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Case Report

Indocyanine Green Fluorescence-Guided Sentinel Node Biopsy during Surgery for Breast Cancer

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Background: After a long history of axillary lymph node dissection surgeries, the current guidelines became more supportive for the use of axillary sentinel node (SN) biopsy technique in a variety of situations. The use of indocyanine green (ICG) fluorescence has recently gained momentum, because it is a viable and safe method for the axillary sentinel node detection during breast cancer surgeries. In the presented case of this case report, the indocyanine green dye was used as a tracer during a sentinel node biopsy, for the first time in Ain Shams University Hospitals. The surgery was done for a thirty-eight-year-old female diagnosed with early breast cancer.

Conclusion: The indocyanine green fluorescence-guided axillary sentinel node biopsy in breast cancer is a feasible, easy, and safe technique.

Key words: Sentinel node biopsy, indocyanine green, ICG, breast cancer, case report.

Introduction

The term "sentinel node" itself was first used in the 1970s.[1] However, in 1992, Donald Morton and Alistair Cochran had reported the sentinel node (SN) biopsy technique,[2] which was one of the most significant developments in surgical oncology, and in 1994 Giuliano and his colleagues described the technique of axillary sentinel node biopsy in breast cancer patients for the first time.[3]

There is a change in the strategy of management of breast cancer and the trend migrated from the "maximum tolerable" to the "minimum effective" interventions.[4] So, after a long history of axillary lymph node dissection, the current guidelines support the use of axillary SN biopsy in a variety of situations.[5,6] It is also supported by the surgical de-escalation strategies in breast cancer, which are increasingly adopted to avoid complications resulting from the axillary lymph node dissection.[7,8]

Several tracers were used for this technique, one of them was the indocyanine green dye (ICG).[9] This case report documents the successful use of ICG as a tracer during SN biopsy for the first time in Ain-Shams University Hospitals, on the 17th of March 2021, in a female patient suffering from early breast cancer.

Case presentation

A thirty-eight-year-old female patient with no significant past medical history presented to the outpatient clinic complaining of a right breast mass, which she discovered accidentally. No other local symptoms were reported. General examination was done followed by local breast and axilla examination which revealed, a single, 2 cm, firm, upper-outer quadrant lump of the right breast with no palpable axillary lymph nodes. Sono-mammography revealed a 26x19 mm mass in the right upper-outer quadrant, 4 cm from the nipple with a BIRADS score of IVb. No suspicious lymph nodes were reported. An ultrasound-guided, core biopsy was done, and it revealed a well-differentiated invasive ductal carcinoma. Immunohistochemistry was ER+/PR+ and HER2neu negative. The patient was counseled, and she consented to a breast-conserving surgery with SN biopsy. Preoperative workup and consultations were done.

On the day of surgery preoperative marking was done before the induction of anesthesia. The patient was in a supine position with an abducted arm. The ICG vial was dissolved in 5 ml of water for injection and the solution was filtered by a special filter. After general anesthesia and skin preparation, the ICG was injected in the peri-areolar area, intra-dermally at five points, 1 ml was injected at each point, **(Figure 1).** The skin was reprepared, and drapes were applied. The lump was excised, marked with sutures for orientation, and was sent for margin assessment.

Fig 1: Injection of the ICG in the peri-areolar region.

A separate axillary incision was used for SN biopsy. The near-infrared light (NIR) was obtained by the use of the Image1 STM NIR/ICG system and a Hopkins® NIR/ICG 30-degree scope by Karl Storz Endoskope, Tuttlingen, Germany. On using the NIR light blue fluorescence was noted in the axilla. Fine dissection was done under white light alternating with the NIR light until 2 sentinel nodes were detected and excised, **(Figure 2).** The specimen was sent for the frozen section. The feedback was that the specimen contains 3 lymph nodes with no malignant deposits. Both axilla and breast incisions were then closed. The patient had a smooth recovery and was discharged the next morning uneventfully.

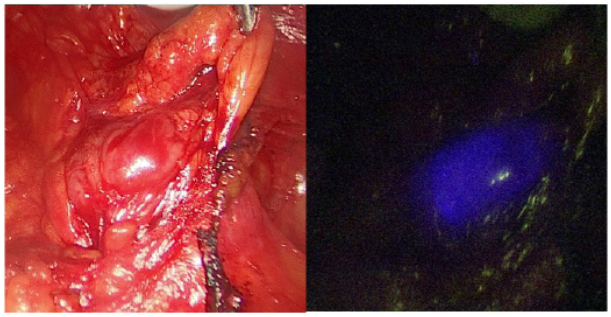

Fig 2: The sentinel node under the white and the near-infrared lights.

On the follow-up visit after one week, there was no evidence of skin and areola staining or discoloration. The wounds were neat with no seroma formation.

Discussion

The concept behind the SN technique is transporting a tracer from the area of interest to the catching lymph node group via the same lymph vessels as the metastases do. The first involved lymph node on that pathway is the sentinel node. Identifying the SN should truly reflect the LN group involvement without removing all of them. However, things are usually more complex, and more than a single SN are detected. Different tracers have different affinities for the nodes, depending on many parameters like the particle size for example.[6,10] It's to be noted that the sensitivity of SN is rarely increased after removing more than 4-5 nodes.[11,12] Tracers suggested for this technique were radiocolloids,[13] blue dyes (Isosulfan blue, patent blue V and methylene blue),[14,15] the indocyanine green dye16 and the combination techniques.

Indocyanine Green is a tricarbocyanine, water-soluble dye, formulated to be used in the photography industry in 1955, it was approved for medical use a few years later.[17] It shows fluorescence when subjected to the light of wavelength of 800 nm; this specific wavelength lies in the near-infrared spectrum of light. The ICG is available as a sterile lyophilized powder packed in vials, when it is dissolved in water for injection, it has a pH of 6.5. The dye is safe and is being used in many surgical procedures e.g. intraoperative florescent cholangiography.[18,19]

The use of ICG fluorescence has recently gained momentum as a viable and safe method for SN biopsy as it allowed the accurate detection of the patient's SLN while being safer and cheaper than radioactive colloids. Moreover, the ICG also evades skin necrosis, discoloration, and tattooing resulting from the use of blue dyes. The intravascular half-life of ICG is short and its adverse effects are scarce.[18]

Conclusion

Indocyanine green fluorescence-guided axillary SN biopsy in breast cancer is a feasible, easy, and safe technique.

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