

# New technique for laryngomicrosurgery: narrow band imaging-assisted video-laryngomicrosurgery for laryngeal papillomatosis

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## Abstract

**Objective:** In the present report, we describe the use of narrow band imaging during video-laryngomicrosurgery for laryngeal papillomatosis.

**Case report:** It is difficult to peri-operatively locate all the superficial papillomatous lesions when the disease is widespread, which then results in tumor recurrence. Therefore, we have constructed a narrow band imaging video-laryngomicrosurgery system, which we have used for two cases of laryngeal papillomatosis.

**Conclusion:** Our narrow band imaging-assisted video-laryngomicrosurgery system to visualise superficial laryngeal papillomatosis more clearly.

**Key words:** Laryngeal Papillomatosis; Narrow Band Imaging; Laryngoscopic Surgery

## Introduction

Laryngeal papillomatosis is one of the most common benign neoplasms. The incidence of recurrent respiratory papilloma is reportedly 4.3 per 100 000 among children and 1.8 per 100 000 among adults,<sup>1</sup> but it may have become more common in recent years. The onset of papilloma is spread in childhood and in adults. It is caused by the human papilloma virus (HPV), most commonly by HPV 6 and 11, although HPV 16 and 18 may rarely be encountered.<sup>2</sup> Multiple lesions may be observed in the vocal fold, supraglottis and occasionally in the subglottis. Papilloma presents with hoarseness and dyspnoea in rare cases.

The current treatment for laryngeal papillomatosis is surgery, which aims at debulking or evaporation of the tumor using a microdebrider and laser ablation. Peri-operatively, it is difficult to locate all the superficial papillomatous lesions when the disease is widespread. Therefore, recurrent lesions are often observed after treatment.

Narrow band imaging can be used for observing the superficial layer of the mucosa and can enhance abnormal angiogenesis using 390–445 and 530–550 nm wavelength bands. Narrow band imaging has recently been used for detecting early squamous cell carcinomas of the head and neck.<sup>3</sup> We have constructed a narrow band imaging-assisted video-laryngomicrosurgery system and used narrow band imaging during

video-laryngomicrosurgery for laryngeal papillomatosis in some cases.

## Case report

We have used narrow band imaging image at laryngomicrosurgery for the laryngeal papillomatous region more clearly. The system consisted of a video-laryngoscope (Karl Storz, Model IV Germany) with a high-definition charge-coupled device camera (Olympus, Visera Pro Japan) mounted on the head to provide narrow band imaging (Figure 1). The camera is usually used for laparoscopic operations.

### Case 1

A 40-year-old man with recurrent laryngeal papillomatosis underwent laryngomicrosurgery during which the tumor was treated by CO<sub>2</sub> laser evaporation and microdebrider debulking. However, the tumor subsequently regrew twice after intervals of 4–6 months. Adjuvantive medication, including cidofovir, was not administered. The third regrowth was observed in the right vocal fold. We treated the tumor by laryngomicrosurgery using a CO<sub>2</sub> laser. The affected area was limited, but we used narrow band imaging-assisted video-laryngomicrosurgery to facilitate a more detailed observation. Under xenon light, a tumorous lesion was noted in the right vocal fold (Figure 2). The narrow band imaging

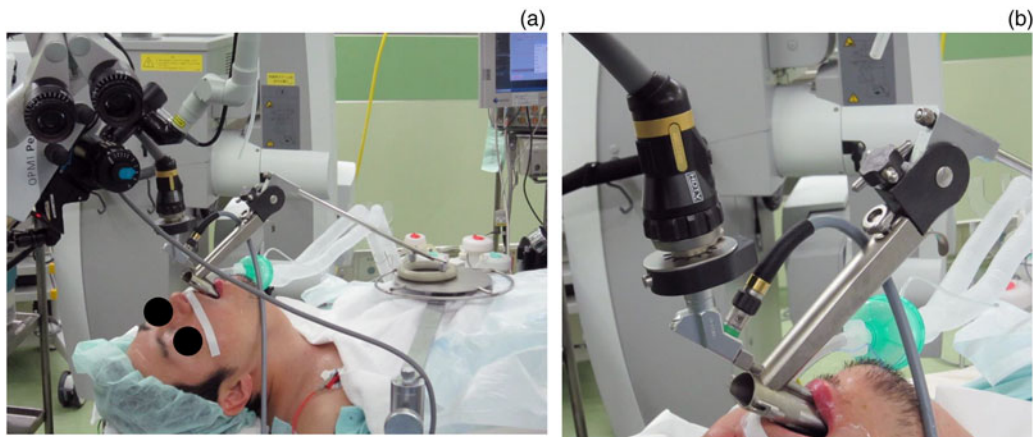


FIG. 1

View during the operation. (a) Far view. When the CO<sub>2</sub> laser is used, it is attached to the operation microscope. When the tumor is treated under narrow band imaging, the microscope light must be turned off. (b) Close-up view. The high-definition camera is mounted at the head of the endoscope.

