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Effect of Pre-pectoral Versus Sub-pectoral Implant-Based Reconstruction on Post-mastectomy Radiation Dosimetry

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Introduction

- After mastectomy for breast cancer, more than 40% of women will have breast reconstruction¹
- There has been increasing interest in using pre-pectoral rather than sub-pectoral (**Figure 1**) implants given the lower rates of deformity, pain and healing time post-surgery.²
- However, many women who undergo reconstruction also receive adjuvant radiation therapy, and the impact of pre-pectoral implants vs sub-pectoral implants on radiation plan quality remains unknown

We aimed to evaluate the impact of pre-pectoral versus sub-pectoral implants on radiation dosimetry

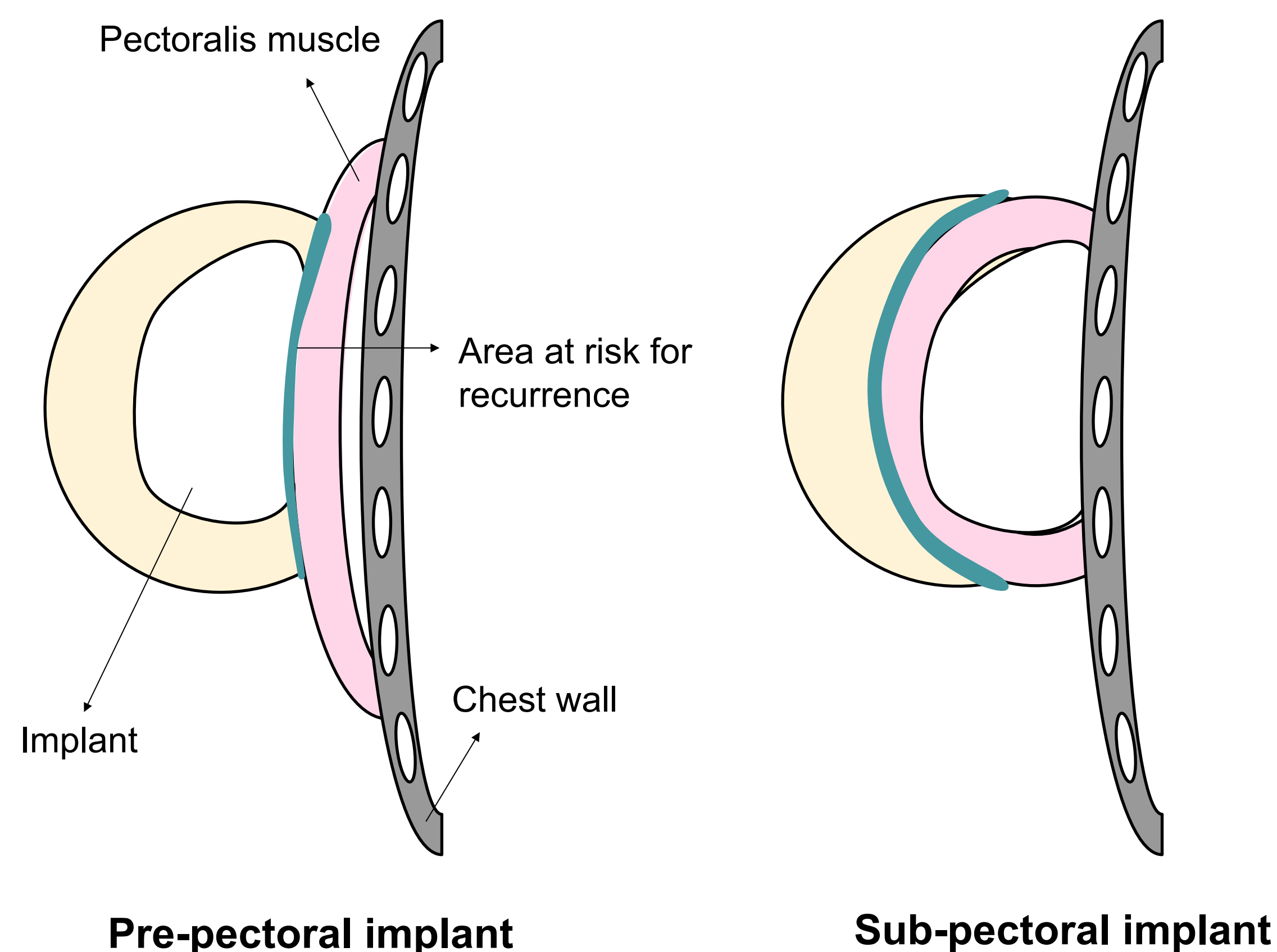


Figure 1. Sagittal representation of pre-pectoral vs sub-pectoral implants. Dark blue line represents area at risk of disease recurrence post-surgery that needs to be covered in radiation field.

