

3484

A Dual-Energy Technique for Enhanced Localization Accuracy in Intracavitary Brachytherapy

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The orthogonal imaging method is commonly used for source localization in brachytherapy. In some cases, however, difficulty is encountered in determining the dummy sources because of the presence of either contrast materials or bony structures. We here offer a novel method for source localization utilizing a dual-energy, radiographic technique. In this approach, two sets of orthogonal radiographic images (anterior-posterior and lateral views) are obtained using two different x-ray energies. Image processing (i.e., subtraction between two image sets) is carried out to enhance the source image. In a study performed using a laboratory developed pelvic phantom, it was demonstrated that the dual-energy method could significantly enhance the image quality of the dummy sources, and improve the achievable precision and relative accuracy in localization of source positions. When directly combined with digital imaging modalities, the dual-energy method can be a useful technique to improve the accuracy in brachytherapy source localization from planar radiographs.

Keywords : Intracavitary Brachytherapy, Source Localization, Dual-Energy Technique