Improving Radical Resection Rates in Patients with Breast Cancer by Intraoperative Imaging using Bevacizumab-IRDye800CW – The MARGIN-2 Study

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Introduction

- Tumor-positive margins are reported in 10-11% of patients undergoing breast-conserving surgery (BCS) for breast cancer and require additional therapy (boost radiotherapy or re-excision) to reduce local recurrence risk.
- Fluorescence imaging shows promise in reducing tumor-positive margins by intraoperative tumor tissue visualization using tumor-specific tracers.

This clinical study, a phase two, non-randomized, prospective and interventional study aims to identify tumor-positive margins intraoperatively using fluorescence imaging with bevacizumab-IRDye800CW, and assess the feasibility of implementing fluorescence imaging in high-volume breast cancer centers.



Figure 2. *Ex vivo* imaging (PEARL trilogy)

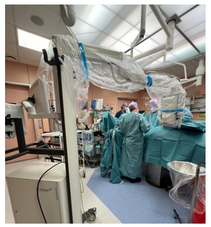


Figure 3. *In vivo* imaging (SurgVision Explorer Air II)

Results

- 53 patients with early-stage breast cancer scheduled for BCS completed all study procedures.
- 5 patients (9.4%) had an initially tumor-positive margin, due to fluorescence imaging we identified all patients with a tumor-positive margin and performed re-excisions in the same session.
- In 35 other patients re-excisions were performed in case of a suspected close or involved (tumor-positive) margin. The re-excision was generally performed at the side with the closest margin based on histopathology assessment.
- Incorporation of fluorescence imaging prolonged the average BCS time by a maximum of five minutes.

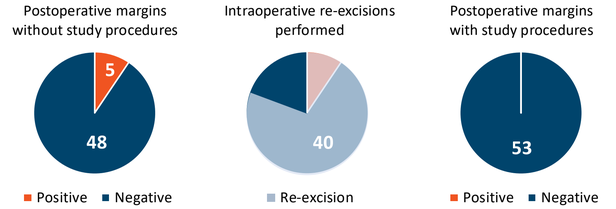


Figure 5. Postoperative margins without study procedures showed initially a tumor-positive margin in 5 patients and in 48 patients tumor-negative margins. Intraoperative re-excisions were performed in 40 cases (fluorescence imaging identified all 5 patients with tumor-positive margins). With study procedures, postoperative margins were negative in 53 cases.

Methods and Materials

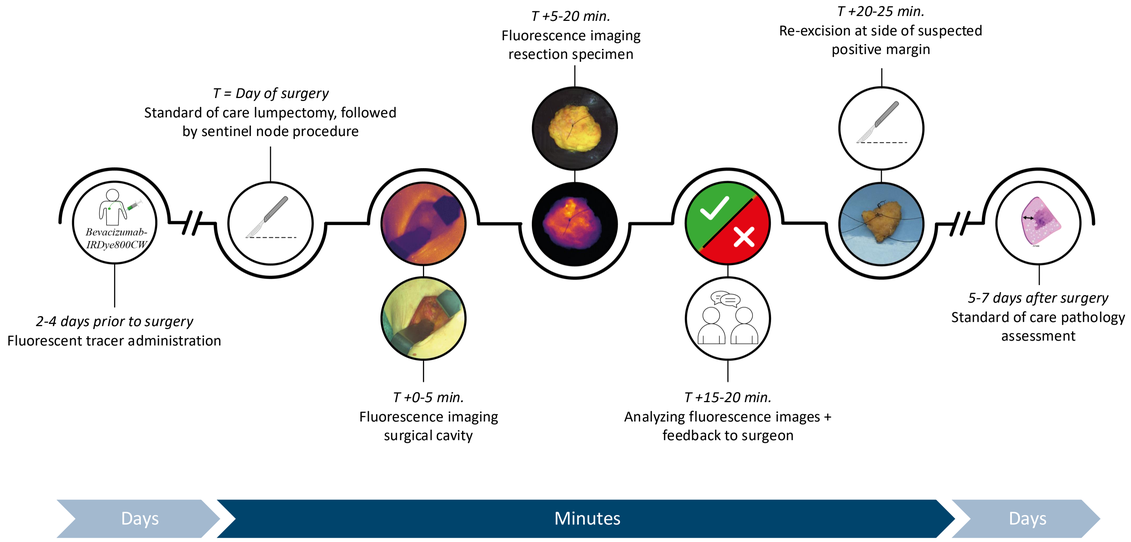


Figure 1. The study procedures and intraoperative margin evaluation workflow.

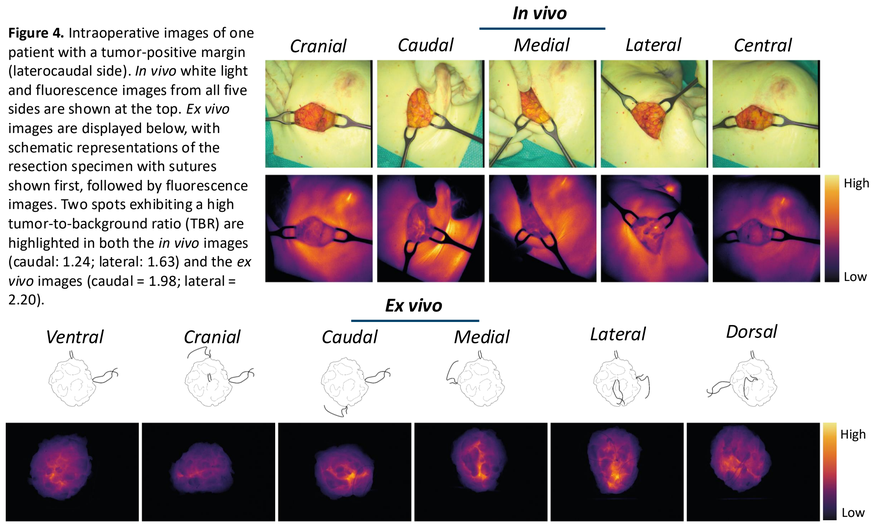


Figure 4. Intraoperative images of one patient with a tumor-positive margin (laterocaudal side). *In vivo* white light and fluorescence images from all five sides are shown at the top. *Ex vivo* images are displayed below, with schematic representations of the resection specimen with sutures shown first, followed by fluorescence images. Two spots exhibiting a high tumor-to-background ratio (TBR) are highlighted in both the *in vivo* images (caudal: 1.24; lateral: 1.63) and the *ex vivo* images (caudal = 1.98; lateral = 2.20).

Conclusions

- Targeted-fluorescence guided re-excisions prevented tumor-positive margins in 9.4% of patients undergoing BCS for breast cancer.
- No tumor-positive margins were missed and tumors were confirmed to be completely resected.
- With only a five-minute increase in surgery time, implementation of fluorescence imaging seems feasible in a high-volume breast cancer center.
- Further optimization of tracer specificity and signal depth quantification is needed to improve accuracy and clinical applicability.

Martini Ziekenhuis · umcg · Optical Molecular Imaging Groningen · San Antonio Breast Cancer Symposium · UT Health San Antonio Mays Cancer Center · AACR American Association for Cancer Research

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