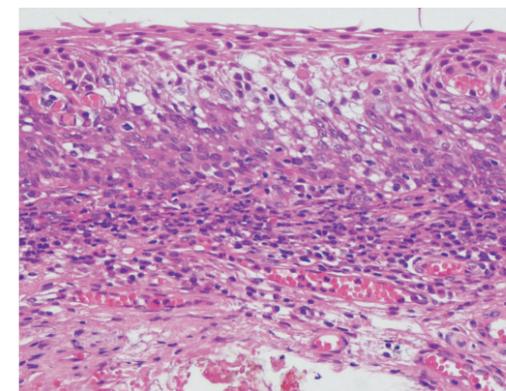
▼white light



▼NBI



pathology



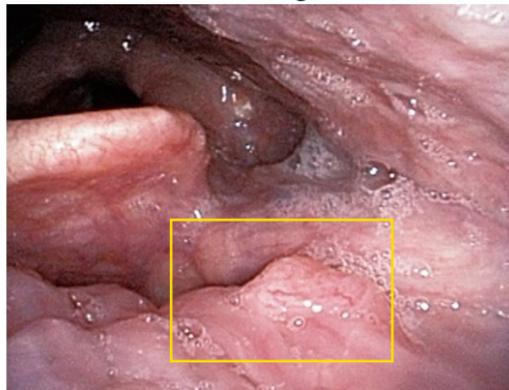
Comment:

These are the peroral endoscopic findings observed under general anesthetic. In the distant view under white light, a flat reddish lesion was observed. In NBI, a brownish area presented in the same region. In the NBI close-focus view, intraepithelial abnormal vessels were visualized as scattered brownish dots, and their extension, dilatation, weaving and different shapes were recognized. The branching vessels in the subepithelial layer of the normal mucosa were visualized in green, presenting clear contrast to the lesion area. The lesion was treated with ELPS (Endoscopic Laryngo Pharyngeal Surgery) resection, and pathologically diagnosed as an intraepithelial carcinoma.

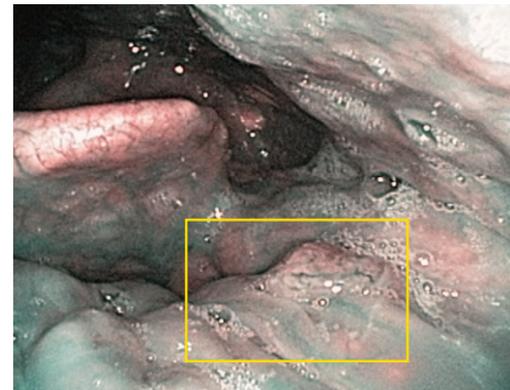
Oropharyngeal Cancer (Left Tongue Base)

Aged 60, male

▼white light



▼NBI

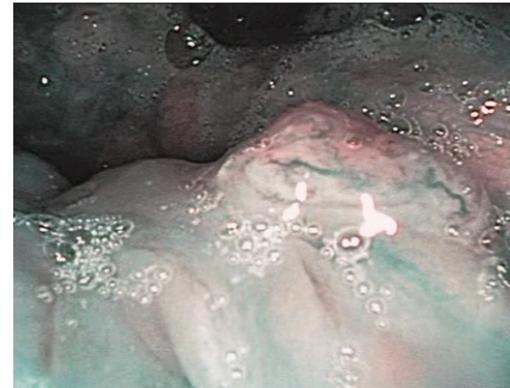


close-focus view

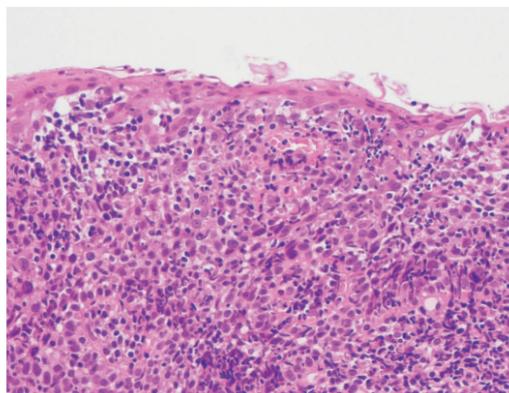
▼white light



▼NBI



pathology



Comment:

Diagnosed as a squamous cell carcinoma after a biopsy of the left cervical lymph node in September 2005. As primary unknown cancer of the cervical lymph node had previously been detected, nasal endoscopic examinations had been performed every one to three months, but no noticeable finding had been recognized in the laryngopharynx. Two years and six months after that diagnosis, a 5 mm small tumor mass was recognized in nasal NBI endoscopy in the left tongue base and the NBI close-focus view suggested enlarged abnormal vessels. A biopsy was performed and the lesion was diagnosed as a moderately- to poorly-differentiated squamous cell carcinoma.

