SYSTEMATIC REVIEW

Diagnostic test accuracy of Xpert MTB/RIF for tuberculous pericarditis: a systematic review and meta-analysis [version 1; peer review: 2 approved]

Andrianto Andrianto1,2, Ni Made Mertaniasih1,3, Parama Gandi1,2, Makhyan Jibril Al-Farabi2,4, Yusuf Azmi1, Michael Jonatan1, Stevanus Immanuel Silahooij1,5

1Faculty of Medicine, Universitas Airlangga, Surabaya, 60132, Indonesia
2Department of Cardiology and Vascular Medicine, Faculty of Medicine, Universitas Airlangga, Soetomo General Academic Hospital, Surabaya, 60286, Indonesia
3Department of Clinical Microbiology, Faculty of Medicine, Universitas Airlangga, Surabaya, 60132, Indonesia
4School of Management, University College London, London, UK
5Department of Internal Medicine, Faculty of Medicine, Universitas Airlangga, Soetomo General Academic Hospital, Surabaya, 60286, Indonesia

First published: 22 Jul 2020, 9:761
https://doi.org/10.12688/f1000research.22770.1
Latest published: 22 Jul 2020, 9:761
https://doi.org/10.12688/f1000research.22770.1

Abstract

Introduction: Xpert MTB/RIF is a rapid diagnostic instrument for pulmonary tuberculosis (TB). However, studies reported varied accuracy of Xpert MTB/RIF in detecting Mycobacterium tuberculosis in pericardial effusion.

Methods: We performed a systematic review of literature in PubMed, published up to February 1, 2020, according to PRISMA guidelines. We screened cross-sectional studies, observational cohort studies, and randomized control trials that evaluated the accuracy of Xpert MTB/RIF in diagnosing TB pericarditis. Papers with noninterpretable results of sensitivity and specificity, non-English articles, and unpublished studies were excluded. The primary outcomes were the sensitivity and specificity of Xpert MTB/RIF. We conducted a quality assessment using QUADAS-2 to evaluate the quality of the studies. A bivariate model pooled the overall sensitivity, specificity, positive likelihood ratios (PLRs), and negative likelihood ratios (NLRs) of included studies.

Results: In total, 581 subjects from nine studies were analyzed in this meta-analysis. Our pooled analysis showed that the overall sensitivity, specificity, PLRs and NLRs of included studies were 0.676 (95% CI: 0.580–0.759), 0.994 (95% CI: 0.919–1.000), 110.11 (95% CI: 7.65–1584.57) and 0.326 (95% CI: 0.246–0.433), respectively.

Conclusions: Xpert MTB/RIF had a robust specificity but unsatisfactory sensitivity in diagnosing TB pericarditis. These findings indicated that although positive Xpert MTB/RIF test results might be valuable in
swiftly distinguishing the diagnosis of TB pericarditis, negative test results might not be able to rule out TB pericarditis.

Registration: PROSPERO CRD42020167480 28/04/2020

Keywords
Extrapulmonary TBC, Pericardial Effusion, PCR, Xpert MTB/RIF

This article is included in the World TB Day collection.
Introduction

Pericarditis tuberculosis (TB) is the deadliest manifestation of extrapulmonary TB. TB is the primary cause of clinically significant pericardial effusion in TB-endemic developing countries, responsible for as much as 90% of pericardial effusion in HIV-infected individuals and 50–70% in non-HIV-infected individuals. Mortality rates due to pericarditis TB rise six months after diagnosis, from 17% to 40%.

Early and accurate diagnostic measures are essential for tackling deadly extrapulmonary TB infections. Until 2018, Lowenstein-Jensen culture (LJ) was considered the gold standard for diagnosing TB pericarditis, since early non-invasive diagnostic procedures such as chest radiographs can only expose changes indicative of TB in 30% of cases, and echocardiography only presents a large frond-like pericardial effusion projection, which is nowhere near specific enough to indicate TB etiology. However, LJ culture is time-consuming and complicated. Thus it is not recommended for use as a routine test. Other alternatives, such as histopathological examination, require invasive procedures and expertise that can only be found in a few medical centers. In addition, its sensitivity remains highly variable, ranging from 30 – 70%. Thus, histopathological examination is also not recommended for use as a routine test.

