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Positron Emission Tomography–Computed Tomography versus Magnetic Resonance Imaging for Adult Patients with Suspected Cardiac Sarcoidosis: Clinical Utility, Cost-Effectiveness, and Diagnostic Accuracy

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Research Questions

1. What is the clinical utility of positron emission tomography–computed tomography compared to magnetic resonance imaging in patients with suspected active cardiac sarcoidosis?
2. What is the cost-effectiveness of positron emission tomography–computed tomography compared to magnetic resonance imaging in patients with suspected active cardiac sarcoidosis?
3. What is the diagnostic accuracy of positron emission tomography–computed tomography in patients with suspected active cardiac sarcoidosis?

Key Findings

One non-randomized study was identified regarding the clinical utility of positron emission tomography–computed tomography compared to magnetic resonance imaging in patients with suspected active cardiac sarcoidosis. Furthermore, two systematic reviews with meta-analysis and eight non-randomized studies were identified regarding the diagnostic accuracy of positron emission tomography–computed tomography in patients with suspected active cardiac sarcoidosis. No relevant literature was identified regarding the cost-effectiveness of positron emission tomography–computed tomography compared to magnetic resonance imaging in patients with suspected active cardiac sarcoidosis.

Methods

Literature Search Methods

A limited literature search was conducted by an information specialist on key resources including Medline and EMBASE via OVID, the Cochrane Library, the University of York Centre for Reviews and Dissemination (CRD) databases, the websites of Canadian and major international health technology agencies, as well as a focused internet search. The search strategy was comprised of both controlled vocabulary, such as the National Library of Medicine’s MeSH (Medical Subject Headings), and keywords. The main search concepts were position emission tomography computed tomography (PET/CT) and cardiac sarcoidosis. No filters were applied to limit the retrieval by study type. The search was also limited to English language documents published between January 1, 2010 and September 16, 2020. Internet links are provided where available.

Selection Criteria

One reviewer screened literature search results (titles and abstracts) and performed limited handsearching, and selected publications according to the inclusion criteria presented in Table 1. Full texts of study publications were not reviewed.

Table 1: Selection Criteria

| | |
|---------------------|---|
| Population | Adults aged 18 years and older with suspected active cardiac sarcoidosis |
| Intervention | PET-CT or PET (Q3: Reference test: endomyocardial biopsy) |
| Comparator | Q1-2: MRI Q3: MRI; No comparator (Reference test: endomyocardial biopsy) |

| | |
|----------------------|---|
| Outcomes | <p>Q1: Clinical utility: effect on clinical decisions, clinician and patient confidence in prognosis; all-cause mortality, hospitalization, transplant, symptom relief, timely treatment</p> <p>Q2: Cost-effectiveness</p> <p>Q3: Diagnostic accuracy: sensitivity, specificity, accuracy, positive predictive value, negative predictive value, disease detection rate</p> |
| Study Designs | Health technology assessments, systematic reviews, randomized controlled trials, non-randomized studies, economic evaluations |

Results

One non-randomized study³ was identified regarding the clinical utility of positron emission tomography–computed tomography compared to magnetic resonance imaging in patients with suspected active cardiac sarcoidosis. Additionally, two systematic reviews^{1,2} with meta-analysis and eight non-randomized studies⁴⁻¹¹ were identified regarding the diagnostic accuracy of positron emission tomography–computed tomography in patients with suspected active cardiac sarcoidosis. No relevant health technology assessments, randomized controlled trials, or economic evaluations were identified.

Additional references of potential interest that did not meet the inclusion criteria are provided in the appendix.

Health Technology Assessments

No literature identified.

Systematic Reviews and Meta-Analyses

Diagnostic Accuracy

1. Kim SJ, Pak K, Kim K. Diagnostic performance of F-18 FDG PET for detection of cardiac sarcoidosis; a systematic review and meta-analysis. *J Nucl Cardiol*. 2019 Jan [PubMed: PM30603894](#)
2. Youssef G, Leung E, Mylonas I, et al. The use of 18F-FDG PET in the diagnosis of cardiac sarcoidosis: a systematic review and metaanalysis including the Ontario experience. *J Nucl Med*. 2012 Feb;53(2):241-248. [PubMed: PM22228794](#)

Randomized Controlled Trials

No literature identified.

