Spacer Study: a pilot on the use of a subcutaneous spacer injection in the breast for skin protection during brachytherapy

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Introduction: Partial breast irradiation following breast conserving surgery has shown equal effectiveness as whole breast irradiation in a selected group of early stage breast cancer patients. Main side effect of all forms of brachytherapy is skin toxicity, with dose to the skin as main risk factor. Creating an extra 5mm between radiation source and the skin by injecting a subcutaneous spacer could reduce the skin dose to 50%.

Aim of this study was to investigate the principle of the spacer injection.

Methods: A pilot study was performed on mastectomy specimen of women with breast cancer. Two products were tested: hyaluronic acid (HA) (“Barrigel”) and iodined PolyEthyleneGlycol (PEG) (“TraceIT”). Success of the intervention was defined as creating a thickness of ≥5mm subcutaneously in a skin area with a 20mm radius. Possibility of hydrodissection was recorded and ease of use was measured with the System Usability Scale (SUS). A CT-scan was made pre- and post-injection. Dosimetry analysis was performed by simulating a Clinical Target Volume and radiotherapy planning on the fused CT-scans. Skin isodose was calculated with and without spacer. Percentage of skin isodose≥85% was calculated as a measure of skin toxicity risk.

Results: 22 specimen were included for spacer injection; 11 HA, 11 PEG. Success of the intervention was 100% for HA and 90.9% for PEG (n.s.). Mean injected volumes were 7.4ml for HA and 7.3 for PEG (n.s.). Hydrodissection was possible in 81.8% with HA and 63.6%
with PEG (p<0.05). Mean SUS score was 96 for HA and 81 for PEG (p<0.05). Mean skin dose was 56Gy without spacer and 26Gy with spacer (p<0.01) Percentage of simulated skin isodose ≥85% was 31.7% without spacer and 2.5% with spacer (p<0.01).

Conclusion: This pilot study shows a very high success rate of a subcutaneous spacer injection for skin protection during brachytherapy of the breast. A spacer thickness of ≥5mm can reduce the skin dose dramatically. For this purpose, HA is superior to PEG regarding possibility of hydrodissection and usability. Clinical evaluation of the effect on skin toxicity is needed. This intervention could potentially protect the skin during several forms of brachytherapy in the future.