Systematic Review Comparing Breast Cancer Detection of Contrast Enhanced Spectral Mammography with Full Field Digital Mammography

Introduction

Full field digital mammography (FFDM) is currently the gold-standard breast imaging modality for suspected breast cancer, however it has limited sensitivity and specificity imaging dense breasts. Contrast enhanced mammography combines low energy and high energy exposures, above and below the k-edge energy threshold of iodine, and intravenous injection of iodinated contrast media (ICM) to highlight areas of angiogenesis, a characteristic of malignancy on mammography images.

Initially temporal contrast enhanced mammography (TCEM) was developed to assess ICM uptake over time, however this progressed to contrast enhanced spectral mammography (CESM) as both breasts could be assessed during the same examination. Figure 1 shows an example of the low energy and recombined CESM images demonstrating areas of increased uptake of ICM, which could represent potential malignancy that might not have been visualised with FFDM.

Methods

A comprehensive search of the literature was conducted between July and October 2015 and repeated in February 2016 and July 2016. The search strategy sources included journal databases, grey literature databases, conference abstracts and clinical trial websites, which were all searched using the multiple terms for CESM, FFDM and breast cancer. The studies identified were screened against a pre-determined inclusion and exclusion criteria: Primary studies investigating human participants eligible for mammography, who underwent CESM and FFDM, and reported sensitivity and specificity values, were included. Studies investigating TCEM or other breast imaging modalities, such as ultrasound or magnetic resonance imaging, were excluded.

The selected studies were assessed for risk of bias using QUADAS-2 and data extracted using a standardised tool. The data was inputted into RevMan and MetaDisc software for statistical analysis.

Results

As the prisma diagram shows (Figure 2), 11 relevant studies were identified, 10 full text articles and one abstract. The included studies performed the same CESM technology (G.E. SenoBright®) and varied mammography technologies on the same patients who had an imaging abnormality or biopsy proven malignancy. The imaging results were then compared to histology as the reference standard.

Quality assessment found that none of the studies fully demonstrated low risk of bias (Figure 3). However this was usually due to not explicitly stating a consecutive sample was used, although implied, or for procedures that reflect normal clinical practice, for example the reference standard of histology would not usually be interpreted blind to imaging results in the clinical setting. All therefore were accepted for data synthesis.

Conclusion

CESM may improve sensitivity and specificity of breast cancer detection compared to mammography. However further research is required to establish applications and determine which patients would benefit.

References

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