The Impact of a Prophylactic Skin Dressing on Surface-Guided Patient Positioning in Breast Radiation Therapy

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INTRODUCTION

- Radiation dermatitis is a common side of effect of Radiation Therapy[1] (RT)
- Prophylactic use of skin dressings such as Mepitel® (Mölnlycke, SE) has been shown to reduce skin reaction significantly[2-4], however the application of these dressings may distort the shape of the tissue underneath (Figure 1,3,4)
- Surface-Guided Radiation Therapy (SGRT) optically tracks the patient's skin surface and compares it to a reference surface to guide setup
- Local Real Time Delta (RTD) data suggests Mepitel® - induced distortion may reduce surface overlap with the reference surface by up to 13% in Breast patients (Figure 2)
- This distortion may impact the accuracy of SGRT setups
- This study investigated the impact of Mepitel®-induced contour changes on setup accuracy when utilising SGRT for Breast Radiation Therapy

Figure 1.

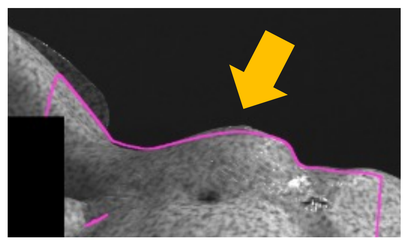
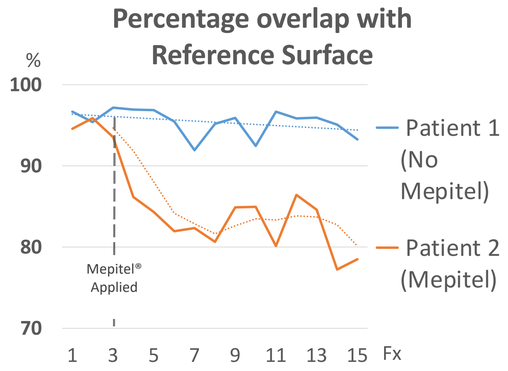


Figure 2.



METHODS

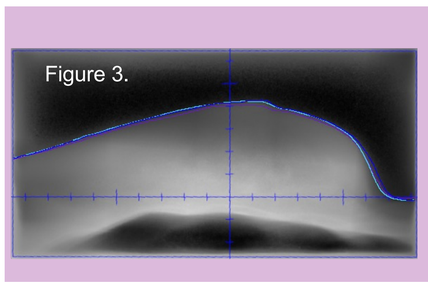
- This retrospective study included patients who received RT to their Breast or Chest wall between Aug 2021 & Aug 2022
- Suitable patients had Mepitel® applied prior to Fx2, 3 or 4. Re-applications were performed as necessary to ensure the film remained in-tact throughout the course of treatment
- AlignRT® (VisionRT, UK) was used for setup and monitoring, and daily image-guidance (IGRT) was performed for all patients using a kV orthogonal pair
- Both Breast and Chest wall patients were grouped into Mepitel® (M+) or Non-Mepitel (M-) groups
- Online corrections (OLCs) were performed following a match to the Chest wall + sternum using a 0mm action threshold
- Daily OLC data was collected for each patient
- A combined translational vector measurement (Vector-d) was calculated for each fraction, where:

Vector-d

$$=\sqrt{(Sup\ Inf\ OLC)^2+(Ant\ Post\ OLC)^2+(Lateral\ OLC)^2}$$

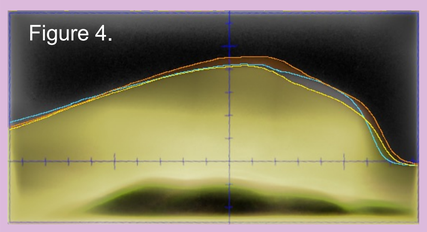
- A Mann-Whitney U test was performed to compare mean OLCs between Mepitel® and Non-Mepitel groups for both Breast and Chest wall patients

Figure 3.



Breast outlines on MV portal images taken Fx1-3, prior to Mepitel® application

Figure 4.



Breast outline on MV portal images taken throughout treatment course following Mepitel® application

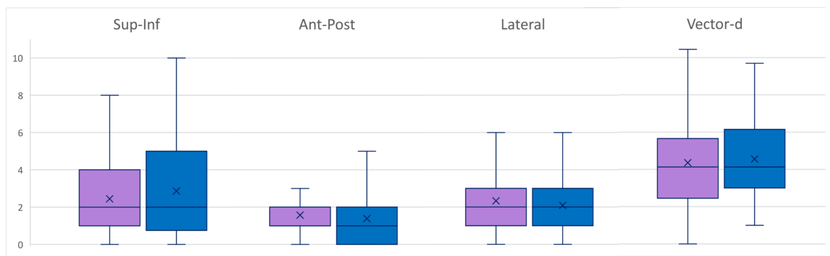
Blue: Fx3 No Mepitel®
Yellow: Fx4 Mepitel® applied
Orange: Fx11 Mepitel® re-applied

Prophylactic skin dressings placed over the treatment area may affect SGRT setup accuracy in Chest wall Radiation Therapy

When using Surface-guidance for setup, average online corrections were larger in the Superior-Inferior direction and combined translational vector for Chest wall patients with Mepitel® film applied

Figure 5.