Methods

- Retrospective chart review of patients who had implant-based reconstruction or tissue expander placement (either pre-pectoral or sub-pectoral implants) followed by post-mastectomy radiation (PMRT), treated at a single institution between 2014-2022.
- Matching 1:1 between patients receiving sub-pectoral or pre-pectoral reconstruction based on the following criteria:
 - Cancer sidedness (left vs right)
 - Use of boost (yes vs no)
 - Fractionation (conventional vs hypofractionation)
 - Extent of radiation fields (chest wall only vs chest wall and regional nodal irradiation)
- Used Mann-Whitney U test to compare DVH metrics including mean heart dose, ipsilateral lung V20Gy, internal mammary node (IMN) D80%, and chest wall (CW) D95%

Results

- 36 patients were identified by matching criteria; 18 patients with sub-pectoral implants and 18 patients with pre-pectoral implants
- Despite differences in individual patient plans in chest wall coverage (see **Figure 2**), there were no statistically significant differences in dose delivery to radiation targets or normal tissues (**Figure 3, 4**)

Results

Figure 2. Representative radiation plans in sagittal plane. Pectoralis muscles (indicated by arrow) are usually within the 100% isodose line (IDL) or within boost volume with sub-pectoral implants (bottom row). With pre-pectoral implants (top row), pectoralis muscle tends to fall within 95% IDL.

