

The sensitivity and specificity of methylene blue dye as a single agent in sentinel lymph node biopsy for early breast cancer

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ABSTRACT

Introduction: Axillary lymph node dissection (ALND), although associated with significant morbidity, has been the standard procedure for axillary staging for breast cancer in many hospitals in Malaysia. The limited resources for radioisotope tracer and nuclear medicine service, coupled with insufficient number of trained surgeons, have been the major obstacles to perform sentinel lymph node biopsy (SLNB).

Materials and Methods: This study looks into the application of 1% methylene blue dye (MBD) as a single agent for SLNB and observes the outcome and any associated complication. Thirty-four patients with early breast cancer were enrolled. Two millilitres (ml) of 1% MBD was diluted with saline to a total volume of 5 ml. After induction of general anaesthesia, 3 ml of the diluted 1% MBD is injected subdermally at the upper outer quadrant of the breast followed by 5 minutes of massage. Sentinel nodes are identified as blue nodes or lymph nodes with a blue-stained lymphatic channel and were surgically removed. All patients then underwent tumour excision, either mastectomy or breast-conserving surgery, and ALND. The sentinel nodes were categorized to positive or negative for metastases and were compared with axillary lymph nodes for diagnostic value assessment.

Results: Identification rate of sentinel nodes was 91.2%. The mean number of removed sentinel nodes was 2 (SD=1) and the mean number of axillary nodes was 16 (SD=6). Sentinel node metastasis was found in 13 (41.9%) cases. There were two false-negative cases, resulting in a sensitivity of 86.7% (95%CI: 62.1-96.3). The negative predictive value of sentinel nodes to predict axillary metastasis was 88.9% (95%CI: 67.2-96.9). There were no complications observed.

Conclusion: Although inferior to the standard dual-tracer technique, the usage of MBD as a single agent in SLNB for early breast cancer still offers favourable accuracy and identification rate. With continuous training and improved surgeons experience, performing SLNB with blue dye alone is feasible in order to reduce the risks and morbidities associated with ALND.

KEYWORDS:

Breast cancer, sentinel lymph node biopsy, dye, sensitivity and specificity

INTRODUCTION

Breast cancer is one of the most common causes of cancer-related death worldwide. In 2012, 1.7 million cases of breast cancer were estimated by World Health Organization (WHO).¹ It accounts 25.1% of all cancers with standardized incidence rate of 43.1 per 100,000 and standardized mortality rate of 12.9 per 100,000.² In Malaysia, approximately 1 in 20 women will develop breast cancer in their lifetime with a higher incidence reported among Chinese followed by the Indians and the Malays.³

Over the years, the surgical treatment of breast cancer has developed substantially. It is known that the recurrence and survival rate in breast cancer are strongly dependent on the presence and extent of axillary lymph node involvement.⁴ Breast-conserving surgery for early breast cancer has reduced the major morbidity of mastectomy and therefore, greater consideration is now placed on the method for axillary staging.⁵ Conventionally, axillary lymph node dissection (ALND) is performed even for early breast cancer based on earlier reported evidence that it improves survival and reduces risk of recurrence.^{6,7} However, ALND is associated with significant morbidity such as lymphoedema, numbness, limited mobility, stiffness, and seroma formation, as well as risk for vascular and brachial plexus injury.^{4,8}

Many studies have proved that performing ALND for early breast cancer patients with clinically negative axillary nodes does not offer added benefit apart from subjecting patients for unnecessary morbidity and complication.^{4,9-12} For that reason, sentinel lymph node biopsy (SLNB) has been performed and studied over the years as an alternative to ALND. Current literatures support the use of dual-tracer technique for lymphatic mapping in SLNB, using both radioisotope and blue dye, as it results in the highest identification rates of up to 90% to 98%.^{13,14} On the other hand, the success rates for mapping with blue dye alone are slightly lower at between 83% and 93%.¹³

However, the non-availability of nuclear medicine service in many hospitals in Malaysia, coupled with limited resources for pre-operative lymphoscintigraphy and intra-operative radioisotope tracer have contributed to the difficulty in administering SLNB in Malaysia. Over the years, studies have been conducted to explore the possibility of performing SLNB using blue dye alone as a single agent. Few randomized

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