Cystic Fibrosis Research News

Title:
Is hyperpolarised gas magnetic resonance imaging a valid and reliable tool to detect lung health in cystic fibrosis patients? A COSMIN systematic review.

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What was your research question?
Hyperpolarised gas magnetic resonance imaging (HP-MRI) is a novel tool for measuring lung health in lung diseases. Our research question was: How valid and reliable is HP-MRI as a tool for detecting lung health in cystic fibrosis (CF) patients based on the evidence to date?

Why is this important?
HP-MRI is a relatively novel technique which provides detailed resolution images of ventilation in the lungs. It has the potential to be used as a measure of lung health in CF standard care, alongside other measures such as spirometry. To understand its suitability for this, we need to know if HP-MRI is both valid and reliable as a tool. This can be done by carrying out a systematic review of all the studies published to date that assessed the validity and reliability of HP-MRI in the CF population. This is the first systematic review to date to do this.

What did you do?
We searched online databases in August 2020 for all prior studies that assessed the measurement properties of HP-MRI. We read the studies and looked at whether the HP-MRI results were reproducible when the scan was repeated over time (test-retest reliability), and how well the results compared to existing techniques that measure lung health (criterion validity).

Measurement properties included:

Reliability:
- Measurement error

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- Test-retest

Validity:
- Criterion
- Construct (convergent)

Responsiveness:
- Responsiveness to treatment

For all included studies we extracted and summarised the study results, assessed the quality of each study, and graded the overall quality of evidence for each measurement property.

What did you find?

25 studies were included in the review. The findings show HP-MRI was able to detect structural and functional abnormalities in the lungs, detect response to treatments, and is more sensitive than other measures in detecting ventilation defects in CF patients. Moderately strong evidence for construct (convergent) validity was found, however evidence for the other types of validity and reliability is currently low. Reasons for this included study's having small sample sizes, inadequate reporting of testing procedures, and not comparing HP-MRI against the gold standard spirometry.

What does this mean and reasons for caution?

HP-MRI is a promising tool for use as a measure of lung health in CF patients. Its use is currently largely limited to research purposes only. Further research is needed investigating the measurement properties of HP-MRI to be able to better assess the validity and reliability of the tool.

What's next?

More studies are needed with large sample sizes comparing HP-MRI against spirometry, the gold standard assessment of lung function. We provide recommendations to future researchers to improve the quality of studies in this field, for example ensuring adequate reporting of testing procedures and improving the statistical quality of studies.

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