Chapter 43
The Russian NBI® endoscopy experience.
A modern method in early differential diagnostics of laryngeal benign and malignant mucosal changes
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Abstract
Here we discuss the significance and the effectiveness of NBI® endoscopy in the early differential diagnostics of laryngeal tumors and vascularized lesions, based on our NBI® experience at The Federal Research Clinical Centre of Otorhinolaryngology in Moscow, Russia. We conclude that this novel optical technology is of paramount significance in the early identification of pathological (malignant and viral) changes in the laryngeal structures.

Keywords: NBI® endoscopy, larynx cancer, pre-cancerous states, neoplasms, early diagnostics

Introduction
Historically, NBI® endoscopy was used in the Russian Federation, as it was the case in other countries, in gastroenterology, gynecology, and urology. NBI® endoscopy use in otorhinolaryngology services dates back to 2009, and was introduced by Professor Kozlov. He and his colleagues initiated, in cooperation with the Otorhinolaryngology Department of the Central Clinical Hospital and with the Hospital of Administrative Department of the President of Russian Federation, a research project to study the advantages of NBI® endoscopy in the diagnostics of tumor cells in a nasal cavity, in paranasal sinuses, and in the nasopharynx [1].

In 2010, Dr. Kirasirova and her colleagues, in cooperation with The L. Sverzhevsky’s Scientific Research ENT Clinical Center, initiated a research protocol aimed at increasing the effectiveness of NBI® endoscopy and of endolaryngeal and endotracheal ultrasonic scanning in the diagnosis of laryngeal and tracheal injuries. They studied 58 patients of different age and gender with chronic laryngostenosis and tracheal stenosis. The mucosa was studied with NBI® in the preoperative stage and the postoperative period. Their findings contributed to a change in the pharmacological basis of treatment. They also demonstrated that NBI® endoscopy was not very effective in showing the erosive and ulcerous changes of the tracheal mucosa or of the fibrinous exudate in a florid stage of suppurative inflammation. However, the main outcome of their research proved that a combination of NBI® endoscopy with ultrasonic scanning of the larynx and the trachea enhanced the diagnostics of laryngeal and tracheal stenosis, and helped to identify the best available treatments [2].
Subsequently, we and other investigators have conducted numerous NBI® examinations of the larynx. For example, in 2013, an important research protocol was developed by Dr. Romanenko of L. Sverzhevski Scientific Research Clinical ENT Centre. After the examination of 36 patients with different larynx pathologies, such as carcinoma in situ and epithelial dysplasia, the high diagnostic value of NBI® endoscopy was discovered histologically [3].

The ENT Center of the Sechenov Moscow State Medical University has also actively used NBI® endoscopy and contact endoscopy since 2013. Their work, under the supervision of Dr. Svistushkin, has shown a high diagnostic yield of NBI® endoscopy in the early differential diagnosis of growths of the upper airways. Results revealed improved diagnostics opportunities by combining these two methods [4].

Our resources and methods

We have been using NBI® Olympus OEV261H tower with CV-170 videosystem techniques only since 2014. All cases referred to the department are routinely examined with NBI® (since 2014), white light (WL), and laryngovideostroboscopy (LVS). In the period of 2014-2015, 309 patients with different laryngeal pathologies were examined in this fashion. The NBI® results are evaluated using Takano classification [5].

Results and discussion

NBI® results from our patient cohort showed the prevalence of benign pathologies, yet some malignancies were also identified. Chronic hypertrophic laryngitis was a most common condition and was found in 122 patients, or in 39.48% of all cases. Cicatrical stenosis was found in ten patients representing 3.24% of the population studied. Traditional vocal fold nodules were found in 78 patients (25.24%), contact ulcer unilateral granuloma of the arytenoids was localized in ten patients (3.24%), and vocal folds cysts were present in 30 patients (9.7%) while vocal polyps were identified in 47 patients (15.21%) of the cohort. Laryngeal papillomatosis was observed in ten patients (3.24%) of this group. Bamboo-nodes (B-nodes), an extremely rare laryngeal condition, was found in 2 cases (0.65%).

Figure 1. Supraglottic view of the larynx with cancer in situ under WL (A) as well as NBI® illumination (B) showing 2nd-3rd stage dysplasia.
Two patients (0.65%) showing laryngeal growths displayed sites of neoangiogenesis which corresponded with high level of dysplasia. One patient was diagnosed by histology with carcinoma in situ (Figure 1). One other patient (Figure 2) was diagnosed by histology with atypical papillary keratosis with local dysplasia of 3rd stage, dysfunction of epithelium stratification, and koilocytosis. Figure 3 shows a papilloma case on the anterior portion of the right vocal fold.

Figure 2. Growth on the right vocal fold under WL (A) and NBI® illumination (C), and at the anterior laryngeal commissure with hyperkeratosis and dysplasia of 3rd stage under WL (B) and NBI® illumination (D).

Figure 3. Papilloma of the right vocal fold under WL (A) and NBI® illumination (B).
Conclusions

The Phoniatrics Department of Federal Research Clinical Centre of Otorhinolaryngology, Russian Federation Ministry of Public Health in Moscow, has utilized laryngeal NBI® endoscopy since 2014 in diagnostic, preoperative, and postoperative periods as well as on postoperative follow-up visits. Thus far, 309 exams were performed (February 8, 2016). These laryngeal examinations have resulted in achieving important clinical goals: 1) evaluating operative therapy, medications, or the effectiveness of radiotherapy; 2) providing qualitative regular control over patients by aiming at early diagnostics of recurrence; 3) detecting pre-cancer states; and 4) improving patient management.

Our results support the clinical effectiveness of NBI® endoscopy. In our opinion, active implementation of NBI® technology together with other endoscopic techniques in the ENT practice will assist in solving the dilemma of differential diagnosis of laryngeal pathologies. The detection of reorganization of capillaries observed on NBI® (e.g., branching, spiral-shaped vessels with changed diameter, vascular slings, concentration of capillary architectonics, dysfunction of epithelium structures) typically suggest epithelial neoplasia and assists in the choice of the best treatment method.

It is important to notice that the success of early cancer diagnostics by NBI® endoscopy is highly dependent on the experience of the examiner, idiosyncratic perception of colors, and the ability to interpret the derived visual data. As there is still no standard pattern of description of pathological conditions of the various ENT tissues highlighted by NBI® endoscopy, we must conclude that interpretation of NBI® endoscopic results remain subjective in many cases.

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References

3. Романенко, С., Мальцева, И., Красникова, Д., Иноземцев, А., 2013. Дифференциальная диагностика предраковых заболеваний гортани при помощи NBI – эндоскопии. Материалы I Междисциплинарного конгресса по заболеваниям органов головы и шеи. Онкохирургия. № 5. Специальный выпуск №1. – С. 95-96.