Currently, the Xpert MTB/RIF assay has FDA-approval as a diagnostic test of pulmonary TB. The Xpert MTB/RIF assay can detect members of the Mycobacterium complex and rifampicin resistance via nucleic acid amplification. This assay has been proven useful to diagnose pulmonary TB, with 89% sensitivity and 99% specificity. However, this method has not been established as a diagnostic test for extrapulmonary TB, such as pericarditis.

Several studies and meta-analyses have explored the benefits of using the Xpert MTB/RIF assay to diagnose extrapulmonary TB. However, to our knowledge, there is no meta-analysis of the use of the Xpert MTB/RIF assay in diagnosing pericarditis TB. Varied results, ranging from 59%–100% sensitivity and 72–100% specificity, have been found for the use of the Xpert MTB/RIF assay to diagnose pericarditis. Thus, this study intended to evaluate the accuracy of TB pericarditis diagnosis using a pericardial fluid sample for the Xpert MTB/RIF assay.

Methods

Study design

A meta-analysis was performed from February to April 2020 to assess the specificity and sensitivity of Xpert MTB/RIF for the diagnosis of pericarditis TB. This research was conducted according to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) statement and Cochrane Handbook for Systematic Reviews of Interventions. A checklist and review protocol adapted from PRISMA was used to guide the meta-analysis protocols in our present study (see Extended data). The systematic review protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO; identification number CRD42020167480) on 28/04/2020.

Eligibility criteria

Any document reporting diagnosis of pericarditis TBC using Xpert MTB/RIF assay based on primary data was considered. We included cross-sectional studies, observational cohort studies, and randomized control trials that evaluated the diagnostic accuracy of Xpert MTB/RIF for TB pericarditis. Exclusion criteria were (i) non-English articles; (ii) review, case-control studies, and case reports; (iii) studies that did not contain primary data in the published articles; and (iv) studies with non-interpretable results of sensitivity and specificity or had no samples that showed true positive (TP) and false positive (FP) results and/or true negative (TN) and false negative (FN) results. Duplicate data, commentaries, letters, correspondence articles, and editorials were excluded. Unpublished records such as conference papers, theses, and patents were not included in this meta-analysis.

Search strategies and data extraction

Articles were systematically searched from inception to February 1, 2020, in PubMed databases. The search strategy conformed to medical subjects heading (MeSH) involving the use of the following keywords: (“tuberculous AND pericarditis”) OR (“extrapulmonary OR pericardial OR pericardium”) AND (tuberculosis) AND (“Xpert OR genexpert”). In our searching strategy, English language restrictions were applied. If the same data were used among studies, the more up-to-date study with the larger sample size was preferred. The references cited by all the selected original research articles and reviews were searched for additional articles that might have been missed. Authors independently reviewed abstracts (Y.A, M.J, P.G, M.J.A, S.I.S) obtained from database searches and selected potentially eligible studies for full-text reviews. Data from included studies were independently extracted from eligible articles using a piloted data extraction form. The review authors extracted data independently on the following characteristics: name of the first author, year of publication, country of subjects, type of data collection, sampling method, patient characteristics and setting, the procedure for processing specimens, reference standards, and the results of the calculation of diagnostic test accuracy. All data were entered into a database manager, Microsoft Excel 2014. Disagreement between independent investigators was resolved by discussion and/or by consultation with the senior investigators (A, N.M.M).

Quality assessment

To ensure quality and to avoid potential bias in each study, the quality of selected studies was controlled and assessed by two independent investigators (M.J.A, S.I.S). Included studies were appraised for their quality and bias using QUADAS-2. QUADAS-2 comprises four independent areas: subject preference, index test, source standard, and the flow and timing of patients through the study.

Data analysis

We used the TP, FN, FP, and TN values reported in each included study to determine sensitivity and specificity. We used 95% confidence intervals (CIs) and generated the results graphically by plotting the data in forest plots. We plotted continuous diagnostic test results versus a gold standard in summary receiver
operating characteristic (sROC) curves using Review Manager 5 (RevMan Cochrane, London, UK). The overall diagnostic sensitivity and specificity of included studies were pooled by a bivariate model using STATA 12 (STATA Corp, USA) with the “metandi” command.