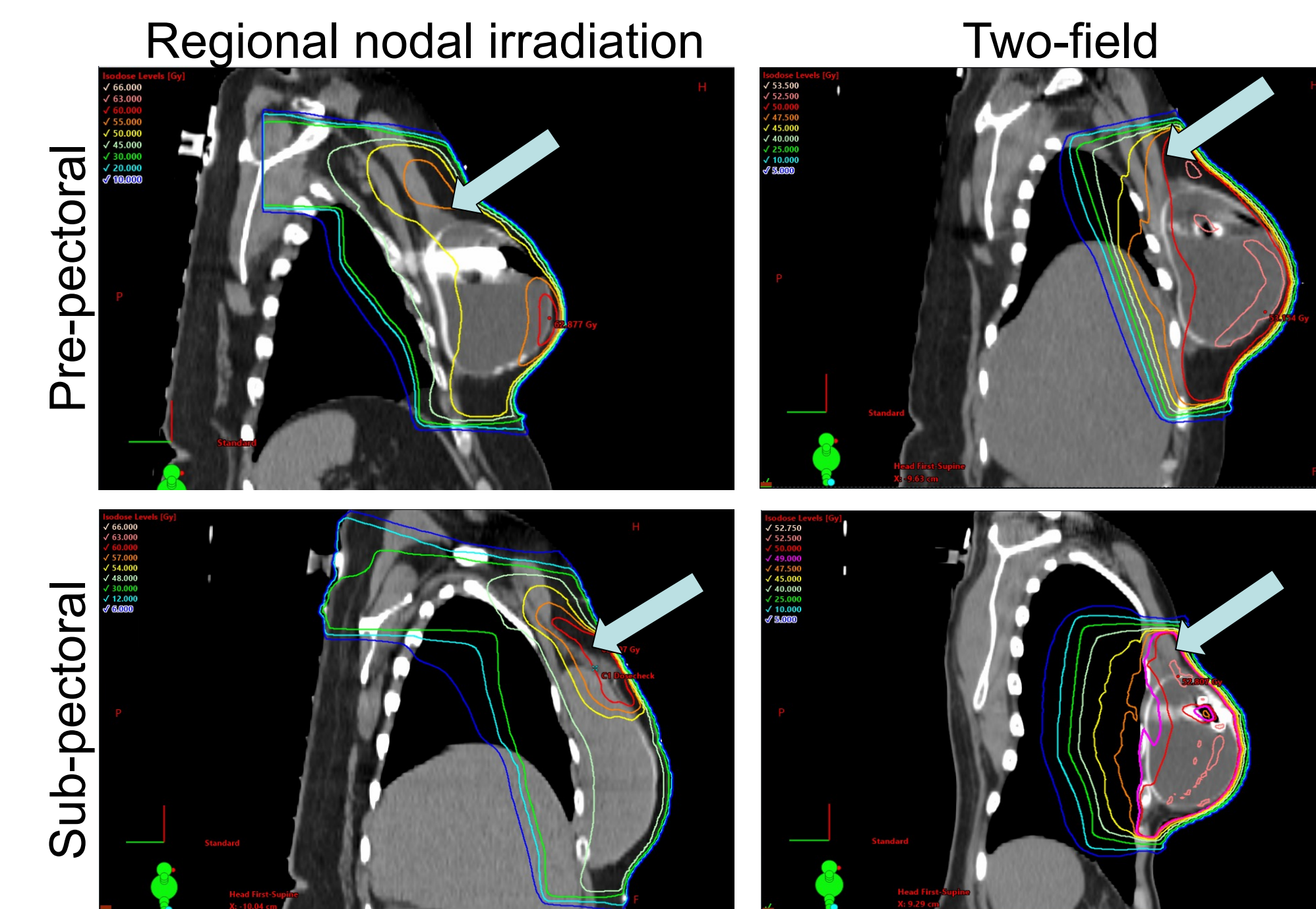
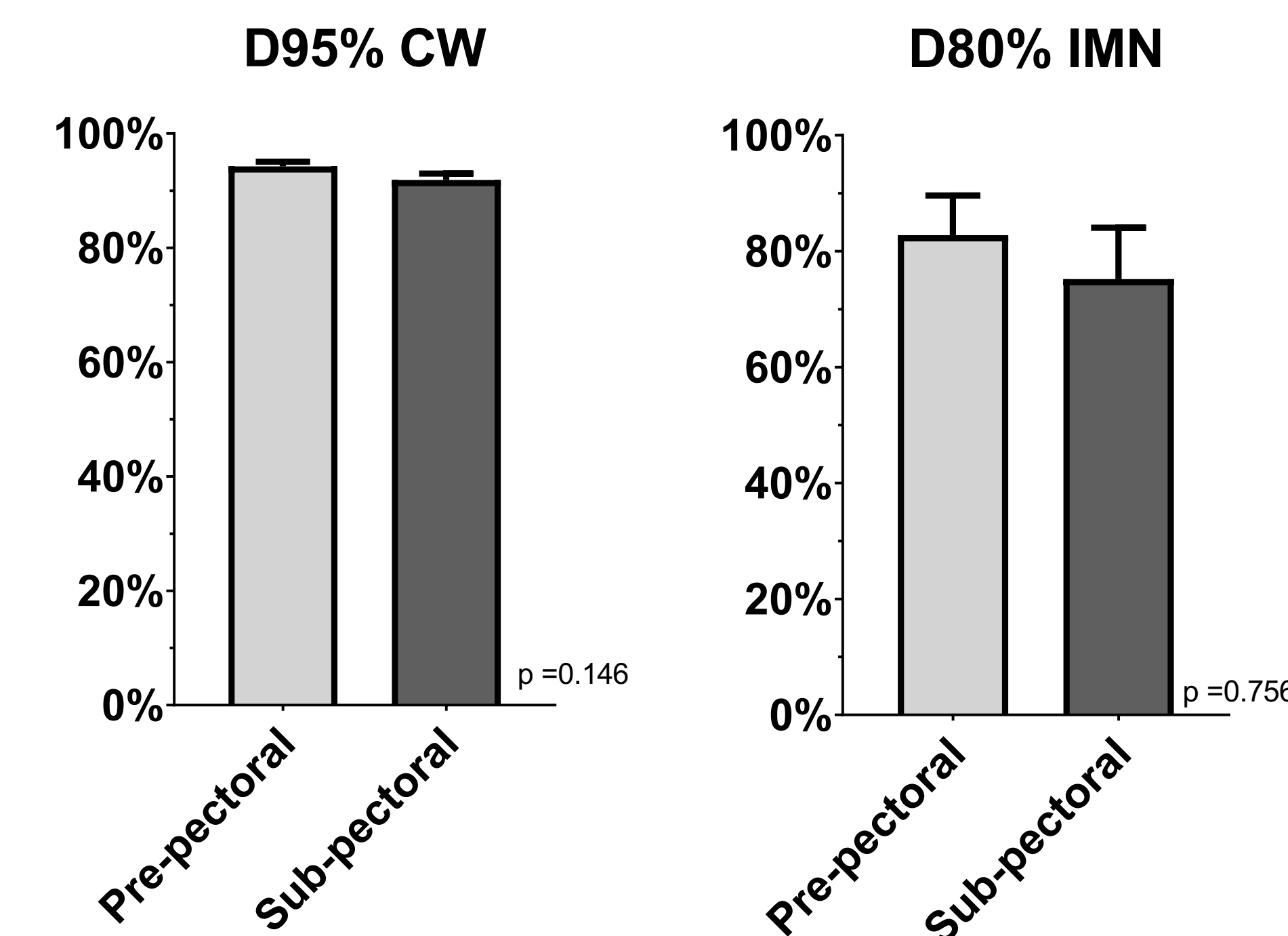
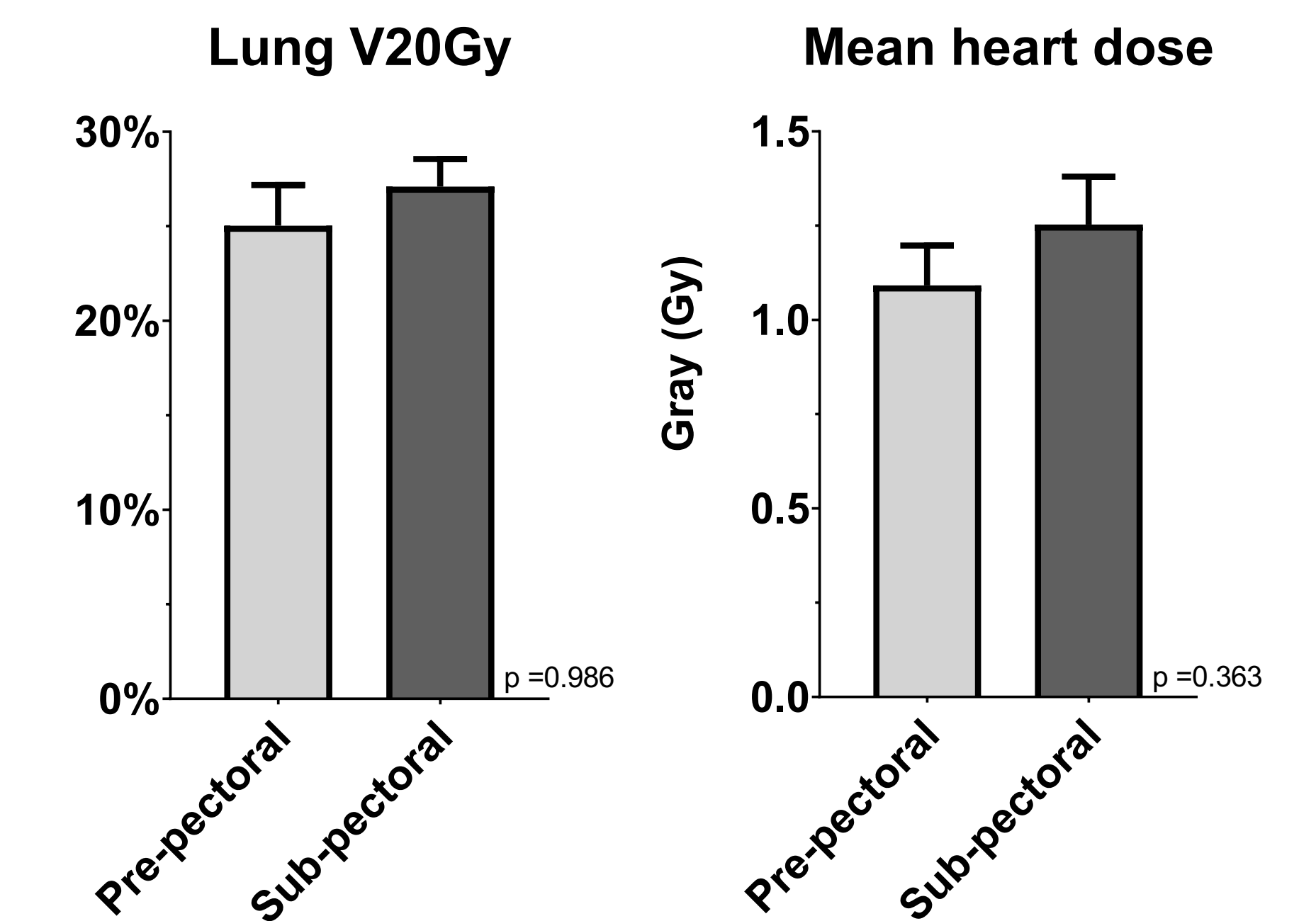


Figure 3. Dosimetric target coverage with pre-pectoral vs sub-pectoral implants



Results

Figure 4. Radiation dose to organs at risk with pre-pectoral vs sub-pectoral implants



Conclusions

- There is no significant difference in target coverage nor dose to organs at risk (lung and heart) based on implant or tissue expander location with respect to the pectoralis muscle
- Implant placement can be selected to optimize reconstructive outcomes without concern of compromising PMRT dosimetry
- More work is needed to understand whether implant type affects oncologic control or rates of complications post-radiation

References

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- (2) Yang JY, Kim CW, Lee JW, Kim SK, Lee SA, Hwang E. Considerations for patient selection: Prepectoral versus subpectoral implant-based breast reconstruction. Arch Plast Surg. 2019 Nov;46(6):550-557. PMID 31775208