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Clinical note

The added value of a portable gamma camera for intraoperative detection of sentinel lymph node in squamous cell carcinoma of the oral cavity: A case report

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ABSTRACT

The use of sentinel lymph node biopsy in squamous cell carcinoma of the oral cavity is still subject to debate although some studies have reported its feasibility. The main reason for this debate is probably due to the high false-negative rate for floor-of-mouth tumors per se.

We report the case of a 54-year-old man with a T1N0 floor-of-mouth squamous cell carcinoma who underwent the sentinel lymph node procedure. Lymphoscintigraphy and SPECT/CT imaging were performed for lymphatic mapping with a conventional gamma camera. Sentinel lymph nodes were identified at right Ib, left IIa and Ia levels. However, these sentinel lymph nodes were difficult to detect intraoperatively with a gamma probe owing to the activity originating from the injection site. The use of a portable gamma camera made it possible to localize and excise all the sentinel lymph nodes.

This case demonstrates the usefulness of this tool to improve sentinel lymph node detecting in floor-of-mouth tumors, especially those close to the injection area.

El valor añadido de la gammacámara portátil en la detección intraoperatoria del ganglio centinela en el carcinoma escamoso de la cavidad oral: caso clínico

Palabras clave:
Ganglio centinela
Carcinoma escamoso
Tumores de la cavidad oral
Tumores del suelo de la boca
Gammacámara portátil

RESUMEN

La biopsia del ganglio centinela en el carcinoma escamoso de la cavidad oral es un tema controvertido aunque varios estudios hayan demostrado su viabilidad, probablemente por la elevada tasa de falsos negativos en los tumores del suelo de la boca.

Presentamos el caso de un hombre de 54 años con carcinoma escamoso del suelo de la boca T1N0 que se sometió al procedimiento del ganglio centinela. Se realizaron imágenes linfogammagráficas y de SPECT/TC con una gammacámara convencional. Se identificaron ganglios centinela en los niveles Ib derecho, IIa izquierdo y Ia, siendo difíciles de localizar intraoperatoriamente con una gammasonda dada la actividad procedente del lugar de inyección. Usando una gammacámara portátil se pudieron localizar y resecar todos los ganglios centinela.

Este caso muestra la utilidad de esta herramienta para mejorar la detección del ganglio centinela en los tumores del suelo de la boca, especialmente en aquellos próximos al área de inyección.

Introduction

The presence of lymph node metastases is the most important prognostic value in the squamous cell carcinoma (SCC) of the oral cavity; in consequence, its precise staging is essential. Although it still remains controversial, as occult lymph node metastases are seen in 20–30% of cases,[1] in the last years sentinel lymph node (SLN) biopsy has evolved as a possible diagnostic tool to improve indication for elective neck dissection in the management of T1 and T2 SCC of the oral cavity with a clinically and CT or MRI assessment N0 neck. This reported risk of occult metastases must be weighed against the possible morbidity of performing cervical lymph node dissection. Predictive parameters for nodal metastases, and therefore prognosis, different from the TNM classification, have been identified during the last decades. These parameters are tumor thickness greater than 4.0 mm,[2] lymphovascular invasion, poor grading and dissolute invasion pattern at the tumor front.[3] SLN detection has a role in this situation where no risk factors are detected in the initial histological assessment of the tumor and "watchful waiting" against elective neck dissection are considered as the possible treatment options. The SLN biopsy technique has the potential of limiting the application of elective neck dissection in the 20–30% of patients who may benefit from it, reducing the number of unnecessary neck dissections and thus, their morbidity.[4] Furthermore, the histopathologic workup of SLNs with step serial sectioning and immunohistochemistry is widely known to be more accurate than routine evaluation of nodes in an elective neck dissection specimen, detecting even isolated tumor cells

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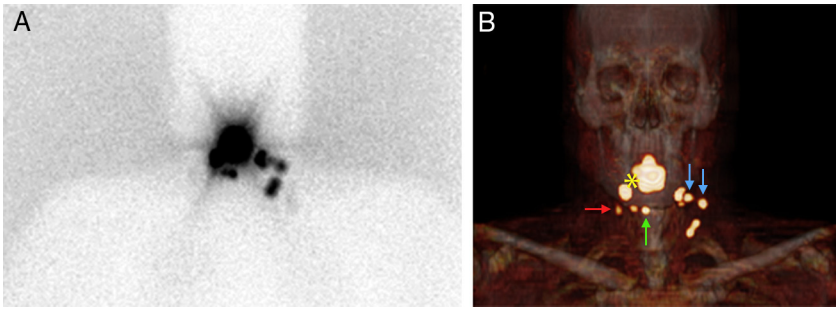

Fig. 1. Preoperative SLN identification. (A) Later static scintigraphic images show drainage to right and left laterocervical and midline cervical areas on anterior projection. (B) The 3D volume rendered SPECT/CT study shows one SLN on the right laterocervical side at level Ib (red arrow), located caudally to the injection site of the radiopharmaceutical (asterisk), and one SLN on the midline cervical region at level Ia (green arrow). Moreover, two SLNs are seen on the left laterocervical side at level IIa (blue arrows), despite there is a hotspot located medially to them which is considered a lymphatic tract as it is seen as a linear uptake in other projections.

and micrometastases which have recently been reported to have an impact on tumor control and survival,[5] that means an upstaging of the disease.