Results
Summary of the included studies
After conducting literature screening, we included 30 studies for full-text article assessment. However, one study had different reference diagnoses, two studies were not in English, ten studies did not contain primary data in their published article, and eight studies had inadequate samples to calculate sensitivity and specificity; thus, they were excluded from our study. Therefore, in this meta-analysis, we included nine studies\textsuperscript{8-17}. Figure 1 showed the flowchart of the research collection, while Table 1 provided a summary of the included studies. Of the nine studies included, three were carried out in Pakistan\textsuperscript{10,13,15}, two were conducted in South Africa\textsuperscript{12,14}, and the rest were carried out in Turkey\textsuperscript{17}, Iran\textsuperscript{8}, China\textsuperscript{16}, and Spain\textsuperscript{11}. All studies used a prospective observational design. The number of pericardial effusion samples from each study ranged from three to 131, with a total sample size of 581 patients. All studies used a sample of patients with pericardial effusion, with an average prevalence of TB pericarditis of 28.4%. The MTB/RIF assay was applied to test the sensitivity and specificity in detecting Mycobacterium tuberculosis and resistance to rifampicin. The MTB/RIF assay ran nucleic acid amplification of the rpoB gene to detect M. tuberculosis, while resistance to rifampicin was assessed in an 81 bp region within the rpoB gene. As a diagnostic reference for MTB/RIF, a culture of pericardial fluid was used with solid and liquid media.

Quality of the included studies
We conducted a quality appraisal of included studies using QUADAS-2, and the results were shown in Figure 2 and Figure 3. QUADAS-2 examined four areas of the study, namely subject preference, index tests, source standards, and flow and timing.

---

**Figure 1. Flow diagram of the research collection.**
Table 1. Details of the included studies.

| Authors                  | Country   | Sample collection | Studied population | Total of the sample (TB/non-TB) | PeE sample (TB/non-TB) | Reference for pericarditis TB |
|--------------------------|-----------|-------------------|--------------------|---------------------------------|------------------------|-------------------------------|
| Allahyartorkaman, 2019   | Iran      | 2015–2018         | Patients with suspected PTB and/or EPTB | 220/1836                     | 5/115                  | Culture/direct smear          |
| Khan, 2018               | Pakistan  | 2013–2015         | Patients with suspected EPTB | 607/130                       | 7/49                   | Culture                       |
| Moure, 2011              | Spain     | 1999–2011         | Patients with suspected EPTB | 108/41                        | 1/2                    | Culture                       |
| Pandie, 2014             | South Africa | 2009–2012       | Patients with PeE | 74/77                          | 69/26                  | Culture                       |
| Saeed, 2017              | Pakistan  | 2014–2016         | Patients with PeE and PuE | 51/235                        | 18/110                 | Culture                       |
| Theron, 2014             | South Africa | NR               | Patients with suspected PTB and/or EPTB | 46/85                         | 46/85                  | Culture                       |
| Ullah, 2017              | Pakistan  | 2014–2015         | Patients with suspected PTB and/or EPTB | 88/178                       | 4/16                   | Culture                       |
| Yu, 2017                 | China     | 2016              | Patients with PE | 14/13                          | 14/13                  | Culture                       |
| Zeka, 2011               | Turki     | 2010              | Patients with suspected PTB and/or EPTB | 89/340                       | 1/5                    | Culture                       |

EPTB, extrapulmonary tuberculosis; PTB, pulmonary tuberculosis; PeE, pericardial effusion; PuE, pleural effusion TB; tuberculosis; NR, not reported.

Figure 2. The author’s review of each domain of risk of bias and applicability concerns are presented as a percentage of all the studies included.

Each area, except flow and timing, consisted of two subdivisions, namely, risk of bias and applicability concerns related to patient characteristics and settings.

Regarding the risk of bias in the subject preference area, six studies\(^9\),\(^10\),\(^12\),\(^14\),\(^16\),\(^17\) were labeled as low risk, two studies\(^11\),\(^15\) were labeled as high risk, and one study\(^11\) was labeled as an unclear risk because it did not explain the exclusion criteria clearly. The reason for the high risk of bias in this domain was due to inappropriate exclusion criteria. In the applicability concern section, we labeled one study as a low concern\(^12\), three studies\(^9\),\(^11\),\(^13\) as high concerns, and five studies\(^9\),\(^11\),\(^13\),\(^15\),\(^17\) as unclear concerns since the setting of patients was not mentioned. Studies in primary health settings were deemed low concern, whereas studies set exclusively in a tertiary care center were deemed high concern.

