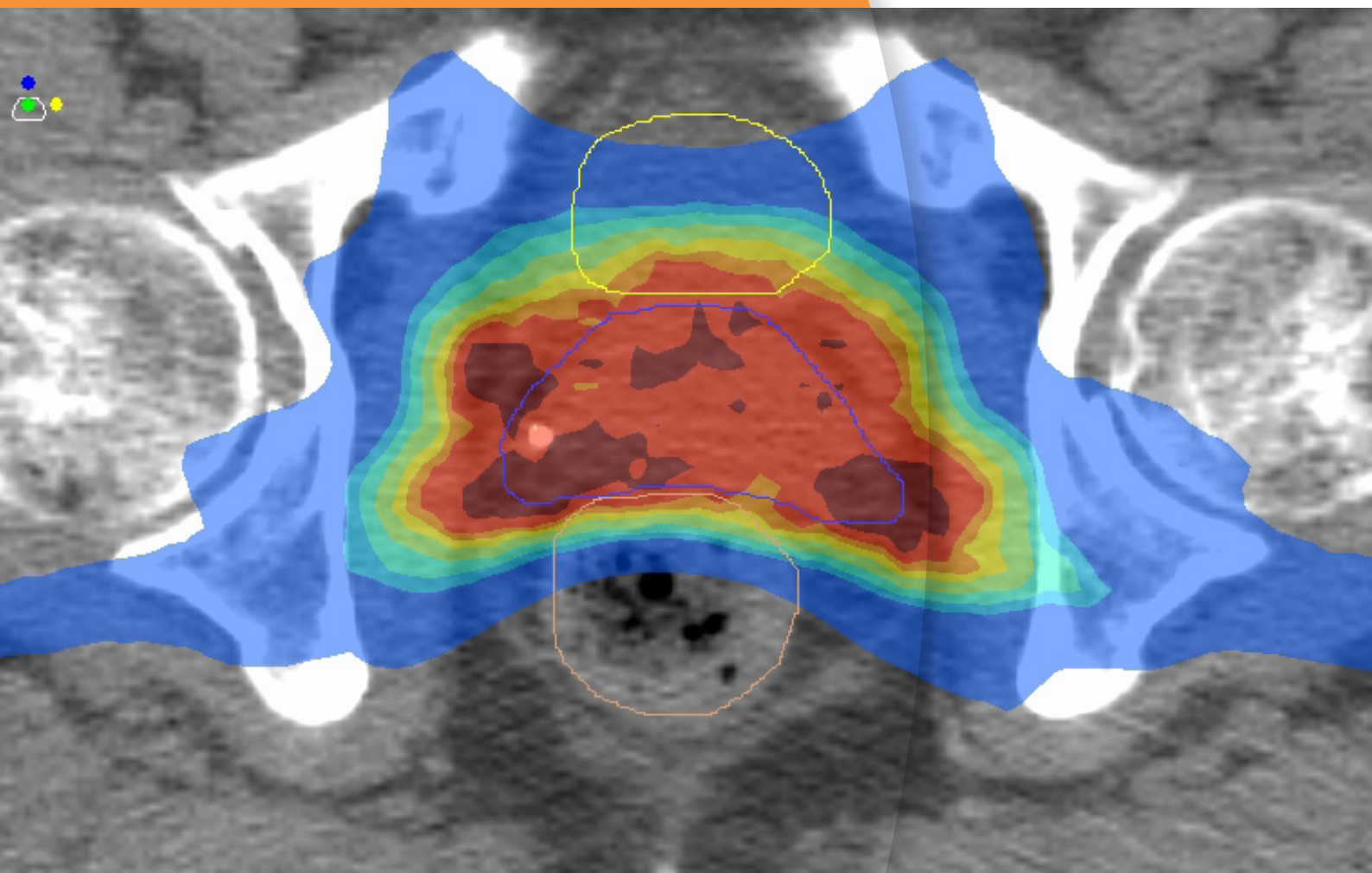# Volumetric modulated arc therapy (VMAT) in the treatment of a patient with prostate cancer