Images and comments by Dr. Y. Satou <ENF-VQ>

Epipharyngeal Intraepithelial Carcinoma (Soft Palate Upper Surface)

Aged 60, male

▼white light



▼NBI

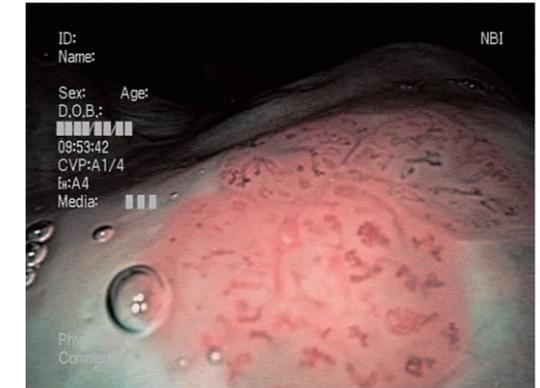


close-focus view

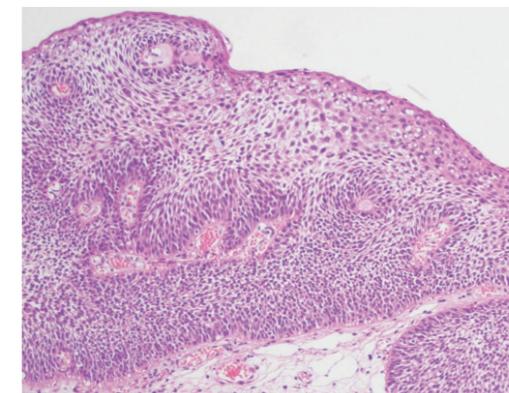
▼white light



▼NBI



pathology



Comment:

The patient visited us complaining abnormal sensation in the laryngopharynx. Nasal NBI observation showed a brownish area with clear boundaries in the midline region of the soft palate upper surface. In the NBI close-focus view, the intraepithelial abnormal vessels showed signs of extension, dilatation, weaving and different shape. The lesion was pathologically diagnosed as an intraepithelial carcinoma.

Images and comments by Dr. Y. Satou <ENF-VQ>

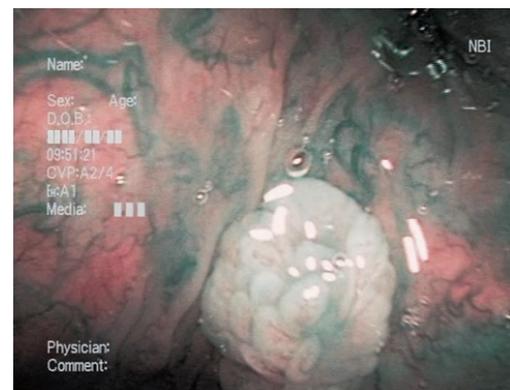
Oropharyngeal Papilloma (Left Epiglottic Vallecula)

Aged 61, male

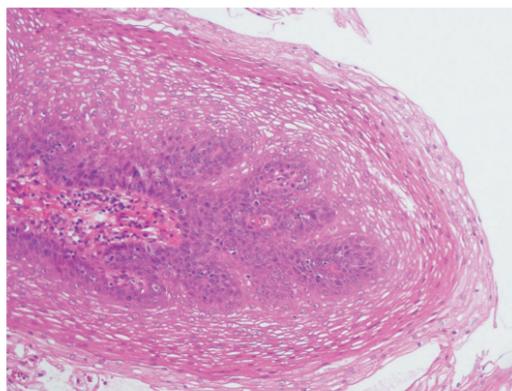
▼white light



▼NBI



pathology



Comment:

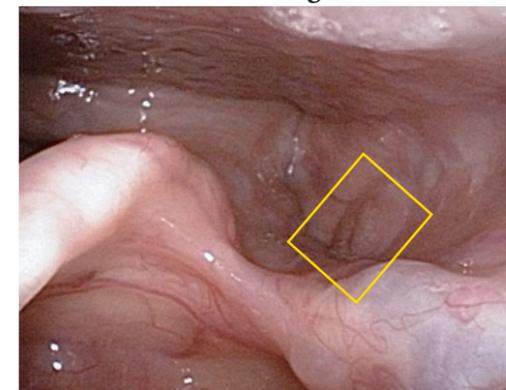
In white light observation, a white lesion was recognized in the left epiglottic vallecula. The NBI close-focus view showed lobular white tumor mass within which thin and constant capillaries were recognized and therefore papilloma was suspected. A biopsy was performed and it was pathologically diagnosed as a papilloma.

