AbstractID: 3451 Title: Accuracy of non-coplanar reconstruction of shielded colpostats in intracavitary brachytherapy

Purpose :
Presence of shields obscures the radiographic visualization of dummy sources by coplanar imaging. In this study a reconstruction method, using non-coplanar images, is tested for clinical use.

Method and Materials :
An isocentric dedicated imaging system with L&C-arm rotation and networked to a treatment planning system (TPS) is used for filmless planning. Testing done by (1) using a 'test phantom' having radiopaque markers separated by known distance (2) using single straight applicator for standardization (3) by orienting the Fletcher-Suit applicator with non-shielded and shielded colpostats to simulate clinical situation. Source position reconstruction was done using orthogonal algorithm for coplanar images and 'IBU reconstruction' algorithm for coplanar & non-coplanar images. Treatment length settings & active dwell positions were pre-fixed . Spatial orientation of dummy source positions, dose-volume histogram, dwell times, total treatment time were all generated. TPS calculated and delivered dose accuracy for both algorithms was checked for the straight applicator by using a 0.13cc ion chamber in a water phantom at various distances.

Results :
Distance variation using 'test phantom' for IBU method was found to be <1mm in the central region & <1.5mm in the corners of the fluoroscopic image and is comparable to the conventional orthogonal method. IBU method was also found to agree with the orthogonal method applicator with respect to source position co-ordinates (<0.5mm), dwell time (<0.3%), total treatment time (<0.3%) and dose-volume histogram analysis. The ratio of measured dose by both algorithms at various distances was close to unity. Reconstructed geometry of shielded colpostats by IBU non-coplanar method was found to visibly match with the "three dimensional" projection.

Conclusion :
Non-coplanar IBU algorithm provides an unambiguous reconstruction method when using shielded colpostats and allows for rapid filmless planning procedure.