ORIGINAL RESEARCH PAPER

Oncology

KEY WORDS: Sentinel lymph node biopsy, Indocyanine green, Near-infrared fluorescence, Oral malignancy, Oropharyngeal malignancy.

INDOCYANINE GREEN IN SENTINEL LYMPH NODE BIOPSY IN EARLY STAGE ORAL AND OROPHARYNGEAL CANCER: A NEW HORIZON BECKONING.

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Background

Management of the clinically node negative neck (cN0) in oral/oropharyngeal squamous cell carcinoma remains a dilemma. Because there is no diagnostic test available that can accurately evaluate cervical lymph node metastatic status, management options for this situation have included elective neck dissection (END) or watchful waiting.[1,2,3] In the past two decades, sentinel lymph node biopsy (SLNB) has been proposed as a promising minimally invasive procedure for management of the cN0 neck of oral/oropharyngeal carcinoma.[4,5] SNB allows the surgeon to identify and harvest the upper echelon lymph nodes that drain the site of a primary malignancy. SNB is a more minimally invasive procedure than END, and it has higher sensitivity and specificity for evaluating the metastatic status of the cN0 neck in oral/oropharyngeal carcinoma compared to traditional physical examination and imaging scans (CT, MRI, or PET/CT) or image-guided FNA.[1,4,5]

Near-infrared fluorescence (NIF) imaging is a newly developed SNB technique firstly introduced by Kitai et al. in breast cancer in 2005.[6] Subsequent reports of its successful use in gastric, gynecologic, lung, esophagus, as well as skin cancer are found in the literature.[7,8,9] To our knowledge, there are only a few pilot studies of SNB with NIF mapping for head and neck mucosal cancer that have been published, which have demonstrated the proof of principle and safety of this technique.

Method

SLN mapping was performed using the 'Stryker 1588 AIM Platform' [Fig.1]. The system consists of two wavelength-isolated light sources: a "white" light source, generating 400–650 nm light and a "near-infrared" light source, generating 760 nm light. The

AIM Platform includes:

1. 1588 AIM 3-chip CMOS high definition endoscopic camera system.
2. L10 LED light source with safelight optic cable.
3. AIM telescopes (5.4 and 10 mm).

The 1588 AIM platform consists of a variety of advanced imaging modalities (AIM):

1. ENV: Endoscopic near infrared fluorescent visualisation enables real time imaging of perfusion. Used with fluorescent ICG dye.
2. DRE: Dynamic range enhancement designed to improve visualisation in the surgical field by creating a brighter image in dark and posterior compartments by upto 150%.
3. DeSaturation: Decreases the saturation of color in the image to the level preferable by the surgeon.

The ICG was dissolved at a concentration of 5 mg/ml. 1 ml of ICG was injected around the tumor in a four-quadrant pattern. Immediately after injection of the tracers, a standard incision was made and the platysma flap was elevated. After exposure of the subplatysmal plane in the neck and retraction of the sternocleidomastoid muscle posteriorly, the surgical field was measured for fluorescent signal using the 1588 AIM telescope. The first appearing lymph nodes with NIF hot spots were defined as SNs and were resected for frozen section examination [Fig.2]. Neck dissection was continued after harvest of the SNs. The resection of the primary tumor was subsequently performed by standard procedure; reconstruction of the defect was done as indicated.

Fig.1: Stryker 1588 AIM Platform.

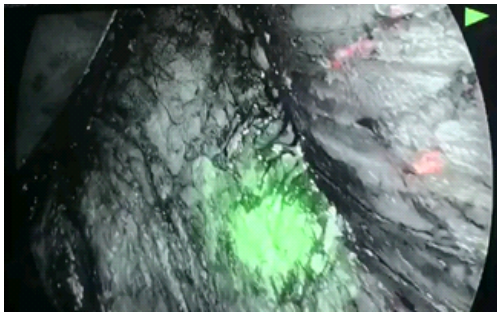

Fig.2: ICG NIF imaging showing sentinel node in level-IB.

Advantages over radiotracer & gamma probe technique

1. ICG is a radiation-free tracer and safe, rare side effects have been reported, and special radiation protection is unnecessary.
2. SNB using NIF imaging with ICG is a convenient one-step procedure; patients' discomfort and anxiety during preoperative injection of the tracer for lymphoscintigraphy can be avoided.
3. The 'shine through phenomenon' is absent.
4. The cost of a full dose of ICG is much less than a radiotracer, and the fluorescence imaging device is also less expensive than a γ probe; therefore, as a result of the lower cost, patients in developing countries may also benefit from SNB with ICG.
5. With stimulation of near-infrared light, the fluorescent signal of the ICG was detectable after platysmal flap elevation and posterior retraction of the sternocleidomastoid muscle, making it easy for a surgeon to remove the SNs.
6. SNB with ICG fluorescent imaging in superficial cancers is that it enables visualization of lymphatic drainage from the primary tumor to the regional lymph node basin.

Drawbacks

1. The inability to detect NIF signal transcutaneously does mean that an initial neck incision of sufficient length must be made to allow exposure of the expected neck levels where the sentinel nodes are likely located.
2. Shadowless lights in the operating theatre give off their own intrinsic NIF beam; therefore, lymphatic navigation must be performed in the dark to minimize the interference with beams produced by the ICG.

Conclusion

NIF imaging with ICG to identify the SLNs is a promising SLNB technique for oral/oropharyngeal cancer that deserves further research to refine the technique. Future consideration should be given to a prospective comparative trial between NIF imaging with ICG and conventional scintigraphy using radioisotopes.

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