Images and comments by Dr. Y. Satou <ENF-VQ>

Lymphoid Follicles in the Hypopharynx (Left Pyriform Sinus)

Aged 74, female

▼white light



▼NBI

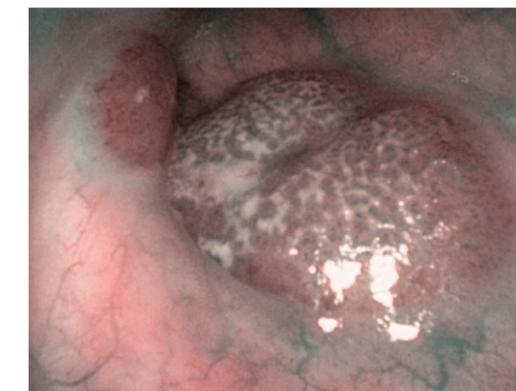


close-focus view

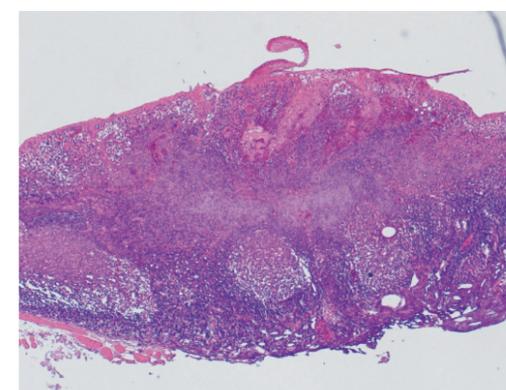
▼white light



▼NBI



pathology



Comment:

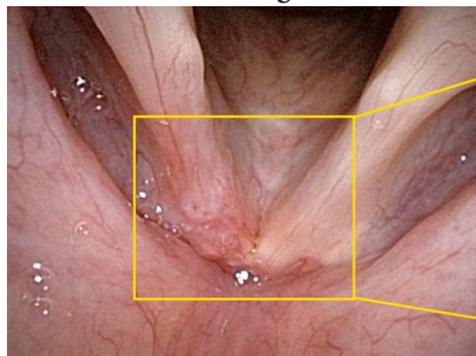
The patient visited a local hospital complaining abnormal sensation in the laryngopharynx, and was referred to us on suspicion of hypopharyngeal cancer of the left pyriform sinus. Because no abnormal vascular proliferation was observed in either while light or NBI close-focus observation, lymphoid follicles were suspected. The lesion was treated with endoscopic resection upon the patient's request, and pathologically diagnosed as lymphoid follicles.

Images and comments by Dr. Y. Satou <ENF-VQ>

Laryngeal Cancer (Right Vocal Cord)

Aged 71, male

▼white light



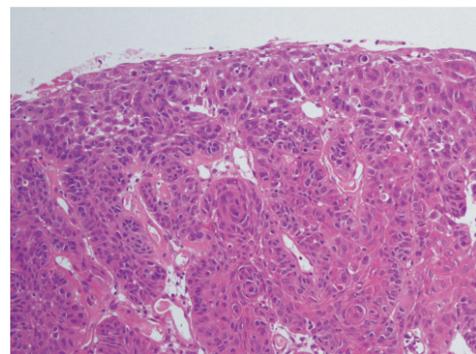
▼NBI



▼laser vaporization



pathology



Comment:

The patient was referred to us complaining hoarseness and a reddening of the right vocal cord. In white light observation, a mild reddish and mucosal irregularities were recognized in the frontal area of the right vocal cord. In the NBI close-focus view, dot-like intraepithelial abnormal vessels localized in the vocal cord were identified. The lesion was treated with the YAG-laser vaporization under endoscopy (through direct laryngoscopy), and pathologically diagnosed as a squamous cell carcinoma.

