Image with confidence. Treat with confidence.

Addressing the effects of motion remains one of the significant challenges facing clinicians when delivering radiation to moving targets. As radiotherapy shifts more to hypofractionated (SRS/SBRT) treatment regimens, initial patient setup and during-treatment monitoring is becoming more important. Real-time visualization of targets of interest and surrounding normal tissue during beam-on plays a vital role in these cases. To address this challenge, Varian has developed a set of tools to provide meaningful information at patient setup and treatment delivery — the Advanced IGRT & Motion package. The package adds new capabilities to the TrueBeam® system portfolio of robust imaging modalities, giving you added confidence that the treatment stays on target.

On-Demand Imaging

On-demand imaging is an advanced form of ad-hoc imaging that allows image acquisition at any gantry angle. Advanced IGRT puts imaging control in the hands of users at the point of treatment. Using On-demand imaging, you can acquire and match images at any gantry position during the treatment session. You are no longer constrained to imaging only what was planned.

- Initiate image acquisition at any time with no preparation
- Use the same image procedure at any gantry angle
- If required, DRRs will be generated for matching

Pretreatment Fluoroscopy

Patient breathing can vary from day to day and this can impact target motion in the thorax and abdomen. Pretreatment fluoroscopic imaging is an excellent tool to evaluate this motion. The Advanced IGRT & Motion package enables features to confirm target location in real-time during setup.

- Overlay contours from the DRR onto fluoroscopy images. Applies to gated and non-gated treatments. For gated treatments, the field aperture contours change color in synchrony with the patient’s breathing
- The field aperture contours; defined by the MLC, jaws and blocks can be superimposed onto fluoroscopy images

Imaging During Treatment — Triggered Imaging

Much effort goes into outlining a patient’s key anatomical structures during treatment planning so that clinicians can customize treatment. Advanced IGRT enables acquisition of single kV images at regular intervals during treatment delivery. Images can be triggered based on the breathing motion of the patient, elapsed time, MU delivered, or gantry angle.

- Trigger intervals are adjustable
- Planning structures contoured on the reference CT at the time of treatment planning can be projected onto the triggered kV images
- If VMAT treatment delivery is used, the shape of the planning structures projected onto the acquired kV images is updated with gantry angle

2D/3D auto-match

Orthogonal paired images play an important role in patient positioning. They can be acquired quickly and contribute less dose to the total treatment than CBCT. 2D/3D brings several advantages:

- Robust to out-of-plane rotations
- Algorithm searches over a larger anatomic range
- Calculates pitch and roll positioning values
- Automatically generates DRR — less preparation time
Auto Beam Hold
Automatic identification of implanted fiducials in the triggered images automates their use. The treatment beam is automatically held if the fiducials cannot be detected or if the fiducials are outside of the allowed geometric tolerances.
- Works with any triggered image, regardless of trigger method
- Spherical and cylindrical fiducials are supported
- Works with as few as a single fiducial
- Color overlays indicate if the fiducial was detected within the tolerance region or not
- Can be setup to only display the color overlays and not hold the treatment beam (passive mode)
- The tolerance region for position of the fiducials can be defined by a circular area or the area defined by the projection of a planning structure
- If the tolerance region is defined by a planning structure, the area adjusts with gantry angle for VMAT treatments

Image Approval at TrueBeam
For increased efficiency and reduced offline review time, image matching of MV, kV and CBCT images can now be approved online at the TrueBeam treatment console.¹

Post treatment
Treating moving targets, such as in the thorax, can be challenging. Analyzing target motion, and verifying that it stays consistent during the treatment course, is vital to successfully treating many clinical cases.

4D Cone Beam CT²
Post treatment visualization of target motion.
- Generate 4D Cone Beam CT dataset that can be compared with the 4D CT in Eclipse
- Basic¹ (faster) and Advanced³ (higher quality) 4D CBCT reconstruction options

Extended Length Cone Beam CT²
There are treatment cases that require large field images, beyond what can be captured in one image rotation. The Advanced Reconstructor allows users to construct and stitch as many CBCTs as needed to create one extended length CBCT scan.
- Users can construct and stitch many CBCTs to create one extended length CBCT scan.
- The extended CBCT can be reviewed in Eclipse™

¹ Not possible to set image status to “reviewed,” only “approved.”
² 4D Cone-Beam CT and and Extended Length CBCT cannot be used for patient repositioning during the treatment
³ Requires the Advanced Imaging package

Intended Use Summary
Varian Medical Systems’ linear accelerators are intended to provide stereotactic radiosurgery and precision radiotherapy for lesions, tumors, and conditions anywhere in the body where radiation treatment is indicated.

Safety
Radiation treatments may cause side effects that can vary depending on the part of the body being treated. The most frequent ones are typically temporary and may include, but are not limited to, irritation to the respiratory, digestive, urinary or reproductive systems; fatigue, nausea, skin irritation, and hair loss. In some patients, they can be severe. Treatment sessions may vary in complexity and time. Radiation treatment is not appropriate for all cancers.

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