

INPLASY

Diagnostic Performance of Simultaneous Multislice Diffusion-Weighted Imaging in Differentiating Breast Lesions: A Systematic Review and Meta-analysis

INPLASY202440082

doi: 10.37766/inplasy2024.4.0082

Received: 20 April 2024

Published: 20 April 2024

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ADMINISTRATIVE INFORMATION

Support - 1·3·5 project for disciplines of excellence, West China Hospital, Sichuan University.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202440082

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 20 April 2024 and was last updated on 20 April 2024.

INTRODUCTION

Review question / Objective This study aimed to investigate the diagnostic performance of simultaneous multislice diffusion-weighted imaging (SMS-DWI) in differentiating malignant and benign breast lesions, and compare it with conventional single shot and readout segmented echo planar imaging without the SMS technique.

Rationale Simultaneous multislice (SMS) technique can accelerate imaging acquisition of diffusion-weighted imaging (DWI). However, the diagnostic performance of SMS-DWI in differentiating breast lesions remains unclear.

Condition being studied Magnetic resonance imaging (MRI) plays a crucial role in the diagnosis and evaluation of breast diseases. As a non-

enhanced MRI technique, diffusion-weighted imaging (DWI) can detect the motion of water molecules and reflect their diffusivity, thus showing tissue cellularity and biophysical properties, which is essential in breast lesion detection and characterization. In addition, by quantitatively mapping the apparent diffusion coefficient (ADC) of the breast, DWI can differentiate benign and malignant breast lesions and evaluate the treatment response of breast cancer.

METHODS

Search strategy A comprehensive literature search was performed by two researchers in Pubmed, Embase and Web of Science databases. The search strategy used the following Medical Subject Headings (MeSH) terms and keywords: “breast lesion OR breast cancer OR breast neoplasm” AND “diffusion weighted imaging OR

diffusion magnetic resonance imaging OR DWI” AND “simultaneous multi-slice OR SMS”. In addition, a manual search was performed on the bibliographies of initially searched articles for additional relevant studies. The literature search was limited to articles in the English language and human-based studies.

Participant or population Patients with breast lesions (malignant or benign).

Intervention To investigate the diagnostic performance of SMS-DWI in differentiating malignant and benign breast lesions, and perform a comparative analysis with conventional SS-EPI and RS-EPI without the SMS technique.

Comparator Diagnostic performance of conventional DWI.

Study designs to be included Diagnostic test accuracy.

Eligibility criteria (a) a DTA study based on ADC values for both SMS-DWI and conventional DWI to differentiate breast lesions; (b) histopathological analysis of biopsy or surgical specimens was used as the reference standard for malignant breast lesions; (c) true-positive (TP), false-positive (FP), false-negative (FN), and true-negative (TN) values, as well as the diagnostic performance metrics could be extracted or calculated.

Information sources Pubmed, Embase and Web of Science databases.

Main outcome(s) This meta-analysis has proven that SMS-DWI has a high diagnostic performance in differentiating malignant and benign breast lesions. Furthermore, we found no statistically significant difference in the diagnostic performance between SMS-DWI and conventional DWI.

Quality assessment / Risk of bias analysis Quality Assessment of Diagnostic Accuracy Studies-2 (QUADAS-2) analysis was conducted to evaluate the methodological quality of included studies in four domains: patient selection, index test, reference standard, and flow and timing.

Strategy of data synthesis The summary sensitivity, summary specificity, and area under the summary receiver operating characteristic curve (AUC) were calculated using a bivariate random-effects model.

Subgroup analysis To explore the potential sources of heterogeneity, meta-regression and subgroup analyses were performed.

Sensitivity analysis A sensitivity analysis was implemented to test the stability of summary effect sizes.

Country(ies) involved China.

Keywords diffusion magnetic resonance imaging; simultaneous multislice; breast cancer; diagnostic test accuracy; meta-analysis.

Contributions of each author

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