Non-Randomized Studies

Clinical Utility

3. Orii M, Hirata K, Tanimoto T, et al. Comparison of cardiac MRI and 18F-FDG positron emission tomography manifestations and regional response to corticosteroid therapy in newly diagnosed cardiac sarcoidosis with complete heart block. *Heart Rhythm*. 2015 Dec;12(12):2477-2485. [PubMed: PM26111805](#)

Diagnostic Accuracy

4. Divakaran S, Stewart GC, Lakdawala NK, et al. Diagnostic accuracy of advanced imaging in cardiac sarcoidosis. *Circ Cardiovasc Imaging*. 2019 06;12(6):e008975.
[PubMed: PM31177817](#)
5. Lebasnier A, Legallois D, Bienvenu B, et al. Diagnostic value of quantitative assessment of cardiac ¹⁸F-fluoro-2-deoxyglucose uptake in suspected cardiac sarcoidosis. *Ann Nucl Med*. 2018 Jun;32(5):319-327.
[PubMed: PM29560563](#)
6. Hanneman K, Kadoch M, Guo HH, et al. Initial experience with simultaneous 18F-FDG PET/MRI in the evaluation of cardiac sarcoidosis and myocarditis. *Clin Nucl Med*. 2017 Jul;42(7):e328-e334.
[PubMed: PM28418949](#)
7. Gormsen LC, Haraldsen A, Kramer S, Dias AH, Kim WY, Borghammer P. A dual tracer (68) Ga-DOTANOC PET/CT and (18) F-FDG PET/CT pilot study for detection of cardiac sarcoidosis. *EJNMMI Res*. 2016 01 Dec;6(1):(52).
[PubMed: PM27316444](#)
8. Lapa C, Reiter T, Kircher M, et al. Somatostatin receptor based PET/CT in patients with the suspicion of cardiac sarcoidosis: an initial comparison to cardiac MRI. *Oncotarget*. 2016 Nov 22;7(47):77807-77814.
[PubMed: PM27780922](#)
9. Ohira H, Birnie DH, Pena E, et al. Comparison of (18)F-fluorodeoxyglucose positron emission tomography (FDG PET) and cardiac magnetic resonance (CMR) in corticosteroid-naive patients with conduction system disease due to cardiac sarcoidosis. *Eur J Nucl Med Mol Imaging*. 2016 Feb;43(2):259-269.
[PubMed: PM26359191](#)
10. Yokoyama R, Miyagawa M, Okayama H, et al. Quantitative analysis of myocardial 18F-fluorodeoxyglucose uptake by PET/CT for detection of cardiac sarcoidosis. *Int J Cardiol*. 2015 Sep 15;195:180-187.
[PubMed: PM26043154](#)
11. Soussan M, Brillet PY, Nunes H, et al. Clinical value of a high-fat and low-carbohydrate diet before FDG-PET/CT for evaluation of patients with suspected cardiac sarcoidosis. *J Nucl Cardiol*. 2013 February;20(1):120-127.
[PubMed: PM23188627](#)

Economic Evaluations

No literature identified.

Appendix — Further Information

Previous CADTH Reports

12. Smith A, Loshak H. PET-CT for cardiology: a rapid qualitative evidence synthesis of patients' and caregivers' perspectives and experiences [CADTH rapid response report: summary with critical appraisal]. Ottawa (ON): CADTH; 2019 Mar: <https://cadth.ca/sites/default/files/pdf/htis/2019/RC1081%20PET-CT%20for%20Cardiology%20Final.pdf> Accessed 2020 Sep 22.
13. Pejic W, Ford C, Argáez C. Positron emission tomography–computed tomography for cardiovascular indications: diagnostic accuracy, clinical utility, cost-effectiveness, and guidelines [CADTH rapid response report: summary of abstracts]. Ottawa (ON): CADTH; 2018 Aug: <https://cadth.ca/sites/default/files/pdf/htis/2018/RB1244%20PET-CT%20for%20Cardiovascular%20Indications%20Final.pdf> Accessed 2020 Sep 22.

Systematic Reviews and Meta-Analyses – Alternative Intervention

Diagnostic Accuracy

14. Tang R, Wang JT, Wang L, et al. Impact of patient preparation on the diagnostic performance of 18F-FDG PET in cardiac sarcoidosis: a systematic review and meta-analysis. *Clin Nucl Med*. 2016 Jul;41(7):e327-339. [PubMed: PM26646995](#)

Non-Randomized Studies

Clinical Utility – No Comparator

15. Giudicatti L, Marangou J, Nolan D, Dembo L, Baumwol J, Dwivedi G. The Utility of whole body 18 F-FDG PET-CT in diagnosing isolated cardiac sarcoidosis: the Western Australian Cardiac Sarcoid study. *Heart Lung Circ*. 2020 Jan;29(1):e1-e6. [PubMed: PM31501049](#)
16. Ning N, Guo HH, Iagaru A, Mittra E, Fowler M, Witteles R. Serial cardiac FDG-PET for the diagnosis and therapeutic guidance of patients with cardiac sarcoidosis. *J Card Fail*. 2019 Apr;25(4):307-311. [PubMed: PM30825644](#)
17. Weinberg RL, Morgenstern R, DeLuca A, Chen J, Bokhari S. F-18 sodium fluoride PET/CT does not effectively image myocardial inflammation due to suspected cardiac sarcoidosis. *J Nucl Cardiol*. 2017 12;24(6):2015-2018. [PubMed: PM27197820](#)
18. Simonen P, Lehtonen J, Kandolin R, et al. F-18-fluorodeoxyglucose positron emission tomography-guided sampling of mediastinal lymph nodes in the diagnosis of cardiac sarcoidosis. *Am J Cardiol*. 2015 Nov 15;116(10):1581-1585. [PubMed: PM26411357](#)

