Real Time Ultrasound Guidance for Optimizing High Dose Rate Prostate Brachytherapy

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Conflicts of Interest

- Royalties from UpToDate.com
- Shareholder in Varian, Inc.
- Non-disclosure agreement with Varian Brachytherapy
My neighborhood bear
Timeline of Events
August 1, 2012 - Timothy Showalter, MD starts at UVa

“I want to do partial prostate brachytherapy with sharks with lasers with HDR”
Timeline cont’d

- Varian introduces Vitesse 3.0 - Dec 2012
- Invitation to give this talk - Feb 2013
- Receive Vitesse 3.0 - March 2013
- Acceptance testing, commissioning, dry runs, “buttonology” - April - August 2013
- First treatment ????????
IGBT Suite at UVa

- anesthesia equipment
- OR lights
- Siemens Somatom Sliding Gantry CT
- Trumpf OR table
Scan-Plan-Treat Workflow at UVa
(time from CT scan to initiation of treatment)

• vaginal cylinder ~ 13 minutes
• T&O ~ 25 minutes
• Gyn Interstitial ~ 1 hour
• (Contura-can place, scan, plan, & treat within ~2 hours)
• HDR Prostate Brachytherapy-????
Why prostate HDR?

- optimization (can compensate for poor placement of the needles)
- fewer radiation safety concerns
- no post plan
Why Ultrasound Based Treatment Planning?

- WYSIWYG (better visualization of base and apex of the prostate)
- Real time visualization of needle insertion
- Obviate the need to move the patient for CT or MR
- Works well in a scan-plan-treat environment (we have experience in maintaining patients under anesthesia during planning and treatment)
Intro to Vitesse 3.0

Variseed

BrachyVision
Vitesse

Variseed-like menu

HDR source activity
Dry-run set up

Vitesse laptop

B&K flex focus ultrasound

Civco EXII stepper

prostate phantom
Ultrasound Capture

manual capture
Ultrasound Capture

Using the ethernet link to the BK ProFocus and FlexFocus US system removes the need to calibrate the US Probe

Tracked stepper capture
Ultrasound Capture

Using the ethernet link to the BK ProFocus and FlexFocus US system removes the need to calibrate the US Probe

twister capture
Needle Identification

Place needles in plan where you think they may be used
Preinsertion of Needle (live display)

Sagittal View (live)

scan plane

transverse view-focus on needle of interest
Needle Inserted

needle flash is within the planned path
What if inserted needle does not overlie the planned needle?
adjust the planned position (can be done with bent needles as well)
Optimization

Optimization Parameters similar to BrachyVision

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Live DVH and dwell time display
Isodose and Dwell Control Window

Variseed-like

BrachyVision-like
QA

- Ensure proper transfer guide tube placement
- Measure needle + transfer tube lengths
- Dose second check
- Transfer plan to HDR Treatment Console
- Check treatment parameters
Dose second check

Excel spreadsheet reads in dwell positions and times, recalculate dose to dose points.
Partial prostate HDR

• used for low risk patients
• dosimetry can be optimized to spare adjacent structures
• CTV can be based on MRI
• US guided partial prostate HDR can be used to spare urethra, rectum
Grant to be Submitted

Ultrasound

CT-on-Rails-Guided Partial Prostate HDR Brachytherapy: A Therapeutic Alternative to Reduce Morbidity and Overtreatment for Low-Risk Prostate Cancer

PI: Timothy N. Showalter, MD (Department of Radiation Oncology)
Ultrasound/MR fusion
Other Uses
Syed Implant
Points to Ponder
Points to Ponder (cont’d)

• Patient Selection
• Ultrasound in place for treatment?
• Database Management
Brachytherapy Planning Systems

- BrachyVision
- VariSeed
- Vitesse
- BeBig Eye Plaque
DANGER WILL ROBINSON!!
Vitesse User’s Guide:

“Vitesse is intended for use by an expert user....Besides having professional certification, users shall be fully trained in HDR brachytherapy procedures, transrectal ultrasound brachytherapy, and the Vitesse application”
In case of problems...

do a CT scan and plan in BrachyVision
Conclusions

- Vitesse 3.0 is a full treatment planning system for ultrasound guided prostate HDR
- optimized for use with existing equipment (B&K ultrasound, Civco tracked steppers)
- can be integrated into a scan-plan-treat IGBT workflow
- all caveats are presumed- correct source activity, acceptance testing, commissioning and training
- can fuse with MR for partial prostate HDR
- some utility for gynecological treatments (???)
Acknowledgements

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• Paul Bagli - Civco
• Jerry Fiddes - B&K Medical
“A boy loves his dog” - Harlan Ellison