Refraction-Based 2D, 2.5D and 3D Medical Imaging: Stepping Forward to a Clinical Trial

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X-ray dark-field imaging (XDFI) [1] using a transmission angle analyzer with a theoretically predicted thickness such as 2.124 mm has been successfully developed. The FOV of 90 mm x 90 mm [2] with the spatial resolution of 50 microns is available. This can visualize articular cartilage [2] and micro-papillary carcinoma [3]. That the contrast of breast cancer is based on Ca concentration was confirmed by 2-D x-ray fluorescence imaging [4]. Thinning the analyzer down to 125 microns can achieve a higher spatial resolution of being able to observe isolated breast cancer cells and stroma of the same micro-papillary carcinoma [5]. Furthermore the algorithm for a 3-D reconstruction due to refraction was newly developed [6-9]. Image of ductal carcinoma has been successfully achieved [10], leading to a potential use as endoscope [11]. Quite recently XDFI-based tomosynthesis [12] has been successfully developed to visualize sliced information of soft tissue such as articular cartilage and breast cancer. This would make a path to a clinical trial much shorter. The system is under development by a collaborative team.

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