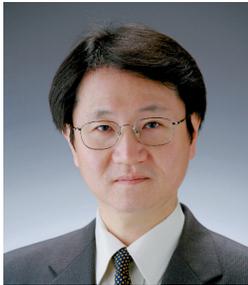


Experiences of Using the Image Processing Function in Otorhinolaryngology

Case Report 1

For Medical Professionals



Dr. Atsunobu Tsunoda
Tokyo Medical and
Dental University



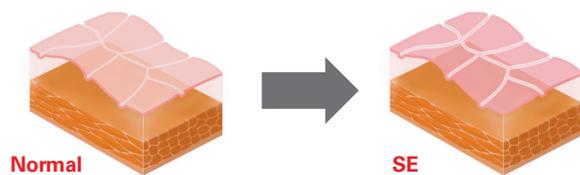
Dr. Ryosuke Kamiyama
Tokyo Medical and
Dental University

Endoscopes are making dramatic advancements in recent years in functional aspects. Numerous reports on the usefulness of such equipment have also been published in the otorhinolaryngology literature, such as the early discovery of suspicious lesions becoming possible with the release of devices that can provide special observations. We interviewed Dr. Atsunobu Tsunoda of the Department of Oto-Rhino-Laryngology, and Dr. Ryosuke Kamiyama of the Department of Head and Neck Surgery, both of Tokyo Medical and Dental University, and asked them to describe the usefulness and usage methods in the otorhinolaryngology sector of the image processing functions featured in the PENTAX EPK-i, a video processor.

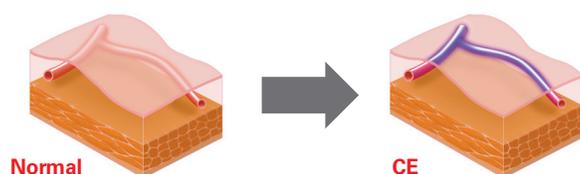
The principles of Surface Enhancement (SE) and Contrast Enhancement (CE)

Surface Enhancement (SE) takes advantage of the unevenness of an endoscope's signal brightness and enhances the points of change, thereby making a mucosal membrane's surface structure easier to see. On the other hand, Contrast Enhancement (CE) relatively raises the blue signal in places with low brightness, and makes the microvessels near the surface and in the submucosal areas easier to see. Both enhancement functions can be switched on instantly without any time lags. Their major characteristic is that the inherent color tone of the organs is kept intact, and only the regions of interest are enhanced.

Surface Enhancement (SE)



Contrast Enhancement (CE)



SE Used in Screening, and CE Used in Detailed Observations

In the pharyngeal-laryngeal regions, white lesions are often seen, caused by the epithelial keratinization, as a precancerous state. Surface Enhancement (SE) characteristically enhances the periphery of the white lesions and makes them stand out. So it is easy to detect even small lesions that may be overlooked in usual observations. Contrast Enhancement (CE) makes it easier to see microvessels near the surface and in the submucous, so we can confirm the blood vessels' changes

and breakdowns. We feel that using Surface Enhancement (SE) during screening and using Contrast Enhancement (CE) during detailed observations of the lesions, is one of the useful and effective methods for realizing early observation of lesions in this clinical field.

Case 1 A 49-year-old male, chiefly complaining of hoarseness of voice. Despite undergoing laryngomicrosurgery several times, no definitive diagnosis could be made, and was therefore referred to our department. Observation using SE showed lesions whose surface had an even rough structure, around the anterior commissure. Squamous cell cancer was observed from this site.



White Light Image

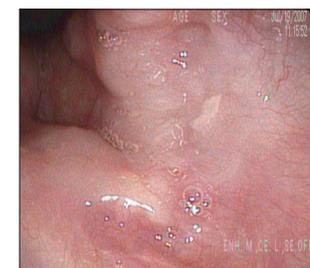


SE Image

Case 2 A 66-year-old male. He was referred to our department because of cervical lymph node metastasis (squamous cell cancer) of unknown original cancer. SE showed mucosal lesions accompanied by keratinization in the left piriform fossa. A biopsy revealed that the original cancer was in the hypopharynx. The CE rendered, even more clearly, images of how the normal mucosal vessels in the surrounding areas were disrupted in the tumor periphery.



