

Purpose:

To study the impact of projection numbers on the quality of tomosynthesis images using megavoltage beams.

Method and Materials:

It has been shown that isocentric kilovoltage tomosynthesis images can be generated with no more than 50 degree scan angle. With only one seventh of scan time and dose of CBCT, this new technology can generate on-board images with comparable quality as CBCT to guide patient's positioning.

In this study, we used megavoltage (MV) beam projections to reconstruct tomosynthesis images. The MV projection images were acquired by using a MV portal imager mounted on a Varian-21EX LINAC. The high-resolution mode was used for acquisition and it required less than 1 cGy dose for each projection. The raw projections data needed background and floor image corrections and was then taken to generate tomosynthesis images by using the FDK cone-beam reconstruction algorithm.

Results:

Compared with kV tomosynthesis images, MV tomosynthesis images also give good contrast for bones. However, for soft tissue, their contrast is relatively lower. We calculate normalized mutual information (NMI) between MV and kV tomosynthesis images and studied its dependence on scan angle and angular interval. The experiment shows that with the angular interval fixed, NMI increases as the scan angle grows and with the scan angle fixed, NMI decreases as the angular interval increases. For our study on a spine phantom, 50-degree scan angle and 1-degree angular interval gives good trade-off between images quality and projection numbers.

Conclusion:

MV beam can be used to generate good quality tomosynthesis images.