In the index test area, all studies included\(^9\)–\(^17\) were labeled as having a low risk of bias. This was because Xpert MTB/RIF provided automatic results with a prespecified threshold test, and the user received the results on a printed sheet. In the applicability concern section, we grouped seven studies as low concerns\(^9\),\(^12\),\(^14\) and two studies as high concerns\(^11\),\(^17\). To be categorized as a low concern, a minimum of 75% of the specimens in the study were required to have been processed according to WHO recommendations.
In the reference standard area, eight studies\(^8\)–\(^{12}\),\(^{14}\)–\(^{17}\) were labeled as having a low risk of bias, and one study\(^13\) had an unclear risk of bias. To be categorized as a low risk of bias, the results of reference standards must be determined without the knowledge of the outcomes of index tests.

In the flow and timing area, all studies\(^9\)–\(^{17}\) were considered to have a low risk of bias because all studies included more than 50% of eligible participants in the analysis.

### Diagnostic test accuracy of Xpert MTB/RIF for TB pericarditis

Table 2 showed the significant findings from the included studies. In general, Xpert MTB/RIF had a high diagnostic accuracy in diagnosing TB pericarditis. The diagnostic test sensitivity and specificity forest plot of Xpert MTB/RIF for TB pericarditis were shown in Figure 4. Xpert MTB/RIF had an overall sensitivity of 0.676 (95% CI: 0.580–0.759), and the overall specificity was 0.994 (95% CI: 0.919–1.000). The PLR and NLR were 110.11 (95% CI: 7.65–1584.57) and 0.326 (95% CI: 0.246–0.433), respectively. Figure 5 showed a summary receiver operating characteristic (sROC) for Xpert MTB/RIF to illustrate continuous diagnostic test results versus the gold standard.

### Discussion

To the best of our knowledge, this is the first meta-analysis that evaluates the diagnostic accuracy of TB pericarditis using Xpert MTB/RIF. Previously, six systematic reviews had assessed the diagnostic test accuracy of Xpert MTB/RIF for extrapulmonary TB. Chang \textit{et al.}, 2012\(^{18}\) (eight studies) and Li \textit{Y et al.}, 2017\(^{19}\) (26 studies), analyzed the diagnostic test accuracy of Xpert MTB/RIF for multiple forms of extrapulmonary TB combined. Denkinger \textit{et al.}, 2014\(^7\) (18 studies), Maynard-Smith \textit{et al.}, 2014\(^{20}\) (27 studies), Penz \textit{et al.}, 2015\(^{21}\) (37 studies), Sehgal \textit{et al.}, 2016\(^{22}\) (24 studies), and Kohli \textit{et al.}, 2018\(^5\) (18 studies) analyzed the diagnostic test accuracy of Xpert MTB/RIF for specific forms of extrapulmonary TB. However, none of them specifically analyzed the diagnostic accuracy of Xpert MTB/RIF for TB pericarditis.

