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**Review of oral and pharyngolaryngeal benign lesions detected during  
esophagogastroduodenoscopy**

Oral and pharyngolaryngeal benign lesions

Masaya Iwamuro, Kenta Hamada, Seiji Kawano, Yoshiro Kawahara, Motoyuki Otsuka

## **Abstract**

Recent advancements in endoscopy equipment have facilitated endoscopists' detection of neoplasms in the oral cavity and pharyngolaryngeal regions. Despite these advancements, limited studies have focused on benign lesions that can be observed during esophagogastroduodenoscopy in the oral and pharyngolaryngeal regions. Therefore, this mini-review aimed to provide essential information on such benign lesions, along with representative endoscopic images of dental caries, cleft palate, palatal torus, bifid uvula, compression by cervical osteophytes, tonsil hyperplasia, black hairy tongue, oral candidiasis, oral and pharyngolaryngeal ulcers, pharyngeal melanosis, oral tattoos associated with dental alloys, retention cysts, papilloma, radiation-induced changes, skin flaps, vocal cord paresis, and vocal fold leukoplakia. This article will be a valuable resource for endoscopists seeking to enhance their understanding of oral and pharyngolaryngeal lesions.

**Key Words:** Diagnosis; Esophagogastroduodenoscopy; Oral lesions; Pharyngolaryngeal lesions

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**Core Tip:** During esophagogastroduodenoscopy, various lesions other than squamous cell carcinoma can be detected in the oral cavity and pharyngolaryngeal regions. These include dental caries, cleft palate, palatal torus, bifid uvula, compression by cervical osteophytes, tonsil hyperplasia, black hairy tongue, oral candidiasis, oral and pharyngolaryngeal ulcers, pharyngeal melanosis, oral tattoos associated with dental alloys, retention cysts, papilloma, radiation-induced changes, skin flaps, vocal cord paresis, and vocal fold leukoplakia. Endoscopists must possess adequate knowledge

about these lesions and promptly identify and diagnose them during an endoscopic examination.

## **INTRODUCTION**

Recent advances in endoscopy equipment have enabled endoscopists to detect neoplasms in the oral cavity and pharyngolaryngeal region. In particular, image-enhanced endoscopy using narrow band imaging (NBI) or blue laser imaging (BLI) play an integral role in the endoscopic diagnosis of oral and pharyngolaryngeal cancers [1–4]. For instance, early-stage squamous cell carcinoma in the oral and pharyngolaryngeal regions typically exhibits a well-demarcated brownish area with irregular microvasculature on NBI or BLI, which resembles the features of early-stage esophageal cancer. A prospective, controlled cohort study on structured screening of the oropharynx, hypopharynx, and larynx using esophagogastroduodenoscopy revealed significantly increased detection rates of precancerous and early cancerous lesions compared with those without structured examination of the pharyngolaryngeal area [5]. A retrospective observational study revealed that the prevalence of pharyngeal cancer, which was detected during esophagogastroduodenoscopy using NBI, was 0.26% (29/11,050) [6]. These results reinforce the growing importance of screening examinations of the laryngopharyngeal area. However, despite the increasing number of articles on the endoscopic features and treatment of squamous cell carcinoma, few articles have focused on benign lesions occurring in the oral and pharyngolaryngeal regions. Herein, we present the endoscopic images of 17 types of lesions detected in the oral and pharyngolaryngeal areas, and review articles associated with these lesions.