19. Blankstein R, Osborne M, Naya M, et al. Cardiac positron emission tomography enhances prognostic assessments of patients with suspected cardiac sarcoidosis. *J Am Coll Cardiol*. 2014 Feb 04;63(4):329-336.
[PubMed: PM24140661](#)
20. Isiguzo M, Brunken R, Tchou P, Xu M, Culver DA. Metabolism-perfusion imaging to predict disease activity in cardiac sarcoidosis. *Sarcoidosis Vasc Diffuse Lung Dis*. 2011 Jul;28(1):50-55.
[PubMed: PM21796891](#)
21. Lee PI, Cheng G, Alavi A. The role of serial FDG PET for assessing therapeutic response in patients with cardiac sarcoidosis. *J Nucl Cardiol*. 2017 02;24(1):19-28.
[PubMed: PM27813028](#)
22. Ambrosini V, Zompatori M, Fasano L, et al. (18)F-FDG PET/CT for the assessment of disease extension and activity in patients with sarcoidosis: results of a preliminary prospective study. *Clin Nucl Med*. 2013 Apr;38(4):e171-177.
[PubMed: PM23429384](#)

Diagnostic Accuracy – Mixed Intervention

23. Wisenberg G, Thiessen JD, Pavlovsky W, Butler J, Wilk B, Prato FS. Same day comparison of PET/CT and PET/MR in patients with cardiac sarcoidosis. *J Nucl Cardiol*. 2019 Jan 2.
[PubMed: PM30603887](#)
24. Dweck MR, Abgral R, Trivieri MG, et al. Hybrid magnetic resonance imaging and positron emission tomography with fluorodeoxyglucose to diagnose active cardiac sarcoidosis. *JACC Cardiovasc Imaging*. 2018 Jan;11(1):94-107.
[PubMed: PM28624396](#)
25. Vita T, Okada DR, Veillet-Chowdhury M, et al. Complementary value of cardiac magnetic resonance imaging and positron emission tomography/computed tomography in the assessment of cardiac sarcoidosis. *Circ Cardiovasc Imaging*. 2018 Jan;11(1):e007030.
[PubMed: PM29335272](#)
26. Wicks EC, Menezes LJ, Barnes A, et al. Diagnostic accuracy and prognostic value of simultaneous hybrid 18F-fluorodeoxyglucose positron emission tomography/magnetic resonance imaging in cardiac sarcoidosis. *Eur Heart J Cardiovasc Imaging*. 2018 Jul 1;19(7):757-767.
[PubMed: PM29319785](#)

Diagnostic Accuracy – Alternative Comparator

27. Schildt JV, Loimaala AJ, Hippelainen ET, Ahonen AA. Heterogeneity of myocardial 2-[18F]fluoro-2-deoxy-D-glucose uptake is a typical feature in cardiac sarcoidosis: a study of 231 patients. *Eur Heart J Cardiovasc Imaging*. 2018 Mar;19(3):293-298.
[PubMed: PM28950301](#)

Review Articles

28. Giorgetti A, Genovesi D, Emdin M. The role of 18FDG PET/CT in the assessment of endocarditis, myocarditis and pericarditis. *Curr Radiopharm*. 2020 Apr. [PubMed: PM32321415](#)
29. Ha FJ, Agarwal S, Tweed K, et al. Imaging in suspected cardiac sarcoidosis: a diagnostic challenge. *Curr Cardiol Rev*. 2020;16(2):90-97. [PubMed: PM31345153](#)
30. Sharma A, Okada DR, Yacoub H, Chrispin J, Bokhari S. Diagnosis of cardiac sarcoidosis: an era of paradigm shift. *Ann Nucl Med*. 2020 Feb;34(2):87-93. [PubMed: PM31848928](#)
31. Wiefels C, et al. The Role of 18F-FDG PET/CT in cardiac sarcoidosis. *Int J Cardiovasc Sci*. 2020 Jul/Aug;33(4): https://www.scielo.br/scielo.php?script=sci_arttext&pid=S2359-56472020005006208&lng=en&nrm=iso Accessed 2020 Sep 22.
32. Bois JP, Muser D, Chareonthaitawee P. PET/CT Evaluation of cardiac sarcoidosis. *Pet Clinics*. 2019 Apr;14(2):223-232. [PubMed: PM30826020](#)

Additional Reference

33. Mattison C, Gauvin FP, Wilson MG. Rapid synthesis: examining the public provision and funding of PET-CT imaging for non-cancer indications. Hamilton (ON): McMaster Health Forum; 2018 Feb: <https://www.mcmasterforum.org/docs/default-source/product-documents/rapid-responses/examining-the-public-provision-and-funding-of-pet-ct-imaging-for-non-cancer-indications.pdf> Accessed 2020 Sep 22.