OPTIMISATION OF LYMPHOSCINTIGRAPHY FOR SENTINEL NODE BIOPSY IN ORAL CAVITY CANCER

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Rationale

- Oral Cavity Squamous Cell Carcinoma (OCSCC) has a yearly incidence of **274,000** patients.
- OCSCC spreads via lymphatic to the regional draining lymph nodes in the neck, **20%- 30%** of patients will harbor occult regional metastases.
- Since the presence of lymph node metastases is an important prognostic factor decreasing survival by **50%**, a **reliable staging of the neck in this disease is imperative to determine further management**.

Multicentre Interventional Trial - Canniesburn Sentinel Node Biopsy in Oral and Oropharyngeal Cancer, 2001
The Concept of the Sentinel Node

- In the late 1980s, Donald L. Morton proposed the innovative concept of "lymphatic mapping with sentinel lymph node biopsy" for melanoma using a Blue Dye.
- This is injected into the tissue at the sight of the primary tumor; This passes along the lymphatic channels that drain this tumor.
- The **first node to turn blue** (the “**Sentinel node**”) is the node most likely to contain any cancer cells migrating from the primary tumor to the drainage basin.

Morton DL 1990
Lymphatic Mapping in H&N’s Cancers: Blue-Dye vs Lymphoscintigraphy

In H&N’s Cancers Blue-dye traverses the lymphatics quickly, appearing in the SN in less than 5 minutes (in the feline study).

Pitman KT et al 2002

SCC FOM, Right Lateral View

5 min

injection

SN

10 min

injection

LAT CERV DX

Tartaglione G et al 2003
SNB in OCSCC

• SNB in OCSCC is “technically challenging”

• Nodes are often small, and drainage to multiple sentinel nodes is common.

• The high number of lymph nodes identified as SNs by Blue-dye or Probe and their localisation on distant Neck’s Levels, could limit the practical application of this approach.

Vigili MG et al 2007
Material and Methods

- From July 2004 to February 2008 we studied 20 consecutive Patients* (10 m, 10 f, mean age 66.5 y) affected by cT1-2N0 OCSCC
- Early Dynamic Lymphoscintigraphy was performed 3 hrs before Surgery (Same-Day protocol)
- We performed SNB in all cases (the patients with pN+ (sn) were subsequently submitted to a radical modified neck dissection)

* 10/20 patients were included in SENT Study (EORTC 24021, 2005)
Lymphoscintigraphy: Injection Technique

- We advise four Superficial Perilesional Injections
- The needle was introduced at an angle (15°-20°) about 1-2 mm under endothelium’s surface where is a high concentration of Lymphatic Capillaries, providing a larger surface area for uptaking, a faster lymph drainage and a better identification of SN in shorter time (< 5’)
- If deeper injections were performed; the timing of the lymphoscintigraphy would be longer, whereas the blood accumulation rate, the background, the bladder and the liver uptake would increase.

Fig.1: The Tongue has the blind lymph capillaries in the filiform papillae with the underlying plexus

Tongue Scanning Electron Micrograph from Gray’s Anatomy Int.Ed., 2000
Lymphoscintigraphy Procedure

Examination Time : 15-30 minutes

Patient Preparation : The patient must fast overnight and remain fasting until surgery (3 hours later); a local anesthetic is given (10% lidocaine spray) few minutes before injections

Equipment & Energy Windows

- **Gamma Camera** : Large field of view
- **Collimator** : LEGP (allowing great gain in sensitivity)
- **Energy Window** : 20% window centered at 140 KeV

Radiopharmaceutical, Dose and Volume

- **Radiopharmaceutical** : 99mTc-HSA Nanocoll ® (Gifarma, Saluggia, Italy, GE Healthcare)
- **Dose** : 30-80 MBq
- **Volume** : <0.4 mL
Lymphoscintigraphy Procedure (2)

Technique of Administration:
• Administration: Four Superficial Perilesional Injections
  A mouthwash is used immediately following injections to prevent pooling or swallowing residual radioactivity by the patient.

Technique of Acquisition:
• Patient Positioning: Sitting
• Imaging Field: Head and Neck
• Views: Lateral / Anterior
• Pixel matrix: 128 x 128
• Zoom: x1.5 - x2
• Preset Time: 5 mins
• Imaging: Acquisition starts immediately after injections, a Sequence of Planar Static Scans were acquired within 15-30 minutes of injection.
• SN’s sites were marked on patient’s neck (usually two for patient).
SCC cT2N0, Tongue 2/3 Posterior, Right Lateral view
Female, 77 years

Injection
SNs
Cranio Lateral DX
5 min
SCC cT2N0, FOM, Left Lateral view

Male, 68 years

Injection

SNs

Second-echelon Lymph Nodes
SCC cT2N0, Tongue, 1/3 Anterior, Anterior view

Male, 52 years

Injection

SNs

R

L

5 min
SCC cT2N0, Tongue 2/3 Posterior, Right Lateral view
Male, 66 years

30 min

# 3, 4, 5 are Second-echelon Lymph Nodes

Injection

SNs
Sites of the SNs in 20 patients with OCSCC

1st Neck’s Level = 17
2nd Neck’s Level = 23
3rd Neck’s Level = 6
4th Neck’s Level = 0
5th Neck’s Level = 1
Results

• The **SNs** were found in all patients (*normally in 5 minutes*)
• The mean number of **SNs biopsed** was **2.3** for each patient.
• In **93%** of them the SNs were localised on **Neck’s Level 1** and/or **2** of the ipsilateral neck.
• **SN+** were found in **7/20** cases (35%)
  – 4 pts. were **pN1 (sn)**
  – 3 pts. were **pN2**
  – 1 pt. was **pN1 (sn) (mi)**
• The **follow-up (mean 44 months)** of patients **pN0 (sn)** showed only **1** recurrence in controlateral neck.
Dynamic Lymphoscintigraphy & Same-Day Protocol for SNB in OCSCC: Advantages

• To try to visualize the lymph drainage pathways of the tumour.
• To try to distinguish SNs, the first echelon lymph node(s) encountered in the regional draining basin, from Second-echelon lymph nodes
• To achieve an optimal count rate and a better ratio target/background at the surgery time.

Tartaglione G et al 2008
Conclusion

• This approach, requiring a close cooperation between nuclear medicine specialist and surgeon, allowed us to identify the **SNs in OCSCC** at the Neck’s Levels closer to the tumour.

• In our experience occurred a pathologic upstaging in **7 out of 20** Pts

• in **4 out of 7** pts the **SN+** was the **only site of metastasis**

• In our experience no *false negative pN0 (sn)* were found.
Thank You!

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