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Purpose: To evaluate the practicality of deformable mannequin in VRS for noncoplanar radiation therapy.

Materials and Method: A deformable mannequin was introduced in 3D VRS system. The system was based on radiation therapy simulation software, FocalSim™ from CMS, Inc. Using 3D stereoscopic technology, the VRS system displays the virtual treatment environment on a DTI™ 3D LCD screen without aid of gaggles. During the process, the selected patient's CT was position to the treatment couch in VRS with either modeled Elekta Synergy or Varian CL21EX machines. The mannequin was then fused on to the CT segment and repositioned to simulate actual patient's setup. The dimensions of the mannequin can be altered to fit real sizes, and its extremities can be bent and rotated to simulate actual positions on different immobilization fixtures. Then the treatment isocenter was selected and confirmed via beam-eye-view for the contoured PTV. In the program, the gantry, couch and the collimator can be realistically manipulated by dragging apparatus on Wacom™ touch screen. If a possible collision may occur between gantry and the mannequin or the couch, collision warning will be immediately indicated. The freedom ranges for different noncoplanar settings were finally recorded for planning guidance.

Results: Five treatment sites – central pelvis, left breast, pancreas, lungs, and mediastinum are evaluated. Depending on the size of the patient and relationship between PTV and OAR, exercises of noncoplanar settings can be greatly limited in conventional patient's position. The deformable mannequin enhanced VRS may maximize the usage of noncoplanner technique for both static and dynamic arc beam arrangements as suggested in this investigation.

Conclusions: The application of deformable mannequin in VRS effectively guided simulation with noncoplanar static or dynamic arc beam settings for different treatment sites.