## **DENTAL CARIES**

Dental caries, also known as dental cavities or tooth decay, are areas of the teeth that have been damaged and weakened by acid-producing bacteria. This damage results in a hole or pit in the tooth, which can cause pain, sensitivity, and other oral health problems [7]. Progressive damage results in significant destruction of the teeth. If the infection is left

untreated or becomes severe, the bacteria causing dental caries spread to other parts of the body *via* the bloodstream, i.e., sepsis, which is a life-threatening condition. Thus, it is important to diagnose dental caries promptly, and maintain good oral hygiene from the standpoint of internists. Furthermore, diabetes is significantly correlates with dental caries [8]. High blood glucose levels make the teeth and gums more susceptible to decay and periodontal diseases. Additionally, patients with diabetes may produce less saliva, leading to dry mouth, another factor that contributes to tooth decay. While visual dental examinations by dental professionals such as hygienists and dentists are crucial, esophagogastroduodenoscopy screening of teeth may be advantageous, particularly in individuals with diabetes. Unfavorable dental health and untreated cavities also lead to periodontal diseases, which are reportedly associated with an increased risk of certain digestive conditions, such as gastroesophageal reflux disease and peptic ulcers [9,10].

Dental caries are visible as discolored or darkened spots, rough or uneven surfaces, visible cavities or holes, or even grossly destroyed areas on teeth. Figure 1 shows representative images of grossly decayed teeth. A 28-year-old man (Case 1) underwent craniotomy for craniopharyngioma, and was treated for panhypopituitarism, diabetes insipidus, and diabetes mellitus. The intraoral view revealed multiple residual roots with carious lesions (Fig. 1A). In another 69-year-old man with diabetes mellitus (Case 2), esophagogastroduodenoscopy revealed a severely damaged tooth (Figure 1B, arrow).

### **CLEFT PALATE**

Cleft palate is a congenital anomaly characterized by a split or opening in the palate, which serves as a demarcation between the oral and nasal cavities. This condition arises from inadequate fusion of the tissues that form the palate during fetal development, and may manifest in varying degrees of severity, size, and location, affecting the soft palate (posterior part of the mouth), hard palate (anterior part of the mouth), or both [11–13]. In severe cases, fissures may extend into the nasal cavity. The global incidence of cleft lip and/or palate is approximately 1 in 700 Live births, signifying its substantial occurrence as a congenital anomaly [14]. Surgical intervention is the primary treatment modality for

cleft palate, although additional therapeutic measures, such as speech therapy and dental management, may be warranted.

A hole on the palate was observed in a 67-year-old man (case 3) during esophagogastroduodenoscopy (Figure 2). The patient had been previously diagnosed with cleft palate and mild dysarthria.

### **PALATAL TORUS**

Palatal torus, or torus palatinus, is a bony lump that develops in the hard palate. Protrusions are benign, non-neoplastic lesions caused by overgrowth of osseous tissue [15–17]. The palatal torus is typically round or lobed and varies in size. Treatment is not required because it is generally asymptomatic.

A 62-year-old man with maxillary cancer (Case 4) underwent esophagogastroduodenoscopy for cancer screening. A protruding lesion was identified in the roof of the mouth (Figure 3A, white light; Figure 3B, NBI). Computed tomography (CT) images showed a bony structure in the hard palate (Figure 3C), confirming the diagnosis of palatal torus. In this patient, although the CT scan was performed for maxillary cancer, the diagnosis of palatal torus was easily and definitively established through palpation of the protrusion with the index finger, thereby confirming its bony solidity.

### **BIFID UVULA**

Bifid uvula is a congenital anomaly in which the uvula is split into two lobes or appears notched [18,19]. The bifurcation of the uvula is considered a minor variation in the normal anatomy, and is usually not associated with any health problems. The prevalence of bifid uvula is estimated to be 0.4%–3.3% among the general population [20].

A uvula with a bisecting tip was unexpectedly identified in a 75-year-old woman (Case 5) (Figure 4A, white light; Figure 4B, NBI). As the patient did not present with either cleft palate or any discernible subjective symptoms, no intervention was deemed necessary for the bifid uvula.

