BC Cancer Agency
CARE + RESEARCH
An agency of the Provincial Health Services Authority

A randomized trial comparing seed loss and displacement of AnchorSeed® to standard uncoated loose seeds

David Bowes MD[1], Juanita Crook MD[2], Cynthia Araujo PhD[2], Brent Parker BSc[2], David Kim MD[2], Miren Gaztanaga MD[2], Marie-Pierre Milette PhD[2], Deidre Batchelar PhD[2], Rasika Rajapakshe PhD[2], David Petrik MD[2], Ross Halperin MD[2]

[1] Nova Scotia Cancer Centre, Halifax, Nova Scotia, Canada

[2] BC Cancer Agency Centre for the Southern Interior, Kelowna, British Columbia, Canada

Introduction

- Permanent seed brachytherapy is a highly effective treatment for clinically localized prostate cancer
- Some reports suggest improved dosimetric[1] and clinical outcomes[2] with loose (vs. stranded) seeds
- Loose seed implants may be complicated by:
  - Inferior displacement of seeds, which increases dose to membranous urethra and erectile tissues
  - Distant migration to pelvis or lung
- AnchorSeed® (Biocompatibles, Inc., Oxford, CT, USA) was designed to contain the radioactive source within a bio-absorbable synthetic polymer, as is used in strands.
- A retrospective study by Badwan et al[3] found less inferior seed displacement with AnchorSeeds® than regular loose seeds (1.5 mm versus 5 mm)
  - Not randomized or blinded
  - *Reviewed day 0 images only*

Figure 1: AnchorSeed® (Biocompatibles, Inc. Oxford, CT, USA, previously BrachyScience Inc.) showing the polymer 'anchoring' material composed of 4 rings and 2 longitudinal ribs

Objectives

1. To determine if AnchorSeed®, a specially engineered coated seed, will show less displacement or seed loss in the 30 days post implant compared with standard loose seeds
2. To determine the effect on prostate dosimetric quantifiers (V100, V150, V200 and D90) and on critical organ doses

Study Design

- 40 patients were randomized and implanted with either uncoated loose seeds or loose AnchorSeeds®.
- Oncologists, patients and all researchers involved were blinded as to seed type until all measurements and analyses were complete.
- Post-implant imaging:
  - Day 0 pelvic x-ray and CT with catheter
  - Day 30 pelvic x-ray, pelvic MRI, and CT with catheter

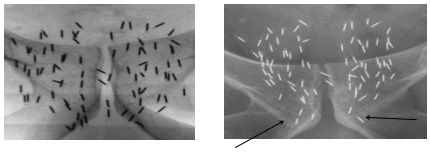

Figure 2: Example of day 30 distal migration of apical seeds. Day 0 on left and Day 30 on right

Methods

- Day 30 MRI and CT were fused using a seed-to-seed match
- Prostate and penile bulb contours were defined from the MRI and urethra was identified by the catheter on CT imaging
- Seed coordinates were determined relative to the center of mass of the seed cloud on the Day 0 and Day 30 CT scans using custom software.

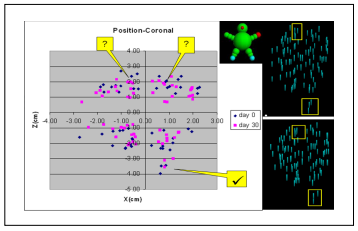

Figure 3: Plot of the superior/inferior seed positions versus the lateral position for Day 0 and Day 30. Custom software (not shown) aided the correlation of seeds by allowing rotation of the images and tagging of seeds

Results

- Superior/inferior displacement from Day 0 to Day 30 was determined for the 6 most superior and 6 inferior seeds with no correction for edema in either arm
- Mean displacement for the inferior seeds:

  Regular seeds 0.31 cm (SD 0.35) vs.

  AnchorSeeds 0.43 cm (SD 0.26), ($p < 0.05$)

→ **AnchorSeeds® *stuck* with the prostate and apical seeds did not migrate inferiorly, but not a clinically significant difference.**

- The number of seeds lost due to distant migration out of the treatment area (for example to the pelvis or lung): 7/1964 vs. 18/1746

  → **Significantly fewer AnchorSeeds® migrated**

SEED MIGRATION	AnchorSeed®	Loose seed	p value
Superior seeds	1/122	2/109	0.605
Inferior seeds	**1/124**	**8/105**	**0.015**
Total between CT scan times (CT Day 0 – CT Day 30)	7/1964	18/1746	0.09
Total between implant and Day 0 CT (implanted – CT Day 0)	4/1968	8/1754	0.115

- No significant difference in Day 30 dosimetry between AnchorSeed® and uncoated loose seeds was found
- A trend was observed towards a higher dose to the hottest 1 cc of penile bulb with AnchorSeed®, but this was not statistically significant

DOSIMETRIC DATA (mean and range)	AnchorSeed®	Loose seed	p value
Prostate volume (cc)	31 (15-63)	32 (20-56)	0.86
Prostate $D_{90\%}$ (%)	122 (100-143)	120 (92-146)	0.69
Prostate $V_{100\%}$ (%)	97 (90-100)	96 (96-100)	0.71
Prostate $V_{150\%}$ (%)	68 (50-86)	66 (50-87)	0.75
Prostate $V_{200\%}$ (%)	34 (18-51)	34 (22-49)	0.92
Rectum $V_{100\%}$ (cc)	0.91 (0-3.26)	0.55 (0-1.46)	0.13
Urethra $V_{150\%}$ (cc)	0.18 (0-0.76)	0.09 (0-0.95)	0.23
Penile bulb D_{1cc} (Gy)	43 (13-86)	33 (12-63)	0.05

Conclusions

Coated AnchorSeeds® were found to have a significant anchoring effect which reduced the number of apical seeds that migrated from the pelvis.

References

1. Reed DR, Wallner KE, Merrick GS, Arthurs S, et al. A prospective randomized comparison of stranded vs. loose 125I seeds for prostate brachytherapy. *Brachytherapy* 2007;6:129-34.
2. Hinnen KA, Moerland MA, Battermann JJ, van Roermund JG, et al. Loose seeds versus stranded seeds in I-125 prostate brachytherapy: Differences in clinical outcome. *Radiother Oncol* 2010;96:30-3.
3. Badwan HO, Shanahan AE, Adams MA, Shanahan TG, et al. AnchorSeed for the reduction of source movement in prostate brachytherapy with the Mick applicator implant technique. *Brachytherapy* 2010;9:23-6.