

Background

In the UK, breast-conserving surgery (BCS) is widely adopted as the treatment of choice for in situ and early invasive breast cancer. Positive tumour margin status is the most important predictor of recurrence, associated with a relative risk of 2.44¹. There is variation in margin policy in the UK in response to the Society of Surgical Oncology and American Society for Radiation Oncology (SSO-ASTRO) and the Association of Breast Surgery (ABS) consensus^{2,3}.

Accurately orientating specimens is crucial in the correct identification and localization of positive margins. Sutures and metallic clips are traditionally used by surgeons to orientate the specimen before formalin-fixation and subsequent inking by the pathologist.

Intraoperative inking involves the surgeon applies coloured inks onto the specimen prior to fixation and transport to the pathologist. The ink forms a durable coating on the specimen surface, with different coloured inks corresponding to the anatomical planes of the excised tissue.

Aims & Objectives

This study aimed to explore the effects of Intraoperative Specimen Inking (ISI) on BCS re-excision rates.

Methods

Western Sussex Breast Centre database was retrospectively analyzed for patients that underwent wide local excision for a known invasive breast cancer diagnosis. Patient demographics, histopathology and specimen orientation method were recorded. Clinical and histopathological outcomes were compared between intraoperative (ISI) and standard inking (SSI) methods.

The primary outcome of this study was the breast conserving surgery re-excision rate.

A two-tailed P-value of <0.05 was considered statistically significant.