After vaporization

▼white light, 3 months after vaporization



▼NBI, 3 months after vaporization



▼NBI, 4 months after vaporization



Comment:

Three months after the laser vaporization, a tumor mass was observed in the same region. However, as no abnormal vascular proliferation was recognized even in the NBI close-focus view, it was diagnosed as a granuloma due to the laser vaporization. Four months after the vaporization, the granulation disappeared and no abnormal vascular proliferation suggesting its recurrence was observed.

Images and comments by Dr. Y. Satou <ENF-VQ>

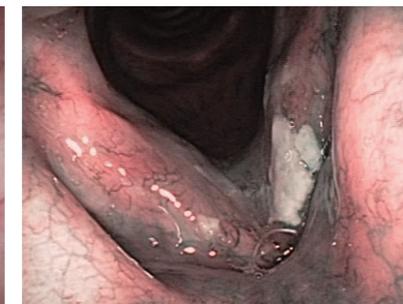
Laryngeal Cancer (Right Vocal Cord) and Vocal Cord Dysplasia (Left Vocal Cord)

Aged 67, male

▼white light



▼NBI



▼NBI (close-focus view)



Comment:

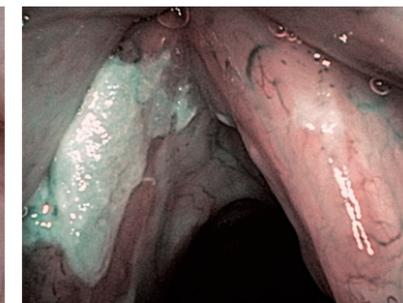
The patient was referred to us by a local hospital with white spots on the left vocal cord. Although the left vocal cord presented obvious leukoplakia, we did not observe any clearly abnormal vessels around the leukoplakia in the NBI close-focus view. On the other hand, and intraepithelial abnormal vessels were identified in the right vocal cord. Therefore a squamous cell carcinoma in the right vocal cord and dysplasia in the left vocal cord were suspected.

general anesthesia

▼white light



▼NBI

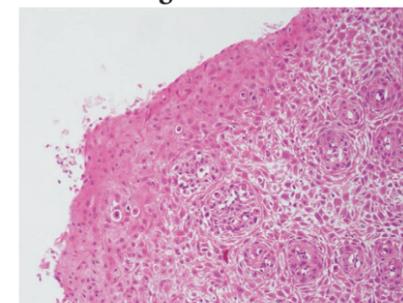


▼after laser vaporization

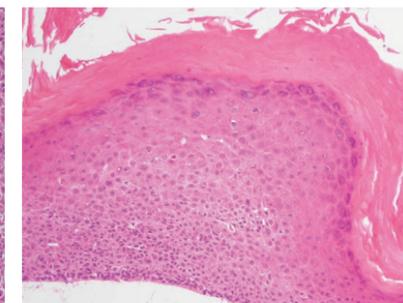


pathology

▼right vocal cord



▼left vocal cord



Comment:

These are the peroral endoscopic findings observed under general anesthesia (through the laryngoscope). NBI was useful for the biopsy of the right vocal cord, because it was difficult to recognize the lesion in the white-light view. After the biopsy of the lesions, both vocal cords were vaporized with a YAG laser. The right vocal cord was pathologically diagnosed as an intraepithelial carcinoma and the left vocal cord was a dysplasia (low-grade).

Images and comments by Dr. Y. Satou <ENF-VQ>

Laryngeal Cancer (Left Vocal Cord)

Aged 66, male

▼white light



▼NBI

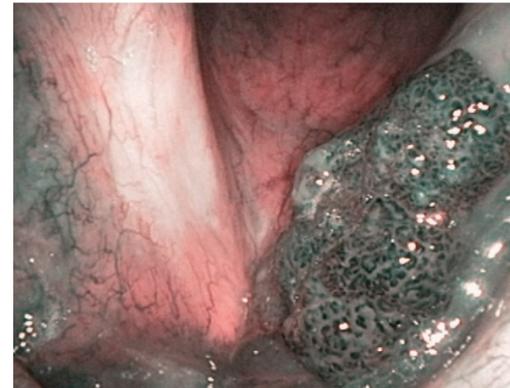


close-focus view

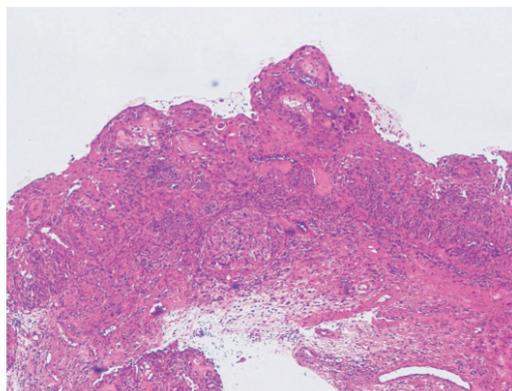
▼white light



▼NBI



pathology



Comment:

The patient visited a local hospital complaining hoarseness and was then referred to us. A reddish tumor mass was recognized in the left vocal cord and the white light close-focus view identified abnormal vascular proliferation. Weaving and dilatation of abnormal vascular proliferation were more clearly visualized in NBI observation, thereby leading to a diagnosis of a malignant tumor. The lesion was treated with laser depolarization and pathologically diagnosed as a moderately-differentiated squamous cell carcinoma.

Images and comments by Dr. Y. Satou <ENF-VQ>

Acute Laryngitis (Left Vocal Cord)

Aged 69, male

▼white light

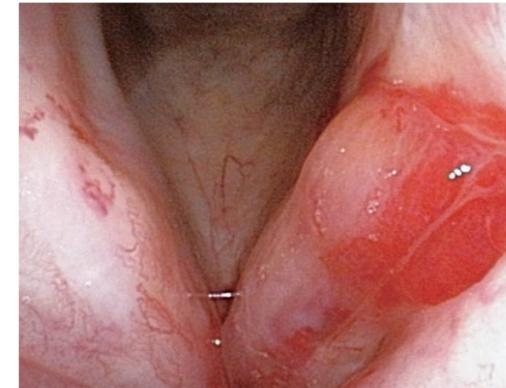


▼NBI



close-focus view

▼white light



▼NBI



1 month after vaporization

▼white light



▼NBI



Comment:

The patient visited us complaining hoarseness after receiving irradiation for a right laryngeal cancer. Reddish swelling was recognized in the left (unaffected side) vocal cord and the entire larynx was edematous due to radiation-induced laryngitis. Since the NBI close-focus view did not show the abnormal vascular proliferation, the lesion was diagnosed as a hematoma caused by acute laryngitis with no malignancy. The reddish lesion disappeared within 1 month as a result of administration of antibiotics and antiphlogistics.

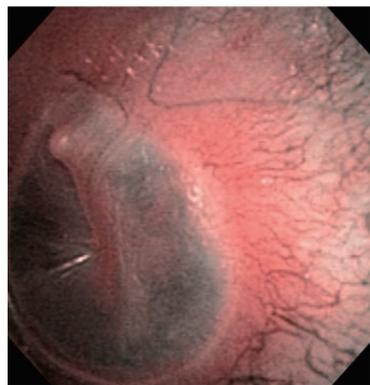
Images and comments by Dr. Y. Satou <ENF-VQ>

Normal Eardrum

▼white light



▼NBI



Comment:

With a normal eardrum, NBI can enhance visualization of superficial vessels running from up above along the malleus.

Images and comments by Dr. S. Takano <ENF-V2>

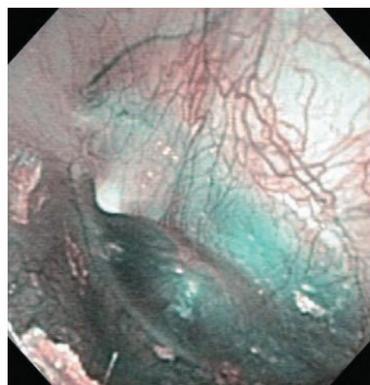
Eardrum during Crying

Aged 1, male

▼white light



▼NBI



Comment:

Dilation of relatively superficial vessels along the malleus was observed.

