Diagnostic Green

CASE REPORT

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Sentinel Lymph Node (SLN) Biopsy

in a Breast Cancer Patient using Indocyanine Green (ICG) with the IC Flow™ Imaging System

FOREWORD

According to the World Health Organization, breast cancer is the most commonly diagnosed cancer in women with one in 4 of all new cancer cases diagnosed in women worldwide are breast cancer and is the leading cause of cancer death in women (15.0%). SLN biopsy has become the preferred SLN technique for axillary staging, because it offers accuracy equivalent to that of axillary lymph node dissection with less morbidity. The SLN biopsy results determine the future course of treatment for the breast cancer patient.

Evidence supports the efficacy and high sensitivity of Indocyanine Green (ICG) fluorescence for SLN identification in early breast cancer, which can be considered equal to the gold standard Technetium method[1,2].

CASE

This case report relates to a 48-year-old female breast cancer patient with clinically negative nodes (cN0).

According to German guidelines, it is recommended that all cN0 patients requiring either a mastectomy or a breast-conserving surgery undergo a mandatory SLN biopsy[3]. In order to detect the SLN in the affected breast, the fluorescent dye, ICG, is used in conjunction with the IC-Flow™ Imaging System. Further, the radionuclide method is used as confirmation.

PROCEDURE

The day before surgery, the patient was injected with the radionuclide agent Technetium (Tc99m). Immediately prior to surgery, a 25 mg vial of ICG was prepared with 5 ml of sterile water. Once the patient was anaesthetized, and prior to skin preparation, ICG (2ml) was injected intra-dermally to the perioareolar quadrant, where the tumor was located (Figure 1 & Figure 2).

Figure 1. Intradermal ICG injection.

Figure 2. Fluorescence following ICG injection.

Holding the IC-Flow™ Imaging System above the injected tissue, lymphatic vessels containing ICG are visible transcutaneously (up to a depth of 2 cm) and can be mapped to the axilla. This combination of ICG fluorescence and the IC-Flow™ Imaging System facilitated the tracking of the breast lymphatics and allowed the user to visualize in real-time the flow of lymph through the vessels (Figure 3). Additionally, mapping of the fluorescent lymphatic vessels helps to identify the approximate location of the SLNs in the axillary region (Figure 4).

Figure 3. Fluorescence begins to spread.

Figure 4. Mapping of fluorescent lymphatics.

After the axilla was incised (Figure 5), the tissue was dissected until the axillary fascia was reached and opened. Using the camera, the axilla was examined for tissue fluorescence (Figure 6). A fluorescent SLN was identified (Figure 7), and confirmed by both palpation and the gamma probe prior to its removal. In this case, the SLN was easily detectable, as the fluorescent tissue was clearly visible. After the SLN excision, fluorescent lymphatic vessels remain visible in the axilla (Figure 8).

Figure 5.
Incision of axilla.

Figure 6.
Tissue dissection reveals fluorescent tissue.

Figure 7.
Fluorescent SLN identified.

Figure 8.
Axillary tissue post SLN excision.

Of note, it has been found that SLN location, especially in patients with high BMI (>25) can be more technically challenging. However, this can be managed with increased surgical experience.

After removal the lymph nodes are examined once again using both the gamma probe and camera (Figures 9 & 10). Then, the lymph nodes are sent to the laboratory for further histological examination. Before closure, the camera is used to reexamine the axillary tissue to ensure that all ICG and Technetium labelled sentinel lymph nodes, have been excised.

Figure 9.
Excised SLN.

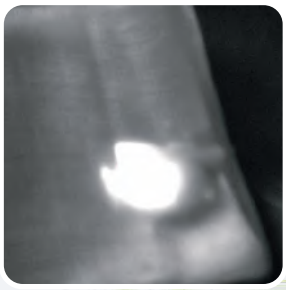

Figure 10.
Excised fluorescent SLN.

FOLLOW UP

The histological examination in this case showed a negative SLN and no further surgical treatment was required.

CONCLUSION

Detection of sentinel lymph nodes (SLN) is the standard procedure to evaluate the axillary lymph node status in breast cancer. Studies such as this case, indicate the efficacy of the method, based on use of the fluorescent dye, indocyanine green (ICG).

ICG offers real-time lymphography and it is a very precise and reliable tool for sentinel lymph node detection. The use of the fluorescent dye ICG also indicated no systemic toxicity or local side effects.

Furthermore, the visualization characteristics of the ICG method is essential when the SLN is located close to the tumor as the acoustical signal coming from a gamma probe approach, may originate from the tumor and not the SLN.

The ICG fluorescence technique for the detection of SLN in clinical practice has been found to be a valid and feasible method when compared with the radioactive method. Considering its high detection rate, real-time visualization, lower cost and wider availability, the ICG method is justified to become the standard technique for SLN detection.

IC Flow™ Imaging System

"I find the IC-Flow™ Imaging System a very flexible system to use as it allows for the use of essential functions such as recording a video, or taking real time pictures by using the buttons located on the camera unit. It is not necessary to darken the room completely as you get good picture quality in ambient daylight".

REFERENCES

[1] Ballardini B. et al. The indocyanine green method is equivalent to the 99mTc-labeled radiotracer method for identifying the sentinel node in breast cancer: A concordance and validation study. Eur. J. Surg Oncol. 2013 Dec;39(12):1332-6.

[2] Wishart G. et al. A feasibility study (ICG-10) of indocyanine green (ICG) fluorescence mapping for sentinel lymph node detection in early breast cancer, Eur J Surg Oncol. 2012 Aug;38(8):651-6.

[3] T. Papathemelis, E. Jablonski, A. Scharl et al. Sentinel Lymph Node Biopsy in Breast Cancer Patients by Means of Indocyanine Green Using the Karl Storz VITOM® Fluorescence Camera, BioMed Research International. 2018 March Article ID 6251468.

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