White Light Image



CE Image

**The cases are examples and not to guarantee similar effects always or in all procedures.*

Usefulness During Stroboscopy

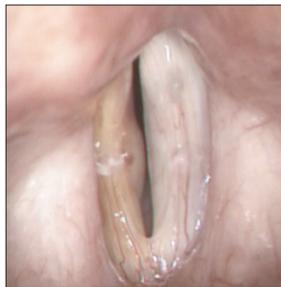
Stroboscopy enables the observation of the characteristics of mucosal undulations as well as the observation of symmetrical and non-vibrating parts, making the assessment of even more detailed lesions of the vocal cords possible. If Surface Enhancement (SE) is used during stroboscopy, mucosal undulations can be observed even more clearly than usual, making it extremely effective for observing and evaluating cancer of the vocal cords, scar of the vocal cords, sulcus vocalis, and cysts, for example. With Contrast Enhancement (CE) also, because of its effects to enhance the blood vessels, the movement of the blood vessels of the vocal cords can be observed vividly. This makes the vocal cord vibrations and their anomalies even clearer, so it is extremely useful for evaluating voice disorders.



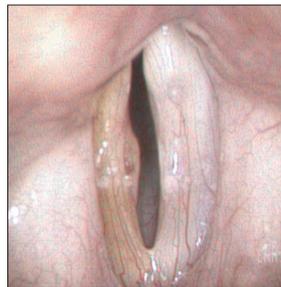
White Light Image



SE Image



White Light Image



CE Image

**The cases are examples and not to guarantee similar effects always or in all procedures.*

**Before actual use, refer to the Instructions For Use.*

Tips When Using Surface Enhancement (SE) and Contrast Enhancement (CE)

Surface Enhancement (SE) and Contrast Enhancement (CE) do not affect an organ's inherent color tone very drastically, so we feel that they can be comfortably accepted by otorhinolaryngology doctors. Even if no abnormalities are seen at a first glance with normal observation, mucosal surfaces having different characteristics are sometimes detected if observed with Surface Enhancement (SE) and Contrast Enhancement (CE). In addition, it becomes even easier to detect lesions by adding some sort of "movements" to the mucosal membrane of the pharyngolarynx, such as by speaking, Valsalva, or by twisting or retroflexing the neck. If there are suspicious lesions, we observe them in close proximity, then use Contrast Enhancement (CE) to confirm the breakup, etc., of the blood vessels. Moreover, if saliva has deposited on the mucosal surface of the pharynx and the larynx, foam and other substances are intensely enhanced, making it difficult to see the lesion. With channel-less nasopharyngoscope for observation purposes, it is important to have the patients drink water before the test to rinse off the saliva. By having them drink water during tests also, you can obtain an image of "seeing a lesion remain in parts where foam has disappeared."

Summary

The biggest characteristic of these image processing functions is that, in observations using otorhinolaryngological endoscopes, they make it easier to see and detect some sort of abnormal sites (= lesions) in terms of mucosal findings. And even if the findings are normal, they make it easier to see the vascular patterns and mucosal movements. These may be said to be a type of marking functions of the mucosal membrane and blood vessels. Once we began using this function, it was found to be so useful that we began to feel uneasy if we did not use the image processing function. Also, the burdens placed on the patients are minimal: it may take a bit longer than the usual, careful observations. These image enhancement effects can be instantly changed with a switch. And, since observations can be made, based on the usual, familiar otorhinolaryngological findings, or, in other words, under white light images, this can be said to be a function which we otorhinolaryngologists can easily become accustomed to, and accept.

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PENTAX
MEDICAL

PENTAX Medical
3 Paragon Drive
Montvale, NJ 07645
Phone +1 800 431 5880
Fax +1 201 391 4189
www.pentaxmedical.com

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