### **COMPRESSION BY CERVICAL OSTEOPHYTE**

Compression by cervical osteophytes, which are bony outgrowths on the cervical vertebrae, can cause deformities in the oropharynx, hypopharynx, and larynx due to their proximity and pressure on these structures. As osteophytes grow and compress, they can lead to narrowing or obstruction of adjacent tissues [21–23]. The presence of a deformity in the pharyngolaryngeal region, specifically in proximity to the pyriform sinus, may pose a challenge during endoscope insertion. The diagnosis of cervical osteophytes is made based on CT imaging. Previous reports have suggested that a similar deformity may manifest with medialization of the common carotid artery [5].

Esophagogastroduodenoscopy revealed a submucosal bulge on the dorsal side of the oropharynx in an 87-year-old man (Case 6) (Figure 5A). CT images showed a bone protrusion on the anterior side of the cervical vertebra (Figure 5B). Another patient (69-year-old man, Case 7) exhibited deformation of the right dorsal side of the hypopharynx (Figure 5C). CT images revealed bone outgrowth on the right anterior side of the cervical vertebra (Figure 5B).

### **TONSIL HYPERTROPHY**

Tonsil hypertrophy can be caused by diverse etiological factors such as recurrent infections, allergies, and genetic factors. Tonsil hypertrophy can lead to several related issues depending on the severity and extent of enlargement [24]. The associated symptoms include difficulty in swallowing, breathing difficulties such as snoring or sleep apnea [25], chronic infections, speech problems, and changes in facial structure called “adenoid face.” Evaluation of the tonsils using sedatives is generally important before endoscopic examination because significant tonsil hypertrophy potentially causes breathing difficulties. If a patient has enlarged tonsils, a healthcare provider may choose to take additional precautions, such as adjusting the dosage of sedative medication, or monitoring the patient's breathing more closely during the sedation procedure. In addition, hypertrophic tonsils prevent endotracheal intubation [26].

A 23-year-old woman (Case 8) underwent screening *via* esophagogastroduodenoscopy, and hypertrophic tonsils were unexpectedly identified (Figure 6A, white light; Figure 6B, BLI). The patient was asymptomatic, therefore no therapeutic intervention was required for the tonsil hypertrophy.

### **BLACK HAIRY TONGUE**

Black hairy tongue manifests as a superficial, dark, and furry carpet-like growth on the tongue. The precise etiology of this lesion remains uncertain, although it is deemed to be a transient and benign condition that is linked to inadequate oral hygiene, tobacco use, and specific medications such as antibiotics [27–29]. Medical intervention is typically not necessary for black hairy tongue, despite its unattractive appearance. It can be resolved by maintaining better oral hygiene and eliminating causative agents, such as abstaining from smoking and refraining from the use of specific medications.

A 65-year-old man (Case 9) diagnosed with schizophrenia and advanced colon cancer, who had become incapacitated due to mental impairments, was admitted to our hospital. Esophagogastroduodenoscopy revealed a black hairy tongue (Figure 7A). A black hairy tongue was also observed in an 86-year-old woman (Case 10) diagnosed with polymyalgia rheumatica after administration of steroids (10 mg prednisolone) (Figure 7B).

### **ORAL CANDIDIASIS**

*Candida* sp. are commensal fungi that reside in the oral mucosa. However, in individuals with compromised immune systems, they can become pathogenic and instigate opportunistic infections. Oral candidiasis can be caused by different species of *Candida*, among which *Candida albicans* is the most common pathogen. Other species that can cause oral candidiasis include *C. glabrata*, *C. tropicalis*, *C. parapsilosis*, and *C. krusei*. Oral candidiasis, also known as oral thrush, is characterized by white or creamy plaques within the mouth [30–32]. Antifungal medication and proper oral hygiene practices are effective for the treatment of oral candidiasis.



Physical examination revealed white adhesions in the mouth of a 63-year-old woman with hypertension and chronic thyroiditis (Case 11). Esophagogastroduodenoscopy revealed multiple white plaques in the oral cavity, pharynx, larynx, and esophagus (Figure 8). A biopsy of the white lesions showed fungi, confirming the diagnosis of oral, pharyngolaryngeal, and esophageal candidiasis.