In this meta-analysis, the pooled specificity of Xpert MTB/RIF to diagnose pericarditis TB was extremely powerful for the majority of studies using Xpert MTB/RIF to diagnose extrapulmonary TB (0.994 (95% CI: 0.919–1.000), which highlights its effectiveness as a test to rule-in TB pericarditis diagnosis and help clinicians to decide on early TB treatment. This early TB treatment will be able to improve outcomes and reduce mortality.
| Authors                  | TP  | FP  | FN  | TN  | Sensitivity (95% CI) | Specificity (95% CI) | Specificity (95% CI) |
|-------------------------|-----|-----|-----|-----|----------------------|----------------------|----------------------|
| Allahyartorkaman, 2019  | 2   | 1   | 3   | 112 | 0.40 [0.05, 0.85]    | 0.99 [0.95, 1.00]     |                      |
| Khan, 2018 (10)         | 6   | 0   | 1   | 49  | 0.86 [0.42, 1.00]    | 1.00 [0.93, 1.00]     |                      |
| Moure, 2011 (11)        | 1   | 0   | 0   | 2   | 1.00 [0.03, 1.00]    | 1.00 [0.16, 1.00]     |                      |
| Pandie, 2014 (12)       | 44  | 0   | 25  | 26  | 0.64 [0.51, 0.75]    | 1.00 [0.87, 1.00]     |                      |
| Saeed, 2017 (13)        | 13  | 0   | 5   | 110 | 0.72 [0.47, 0.90]    | 1.00 [0.97, 1.00]     |                      |
| Theron, 2014 (14)       | 27  | 24  | 19  | 61  | 0.59 [0.43, 0.73]    | 0.72 [0.61, 0.81]     |                      |
| Ullah, 2017 (15)        | 4   | 0   | 12  | 0   | 1.00 [0.40, 1.00]    | 1.00 [0.74, 1.00]     |                      |
| Yu, 2017 (16)           | 11  | 3   | 12  | 0   | 0.79 [0.49, 0.95]    | 0.92 [0.64, 1.00]     |                      |
| Zeka, 2011 (17)         | 1   | 0   | 5   | 0   | 1.00 [0.03, 1.00]    | 1.00 [0.48, 1.00]     |                      |

TP: true positive; FP: false positive; FN: false negative; TN: true negative.

Figure 4. The approximated sensitivity and specificity of each of the included studies are plotted in forest plots. TP, true positive; FP, false positive; FN, false negative; TN, true negative.

The sensitivity of Xpert MTB/RIF for TB detection in pericardial fluid varied widely across the studies involved in this meta-analysis. Thus, the pooled sensitivity outcome was not very high (0.676 [95% CI: 0.580–0.759]). The paucibacillary characteristics of the TB pericarditis might cause the reduced sensitivity of diagnosis with Xpert MTB/RIF using pericardial fluid. The detection limit of Xpert MTB/RIF is 131 CFU/ml; any unit lower than this cannot be detected, resulting in negative results. Hence, this may lead to a false-negative diagnosis of pericarditis TB. Other possible explanation are the variation in the sample size, sampling method, patient characteristics, and settings. In this meta-analysis, 45% of the included studies were conducted in areas with low prevalence. Patients in these areas may present with a paucibacillary disease earlier, which reduce the sensitivity of Xpert MTB/RIF. Limited sensitivity will hinder the usage of Xpert MTB/RIF for ruling out TB pericarditis, especially when samples are shown to be smear-negative. Meanwhile, LJ culture can detect an organism from as low as 10 CFU/ml to 100 CFU/ml, resulting in cell culture as the best reference standard for TB detection, especially when a very low number of organisms are involved.

Though the interpretation is not straightforward, the sensitivity, specificity, and AUC under sROC are the fundamental aspects that demonstrate the accuracy of the diagnostic test. Nevertheless, in a clinical setting, NLR and PLR can be essential and exhibit the actual state. In order to identify and rule out target diseases, it is frequently accepted that a PLR above 10 and an NLR below 0.1 signify clinical significance. In this present study, the PLR and NLR values for Xpert MTB/RIF in the diagnosis of TB pericarditis were 110 and 0.3, respectively. These values indicate that the Xpert MTB/RIF test is reliable in identifying or ruling in pericarditis TB, and is a faster and easier method compared to other tests.

The strengths of our study were the use of standard protocols from the PRISMA guidelines and the Cochrane Handbook, strict inclusion and exclusion criteria, extraction of data by independent reviewers, and the use of bivariate models to calculate pooled sensitivity and specificity. However, we realized that our study has several limitations. We acknowledge that...
Figure 5. sROC for Xpert MTB/RIF. The black curve describes a pattern that considers culture as the perfect reference standard. The cleared circles outlined on several coordinates represent the estimated sensitivity and specificity of each of the included studies, and the black circle is a pooled estimate of sensitivity and specificity achieved from the bivariate model. sROC, summary receiver operating characteristic; HRSOC, hierarchal summary receiver operating characteristic.

we might excluded numerous studies of extrapulmonary TB that did not have enough data on TB pericarditis despite comprehensive exploration. Furthermore, this meta-analysis involved a relatively low number of patients (581 eligible patients) due to the limited study of the use of Xpert MTB/RIF to diagnose pericarditis TB. Thus, the result might not reveal the actual state in the population. Further meta-analysis should be conducted when more studies specifically evaluate the use of Xpert MTB/RIF to diagnose pericarditis TB with a larger sample size.

