

Chapter 42

Laryngology-related NBI® literature review

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Abstract

Here we review the most contemporary NBI® literature pertaining to laryngeal applications. This review is based on PubMed and Google Scholar listings as of July 7th, 2015 and on personal communications.

Keywords: *NBI®, larynx, histology, malignant and non-malignant findings, efficacy, neo-angiogenic findings, new technology, in-office applications, OR applications, Ni classification, IPCL*

Introduction

Narrow Band Imaging (NBI®) is an endoscopic visualization system produced by Olympus (Japan) utilizing technology that splits the white light (WL) spectrum into 415 µm and 540 µm frequency bands [1]. These frequencies are attracted by hemoglobin and therefore highlight vascular, or neo-angiogenic, presence in the mucosa. NBI® applications have been proven very useful in detecting vascular changes associated with malignant changes in many human tissues, but NBI® applications to the larynx are just beginning to emerge. One review article written in 2008 stated that although NBI® is used extensively in the lower aero-digestive system, NBI® use in the head and neck region is rare, specifically in the oropharynx and the hypopharynx [2]. Only after 2008, by our estimation reviewing the literature, did reports of NBI® applications in the larynx begin to appear in the world literature.

Malignancy

Since that time, NBI® literature about its application to the larynx is growing, albeit slowly, and primarily discusses malignant changes [3]. From the very beginning, the use of NBI® in patients suspected of having laryngeal cancer led to an early detection of abnormal microvascular changes, specifically to the identification of intraepithelial papillary capillary loops (IPCL). Accordingly, NBI® was also deemed useful in distinguishing between low- and high-grade dysplasias. There was also a general agreement that, as in other areas of the body, NBI® of the laryngeal mucosa will help to detect changes in the microvasculature that can be useful in distinguishing nonmalignant from malignant laryngeal lesions.

The most quoted work so far on NBI® diagnosis of laryngeal precancerous and cancer laryngeal lesions is known as the Ni classification [4]. This research team performed NBI® studies on 104 laryngeal lesions (of which 45 were benign and 59 were malignant) and correlated the NBI® morphological changes with histopathologic findings. They categorized 5 recognizable types of lesions. Types I-IV changes were associated with benign lesions. The changes were progressive distortion (arborization and dilatation) of the superficial blood vessels (I-III) and the detection of faint, speckled vascular dots described as intraepithelial papillary capillary loops- IPCLs (III-IV). These types were associated with

a variety of benign lesions such as polyps, laryngitis, squamous hyperplasia and mild dysplasia. Type V lesions were strongly associated with prominent IPCL formation and subsequent IPCL fragmentation (subtypes a, b, c). The Ni group stated that Type Va patterns were present in 84% of patients with invasive carcinoma (mild to severe dysplasia or carcinoma in situ) while Types Vb and Vc were associated with diagnosis of invasive cancer in 100% of cases.

In summary, they reported WL endoscopy had a 68.9% sensitivity and 89.8% specificity, while NBI® had a 88.9% sensitivity and 93.2% specificity for identifying cancer. In particular, NBI® observations were much more sensitive than WL evaluations.

Non-malignancy

Non-malignant NBI® findings are typically reported about NBI® examinations of the laryngeal mucosa associated with the human papilloma virus (HPV) [3-10]. Other non-malignant mucosal changes than those associated with recurrent respiratory papillomatosis (RRP) are essentially non-existent with the exception of not yet cancerous dysplastic changes previously cited in the Ni et al. paper [3]. However, other non-malignant laryngeal mucosal changes may also involve vascular components and NBI® is beginning to characterize these lesions [10]. A preliminary discussion on how NBI® aids in identifying the formation, diagnosis, and treatment of these non-malignant vascularized mucosal glottic lesions is presented in Chapter 45 of this volume.

Utility

Because NBI® is a relatively new technology, it is just beginning to be utilized in the assessment of laryngeal tissues. Early experience with laryngeal cancer and RRP have led to recommendations for potential usage in 3 clinical scenarios. Reports on using NBI® both in the office setting for initial diagnosis and post-treatment surveillance [5, 13-14] as well as in the operating room to guide lesion resection margins [5, 14-16] are now appearing in the literature. However, success appears to be dependent on the clinical experience of the endoscopist, as a Belgian study [12] found that it is possible to miss carcinoma in NBI® negative patients, suggesting an expected learning curve.

Currently three potential limiting factors for NBI® utility have been noted. Studies suggest that optimized NBI® images require coupling with HDTV monitoring [5], images with no adverse conditions masking glottic findings (blocking of wavelengths transmissions) [8, 17], or image quality limited by magnification (reported in pharyngeal cancer cases) [18].

Conclusions

Our own clinical experience supports the usefulness of NBI® in diagnostics and in follow-up procedures of both malignant and benign (non-malignant) mucosal laryngeal changes, even outside of RRP [10]. Further experience with this new technology will refine its place in clinical laryngology practice.

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