### **CORROSIVE INJURY**

Corrosive injury in the oral and pharyngolaryngeal regions occurs following exposure to corrosive agents, including acids, alkalis (bases), or other potent chemicals [33]. The ingestion of corrosive substances primarily occurs as acts of deliberate self-harm in adults and accidentally in children. Corrosive substances can induce profound harm upon contact with the mouth, throat, and larynx. According to a study investigating individuals who ingested ammonia, 69.8% of patients (30 out of 43) displayed oropharyngeal lesions [34]. The severity of the injury is contingent upon multiple factors, including the concentration, volume, and duration of exposure to the corrosive substance, as well as the nature of the chemical involved. Reports indicate that early endoscopy within 12–24 h after ingestion enables careful assessment of anatomical disruptions in the oropharyngolaryngeal areas [35] and the esophagus, stomach, and duodenum.

### **ORAL AND PHARYNGOLARYNGEAL ULCERS**

The manifestation of oral and pharyngolaryngeal ulcers stems from their diverse etiologies. Differential diagnosis depends on the patient's history, physical examination findings, and any accompanying symptoms. Common differential diagnoses include bacterial (e.g., *Streptococcus* sp.) and viral infections (e.g., herpes simplex virus, Epstein-Barr virus, cytomegalovirus, and Coxsackie virus), autoimmune disorders (e.g., Behcet's disease, systemic lupus erythematosus, and Crohn's disease), skin diseases (e.g., pemphigus vulgaris and mucous membrane pemphigoid), trauma (e.g., biting and scratching), allergic reactions, chemical irritation, and neoplasms [36,37]. Thus,

physicians must uncover the underlying cause of the disease in patients with chronic relapsing or intractable ulcers in the oral and pharyngolaryngeal regions.

A 64-year-old woman (Case 12) was referred to our hospital for evaluation of oral ulceration and fever. During her hospitalization, the patient developed macrocytic anemia and neutropenia. Subsequent bone marrow examination led to a diagnosis of myelodysplastic syndrome with trisomy 8. Colonoscopy revealed multiple ulcers involving Bauhin's valve, and esophagogastroduodenoscopy revealed ulcers in the oral cavity (Figure 9). Behçet's disease-like symptoms have been reported to arise in conjunction with myelodysplastic syndrome involving trisomy 8 [38].

### **MELANOSIS**

Melanosis is characterized by the presence of dark pigmentation in the epithelium. Melanosis in the oral and pharyngolaryngeal regions is also known as smoker's melanosis, as it typically manifests in up to 30% of chronic smokers and gradually regresses following smoking cessation [39]. One study demonstrated a robust correlation between the presence of melanosis and elevated susceptibility to squamous cell carcinoma in the oral cavity, pharynx, larynx, or esophagus [40]. These results suggest that screening for squamous cell carcinoma is important in patients with melanosis.

In a 58-year-old man (Case 13) with advanced esophageal cancer (Figure 10A), melanosis was identified in the pharynx (Figure 10B). The patient had a history of smoking 20 cigarettes daily for 39 years.

### **ORAL TATTOOS ASSOCIATED WITH DENTAL ALLOYS**

Oral tattoos, also known as amalgam tattoos or intraoral tattoos, are characterized by pigmentation or staining of oral tissues, most commonly affecting the gingiva and mucosa of the oral cavity [41–43]. Discoloration arises from exposure to dental restorative materials containing metals including amalgam, gold, and various alloys. Although oral tattoos are generally considered benign and do not cause any symptoms, they can be a source of cosmetic concerns. Additionally, in some instances, they can be misdiagnosed

as oral melanoma or other pigmented lesions, warranting an appropriate diagnosis and follow-up by a dental professional or otolaryngologist.

Multiple points of black pigmentation were identified bilaterally on the buccal mucosa of a 68-year-old man (Case 14) (Figure 11) [42]. We performed an endoscopic biopsy of the lesion to exclude melanoma, which revealed no neoplastic cells. Since the pigmented lesions were adjacent to the metal crowns of gold-silver-palladium alloys, we diagnosed oral tattoos associated with dental restorative materials.