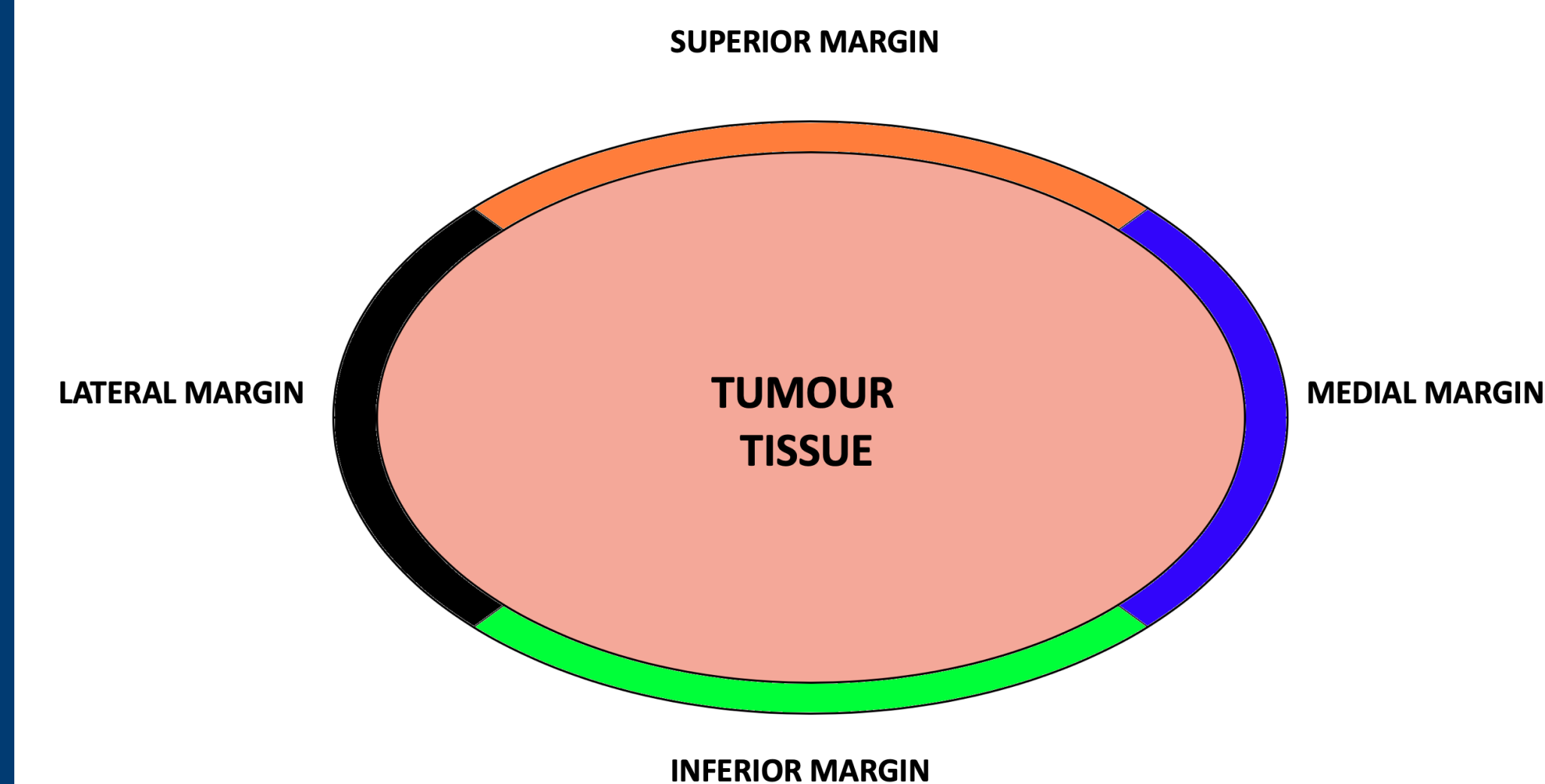


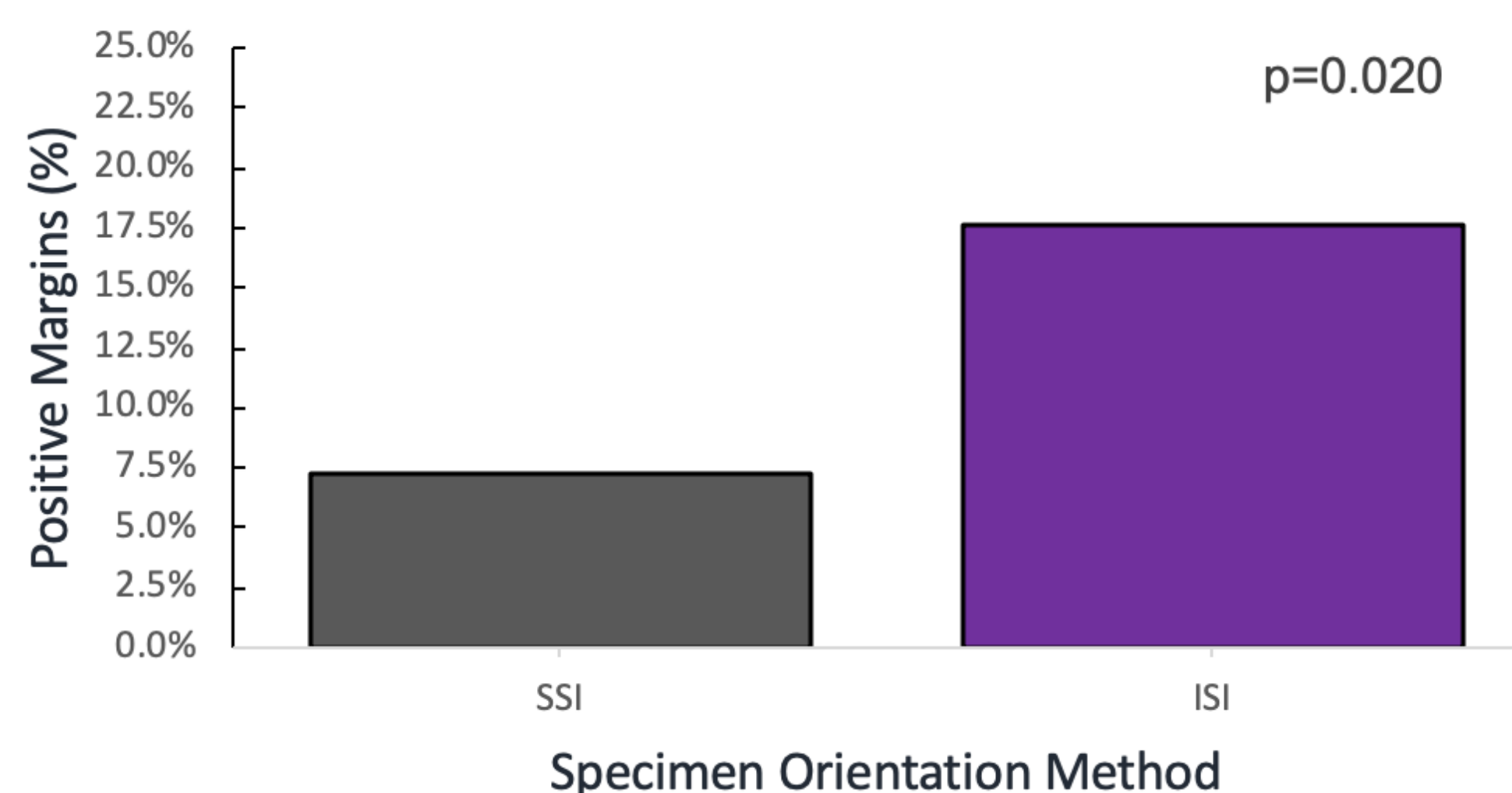
Figure 1. Diagram demonstrating tumour inking in the coronal plane.

