

A Review of Accuracy Optical Surface Imaging Systems for Setup Verification During Breast Radiotherapy Treatment

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Abstract : Background: The use of optical surface imaging systems (OSISs) is increasingly becoming popular in radiotherapy practice, especially during breast cancer treatment. This study reviews the accuracy of the available commercial OSISs for breast radiotherapy. Method: A literature search was conducted and identified the available commercial OSISs from different manufacturers that are integrated into radiotherapy practice for setup verification during breast radiotherapy. Studies that evaluated the accuracy of the OSISs during breast radiotherapy using cone beam computed tomography (CBCT) as a reference were retrieved and analyzed. The physics and working principles of the systems from each manufacturer were discussed together with their respective strength and limitations. Results: A total of five (5) different commercially available OSISs from four (4) manufacturers were identified, each with a different working principle. Six (6) studies were found to evaluate the accuracy of the systems during breast radiotherapy in conjunction with CBCT as a goal standard. The studies revealed that the accuracy of the system in terms of mean difference ranges from 0.1 to 2.1 mm. The correlation between CBCT and OSIS ranges between 0.4 and 0.9. The limit of agreements obtained using bland Altman analysis in the studies was also within an acceptable range. Conclusion: The OSISs have an acceptable level of accuracy and could be used safely during breast radiotherapy. The systems are non-invasive, ionizing radiation-free, and provide real-time imaging of the target surface at no extra concomitant imaging dose. However, the system should only be used to complement rather than replace x-ray-based image guidance techniques such as CBCT.

Keywords : optical surface imaging system, Cone beam computed tomography (CBCT), surface guided radiotherapy, Breast radiotherapy

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