Institution
Santa Cruz

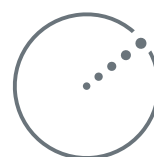**Location**
Santa Cruz, CA, USA
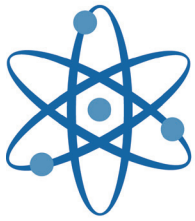
Patient
62-year-old male

Diagnosis
Prostate cancer

ELEKTA

Author: Wes Culberson, PhD, DABR

Volumetric modulated arc therapy (VMAT) in the treatment of a patient with prostate cancer

Patient History and Diagnosis

This is a 62-year-old white male that was diagnosed with prostate cancer in late 2010. He had a PSA level of 8.3, and a PCA-3 test elevated at 143 with the normal being less than 35. He had a transrectal ultrasound and prostate biopsy in November 2010, revealing 4/7 cores in the left lobe with Gleason 3+3 cancer and 3/7 cores on the right lobe of the prostate with Gleason 3+3 cancer.

Planned Treatment

The patient chose to undergo combination external beam and brachytherapy. Initial planning CT scans were obtained with the intent of delivering 45 Gy in 25 fractions. Pd 103 seed implants were used to boost the tumor dose on completion of the external bean therapy.

For the plan, 95% of the target was to be covered with the prescription isodose line of 45 Gy. The target is the PTV, which includes an asymmetric expansion of the CTV. For OAR criteria, the UCSF criteria in the book "Handbook of Evidence-Based Radiation Oncology 2nd Edition" written by Eric K Hansen and Mack Roach III were followed. The OAR constraints were scaled as appropriate for the prescribed dose.

Planning Techniques and Results

Planning was conducted on both XiO® IMRT and Monaco® using, dMLC, and VMAT. The target coverage and OAR sparing for each plan was compared as well as delivery time.

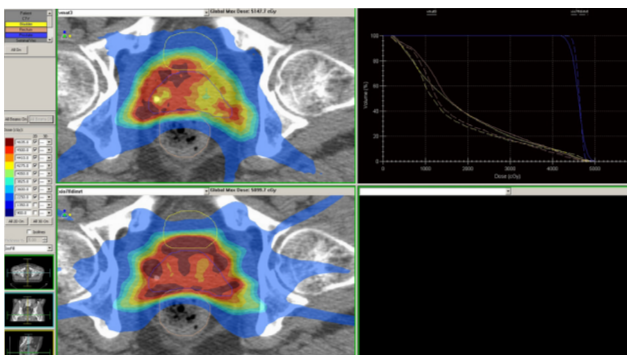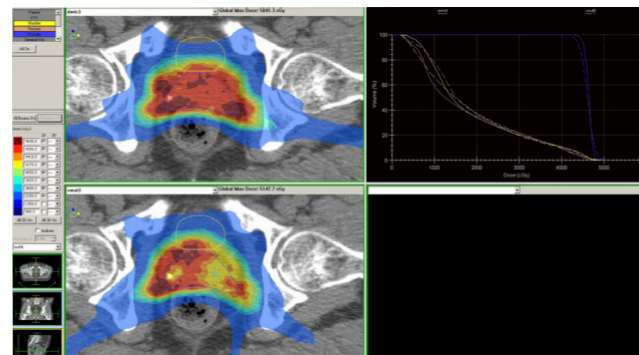| Item	Delivery Time
XiO	8 min, 48 sec
Monaco DMLC	6 min, 4 sec
Monaco VMAT	3 min, 22 sec

◀ Table 1.

Figure 1. VMAT vs. XiO®.

Figure 2. DCLM vs. VMAT.

Plan Outcome

VMAT was chosen as the treatment technique due to the comparable plans and reduced treatment time.

Planning Imaging	CT planning scan prior to treatment
Planning System	Monaco®
Energy	10MV
Dose	45Gy to the 100% isodose line
Critical Structures	Bladder and Rectum
Delivery Mode	VMAT
Arc Length	360º
Algorithm	Monte Carlo with inhomogeneity corrections
Treatment Time	3 min, 22 sec
Immobilization	Leg holder, foot holder, tattoos for setup

Table 2.