Images and comments by Dr. S. Takano <ENF-V2>

Acute Otitis Media (Bullae in Eardrum)

Aged 7, female

Before paracentesis

▼white light



▼NBI



▼white light

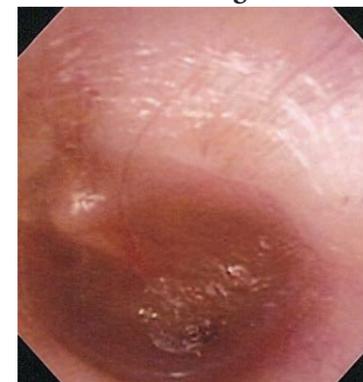


▼NBI

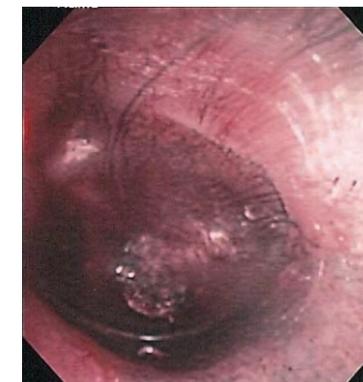


6th day after paracentesis

▼white light



▼NBI



Comment:

Views on the 2nd day after onset of acute left otitis media. NBI enhanced visualization of deeper vessels. After paracentesis, NBI could still enhance visualization of deeper vessels thus another incision was required.

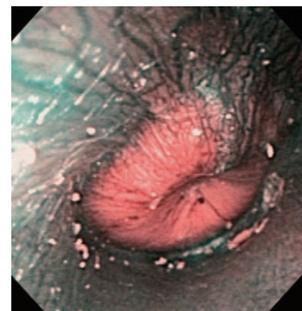
Images and comments by Dr. S. Takano <ENF-V2>

Acute Otitis Media (Fluid Retention in Eardrum)

▼white light



▼NBI

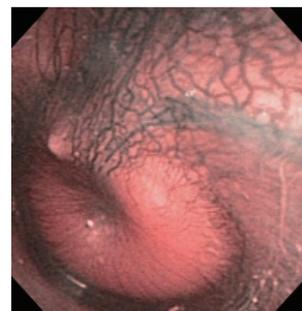


Aged 4, female

▼white light



▼NBI



Aged 5, female

Comment:

In the case of fluid retention in the eardrum, NBI was often able to enhance visualization of superficial vessels.

Images and comments by Dr. S. Takano <ENF-V2>

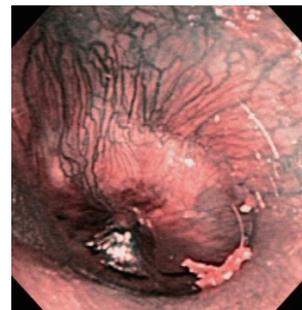
Acute Otitis Media (Eardrum Bulging)

Aged 11, female

▼white light



▼NBI



Comment:

In the case of a bulging eardrum, NBI was often able to enhance visualization of deeper vessels.

Images and comments by Dr. S. Takano <ENF-V2>

Acute Otitis Media (Eardrum Thickening)

