The Use of Methylene Blue in Early Detection of the Vocal Fold Cancer

RAZVAN HAINAROSIE1,2, VIOREL ZAINEA1,2, OCTAVIAN CEACHIR1,2, MURA HAINAROSIE1, CATALINA PIETROSANU1,2, CRISTIAN DRAGOS STEFANESCU3

1 Carol Davila University of Medicine and Pharmacy, 8 Eroii Sanitari Blvd., 060474, Bucharest, Romania  
2 Prof Dr Dorin Hociota Institute of Phonoaudiology and Functional ENT Surgery, 21 Mihail Ciocanu Str., Bucharest, Romania  
3 Gen. Dr. Aviator Victor Anastasiu National Institute of Aeronautical and Space Medicine, 88 Mircea Vulcanescu Str., Bucharest, Romania

Laryngeal cancer represents an important problem in the public health department, mainly due to the fact that the lack of early symptoms leads to most cases being diagnosed in advanced stages, when surgical procedures must be extensive and will affect the quality of life of the patient. Nowadays, the problem of early diagnosis of laryngeal cancer and procedures that may facilitate it is of great importance, with contact endoscopy following in vivo methylene blue coloration being one of the most promising options.

Keywords: methylene blue, vocal fold, cancer

Fig. 2. Inspection of the glottis level thru direct laryngoscopy

Fig. 3. Clear limits of the lesion suspected of malignant degeneration, after methylene blue in vivo coloration

The purpose of this paper is to critically evaluate the method of contact endoscopy using methylene blue in vivo coloration and to establish its capacity in detecting an early cancer.

Experimental part

In patients that presented lesions suspected of malignant degeneration we performed a direct laryngoscopy under general anesthesia with tracheal intubation. Before performing the biopsy, we used the method contact endoscopy with methylene blue in vivo coloration to evaluate the lesion.

After introducing the metallic laryngoscope, one can expose the level of the vocal folds.

Both vocal folds are colored by a moist gauze soaked in 1% methylene blue solution that is introduced in the larynx with an endoscopy forceps. Each vocal fold is colored by moving it repeatedly along its free edge. One must wait for approximately 3 min in order for the methylene blue to be absorbed by the superficial layer of the vocal fold. Afterward, the vocal fold is washed with acetic acid.

Fig. 1. Chemical formula of methylene blue

* email: octavianceachir@gmail.com ; Phone: +40727287182  
All authors have contributed equally.
The contact endoscopy rod is applied on the colored surface of the vocal fold and the obtained microscopic image can be studied. In our study, we used 8715 A Karl Storz contact endoscopy rod with an angle of 0° and a high resolution camera, necessary for assessing the finest details [8].

By means of contact endoscopy we can obtain an in vivo histological image. The parameters that must be studied are the uniformity of the cellular field, the nucleus/cytoplasm ratio of the cell and the size and shape of the cells.

Another parameter that must be studied is the distribution of the vascular network of the vocal fold. In a healthy individual, the vascular network is parallel with the free edge of the vocal fold.

A neoplastic process as little as 1 millimeter at the level of the vocal fold will secrete endothelial growth factor. This will lead to an increase in the number of blood vessels at this level, and the vascular network will become disorganized, chaotic.

We used the method of contact endoscopy in a number of 29 patients with lesions suspected of malignant degeneration at the level of the vocal folds. 8 women and 21 men were evaluated. The age of the patients ranged from 42 to 64 years. In all patients we used the methylene blue in vivo coloration of the vocal fold prior to contact endoscopy examination.

After carefully evaluating the cellular field and the superficial vascular network, we performed multiple targeted biopsies from the areas suspected of malignant degeneration. The results obtained thru the contact endoscopy technique were compared to the histopathological result of the biopsy pieces.

**Results and discussions**

The results obtained after comparison of the contact endoscopy technique and the histopathological result are as follows:

- the sensitivity of the contact endoscopy technique was 79.21%;

- the degree of specificity was 79.62%

These results allowed us to conclude that the method is of practical importance, allowing the surgeon to perform targeted biopsies from areas highly suspicious of malignant degeneration. This in turn will translate into an early diagnosis and a conservative procedure, meaning a lower morbidity for the patient.

However, the surgeon must always bare in mind the fact that in cases of high clinical suspicion, even if the result of the contact endoscopy is negative, only a histopathological result can confirm for certainly the absence of a malignant process.

**Conclusions**

The advantages of using in vivo methylene blue coloration of the superficial layer of the vocal fold consist in the facts that it is a cheap and easy to obtain substance. Furthermore, the local effects of methylene blue are bacteriostatic, antioxidant and a stimulus for cicatrization.

The methylene blue coloration with contact endoscopy at the level of the vocal fold is a minimally invasive endoscopic technique that can detect early malignant lesions with an important rate of success. However, the endoscopic exam with a 0° rigid rod after methylene blue coloration does not replace the histopathological result.

Also, there is a learning curve for the ENT surgeon, that must learn to interpret alone the aspect of the cellular field. The instruments necessary for contact endoscopy have a high price (rigid contact endoscopes, high resolution video camera).

One of the disadvantages of contact endoscopy is that it requires for the patient to undergo general anesthesia with tracheal intubation.

**References**

8. C. PIAZZA, D. COCCO, F. DEL BON et al., Oral Oncology, 46, nr. 4, 2010, p. 307–310

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