The reasoning behind the reluctance to adopt SLN detection in the oral cavity would be its low sensitivity, especially for floor-of-mouth (FOM) tumors compared to other locations in this region. A 5-year follow-up multicenter trial reported an overall sensitivity of 91% for SLN biopsy. When comparing alone SCC of the FOM to other sites of the oral cavity, the sensitivity ranged from 80% to 97%, with also disparate negative predictive values, 88% for FOM vs. 98% for other sites.[6] Similar results were seen in a prospective multi-institutional trial which reported 25% of false negative for FOM and 10% for tongue tumors.[7] Further attempts should be endeavored to improve low SLN detection rate in the oral cavity.

Case report

A 54-year-old-man with smoking habit, enolism and history of surgery for seminoma ten years ago without evidence of recurrence, underwent SLN detection in a T1N0 SCC located at FOM, nearby the right sublingual caruncle. The day before surgery, 111 MBq (3 mCi) of ^{99m}Tc-nanocolloid were injected around the scar of the excisional biopsy. Routine imaging with a conventional gamma camera was performed, consisting of 10 min dynamic lymphoscintigraphy and 300 s planar static images within the first 30 min and 2 h after injection.

The dynamic study showed unilateral drainage to the left laterocervical region. On the early and later static planar images, hotspots were identified in the laterocervical region bilaterally and in the midline cervical area (Fig. 1A), which required SPECT/CT study for its proper anatomical localization (Fig. 1B). Thereby, one SLN was identified at Ib level of the right laterocervical region whereas four lymph nodes were seen in the left laterocervical region, two of which, located at IIa level, were considered SLNs, although tracer activity was also seen through lymphatic pathway. Furthermore, two hotspots were seen in the midline cervical region being only considered as a SLN the one with more activity situated at Ia level, as it depended on a lymphatic duct. Nevertheless, no lymph nodes could be identified intraoperatively with a gamma probe on account of the proximity to the injection site of the radionuclide. Hence, as part of our routine, a portable gamma camera (PGC) was used (Sentinella, S102; Oncovision), enabling the precise localization and resection of four SLNs. Right laterocervical SLN appeared on the first image caudally to the injection site (Fig. 2A) and was then removed (Fig. 2B). Afterwards, midline bilobulated SLN (Fig. 2C) was resected (Fig. 2D), which would explain the two hotspots seen on planar and tomographic images. Lastly, two left laterocervical SLNs were identified (Fig. 2E) and post-excision imaging only showed a second-echelon lymph node in the bottom left corner corresponding to the supraclavicular area (Fig. 2F). Following SLNs removal, their maximum radioactivity was measured by means of a gamma probe to ensure that the node removed was the SLN. All SLNs were negative for malignancy in the pathological study. After SLN harvesting, a new picture was taken by means of the PGC to demonstrate the absence of SLNs in the remaining surgical field.

After twenty months of follow-up, the patient is free of recurrence.

Discussion

The aforementioned case report is an example of the outstanding help a PGC can provide in the operating theater to identify SLN of tumors located in the head and neck region. Some groups have reported their experience in the detection of SLNs in other anatomical locations using a PGC complementary to a gamma probe, predominantly in breast cancer, but also in melanoma,[8] in urological malignancies like renal cell carcinoma, prostate, and testicular cancer, and to a lesser extent in gynecological carcinomas. PGCs have also been used to guide parathyroid glands and breast cancer resection. However, few data have been reported insofar about the feasibility of this imaging technique in the detection of SLNs in the head and neck area. Only Vermeeren et al. showed that a PGC might refine intraoperative identification of SLNs in patients with melanoma in the head and neck region or oral cavity carcinoma.[8]

One of the reasons why SLN detection rate in the head and neck area is lower than in other regions might be that lymph node identification with a gamma probe in the head and neck region is hampered by the high scattered radiation from the injection point, as in this location lymph nodes are closer to the malignancy. A decisive way to overcome this obstacle is using a PGC intraoperatively. Whilst Vermeeren et al., from a series of 25 patients with melanoma or oral cavity carcinoma, only reported a unique SLN which required the PGC as it could not be excised with a gamma probe,[8] in our case, this technique was crucial to guarantee all four SLN excisions indeed. Moreover, post SLN resection image with a PGC may disclose masked lymph nodes which were unknown before the intervention. In the Dutch study, where SLNs were identified preoperatively with lymphoscintigraphy and SPECT/CT, a supplementary SLN was resected in 24% of patients in the operating room with a PGC. Recently Stoffels et al. also described an additional removal of 23 SLNs in 15 patients with cutaneous malignancies using same preoperative images.[9] The authors mention two possible causes of the appearance of new SLN intraoperatively. One of them could be that hotspots on preoperative images are a cluster of SLNs and the other reason is the increase of radiotracer shift from the injection site to SLNs, particularly when the radiopharmaceutical is administered the day before surgery. On the other