Results

A total of 228 patients underwent WLE for a known cancer diagnosis between January 2014 and October 2017. 109 patients were operated on under the SSI protocol compared to 119 patients in the ISI group. The two groups were largely similar in term of patient demographics and tumour characteristics (Table 1).

29 of the 228 patients who underwent WLE were found to have positive tumour margins and subsequently went on to have a primary re-excision. The positive margin rate, and subsequently re-excision rate, was 7.3% among SSI patients compared to 17.6% of ISI patients (p=0.020) (Fig.2).

Figure 2 Positive Margin Rates Following Primary Excision



In total there were 4 local recurrences- 1 using intraoperative inking and 3 with standard inking. ISI demonstrated a 20.2% real reduction in local recurrence rate in comparison to SSI (4.5% vs 25.0%). However, this failed to reach statistical significance (p=0.110)(Fig.3).

Figure 3 Local Recurrence Amongst Re-operated Patients

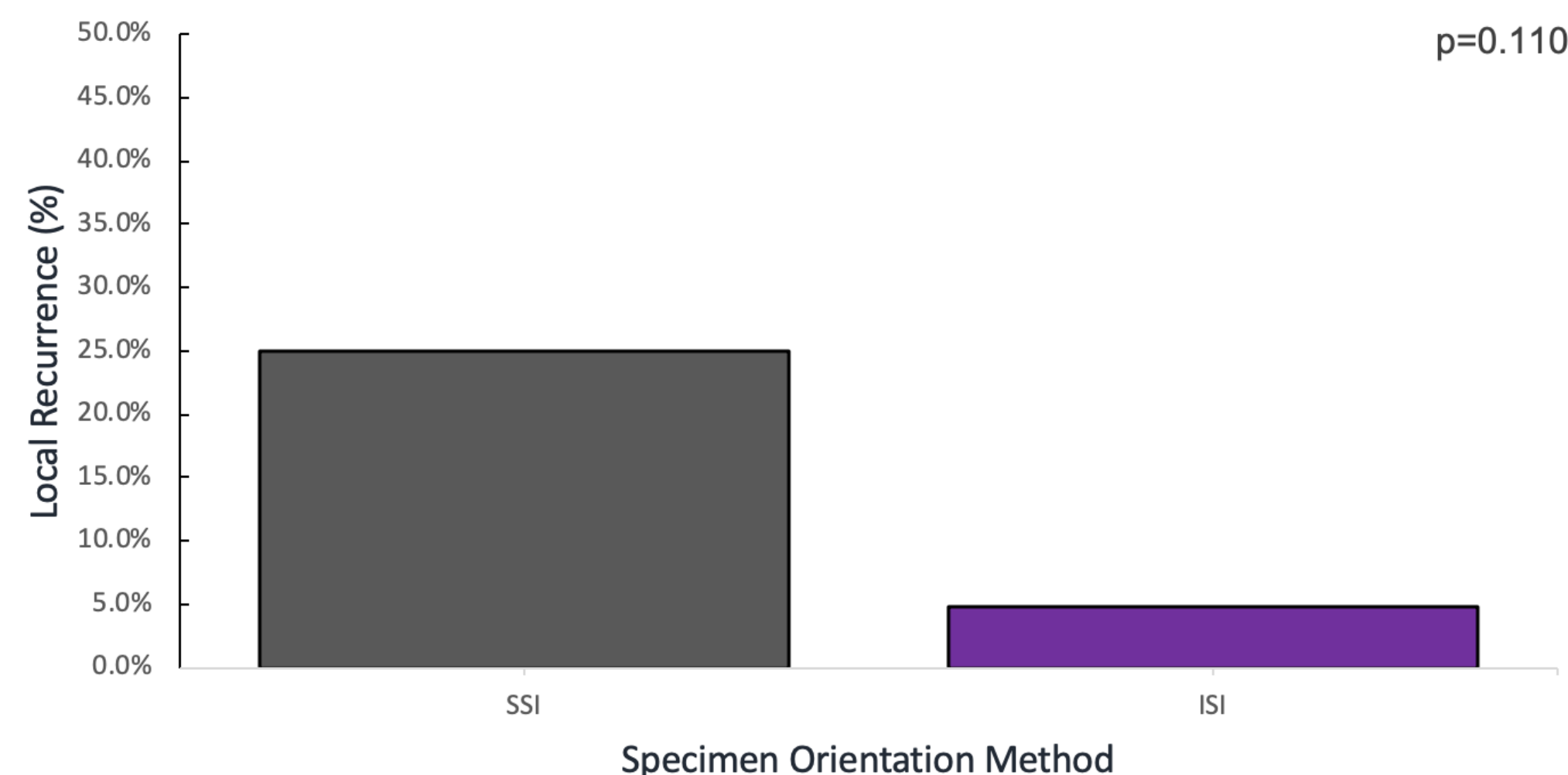


Table 1. Summary of patient and tumour characteristics

Patient Characteristics, Tumour Characteristics	Inking Strategy		
	SSI (n=109)	ISI (n=119)	p-value
Patient age	57 (30-97)	64 (27-90)	0.095
Tumour Histology			
DCIS alone	10 (9%)	18 (15%)	0.171
IDC	64 (59%)	79 (66%)	0.231
ILC	9 (8%)	8 (7%)	0.660
Other (including mixed)	26 (24%)	14 (12%)	0.017
Tumour Grade			
1	27 (25%)	32 (27%)	0.715
2	41 (38%)	52 (44%)	0.351
3	41 (38%)	35 (29%)	0.189
Tumour Receptor Status			
ER+	97 (89%)	101 (85%)	0.358
HER2+	8 (7%)	8 (7%)	0.855
Lymph Node Positive	28 (26%)	24 (20%)	0.321
Adjuvant Therapy	107 (98%)	106 (89%)	0.006
Wide Local Excision Volume (cm ³)	128.3 (± 121.7)	134.5 (± 378.1)	0.872

Conclusions

Intraoperative inking is superior to traditional methods of specimen orientation in the detection of residual disease.

Intraoperative inking offers a simple, effective and low-cost means of improving margin assessment to better clinical outcomes.

Future research must address the limitations of this study and focus on intraoperative inking's effect on local recurrence rates by utilizing a multi-center longitudinal study.

References

- Houssami N, Macaskill P, Luke Marinovich M, Morrow M. The association of surgical margins and local recurrence in women with early-stage invasive breast cancer treated with breast-conserving therapy: A meta-analysis. *Ann Surg Oncol.* 2014;21(3):717-730. doi:10.1245/s10434-014-3480-5
- ABS Consensus Margin Width in Breast Conservation Surgery. www.associationofbreastsurgery.org.uk. Accessed November 29, 2019.
- Morrow M, Van Zee KJ, Solin LJ, et al. Society of Surgical Oncology–American Society for Radiation Oncology–American Society of Clinical Oncology Consensus Guideline on Margins for Breast-Conserving Surgery With Whole-Breast Irradiation in Ductal Carcinoma in Situ. *Pract Radiat Oncol.* 2016;6(5):287-295. doi:10.1016/j.proro.2016.06.011