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Comparative detection performance of different imaging modalities in suspected cardiac sarcoidosis: A systematic review and network meta-analysis

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ADMINISTRATIVE INFORMATION

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Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 19 June 2026 and was last updated on 19 June 2026.

INTRODUCTION

Review question / Objective This network meta-analysis provides robust evidence supporting the diagnostic accuracy of cardiac sarcoidosis imaging, thereby informing and enhancing clinical decision-making.

Rationale The optimal imaging modality for detecting cardiac sarcoidosis (CS) remains uncertain due to limited direct comparative data. The majority of published literature is confined to single-comparator designs (e.g., comparing a novel radiotracer solely against 18F-FDG or comparing PET with MRI). To bridge this critical evidence gap, this systematic review and network meta-analysis (NMA) aims to simultaneously evaluate and rank the diagnostic detection performance of various positron emission tomography (PET), cardiac magnetic resonance imaging (CMR), and conventional scintigraphy

modalities, thereby establishing an evidence-based hierarchy to guide clinical decision-making.

Condition being studied Cardiac sarcoidosis (CS) is a granulomatous inflammatory disorder defined by myocardial infiltration of non-caseating granulomas. Although systemic sarcoidosis predominantly affects the lungs and the lymphatic system, cardiac involvement carries disproportionate prognostic weight and represents the leading determinant of disease-specific mortality. The clinical phenotype of CS comprises a broad spectrum, extending from asymptomatic conduction abnormalities and atrioventricular block to life-threatening arrhythmias, heart failure, and sudden cardiac death. Because the inflammatory phase may ultimately lead to irreversible myocardial fibrosis, early recognition is critical to interrupt the inflammatory cascade, preserve ventricular function, and reduce the risk of sudden cardiac death. However, establishing a

definitive in vivo diagnosis of CS remains challenging.

METHODS

Search strategy The literature search strategy was formulated as follows: ((((((FDG) OR (GA)) OR (MRI)) OR (CMR)) OR (FLT) OR AND (cardiac sarcoidosis)). No publication date or language restrictions were applied.

Intervention N/A.

Comparator N/A.

Participant or population We included prospective or retrospective comparative studies that directly examined at least two imaging modalities in the same patients with suspected CS. Case reports, meta-analyses, reviews, and animal studies were excluded. Both reviewers screened titles and abstracts, and full texts of potentially eligible records were assessed by a third author. Disagreements were resolved by consensus.

Study designs to be included Studies directly comparing at least two imaging modalities for suspected CS. Eligible study designs included randomized controlled trials, controlled clinical trials, pragmatic trials, and prospective or retrospective comparative studies.

Eligibility criteria Inclusion criteria: Studies directly comparing at least two imaging modalities for suspected CS. Eligible study designs included randomized controlled trials, controlled clinical trials, pragmatic trials, and prospective or retrospective comparative studies. Exclusion criteria: Case reports, meta-analyses, review articles, and non-human (animal) studies.

Information sources Two authors (H.N.W. and C.K.H.) independently searched PubMed, Embase, the Cochrane Library, and ClinicalTrials.gov from inception to June 2026, using the Boolean string ((((((FDG) OR (GA)) OR (MRI)) OR (CMR)) OR (FLT) OR (FAP)) AND (cardiac sarcoidosis)) with no language or date restrictions.

Main outcome(s) The primary outcome was the detection rate (DR), defined as the proportion of patients or lesions exhibiting positive findings on the imaging scans. The criteria defining a positive scan were documented for each study, and any equivocal results were classified as negative.

Data management The NMA was performed with MetaInsight (version 6.4.1; Complex Reviews

Support Unit, National Institute for Health Research, London, UK), applying a frequentist random-effect model to allow for heterogeneity across studies. Pooled odds ratios were converted into absolute risk differences (RDs) and 95% confidence intervals (CIs) according to the median baseline risk of the comparator group. Modalities forming isolated nodes – i.e., those not connected to the rest of the network – were excluded.

Quality assessment / Risk of bias analysis Two authors (H.N.W. and C.K.H.) independently appraised the methodological quality of the included studies utilizing the revised Quality Assessment of Diagnostic Accuracy Studies (QUADAS-2) tool. This instrument systematically evaluates the risk of bias and applicability concerns across four domains: (1) patient selection, (2) index test, (3) reference standard, and (4) flow and timing.

Strategy of data synthesis The NMA was performed within a frequentist random-effects framework using MetaInsight software to account for the anticipated methodological heterogeneity across the included studies. To facilitate clinical translation, pooled odds ratios (ORs) were converted into absolute risk differences (RDs) with 95% confidence intervals (CIs). All imaging modalities were ranked based on point estimates derived from both direct and indirect comparisons, and forest plots were generated to visualize pairwise comparisons across studies. The consistency between direct and indirect evidence was rigorously evaluated utilizing the node-splitting method. Imaging modalities forming isolated nodes that could not be connected to the rest of the network were excluded from the analysis.

Sensitivity analysis Sensitivity analyses were conducted utilizing a one-study removal approach (sequentially excluding each study) to determine the influence of individual studies on the pooled effect estimates. The analysis confirmed that the overall effect estimates and the hierarchical rankings of the diverse imaging modalities remained stable and consistent despite the serial exclusion of individual studies.

Language restriction No language restrictions were applied to the literature search and study selection.

Country(ies) involved Taiwan.

Keywords Network meta-analysis, cardiac sarcoidosis, PET/CT, 67Ga-citrate, cardiac magnetic resonance, 18F-FDG.

Contributions of each author

Author 1 - Hsin-Ning Wang - Drafted the manuscript.

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