Data availability
Underlying data
All data underlying the results are available as part of the article and no additional source data are required.

Extended data
Figshare: Detailed search strategy. https://doi.org/10.6084/m9.figshare.11974356.v1

Figshare: Review protocol. https://doi.org/10.6084/m9.figshare.11974260

Reporting guidelines
Figshare: PRISMA checklist for Diagnostic Test Accuracy of Xpert MTB/RIF for Tuberculous Pericarditis: A Systematic Review and Meta-Analysis https://doi.org/10.6084/m9.figshare.11955003.v1

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).

Acknowledgments
This paper and the research behind it would not have been possible without the exceptional support of Faculty of Medicine Universitas Airlangga, Dr. Soetomo General Academic Hospital and Institute of Tropical Disease, Surabaya, Indonesia.
References

1. Reuter H, Burgess LJJ, Doubell AF. Epidemiology of percutaneous efficacies at a large academic hospital in South Africa. Epidemiol Infect. 2005; 133(3): 393–9. PubMed Abstract | Publisher Full Text | Free Full Text
2. Mayosi BM, Wiysonge CS, Ntsieke M, et al. Mortality in patients treated for tuberculous pericarditis in sub-Saharan Africa. S Afr Med J. 2008; 98(1): 36–40. PubMed Abstract
3. Liu C, Cui YL, Ding CM, et al. Diagnostic accuracy of interferon-gamma in percutaneous efficacies for tuberculous pericarditis: a meta-analysis. J Thorac Dis. 2018; 10(2): 854–60. PubMed Abstract | Publisher Full Text | Free Full Text
4. Adler Y, Charron P, Inazio M, et al. 2015 ESC Guidelines for the Diagnosis and Management of Pericardial Diseases: The Task Force for the Diagnosis and Management of Pericardial Diseases of the European Society of Cardiology (ESC) Endorsed By: The European Association for Cardio-Thoracic Surgery (EACTS). Eur Heart J. 2015; 36(42): 2921–64. PubMed Abstract | Publisher Full Text
5. Kohli M, Schiller I, Dendukuri N, et al. Diagnostic accuracy of the Xpert ® MTB/RIF assay for extrapulmonary tuberculosis and rifampicin resistance. Cochrane Database Syst Rev. 2018; 8(8): CD012768. PubMed Abstract | Publisher Full Text | Free Full Text
6. Lombardi G, Dri Gregori V, Girometti N, et al. Diagnosis of smear-negative tuberculosis is greatly improved by Xpert MTB/RIF. PLoS One. 2012; 12(4): e0170189. PubMed Abstract | Publisher Full Text | Free Full Text
7. Denkinger CM, Schumacher SG, Boehme CC, et al. Xpert MTB/RIF assay for the diagnosis of extrapulmonary tuberculosis: a systematic review and meta-analysis. Eur Respir J. 2014; 44(2): 435–46. PubMed Abstract | Publisher Full Text
8. Saeed M, Ahmad M, Iram S, et al. GeneXpert technology. A breakthrough for the diagnosis of tuberculous pericarditis and pleuritis in less than 2 hours. Saudi Med J. 2017; 38(7): 699–705. PubMed Abstract | Publisher Full Text | Free Full Text
9. Alahyartorkaman M, Mireaeei M, Hamzehloo G, et al. Low diagnostic accuracy of Xpert MTB/RIF assay for extrapulmonary tuberculosis: A multicenter surveillance. Res Rep 2019; 4(1): 18515. PubMed Abstract | Publisher Full Text | Free Full Text
10. Khan AS, Ali S, Khan MT, et al. Comparison of GeneXpert MTB/RIF assay and LED-PM microscopy for the diagnosis of extrapulmonary tuberculosis in Khyber Pakhtunkhwa, Pakistan. Braz J Microbiol. 2016; 47(4): 909–913. PubMed Abstract | Publisher Full Text | Free Full Text
11. Moure R, Martín R, Alcaide F. Effectiveness of an Integrated Real-Time PCR Method for Detection of the Mycobacterium tuberculosis Complex in Smear-Negative Extrapulmonary Samples in an Area of Low Tuberculosis Prevalence. J Clin Microbiol. [Internet]. 2012; 50(2): 513–5. PubMed Abstract | Publisher Full Text | Free Full Text
12. Pande S, Peter JG, Kerbelzki ZS, et al. Diagnostic accuracy of quantitative PCR (Xpert MTB/RIF) for tuberculous pericarditis compared to adenosine deaminase and unstimulated interferon-γ in a high burden setting: a prospective study. BMC Med. 2014; 12(1): 101. PubMed Abstract | Publisher Full Text | Free Full Text
13. Saeed M, Iram S, Hussain S, et al. GeneXpert: A new tool for the rapid detection of rifampicin resistance in mycobacterium tuberculosis. J Pak Med Assoc. 2017; 67(2): 270–274. PubMed Abstract
