

Comparison of ExacTrac Dynamic and ExacTrac v6.0 for off-axis targets

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Purpose

In this study we compared the displacements produced after the image correction using an off-axis Winston-Lutz (WL) test for multiple brain metastases in two versions of ExacTrac: version 6.0 (ETv6) and Dynamic (ETD) on the same Linac (TrueBeam STx[®]).

Materials and Methods

An upgraded of the ExacTrac[™] system was done in our institution in August 2022. It was designed an off-axis WL test before the update for comparison purposes. A head 3D-printed phantom based on a patient's CT images was used (Fig. 1). Nine metallic fiducials were inserted and distributed on the phantom. For each target (fiducial) was designed an off-axis WL test with eight different gantry/collimator/table combinations (Fig. 2). The phantom was placed using two different ETv6 and ETD in the same linac and CBCT and electronic portal device imaging (EPID) images were acquired. The 2D deviation between the center of the fiducial and the radiation field was found and compared with the original DRR by the profiles.

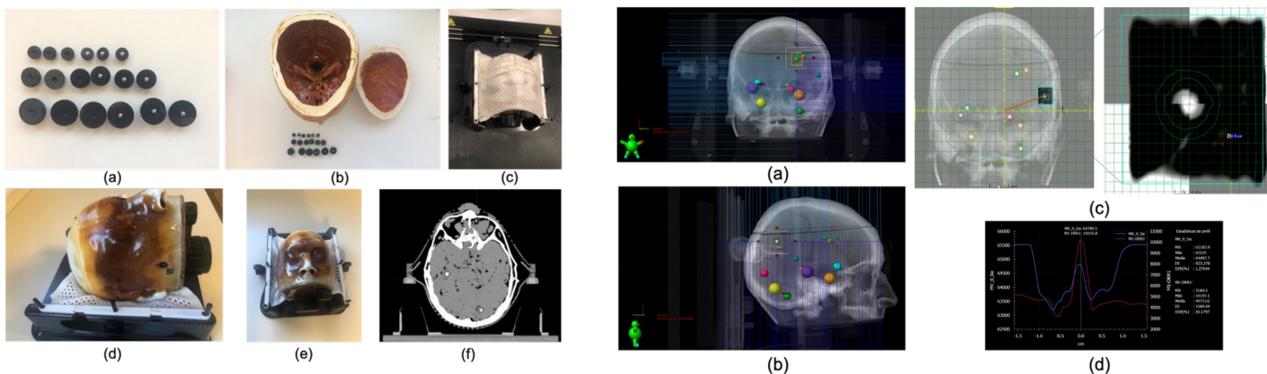


Figure 1

Figure 2

Results

The phantom allows the definition of a procedure to determine off-axis deviations in SRS treatments. Fig. 3 shows the EPID and CBCT shifts produced after the verification and correction by IGRT using both ExacTrac[™] versions. The shifts between pre-positioning and at the final of the test CBCTs were evaluated and no differences were obtained. However, ETD indicated more accurate values for all the targets no matter the distance to the isocentre (3D displacements < 0.5 mm) as shown in Fig. 4.

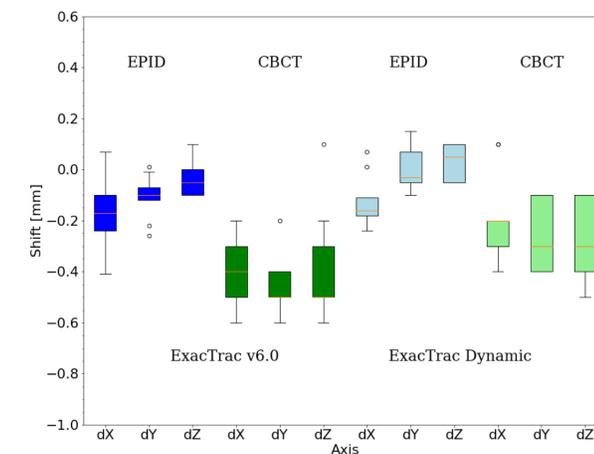


Figure 3

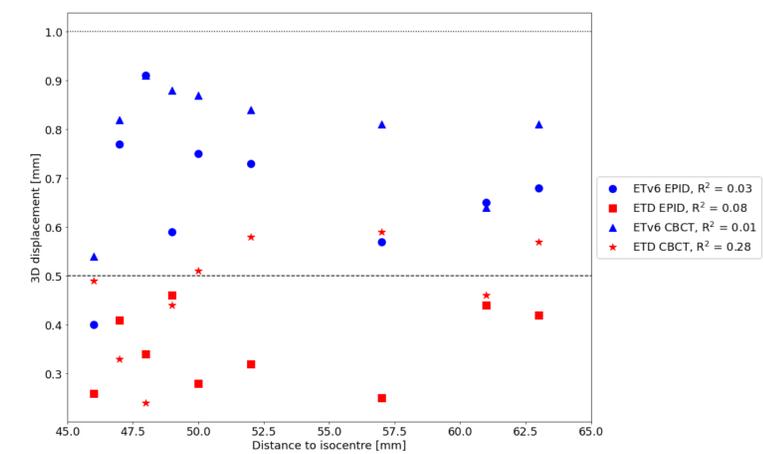


Figure 4

Conclusion

We consider that MBM SRS patient positioning by ExacTrac[™] system is the benchmark. The new features such as the use of optical/thermal and stereoscopic X-ray imaging information, the fusion algorithm, and the image quality performed by ExacTrac Dynamic[™] allow more accurate definition of the displacements for off-axis targets than its version v6.0, showing 3D displacements up to 0.5 mm in all targets no matter the distance to isocentre.