### **RETENTION CYSTS**

Retention cysts are the most prevalent benign lesions of the pharyngeal and laryngeal mucosa. These cysts are lined with epithelial tissue and are characterized by the presence of serous or mucous fluid [44,45]. The pathogenesis of these cysts is believed to involve dilation and obstruction of the mucous gland ducts within the lamina propria or deeper layers of the pharyngolaryngeal region due to the retention of secretions and/or chronic inflammatory processes. Most small and asymptomatic cysts do not require treatment. However, larger cysts or those causing significant symptoms, such as dysphagia, dysphonia, or respiratory distress, may require intervention.

Figures 12A and B show a retention cyst incidentally observed on the ventral side of the epiglottis in a 60-year-old man (Case 15) during esophagogastroduodenoscopy (Figure 12A, B). In an 80-year-old woman (Case 16), a retention cyst was identified on the left side of the epiglottis (Figure 12C). Neither of the patients exhibited any symptoms associated with the presence of epiglottic cysts.

### **PAPILLOMA**

Papillomas in the oral and pharyngolaryngeal regions are benign tumors that generally present exophytic growth with wart-like projections [46,47]. The microscopic features of pharyngeal papillomas typically include papillary architecture, hyperkeratosis, koilocytosis, and fibrovascular cores. Considering the benign nature of papillomas, treatment is reserved only for symptomatic cases.

Reddish wart-like projections were observed on the uvula of a 67-year-old man (Case 17) during esophagogastroduodenoscopy (Figure 13A). Magnifying NBI revealed dilated microvasculature, arranged in an orderly manner, and demarcated into clusters (Figure 13B). Histopathological examination of the endoscopic biopsy specimen confirmed a diagnosis of papilloma.

### **RADIATION-INDUCED CHANGES**

Radiation therapy is used to treat malignant lesions in the oral cavity, pharynx, and larynx [48,49]. This therapeutic modality induces several mucosal alterations, including mucosal erythema, friability, erosion, and angiectasia. Caution is required during endoscopic observation of irradiated regions, as differentiating between neoplastic lesions (i.e., recurrence of cancer) and radiation-induced mucosal alterations may be challenging.

A 58-year-old man who had undergone radiotherapy for laryngeal cancer (Case 18) showed patchy redness in the pharyngolaryngeal region (Figure 14A). Another 70-year-old man with a history of laryngeal cancer treated with radiotherapy (Case 19) showed vascular dilatation in the larynx (Figure 14B), which was observed more strongly on BLI (Figure 14C).

### **SKIN FLAP**

In reconstructive surgery for oral and pharyngeal defects, skin flaps or skin grafts are sometimes used for both functional and cosmetic restoration. Differentiation between these techniques is defined by vascularization, as a skin graft relies on the vascular bed of the recipient site for blood supply, whereas a skin flap retains its intrinsic blood supply from the donor site [50,51].

We performed a screening esophagogastroduodenoscopy in a 68-year-old man (Case 20). The patient underwent surgery for laryngeal cancer and reconstruction with a pectoralis major myocutaneous flap. Esophagogastroduodenoscopy revealed a clearly demarcated, yellowish-white skin flap through the pharynx, larynx, and esophagus

(Figure 15A, white light; Figure 15B, NBI). In a 71-year-old man who underwent reconstructive surgery for laryngeal cancer (Case 21), a pectoralis major myocutaneous flap was observed during esophagogastroduodenoscopy (Figure 15C).

### **VOCAL CORD PARESIS**

Paresis of the vocal cords denotes a condition in which one or both the vocal cords suffer an impairment in their motility or function [52,53]. The possible etiologies of vocal cord paresis include congenital factors, infectious agents, neoplasms, traumatic incidents, endocrine diseases (e.g., thyroid disorders), and systemic neurological disorders. Hoarseness, breathiness, dysphonia, dysphagia, and/or dyspnea may occur because of vocal cord paresis.

