Bedside screening tests vs. videofluoroscopy or fibreoptic endoscopic evaluation of swallowing to detect dysphagia in patients with neurological disorders: systematic review

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CRD summary
This review concluded that a water test combined with pulse oximetry was the best method to screen patients with neurological disorders for dysphagia. These conclusions should be interpreted with extreme caution as they were based on only two studies that showed good ability for ruling out but not ruling in dysphagia and there were some methodological limitations in the review.

Authors' objectives
To determine the accuracy of bedside screening methods for detecting dysphagia in patients with neurological disorders.

Searching
MEDLINE via PubMed, EMBASE, CINAHL and PsycLIT were searched to 2008, References of selected studies and relevant reviews were screened. Search terms were reported and included a diagnostic filter. The review was restricted to studies published in English, German or Dutch.

Study selection
Randomised controlled trials or diagnostic accuracy studies that evaluated a bedside screening test (or test that could be evaluated at the bedside) in comparison to the reference standard of videofluoroscopy or fibreoptic endoscopic evaluation of swallowing (FEES) in which the endpoint was aspiration (entry of material below the level of the true vocal folds) or aspiration and/or penetration (entry of material in the laryngeal vestibule but remaining above the levels of the vocal folds) were eligible for inclusion. Studies had to be conducted predominantly in adult patients with neurological disorders.

Most bedside tests evaluated were based on trial swallows that used either liquids in various aliquots or substances with a range of viscosities (liquids, thickened liquids, semi-solids and solids). Some studies combined swallow tests with pulse oximetry or evaluated pulse oximetry alone. Other bedside tests evaluated included clinical features, cough reflex elicited with acid dissolved in saline, cervical or bronchial auscultation, medical history and standardised form with a variety of clinical features combined with a trial swallow test. Most included studies used videofluoroscopy evaluation with test material impregnated with barium as the reference standard; a minority used FEES. All studies used aspiration and/or penetration as the endpoint. Most studies included patients with acute or recent stroke; one also included patients with other neurological conditions.

Two reviewers independently selected studies for inclusion. Disagreements were resolved through consensus.

Assessment of study quality
Two reviewers independently assessed study quality according to the following criteria: independence of index test and reference standard; blinding to clinical data; avoidance of verification bias; avoidance of disease progression bias; valid selection of study population; presentation of sufficient data to calculate test accuracy; appropriateness of study population; sufficient detail on index test; and appropriate definition of positive test result. Studies were given gradings of sufficient (no more than one item rated as no or unclear), doubtful (two items rated as no or unclear) and insufficient (not enough data to calculate test accuracy or more than two items rated as unclear) based on quality assessment results. Disagreements were resolved through discussion.

Data extraction
Data were extracted and used to calculate prevalence, sensitivity, specificity, positive and negative predictive values and positive and negative likelihood ratios (LR+ and LR-). The authors did not state how many reviewers performed the data extraction.
Methods of synthesis
Only studies rated as sufficient on quality assessment were included in the analysis. Pooling was not undertaken due to differences between studies; a narrative synthesis was presented.

Results of the review
Thirty five studies fulfilled the review inclusion criteria, but only 11 (n=886) achieved a quality rating of sufficient and were included in the review.

Five studies assessed trial swallows using water and reported sensitivity that ranged from 27% to 85% and specificity that ranged from 50% to 88%. LR+ ranged from 2.1 to 3.6 and LR- ranged from 0.2 to 0.8.

Four studies evaluated trial swallows using substances with different viscosities. Sensitivity ranged from 41% to 100% and specificity ranged from 57% to 82%. LR+ ranged from 1.3 to 3.7 and LR- ranged from 0.0 to 0.8.

Three studies assessed oxygen desaturation (≥2%). Sensitivity ranged from 56% to 87% and specificity ranged from 39% to 97%. LR+ ranged from 1.4 to 18.9 and LR- ranged from 0.3 to 0.5.

Three studies assessed a combination of a swallow test and oxygen desaturation. Sensitivity ranged from 73% to 98% and specificity ranged from 63% to 76%. LR+ ranged from 2.5 to 3.3 and LR- ranged from 0.0 to 0.3.

Three studies assessed a range of clinical features that had low sensitivity, low specificity or both. LR+ ranged from 1.1 to 3.2 and LR- ranged from 0.1 to 1.0.

One study assessed a history of poor nutrition and reported LR+ of 2.1 and LR- of 0.7.

Three studies assessed a standardised form to record various clinical features. Sensitivity ranged from 58% to 93% and specificity ranged from 30% to 63%. LR+ ranged from 1.2 to 6.7 and LR- ranged from 0.1 to 0.7.

Authors' conclusions
A water test combined with pulse oximetry using coughing, choking and voice alteration as endpoints was currently the best method to screen patients with neurological disorders for dysphagia.

CRD commentary
The review addressed a clear question and inclusion criteria were defined. The literature search included relevant databases, but the use of a diagnostic filter meant that relevant studies may have been missed. The review was restricted to published studies in certain languages. So there was a possibility of language and publication biases. Appropriate steps were taken to minimise bias and errors in the selection of studies and assessment of study quality; it was unclear whether such steps were taken for data extraction. Study quality was assessed using appropriate criteria, but the way in which this was used to select studies for inclusion in the review was questionable. The decision not to pool results appeared appropriate given differences between studies; results from included studies were presented clearly in tables. The authors’ conclusions were based on data from two studies that showed good ability for ruling out dysphagia and more limited potential for ruling in dysphagia, which was not reflected by the conclusions. The likelihood of missed studies and questionable use of quality to restrict inclusion in the review mean that the authors’ conclusions should be interpreted with extreme caution.

Implications of the review for practice and research
Practice: The authors stated that a water test combined with pulse oximetry should be used for screening patients with neurological disorders at risk of dysphagia.

Research: The authors stated that further research was needed to establish the most effective standardised administration procedure for the water test, assess the value of pulse oximetry and a trial swallow to detect silent aspiration.

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