Chromoendoscopy Associated With Endoscopic Laryngeal Surgery: A New Technique for Treating Recurrent Respiratory Papillomatosis

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Summary: Outline. Chromoendoscopy is a dye enhancement technique that uses epithelial tissue dyeing for assessing any changes in it by determining its characteristics and eventually to improving mucosal lesions detection at endoscopy. Currently with the addition of a joint use of rigid endoscopes and video systems at surgery, visualization of the larynx and trachea areas significantly improved with wide angle viewing. However, in certain diseases, such as laryngeal papillomatosis, certain conditions were overlooked by these approaches and with the likelihood of postoperative early relapse. With the addition of chromoendoscopy to endoscopic laryngeal surgery, we were able to increase the ability to recognize intraoperatively inconspicuous lesions, improve lesion limit visualization, observe in detail their surfaces, and determine as well the existence of residual lesion if any after surgical removal.

Objectives. To prove the helpfulness of chromoendoscopy in otolaryngology as an innovative diagnostic technique associated with laryngeal endoscopical surgery.

Materials and Methods. The present study uses contrast dyeing agents such as indigo carmine as endoscopic tissue staining and, incidentally, which is the most widely used detection method in gastroenterology. The dye fills the interstices, highlighting irregularities, such as depressions and elevations in architecture.

Results. This diagnostic enhancing technique was used with six patients who presented recurrent laryngeal papillomatosis. We committed ourselves to get the most out of the intraoperative diagnostic yield and reduce the relapse likelihoods in all cases.

Conclusion. Chromoendoscopy joined with endoscopic laryngeal surgery is an excellent intraoperative diagnostic approach in the management of laryngeal invasive conditions such as laryngeal papillomatosis.

Key Words: Chromoendoscopy–Endoscopy–Endoscope–Intraoperative–Dyeing–Staining–Indigo carmine–Larynx–Epithelial–Papilloma–Papillomatosis–Respiratory–Surgeries–Diagnosis–Pathology–Relapse–Rigid endoscope.

INTRODUCTION

The usual technique of removal of papillomas of the larynx and trachea consists in using an optical microscope under general anesthesia (GA), surgical instruments, and the Kleinsasser Technique.[1] Currently, with the combination of rigid endoscopes and video systems, the visualization of the larynx and trachea significantly improved with wide angle viewing. However, under certain conditions, such as recurrent respiratory papillomatosis (RRP), certain lesions might be overlooked under optical microscopy with the possibility of early postoperative recurrence. Chromo-endoscopy is a technique that uses the application of stains (dyes) to assess epithelial changes, tissue characteristics, and is used to improve diagnosis of mucosal lesions during endoscopy.[2]

On its integration with the RRP surgical technique, we were able to detect lesions early, thus reducing the chances of recurrence by reducing the number of affected anatomical sites in the larynx and trachea.

In recent years, interest in chromo-endoscopy has greatly increased because it is simple, cost-effective, and without potential risks. This technique gained prominence using edge endoscopes, for example, use of magnification endoscopy in gastroenterology.[3,4]

Currently, the major clinical use of dyes in gastroenterology is for the diagnosing of Barrett's esophagus, stomach, and esophagus carcinoma; differentiation of neoplastic and non-neoplastic colorectal lesions, among others.[2–6]

No side effects, neither anaphylactic events, have been reported with topical application of dyes into the mucosa. It has been mentioned the occurrence of anaphylactic reactions, cardiac arrest, and bronchospasm after intravenous administration in urological practice.[7]

The aim of this study was to demonstrate the usefulness of chromoendoscopy in otolaryngology, during endoscopic surgery of the larynx, for the detection of unsuspected papilloma that might go overlooked with conventional surgical techniques, such as microsurgery.

Direct vision and microscopy, during surgery for papilloma in larynx or trachea, often times would not be suitable for detecting superficial or small lesions, for instance throughout the early stages of papillomavirus infection.

That is why we would suggest the use of intraoperative chromoendoscopy as an innovative, valuable, and effective method for treating papilloma virus infection. Besides it is a valuable tool as well in correctly differentiating a lesion type because contrast dying helps determine the exact macroscopic limit, thus promoting local control, maximum preservation of the structures of the vocal folds, and improving postoperative functional outcomes.

