



Narrow Band Imaging of Recurrent Respiratory Papillomatosis

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Abstract

We report about a case of a 13-year-old boy with recurrent respiratory papillomatosis. The patient suffered from recurrent stridor and permanent hoarseness. On examination large islands of papillomas were found on both sides of the glottis region. The larynx was then examined with Narrow Band Imaging, a new technique, which enables the medical professional to investigate the capillary and submucous vasculature of the mucosa. Endolaryngeal findings showed multiple vascular loops in the capillary layer, larger submucous vessels could not be found. These findings may be interesting for surgeons, who perform laser ablation of papillomas. Bleedings from large-bore submucous vessels are unlikely, as long as the surgeon ablates superficially, within the plane of the papillomas.

Background

Recurrent Respiratory Papillomatosis (RRP) arises from the stratified squamous epithelium of the oral cavity, the tongue, the pharynx and the larynx [1]. The lesions are usually associated with human papilloma viruses, of which more than 170 subtypes have been identified so far. Pathogenic for RRP are HPV Type 6 and 11. The larynx is most commonly affected and there is a biphasic occurrence: juvenile onset (m:f=1:1) and adult onset (m:f=4:1). The incidence varies between 3.6 and 4.3/100000 inhabitants. Diagnosis is usually made by inspection/endoscopy. White light rigid endoscopy offers the best images, histologic assessment of samples is usually recommended to exclude high risk types of HP virus infection. Treatment is mostly symptomatic, since there is no causal treatment, expect vaccination. Vaccination however, is not available for all HPV strands. Mainstay of therapy is laser surgery aiming at the debulking of the papillomatous tumors while preserving the voice.

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Received Date: 24 Sep 2018

Accepted Date: 25 Oct 2018

Published Date: 29 Oct 2018

Citation:

Folz BJ. Narrow Band Imaging of Recurrent Respiratory Papillomatosis. *Clin Case Rep Int.* 2018; 2: 1082.

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Patient and Method

A 13-year old boy, who was suffering from recurrent airway obstruction due to papillomatosis since infancy, presented with increasing hoarseness. On flexible endoscopy papillomas on both vocal and false cords were visible and the boy was scheduled for laser vaporization. After intubation the larynx was assessed by white light endoscopy and Narrow band imaging. Narrow band imaging is a new diagnostic method [2], which allows assessing the vasculature of the mucosa clinically. Light of 415 nm wave length penetrates through the epithelial layer of the mucosa, depicting capillary vessels in a brownish color. Light of 540 nm wave length is emitted to assess the vessels of the submucous layer in a bluish colour. The endoscopic imaging system was EVIS EXERA II (Olympus Deutschland GmbH, Medical Systems) in combination with a CLV-180 high intensity Xenon light source (300W), a CV-180 HDTV-compatible video processor and a 24 inch full HD widescreen TFT-monitor (Sony, LDM-2451).

Findings

On white-light endoscopy papillomas on the left false cord, the left true cord and the right true cord were evident. On the right false cord an island of papillomas became evident at the height of the vocal process [3]. Multiple papillomas could be found in the anterior commissure (Figure 1). Narrow Band Imaging showed a dense vasculature in the epithelial layer of the mucosa of the glottis. Islands of papillomas consisted of pedunculated masses with villous structures. A central epithelial vessel loop could be seen in each protuberance (Figure 2). No vessels of the submucous layer could be identified. Papillomas were vaporized with the carbon dioxide laser. Since larger submucous vessels had been excluded by NBI prior to the vaporization with the laser, only minor bleeding occurred, which could be stopped effectively with swabs soaked in vasoconstrictants. Recovery of



Figure 1: The endoscopic imaging system was EVIS EXERA II Endoscopy System (Olympus Deutschland GmbH, Medical Systems) in combination with a CLV-180 high intensity Xenon light source (300W), a CV-180 HDTV-compatible video processor and a 24 inch full HD widescreen TFT-monitor (Sony, LDM-2451).



Figure 2: The glottis space of the patient on Narrow Band Imaging. The NBI filter extracts two distinct light bands from the light source (415 nm wave length and 540 nm wave length). Both bands peak in the absorption spectrum of haemoglobin and allow studying the vascular network of a growth in the subepithelial and submucosal layer. Subepithelial vessels are depicted in a brownish colour, submucosal vessels in a bluish colour. The papillomas and the mucosa of the glottis space present almost exclusively subepithelial vessels.

the boy was uneventful. Within the next 2 years the treatment had to be repeated three times, the boy was then lost to follow-up.

Discussion

RRP is still kind of a nuisance. The majority of the patients are children, who have to be treated with laser surgery at intervals of a few weeks to months. Some children have to undergo tracheotomy, because of the constant threat of airway obstruction. So far there is no medical cure for the disease. Herd immunization through HPV vaccinations is hoped to reduce the number of infected children. HPV vaccines are available which can protect recipients against HPV types 6, 11, 16, 18, 31, 33, 45, 52 and 58 [4]. Vaccination should be performed before an actual infection, which makes it difficult for use in children suffering from RRP of the upper airways. These children are usually infected during birth by their mothers. It is unclear, whether immediate vaccination after birth can help to prevent a latent infection. Laser vaporization of papillomas therefore is still mainstay of therapy. Laser vaporization aims at the removal of papillomas with the least collateral damage to surrounding tissues. However, due to the total number of laser procedures, which a child suffering from RRP has to receive until it reaches puberty, it is hardly possible to keep the larynx completely intact. Changes in voice and narrowing of the airway cannot be avoided in every case.

New developments in endoscopic diagnosis may prove to be helpful to identify subclinically infected mucosa. NBI is such a technique. NBI may help to make the correct clinical diagnosis and to differentiate between papillomas, inverted papillomas and malignant lesions. Papillomas have a very characteristic appearance. In addition there is a distinct pattern of vasculature in the subepithelial layer. Submucosal vessels cannot be identified, a finding which may help laser surgeons to identify the correct plane for dissection and keeping the risk for haemorrhage at a minimum [5].

Conclusion

White-light endoscopy with high resolution and Narrow Band Imaging allow the depiction of laryngeal papillomatosis in excellent quality. This may help in differential diagnosis, which has to be made clinically in the majority of cases. Papillomas show a distinct pattern of subepithelial vasculature, with a central vessel loop in each papilloma. Submucosal vessels could not be identified, which may help to find the correct plane of dissection.

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