

Purpose: Two Varian on-board imaging (OBI) systems have been installed and commissioned in our clinic. Over recent months, a daily QA procedure was developed to monitor system's performance and a clinical study was implemented to transition electronic portal image (EPI) guided to OBI guided prostate treatments.

Method and Materials: A Penta-Guide phantom (QUASARTM) is used for daily QA. The functions of match and couch auto motion in the OBI kilo-voltage (kV) and OBI-CBCT systems are tested. For the clinical study, to be finished in April, 2008, 14 prostate (78Gy/39) patients have been recruited. CBCT soft tissue-based (ST) match and couch shift are performed twice a week and kV-orthogonal fiducial marker (FM) match and shift are executed 3 times a week for each patient before treatment. EPI FM match, our standard image guided procedure is used to verify the OBI match and couch motion. The differences are recorded.

Results: Daily QA data over 5 months show that the coincidence between EPI and OBI after couch motion is $0.1\pm 0.5\text{mm}$, $-0.2\pm 0.6\text{mm}$ and $-1.3\pm 0.6\text{mm}$ (2σ) in RL, SI and AP direction, respectively. The AP mean was caused by the systematic couch motion error. For the clinical study, the preliminary data from the first 8 patients have been analyzed. The differences between OBI-kV FM match and EPI FM match are $-0.1\pm 1.6\text{mm}$, $-0.4\pm 1.8\text{mm}$ and $-1.2\pm 2.6\text{mm}$ (2σ) in RL, SI and AP direction, respectively. The differences between OBI-CBCT ST match and EPI-FM match are $-0.9\pm 4.1\text{mm}$, $-0.8\pm 5.0\text{mm}$ and $-1.6\pm 5.1\text{mm}$ (2σ) in RL, SI and AP direction respectively. The AP mean is largely due to the systematic treatment couch motion error.

Conclusion: The daily QA is comprehensive to capture systematic errors; OBI-kV FM and EPI FM match agree within 3 mm in all three directions and CBCT-ST match demonstrates larger variations of 5mm compared with EPI-FM in three directions.