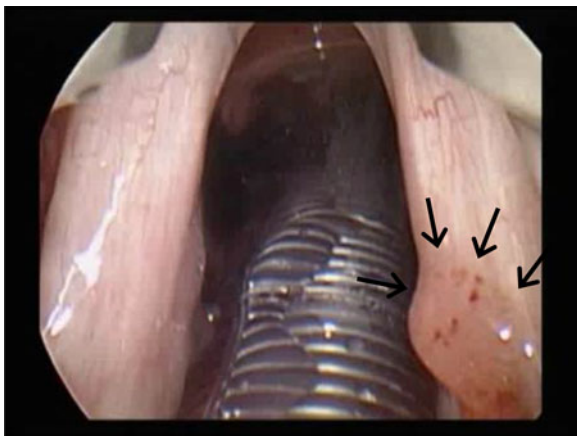


FIG. 2

Case 1: Image during the operation under white light showing the papillomatous lesion (arrows) in the right vocal fold.

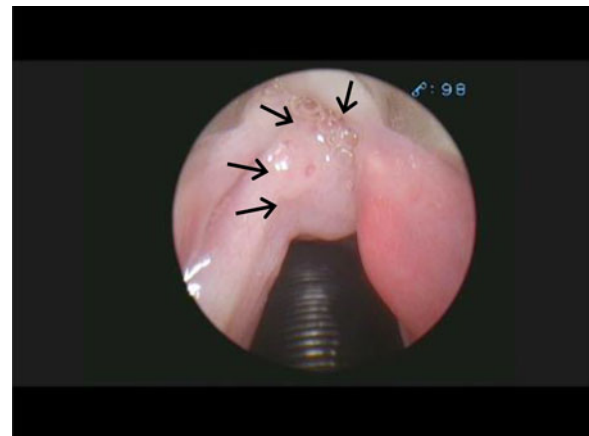


FIG. 4

Case 2: Image during the operation under white light. The papillomatous lesion (arrows) at the anterior commissure.

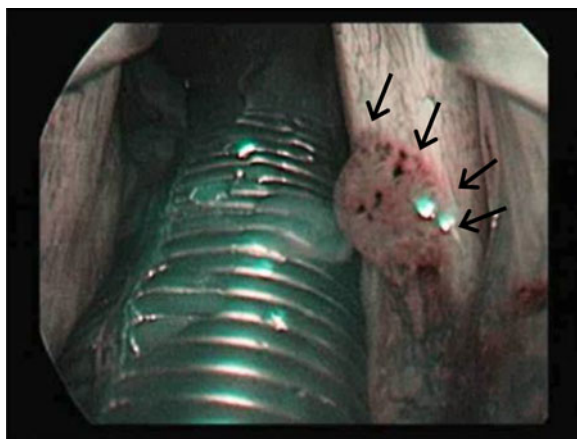


FIG. 3

Case 1: Narrow band imaging showing enhancement of the papillomatous lesion (arrows).

showed the papillomatous lesion more clearly, enhancing the visibility of the capillaries (Figure 3).

We performed the surgery under narrow band imaging using a microdebrider and CO<sub>2</sub> vaporisation. No recurrence of the tumor was observed for 12 months after the operation.

#### Case 2

A 53-year-old man with fifth recurrent laryngeal papillomatosis underwent laryngomicrosurgery. The tumor was found at the anterior commissure (Figure 4). The region is detected post-operation by narrow band imaging suggested with endoscopic findings. We used narrow band imaging-assisted video laryngomicrosurgery and could observe more details (Figure 5). We used CO<sub>2</sub> laser for evaporating the tumor and injected cidofovir.