A 65-year-old man (Case 22) underwent surgery for advanced esophageal cancer. His right recurrent laryngeal nerve was injured during surgery, resulting in unilateral vocal cord paresis. Subsequent esophagogastroduodenoscopy revealed that the right vocal cord displayed no movement during respiration (Figure 16A) and phonation (Figure 16B) owing to paresis.

### **VOCAL FOLD LEUKOPLAKIA**

Vocal fold leukoplakia, also known as laryngeal leukoplakia, refers to the manifestation of white patches or plaques on the mucosa of the vocal cords [54,55]. Smoking or chewing tobacco is a primary risk factor for the development of vocal fold leukoplakia. In addition, this condition is commonly linked to excessive alcohol consumption, viral infections such as human papillomavirus, chronic laryngopharyngeal reflux, and voice misuse [56]. It is important to note that the term “leukoplakia” does not indicate a specific histological diagnosis, as it encompasses several histological features, including benign, premalignant, and malignant lesions [57]. Although excisional surgery is the primary modality for treating vocal fold leukoplakia, a definitive threshold for surgical intervention remains elusive owing to the need for judicious therapeutic decision-making that optimizes both vocal function and oncologic safety [58]. Consequently, referral to an

otolaryngologist is a crucial step when vocal fold leukoplakia is identified during esophagogastroduodenoscopy.

Figure 17 shows vocal fold leukoplakia observed in a 68-year-old man (Case 23). A whitish nodular lesion was observed mainly on the left side of the vocal fold (Figure 17A), which was emphasized on NBI (Figure 17B). The patient had undergone a biopsy of the leukoplakia lesion at 64 years of age. A pathological diagnosis of dysplasia was made, and the vocal fold lesion was under active surveillance by otolaryngologists.

### **CONCLUSION**

We presented representative endoscopic images of dental caries, cleft palate, palatal torus, bifid uvula, compression by cervical osteophytes, tonsil hyperplasia, black hairy tongue, oral candidiasis, oral and pharyngolaryngeal ulcers, pharyngeal melanosis, oral tattoos associated with dental alloys, epiglottic cysts, papilloma, radiation-induced changes, skin flap, vocal cord paresis, and vocal fold leukoplakia. The images show various lesions observed in the oral and pharyngolaryngeal regions during esophagogastroduodenoscopy. While it is essential to consult otolaryngologists or dentists when the diagnosis cannot be established by endoscopists, the benefits of acquiring foundational knowledge concerning oral and pharyngolaryngeal lesions and identifying them for the welfare of patients cannot be denied. We believe that this mini-review will be valuable to endoscopists seeking to enhance their understanding of oral and pharyngolaryngeal lesions.

### Figure Legends

Fig. 1. Endoscopic images of dental caries. A: Case 1. A 28-year-old man with panhypopituitarism, diabetes insipidus, and diabetes mellitus had multiple residual roots and carious lesions. B: Case 2. A 69-year-old man with diabetes mellitus also had a severely damaged tooth (arrow).

Fig. 2. Endoscopic images of cleft palate. A and B: Case 3. A 67-year-old man had a hole in the palate (arrow). The patient was previously diagnosed with cleft palate and mild dysarthria.

Fig. 3. Endoscopic and CT images of palatal torus. A–C: Case 4. A protruding lesion was identified in the roof of the mouth of a 62-year-old man. A: White light. B: Narrow band imaging. C: CT image showing a bony structure in the hard palate. CT: Computed tomography

Fig. 4. Endoscopic images of bifid uvula. A&B: Case 5. A 75-year-old woman had a uvula with a bisecting tip. A: White light. B: Narrow band imaging.