Imaging

On-line Imaging	VolumeView™ for first 10 fractions, then 2x per week thereafter
iViewGT™	For verification of first fraction only
Image Review	MOSAIQ™ for physicians to review
CBCT Parameters	M10 Aperture, F1 filter, 360 º acquisition
CBCT Time	Approximately 2 min acquisition
Registration	Automatic "grey match" + manual

Table 3.

Treatment Time Broken into Stages

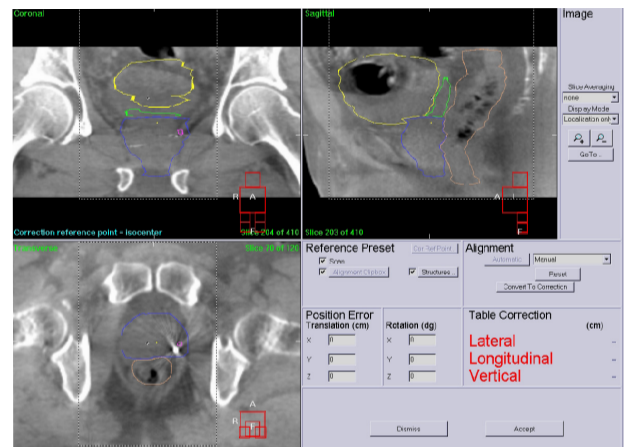|	
Approximate Setup Time	3 min
CBCT Acquisition	2 min
CBCT Registration	1 min – 2 min
Apply Shifts	10 sec
Treatment	3 min, 22 sec

Table 4.

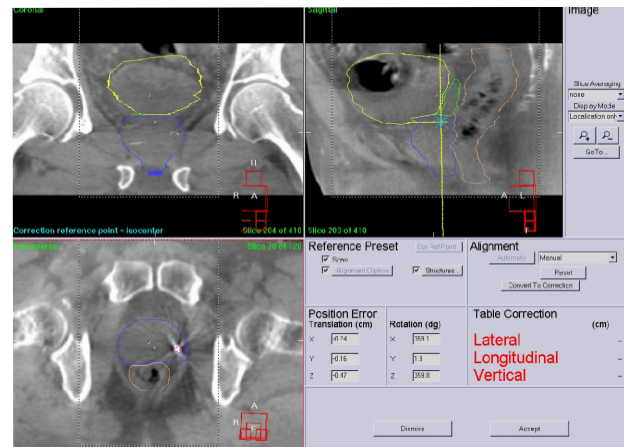

Figure 3. XVI Pre-Registration.
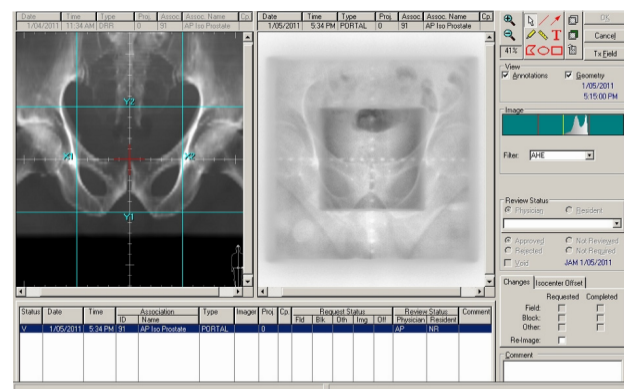

Figure 4. XVI Post-Registration.

Figure 5. XVI Physician AP Portal Review MOSAIQ®.

Conclusion

Advantages of using Monaco with VMAT:

- Monte Carlo calculation algorithm is considered one of the most accurate, currently available, algorithms
- Faster delivery time with comparable plans
- Decreased chance of intra-fraction motion
    - Less time for patient to be immobilized in an uncomfortable position
    - Shorter IMRT treatment slots

By using Monaco with VMAT treatments for this patient and others like him, we have been able to ensure continued quality of treatment, while reducing the delivery time. This allows for the maximum use of available time with our single linac, ensuring we can provide quality treatment to as many customers in our region as possible.