#### Discussion

Narrow band imaging is an optical enhancement technique used for diagnosing malignant lesions – mainly of the mucosa. Since narrow band light is absorbed

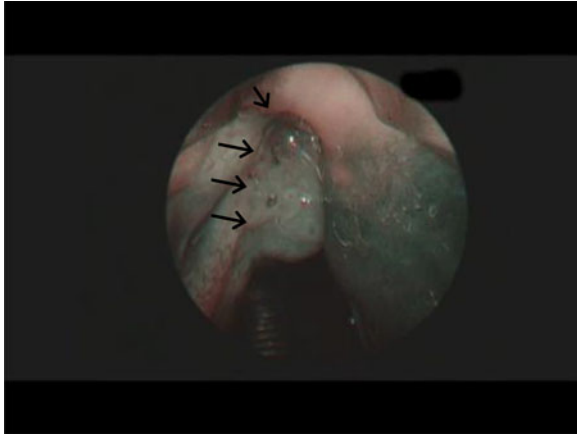


FIG. 5

Case 2: Narrow band imaging showing enhancement of the papillomatous lesion (arrows).

by hemoglobin, narrow band imaging enhances the microvascular structure and can assist in the identification of malignant lesions. The wavelength bands used in narrow band imaging are 390–445 and 530–550 nm. The former shows the capillaries of the superficial mucosa, whereas the latter reveals submucosal capillaries. Narrow band imaging has recently been applied to the head and neck area,<sup>1</sup> and was used for detecting cancerous lesions.<sup>2</sup> The sensitivity of narrow band imaging was found to be superior to that of white light imaging.<sup>3</sup> Narrow band imaging supported by flexible fiberscopy was recently used during a laryngomicrosurgery procedure.<sup>4</sup> It is a very simple method, but has some drawbacks: the inserted fiberscope is cumbersome, and it is not easy to observe and treat the papillomatous lesion simultaneously.

Laryngeal papilloma has characteristic findings, with red spots indicating neovascularisation. The current therapy involves debulking the tumour using laser evaporation and a microdebrider.<sup>5</sup> Adjunctive therapy can include the administration of drugs such as cidofovir or indole-3-carbinol.<sup>5</sup> Since laryngeal papilloma may have extensive lesions, it can be very difficult to detect all the affected areas at the time of operation. Pathological lesions are often overlooked, which may lead to tumor recurrence.

For treating the papillomatous region, it is very important to inspect the area precisely and vaporise all lesions. If we evaporate the mucosa blindly, then it gets scarred broadly, and the voice function may get worse. There are limitations in detecting papillomatous lesions by white light only, but narrow band imaging can enhance the pathological lesions of papilloma, so that they can be observed more clearly. Using the currently described method, lesions can be observed and treated simultaneously, since the optical source of the narrow band imaging is the video-laryngoscope.

The system is not made for laryngomicrosurgery, and so has some deficits. The focal length is limited, and sometimes the illumination of narrow band imaging is insufficient. As the angle of the endoscope is limited, the visualised area is limited to the anterior side and it is difficult to observe the posterior area. From these points the system is imperfect at the moment. This system is preliminary and a more perfect system will be constructed in the future. The same system could be used for checking tumor recurrence post-operatively, and we recognised the usability of this system. Thus, we believe that the narrow band imaging-assisted video-laryngomicrosurgery system is an innovative method, which could potentially be used for the routine treatment of laryngeal papilloma.

- **This is a new trial for visualising papillomatous regions more clearly during operation**
- **We report two cases of laryngeal papilloma and use of the narrow band imaging-assisted video-laryngomicrosurgery system**
- **The system can aid visualisation of papillomatous regions more clearly, but with some deficits**

### Sources of funding

None.

### References

- 1 Katada C, Nakayama M, Tanabe S, Koizumi W, Masaki T, Takeda M *et al.* Narrow band imaging for detecting metachronous superficial oropharyngeal and hypopharyngeal squamous cell carcinomas after chemoradiotherapy for head and neck cancers. *Laryngoscope* 2008;**118**:1787–90
- 2 Watanabe A, Tsujie H, Taniguchi M, Hosokawa M, Fujita M, Sasaki S. Laryngoscopic detection of pharyngeal carcinoma in situ with narrowband imaging. *Laryngoscope* 2006;**116**:650–4
- 3 Nguyen P, Bashizadeh H, Hodge R, Agnew J, Farah CS, Clarke B *et al.* High specificity of combined narrow band imaging and autofluorescence mucosal assessment of patients with head and neck cancer. *Head Neck* 2013;**35**:619–25
- 4 Imaizumi M, Okano W, Tada Y, Omori K. Surgical treatment of laryngeal papillomatosis using narrow band imaging. *Otolaryngol Head Neck Surg* 2012;**147**:522–4
- 5 Goon P, Sonnex C, Jani P, Stanley M, Sudhoff H. Recurrent respiratory papillomatosis: an overview of current thinking and treatment. *Eur Arch Otorhinolaryngol* 2008;**265**:147–51

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Competing interests: None declared