Fig. 5. Endoscopic and CT images of compression by cervical osteophyte. A: Case 6. An 87-year-old man had a submucosal bulge on the dorsal side of the oropharynx (arrow). B: Case 6. CT imaging showed a bone protrusion on the anterior side of the cervical vertebra (arrow). C: Case 7. Deformation was observed on the right dorsal side of the hypopharynx in a 69-year-old man (arrow). D: Case 7. CT image showing outgrowth of the bone of the cervical vertebra (arrow). CT: Computed tomography

Fig. 6. Endoscopic images of tonsil hyperplasia. A and B: Case 8. Hypertrophic tonsils were unexpectedly identified in a 23-year-old

woman who underwent screening esophagogastroduodenoscopy. A: white light; B: blue laser imaging.

Fig. 7. Endoscopic images of black hairy tongue. A: Case 9. A 65-year-old man with schizophrenia and advanced colon cancer presented with black hairy tongue (arrows). B: Case 10. A black hairy tongue was observed in an 86-year-old woman with polymyalgia rheumatica.

Fig. 8. Endoscopic images of oral candidiasis. A and B: Case 11. A 63-year-old woman had multiple white plaques in the oral cavity, pharynx, larynx, and esophagus. Endoscopic biopsy revealed fungal infection, confirming the diagnosis of candidiasis.

Fig. 9. Endoscopic images of oral and pharyngolaryngeal ulcers. A and B: Case 12. A 64-year-old female patient was diagnosed with myelodysplastic syndrome with trisomy 8. The patient had multiple ulcers in the oral cavity. A: White light; B: Narrowband imaging.

Fig. 10. Endoscopic images of pharyngeal melanosis. A: Case 13. A 58-year-old man presented with advanced esophageal cancer. B: Case 13. The patient had melanosis in the pharynx.

Fig. 11. Endoscopic images of oral tattoos associated with dental alloys. A and B: Case 14. Multiple points of black pigmentation were identified on the bilateral buccal mucosa of a 68-year-old man (arrow). The pigmented lesions were adjacent to the metal crowns of the gold-silver-palladium alloys.

Fig. 12. Endoscopic images of retention cysts. A and B: Case 15. A 60-year-old man had a retention cyst on the ventral side of the epiglottis (arrows). A: White light; B: Blue laser imaging. C: Case 16. An 80-year-old woman also presented with a retention cyst on the left side of the epiglottis (arrow).

Fig. 13. Endoscopic images of papilloma. A and B: Case 17. A 67-year-old man had reddish wart-like projections on the uvula. A:



White light; B: Magnified observation with narrow band imaging. Papilloma was diagnosed based on the pathological analysis of the biopsied specimen.

Fig. 14. Endoscopic images of radiation-induced changes. A: Case 18. A 58-year-old man who had undergone radiotherapy for laryngeal cancer developed patchy redness. B and C: Case 19. A 70-year-old man with a history of laryngeal cancer treated with radiotherapy shows vascular dilatation of the larynx (arrows). A: White light; B: Blue laser imaging.

Fig. 15. Endoscopic images of skin flap. A and B: Case 20. In a 68-year-old man who underwent surgery for laryngeal cancer and reconstruction with a pectoralis major myocutaneous flap, esophagogastroduodenoscopy revealed a clearly demarcated yellowish white skin flap. A: White light; B: Narrow band imaging. C: Case 21. A pectoralis major myocutaneous flap was observed in a 71-year-old man who underwent reconstructive surgery for laryngeal cancer.

Fig. 16. Endoscopic images of vocal cord paresis. A and B: Case 22. Esophagogastroduodenoscopy of a 65-year-old man with right vocal cord paresis revealed that the right vocal cord displayed no movement during respiration and phonation. A: Respiration; B: Phonation.

Fig. 17. Endoscopic images of vocal fold leukoplakia. A and B: Case 23. A 68-year-old man presented with leukoplakia of the vocal fold (arrow). Therefore, a pathological diagnosis of dysplasia was made. A, White light; B, Narrow band imaging.

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