14. Theron G, Peter J, Calligaro G, et al. Determinants of PCR performance (Xpert MTB/RIF), including bacterial load and inhibition, for TB diagnosis using specimens from different body compartments. Sci Rep. 2014; 4(1): 5658. PubMed Abstract | Publisher Full Text | Free Full Text
15. Ullah J, Javaid A, Masud H, et al. Rapid detection of Mycobacterium tuberculosis and rifampicin resistance in extrapulmonary tuberculosis and sputum smear-negative pulmonary suspects using Xpert MTB/RIF. J Med Microbiol. 2017; 66(4): 412–418. PubMed Abstract | Publisher Full Text | Free Full Text
16. Yu G, Ye B, Chen D, et al.: Comparison between the diagnostic validities of Xpert MTB/RIF and interferon-γ release assays for tuberculosis pericarditis using pericardial tissue. J Infect. 2017; 12(12): e1018704. PubMed Abstract | Publisher Full Text | Free Full Text
17. Zeka AN, Tasbakan S, Cavusoglu C: Evaluation of the GeneXpert MTB/RIF Assay for Rapid Diagnosis of Tuberculosis and Detection of Rifampin Resistance in Pulmonary and Extrapulmonary Specimens. J Clin Microbiol. 2011; 49(12): 4138–41. PubMed Abstract | Publisher Full Text | Free Full Text
18. Chang K, Lu W, Wang J, et al.: Rapid and effective diagnosis of tuberculosis and rifampicin resistance with Xpert MTB/RIF assay: A meta-analysis. J Infect. 2012; 64(6): 580–8. PubMed Abstract | Publisher Full Text | Free Full Text
19. Li S, Liu B, Peng M, et al.: Diagnostic accuracy of Xpert MTB/RIF for tuberculosis detection in different regions with different endemic burden: A systematic review and meta-analysis. PLoS One. 2012; 7(7): e41807. PubMed Abstract | Publisher Full Text | Free Full Text
20. Maynard-Smith L, Larke N, Peters JA, et al.: Diagnostic accuracy of the Xpert MTB/RIF assay for extrapulmonary and pulmonary tuberculosis when testing non-respiratory samples: a systematic review. BMC Infect Dis. 2014; 14(1): 709. PubMed Abstract | Publisher Full Text | Free Full Text
21. Penz E, Bofia J, Roberts DJ, et al.: Diagnostic accuracy of the Xpert ® MTB/RIF assay for extra-pulmonary tuberculosis: a meta-analysis. Int J Tuberc Lung Dis. 2015; 19(3): 278–84. PubMed Abstract | Publisher Full Text | Free Full Text
22. Seagal IS, Dhonia S, Aggarwal AN, et al.: Diagnostic Performance of Xpert MTB/RIF in Tuberculous Pleural Effusion: Systematic Review and Meta-analysis. Land GA, editor. J Clin Microbiol. 2016; 54(4): 1133–1138. PubMed Abstract | Publisher Full Text | Free Full Text
23. Hankishna J, Mohan A: Treatment of tuberculosis pericarditis. J Pract Cardiavasc Sci. 2015; 1(2): 179–181. Publisher Full Text
24. Pasipanodya JG, Mubanga M, Ntsieke M, et al.: Tuberculous Pericarditis is Multibacillary and Bacterial Burden Increases High Mortality. ElBioMedicine. 2015; 2(1): 1634–9. PubMed Abstract | Publisher Full Text | Free Full Text
25. Chakravorty S, Simmons AM, Rowseki M, et al.: The new Xpert MTB/RIF ultra: Improving detection of Mycobacterium tuberculosis and resistance to Rifampin in an assay suitable for point-of-care testing. mBio. 2017; 8(4): e00812–17. PubMed Abstract | Publisher Full Text | Free Full Text
26. Griffiths C, Barne M, Saxena P, et al.: Challenges of tuberculosis management in high and low prevalence countries in a mobile world. Prim Care Respir J. 2014; 23(1): 106–11. PubMed Abstract | Publisher Full Text | Free Full Text
27. Asmar S, Chatellier S, Miranda C, et al.: A novel solid medium for culturing mycobacterium tuberculosis isolates from clinical specimens. J Clin Microbiol. 2015; 53(8): 2566–9. PubMed Abstract | Publisher Full Text | Free Full Text
28. Deeks JJ, Altman DG: Diagnostic tests 4: likelihood ratios. BMJ. 2004; 329(7458): 168–9. PubMed Abstract | Publisher Full Text | Free Full Text
29. Al Farabi MJ: Detailed Search Strategy. figshare. Dataset. 2020. http://www.doi.org/10.6084/m9.figshare.11974260.v1
30. Al Farabi MJ: PRISMA Checklist for Diagnostic Test Accuracy of Xpert MTB/RIF for Tuberculous Pericarditis: A Systematic Review and Meta-Analysis. figshare. Online resource. 2020. http://www.doi.org/10.6084/m9.figshare.11955003.v1
Open Peer Review