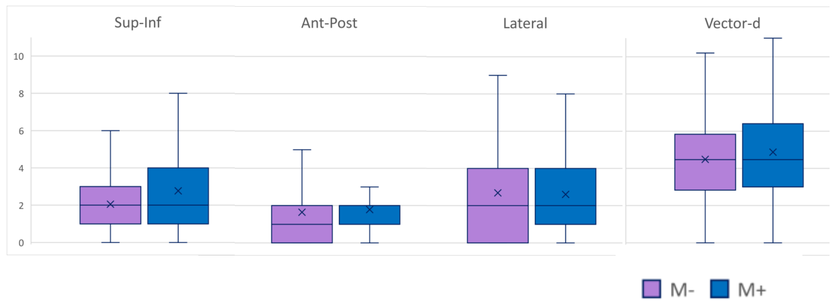
Breast OLC distributions (mm)



M- = No Mepitel, M+ = Mepitel®

Figure 6.

Chest wall OLC distributions (mm)



M- = No Mepitel, M+ = Mepitel®

RESULTS

- 189 Breast patients were included (M-, n=184 ; M+, n=5), with 2587 OLCs for the Breast M- group, and 94 OLCs for the Breast M+ group
- 37 Chest wall patients were included (M-, n=10 ; M+, n=27), with 159 OLCs for the Chest wall M- group, and 384 OLCs for the Chest wall M+ group
- Breast patients with Mepitel® had no significant differences in mean OLC magnitudes compared to Non-Mepitel patients (Figure 5 & Table 1)
- Chest wall patients with Mepitel® had significantly larger mean OLCs in the Superior-Inferior direction (2.77mm vs. 2.06mm, p=0.004) and Vector-d (4.87mm vs. 4.49mm, p=0.038), while differences between groups in other directions were insignificant (Figure 6 & Table 2)

Table 1.

Breast mean OLCs (mm)

	Sup/inf	Ant/Post	Lateral	Vector-d
M-	2.45	1.57	2.33	4.36
M+	2.86	1.38	2.10	4.55
Diff	+0.41 (p=0.380)	-0.19 (p=0.284)	-0.24 (p=0.772)	+0.19 (p=0.362)

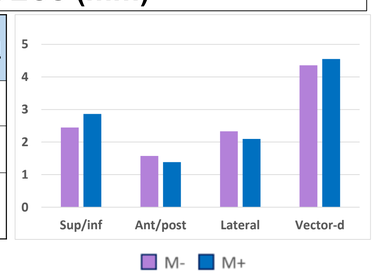


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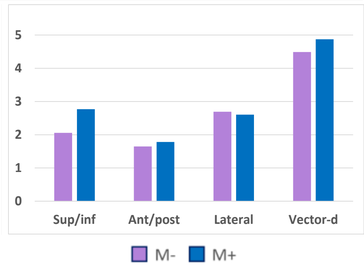
Table 2.

Chest wall mean OLCs (mm)

	Sup/inf	Ant/Post	Lateral	Vector-d
M-	2.06	1.65	2.69	4.49
M+	2.77	1.78	2.60	4.87
Diff	+0.71 (p=0.004)	+0.14 (p=0.229)	-0.09 (p=0.898)	+0.38 (p=0.038)



M- = No Mepitel, M+ = Mepitel®

CONCLUSION

- The application of Mepitel® over the treatment area can impact the accuracy of setups when utilising SGRT for Chest wall treatments. Larger sample sizes are required to conclusively assess the impact on Breast treatments
- The impacts are likely to have minimal clinical significance given the differences were less than 1mm
- The results highlight the importance of coupling SGRT with daily IGRT to generate a 'best of both worlds' approach
- Further investigation to accurately quantify both Mepitel®-induced contour changes, and any potential dosimetric impacts is warranted

1. Herst, P.M., *Protecting the radiation-damaged skin from friction: a mini review.* Journal of Medical Radiation Sciences, 2014. **61**(2): p. 119-25
2. Herst, P.M., et al., *Prophylactic use of Mepitel® Film prevents radiation-induced moist desquamation in an intra-patient randomised controlled clinical trial of 78 Breast cancer patients.* Radiotherapy & Oncology, 2014. **110**(1): p. 137-43.
3. Yee, C., et al., *A Feasibility Study of Mepitel® Film for the Prevention of Breast Radiation Dermatitis in a Canadian Center.* Practical Radiation Oncology, 2021. **11**(1): p. e36-e45.
4. Fernandez-Castro, M., et al., *Effectiveness of semi-permeable dressings to treat radiation-induced skin reactions. A systematic review.* European Journal of Cancer Care, 2017. **26**(6)

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