Aged 3, female

Before
paracentesis

▼white light



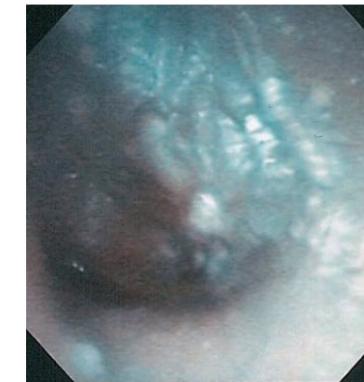
▼NBI



▼white light



▼NBI

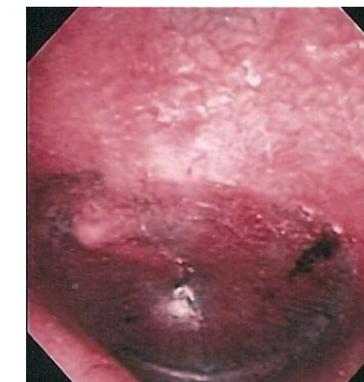


7th day
after
paracentesis

▼white light



▼NBI

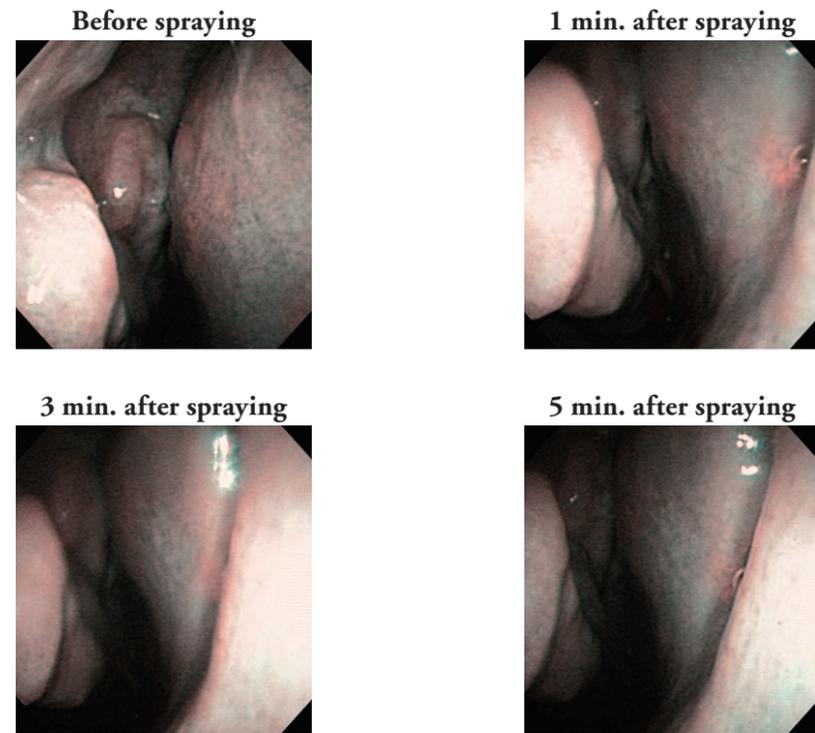


Comment:

In the case of eardrum thickening, NBI was not able to enhance visualization of the vessels clearly. Fluid pooled again after paracentesis. However, even NBI did not enhance visualization of the vessels and the lesion was cured completely without further intervention.

Images and comments by Dr. S. Takano <ENF-V2>

The Change Caused by 1:5000 Epinephrine Spraying

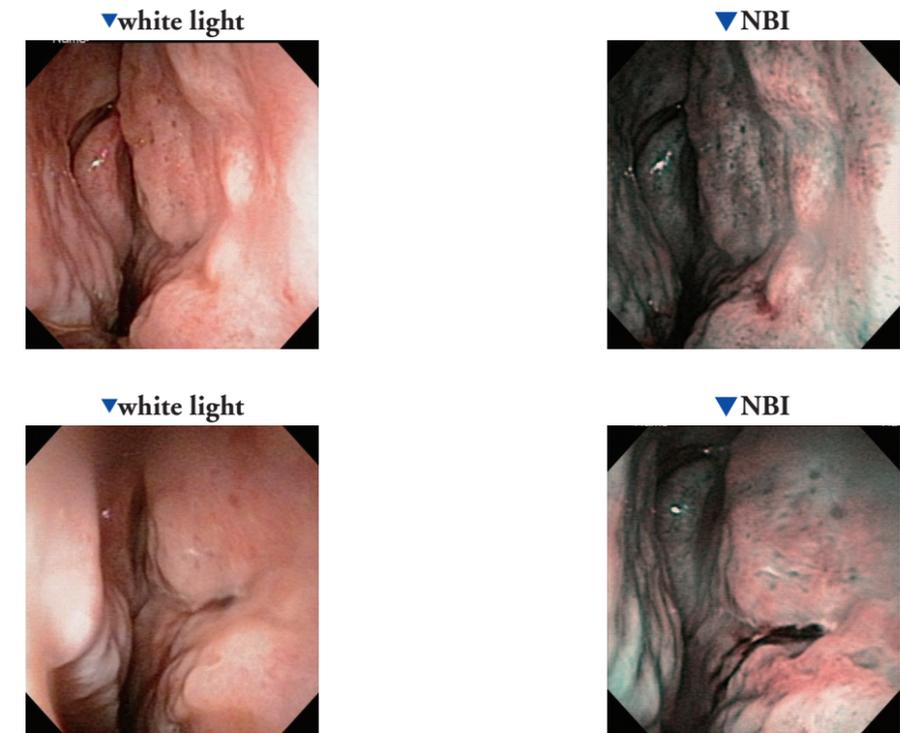


Comment:
3 to 5 minutes after spraying 1:5000 epinephrine into the nasal cavity for a few seconds, constriction of the deeper vessels in the nasal mucosa was identified with NBI.