Current Peer Review Status:  ✔  ✔

Version 1

Reviewer Report 10 August 2020

https://doi.org/10.5256/f1000research.25141.r67746

© 2020 Rohman M. This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Mohammad Saifur Rohman

Departement of Cardiology and Vascular Medicine, Faculty of Medicine, Saiful Anwar General Hospital, Brawijaya University, Malang, Indonesia

The study is well written with objective and reliable method was used. It is acceptable for scientific standard. It is interesting looking at the result of this study. Which tried to do metanalysis from 9 research in diagnosing tuberculosis related pericardial effusion using Xpert MTB/RIF. The author also already considered bias risk and applicability concern.

Are the rationale for, and objectives of, the Systematic Review clearly stated?
Yes

Are sufficient details of the methods and analysis provided to allow replication by others?
Yes

Is the statistical analysis and its interpretation appropriate?
Yes

Are the conclusions drawn adequately supported by the results presented in the review?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Cardiology Translational research : Pharmacogenetic, Interventional cardiology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.
Pieter A.F.M. Doevendans

Division of Heart and Lungs, Department of Cardiology, University Medical Center Utrecht, Netherlands Heart Institute, University of Utrecht, Utrecht, The Netherlands

- The study is combing the available data on a diagnostic test to detect TB as a cause in this case for pericarditis. From the various studies it becomes clear that the specificity is excellent. Sensitivity is however disappointing, maybe due to a low bacterial load. So there is a place for the test in making a fast diagnosis to start early treatment. Yet a negative result does not exclude TB as the possible aetiology.

- Study is well designed well performed and not overstating the technique can be used for rule in. Well done work, well written.

- Only 1 typo on page 8: we might excluded
  No other corrections are needed at this point in time

Are the rationale for, and objectives of, the Systematic Review clearly stated?
Yes

Are sufficient details of the methods and analysis provided to allow replication by others?
Yes

Is the statistical analysis and its interpretation appropriate?
I cannot comment. A qualified statistician is required.

Are the conclusions drawn adequately supported by the results presented in the review?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: General cardiology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.
The benefits of publishing with F1000Research:

- Your article is published within days, with no editorial bias
- You can publish traditional articles, null/negative results, case reports, data notes and more
- The peer review process is transparent and collaborative
- Your article is indexed in PubMed after passing peer review
- Dedicated customer support at every stage

For pre-submission enquiries, contact research@f1000.com