

Comparison of the Indocyanine Green Dye Method versus the Combined Method of Indigo Carmine Blue Dye with Indocyanine Green Fluorescence Imaging for Sentinel Lymph Node Biopsy in Breast Conservative Therapy for Early Breast Cancer

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Abstract : Background: Fluorescence imaging (FI) is one of the methods to identify sentinel lymph nodes (SLNs). However, the procedure is technically complicated and requires procedural skills, as SLN biopsy must be conducted in dim light conditions. As an improved version of this method, we introduced a combined method (Combined mixed dye and fluorescence; CMF) consisting of indigo carmine blue dye and FI. The direct visualization of SLNs under shadowless surgical light conditions is facilitated by the addition of the blue dye. We compared the SLN detection rates of CMF with that of the indocyanine green (ICG) dye method (ICG-D). Methods: A total of 202 patients with stage \leq IIA breast cancer who underwent breast conservative therapy with separate incision from January 2004 to February 2017 were reviewed. Details of the two methods are as follows: (1) ICG-D: 2ml of ICG (10mg) was used and the green-stained SLNs were resected via a 3-4cm axillary incision; (2) CMF: A combination of 1ml of ICG (5mg) and 1-3ml of indigo carmine (4-12mg) was used. Using Photodynamic Eye (PDE), a 1.5-2 cm incision was made near the point of disappearance of the fluorescence and SLNs with intermediate color of blue and green were resected. Results: There were 92 ICG-D and 110 CMF cases. CMF resulted in a significantly higher detection rate than ICG-D (96.4% vs. 83.7%; $p=0.003$). This difference was particularly notable in those aged ≥ 60 years (98.3% vs. 74.3%) and individuals with BMI $\geq 25\text{kg/m}^2$ (90.3% vs. 58.3%). Conclusion: CMF is an effective method to identify SLNs which is safe, efficient, and cost-effective. Furthermore, radiation exposure can be avoided, and it can be performed in institutes without nuclear medicine facilities. CMF achieves a high SLN identification rate, and most of this procedure is feasible under shadowless surgical light conditions. CMF can reliably perform SLN biopsy even in those aged ≥ 60 years and individuals with BMI $\geq 25\text{ kg/m}^2$.

Keywords : sentinel lymph node biopsy, identification rate, indocyanine green (ICG), indigocarmine, fluorescence

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