Images and comments by Dr. S. Takano <ENF-V2>

Right Epistaxis (Hypertensive Epistaxis)

Aged 81, male

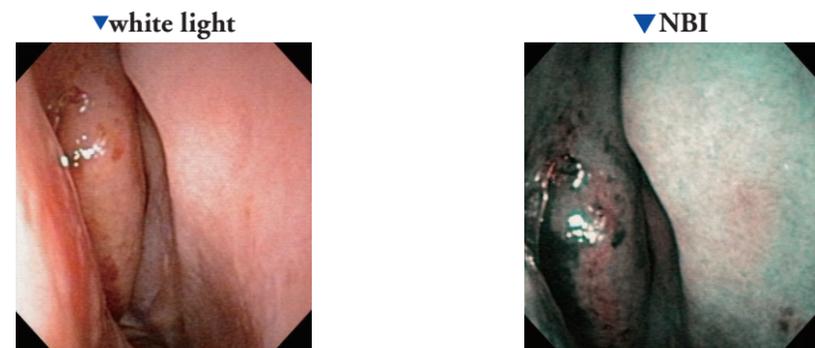


Comment:
Hypertensive epistaxis on the 2nd day after onset. The suspected bleeding region was identified on nasal septum with NBI before epinephrine spraying. However, 5 minutes after epinephrine spraying, it was possible to identify the bleeding region more clearly.

Images and comments by Dr. S. Takano <ENF-V2>

Right Epistaxis (Thrombocytopenia)

Aged 80, male

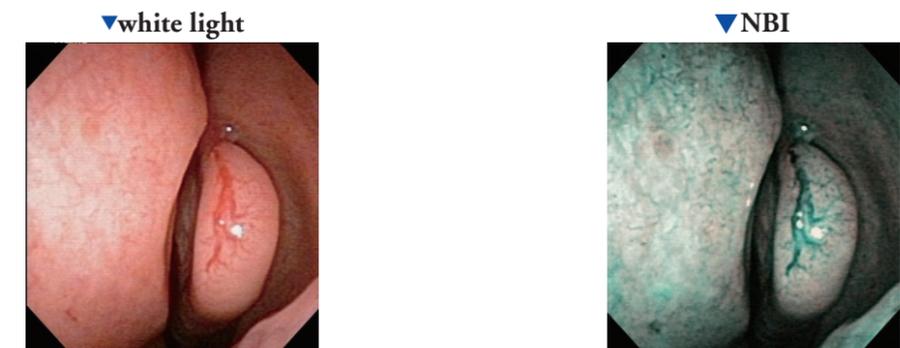


Comment:
The white light imaging suggested that the right epistaxis was bleeding from the middle meatus side of the middle nasal turbinate, and NBI was used to identify the deeper vessels.

Images and comments by Dr. S. Takano <ENF-V2>

Right Epistaxis (Hypertensive Epistaxis)

Aged 72, male



Comment:
The patient came to us reporting repeated epistaxis since the previous day. The bleeding was from the middle nasal turbinate. The vessels were identified clearly with white light imaging and NBI. Bipolar cauterization succeeded in the hemostasis.

Images and comments by Dr. S. Takano <ENF-V2>

Supervisor's Note

The development of NBI has facilitated recognition of intraepithelial vascular abnormalities that are hard to be identified with the naked eyes, and is expected to enable diagnoses of earlier cancers in the epithelium or the subepithelial layers. The resolution of OLYMPUS ENF TYPE VQ, which was used in these observations is 2.5 times that of the previous model (OLYMPUS ENF TYPE V2), making possible more detailed observations of weaving and dilatation of the intraepithelial abnormal vessels when used in combination with NBI. This is expected to improve the accuracy of the assessment of the extent of the cancer as well as differentiation of benign diseases. Above all, accurate diagnosis of benign diseases such as lymphoid follicles and inflammations is extremely important in reducing the physical and economic burdens on the patients by eliminating unnecessary examinations.

Yasuo Satou, M.D.

Department of Otorhinolaryngology, Kawasaki Municipal Kawasaki Hospital

We recently attempted to apply NBI in routine ENT examinations. We would like to express our deep gratitude to everyone who helped put this booklet together.

Many of acute otitis media cases are infants, making good communication skills are very important.

By sharing their point of view and making them comfortable, we should be able to photograph their eardrums using a 3.2 mm videoscope (VISERA RHINO-LARYNGO VIDEOSCOPE OLYMPUS ENF TYPE V2).

For nasal observation, we would like to emphasize the importance of findings after 1:5000 epinephrine spraying. That is, spraying for about 3 to 5 seconds inside the nose is sufficient.

Shinya Takano, M.D.

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Tokyo Women's Medical University Yachiyo Medical Center

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