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TABLE 1.
Dyes used in chromoscopy are classified based on its interaction with the mucosa[9]

Dyes	Mucosal Interaction
Absorption (vital)	Enter the cell through diffusion or absorption through the cell membrane.
Reactive	Interact with certain substances in the cell producing distinctive color changes.
Contrast	Are not absorbed, such as indigo carmine and cresyl violet when impregnate slopes, elevations, and depressions of the mucous surface area provide enhanced topographic views.
Tattoo	Provide long-lasting stains when injected into the mucosa

On the other hand, through the magnification rendered from rigid endoscopes, lesions can be studied by analyzing the architecture of the mucosal surface and eventually come to the suspect ion of the presence of malignancy.

Chromoendoscopy applied to RRP would determine a possible correlation between a given appearance of a papillary pattern and a type of virus. Further studies are needed to confirm a relationship. Dr Shin-ei Kudo established a classification of mucosal patterns of the lesions due to pathological changes it undergoes when it is modified by various neoplastic, inflammatory, or scar tissue contingencies. His work was performed in the field of gastroenterology.[8]

After surgical resection, chromoendoscopy facilitates further detection of residual lesions and their immediate removal. This is a common setting found in respiratory papillomatosis where the involvement of multiple areas affecting the larynx and trachea makes their complete removal difficult and even leaving untreated lesions therefore enabling unwanted relapses. Chromoscopy was used only during larynx surgery and not as an in office follow-up procedure; nonetheless, in papillomatosis of pharynx, chromoscopy is indeed useful for the tracking of lesions as an office routine.

From our review of the literature, the present publication appears to be the first description of the use of contrast dyeing for detecting conditions such as RRP in the aerodigestive tract.

MATERIALS AND METHODS

This study was conducted between December 2005 and December 2011 in the Otorhinolaryngology Center of the Clinica Chutro in Cordoba, Argentina. During this period of time, 11 patients (two children and nine adults), with a presumptive diagnosis of RRP, had endoscopic and microscopic laryngeal surgery associated with chromo-endoscopy. Informed consent was obtained from all patients before their enrollment in the study.

All the subjects underwent outpatient preoperative endoscopic examinations, previous 4% lidocaine topical spraying. Fiber-optic laryngoscopy or laryngeal telescopes were used.

The extent of each lesion was carefully determined, digitally recorded, and subsequently analyzed with the aid of a custom

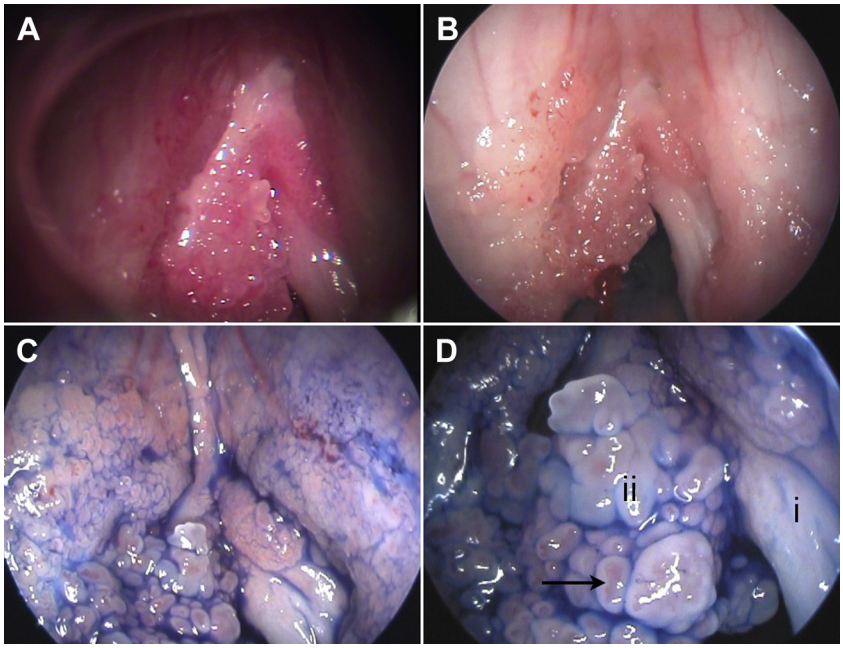

FIGURE 1. Recurrent respiratory papillomatosis. Microscopy with a 400 mm optical zoom lens makes possible the viewing of the larynx only in its vertical axis (Photo A); this is a wide-angle view of the larynx with a 30° telescope (Photo B); the use of chromoendoscopy allows observing real extent of laryngeal papillomatosis involving difficult to treat areas such as the anterior-commissure infrapetiole region (Photo C). Laryngeal papillomas at a closer look appear to be separate sessile masses, of different sizes, like a blanket covering the endolarynx. Villi and papillary lacunar pattern of the lesion (arrow) can be clearly observed and the difference between the healthy (i) and sick tissue (ii) is easily noted as well (Photo D).