Purpose:
Stereotactic body radiation therapy (SBRT) requires high precision of patient position and target localization. For SBRT patients positioning, cone beam CT imaging has been widely used, generally with zero couch rotation. The purpose of this study is to implement Stereotactic radiation surgery (SRS) patient positioning technology to SBRT by expanding patient positioning with couch rotation.

Methods:
Currently we are using Varian® Novlis Tx for treating SBRT patients implementing CBCT. BrainLAB® X-ray imaging system in conjunction with optical guidance is primarily used for SRS patients. CBCT and X-ray imaging system were independently calibrated with 1.0 mm accuracy.
For daily imaging QA, we set up a Penta™ imaging phantom with infrared markers. The imaging phantom has two image isocenters for CBCT and X-ray imaging respectively with CBCT isocenter offset from the X-ray imaging isocenter.
The X-ray imaging system was implemented through BrainLAB® ExacTrac system with CBCT localized position at the initial zero position for the X-ray imaging system. For the other couch positions, X-ray images were fused with patient DRRs for positioning.

Results:
For daily imaging QA, the longitudinal, vertical and lateral coordination between CBCT and X-ray imaging average 0.4+/-0.6, 0.1+/-0.6 and 0.6+/-0.7 mm. The shift from the CBCT imaging isocenter to the X-ray imaging isocenter is 0.7+/-0.5 mm accuracy for a 6-month period of tracking.
Patient position accuracy: After initially localizing the patient with CBCT at the zero couch position, we then position the patient with the X-ray imaging system. The computed translational and rotational shift accuracy are 0.6+/- 0.6 mm and 0.5+/-0.3 degree respectively, based on 39 SBRT patients couch rotations.

Conclusion:
Accurate coordination of CBCT and X-ray imaging in conjunction with optical imaging guidance can be expanded to patient positioning with couch rotation. The X-ray imaging capability at rotated-couch positions improved the physician confidence level during SBRT treatment.