



Article Appraisal

Article: Test Characteristics of Point-of-care Ultrasound for the Diagnosis of Retinal Detachment in the Emergency Department

Date of Journal Club: March 19th, 2019

Resident Reviewer Name(s) and Residency Affiliation: Brad Stebner PGY-1 Kelowna EM, James Liu PGY-3 Nanaimo EM

Faculty Methodology/Bio-statistics Resource Person: Dr. Jessica Moe; jessica.moe@gmail.com

Background and Study Objective(s):

The use of ultrasound in assessing ocular complaints has been in practice since the 1950's. Point of care ultrasound (POCUS) has been proposed as part of the assessment of patients presenting with symptoms suspicious of retinal detachment. Prior studies have characterized the diagnostic test characteristics of POCUS for RD as being highly sensitive and specific. However, these studies used only POCUS operators who were highly trained, which limited the generalizability. This study aimed to assess the test characteristics among physicians with varying degrees of prior experience with POCUS.

Study Design:

This prospective diagnostic test assessment was completed at an academic tertiary care hospital in Vancouver, BC with an annual Emergency census of 95,000 patients. Patients presenting to the ED with new onset of flashes or floaters were assessed by an Emergency staff or resident who then performed an ocular POCUS scan. All scans were performed by previously enrolled staff EPs or residents who received a 1-hour didactic lecture and a supervised training scan. Enrolled EPs recorded their POCUS findings and his or her level of training and referred the patient to an unblinded ophthalmology resident. All patients were subsequently referred to a retinal specialist who was blinded to the ED POCUS results and their assessment and diagnosis of the patient was used as the reference standard for retinal detachment. The recorded POCUS results and evaluation by the retinal specialist were then directly compared. The primary outcome of the study was to evaluate the test characteristics (sensitivity and specificity) of POCUS for the diagnosis of retinal detachment in the ED.

Results:

128 patients were enrolled, 11 were lost to follow up and 2 met exclusion criteria making a reference standard available in 115 patients. Patients lost to follow-up were not described. Median age of patients was 60 years old and 64% were female. Scans were performed by 30 different EPs, 20 of whom were staff, 2 fellows, and 8 residents. Majority of scans (81%) were performed by staff EPs.

Retinal specialists, whose assessment was the reference standard in this study, diagnosed retinal detachment in 16 (14%) of the cases and posterior vitreous detachment in 62 (54%) patients. EPs diagnosed retinal detachment on POCUS in 18 (16%) of these same patients.

Sensitivity of POCUS for retinal detachment by EPs was 75% (95%CI = 48%-96%) while specificity was calculated at 94% (95%CI = 87%-98%). Positive likelihood ratio was 12.4 (CI95% = 5.4-28.3) and the negative ratio was 0.27 (95%CI = 0.11-0.62). Diagnostic accuracy was 91% (CI= 85-96%). All 16 patients diagnosed with retinal detachment by retinal specialist underwent an ophthalmologic procedure. There were 4 false-negative scans performed by EPs. There was large variability in the accuracy of diagnosis among individual providers.

The wide confidence interval for POCUS sensitivity indicates a lack of precision and limits our ability to draw definitive conclusions about its true test characteristics. As the confidence interval includes 50%, it is possible that POCUS is no better than a “coin flip” to diagnose retinal detachment.

Validity of Results:

The authors proposed a clear question to be answered by the study. They sought to estimate the test characteristics of POCUS for the diagnosis of retinal detachment when performed by a heterogeneous group of emergency physicians with varying degrees of ultrasound experience in an academic emergency department. Their test results were compared to an appropriate reference standard which was diagnosis of retinal detachment by a retinal specialist. All patients in whom a POCUS was performed were referred to a retinal specialist, regardless of the results of the test, and all patients included in the final analysis received both the diagnostic test and the reference standard, however there was no description of the patients lost to follow-up. The EPs' POCUS results could not have been influenced by the reference standard as the retinal specialist evaluation occurred after the test was performed in the ED and results documented. A key question around the validity of this study stems from the decision to blind the retinal specialist but not the ophthalmology resident who received the initial consult. By not blinding the ophthalmology resident it could have affected his/her triage of the patient, assessment and diagnosis of the patient, and their interaction with the retinal specialists and it is unclear how the specialist was blinded from the initial results. The presenting complaint was clearly described in the inclusion criteria as chief complaint of flashes or floaters. The differential diagnosis for retinal detachment includes posterior vitreous detachment (PVD) and vitreous hemorrhage, both of which appeared in this study's false negatives and false positives. These may be limitations in the use of POCUS for retinal detachment and these diagnoses must be considered as part of the differential when completing the scan. Overall the process of screening patients for presenting complaint, evaluation of patients, scanning technique, and referral process were adequately described and these study procedures are reproducible. The education intervention was not described in great detail. It is possible that the study results could have been influenced by inadequate implementation of the education intervention. It is unclear what level of training is required to allow POCUS to be applied with acceptable accuracy and precision. The 1-hour didactic lecture and single observed adequate scan is both a strength and weakness of this paper. With minimal training and no supervision during the diagnostic scan it is difficult to evaluate if the scans were adequate compared to the expected 'test' as the participating physicians' skills could have certainly deteriorated from their single observed scan. However, this can also be viewed as a strength of the paper as this makes it more realistic and generalizable to the average Emergency physician who has minimal ultrasound experience and may only receive minimal training for this particular indication. Finally, this paper used a convenience sampling to enrol patients in the study, presumably due to the fact a limited number of physicians signed up for the necessary training session. By taking a convenience sampling we are unaware of the potential provider (e.g. age, training) or patient factors (e.g. co-morbidities) that could influence the test characteristics as potential confounding factors have not been controlled for. The study excluded patients with advanced cataracts, however as patient enrolment was left to the discretion of the emergency physician, it is possible that other patient factors such as obesity, facial abnormalities, difficult clinical examination, or factors in history may have dissuaded the EP from performing POCUS. If certain patients were excluded, this study would have unclear applicability to all populations.

Generalizability of Results:

This study investigated a diagnostic test that is broadly available in most Emergency Departments across Canada and is gaining in popularity for many clinical applications therefore making it very applicable to modern practice. There is

also a growing body of research around ultrasonography and the previously published research for POCUS in retinal detachment is limited by small patient numbers and often performed by highly trained and experienced sonographers. A strength in the generalizability of this test is the heterogeneity in the level of training and number of EPs performing the scan. With 115 enrolled patients, this investigation had a fairly large patient population in comparison to similar studies. The heterogeneity of diagnostic accuracy among providers within this study likely indicates that ultrasonography is a technical skill that requires standardization, repetition and practice to become proficient. Although participating EPs received a 1-hour didactic lecture there was a broad spectrum of experience with ultrasound and therefore likely more applicable to the average Emergency Department physician than previously published studies.

Another limitation to the generalizability of these findings enrolled physicians had access to a 1-hour retinal POCUS training session, which will not be available in all EDs. Furthermore, the study was performed at an academic center which trains Emergency Medicine residents and home to many ultrasound enthusiasts, potentially inflating the sensitivity and specificity of the scans.

The Bottom Line:

This well-performed, prospective, diagnostic test assessment evaluating POCUS for detection of retinal detachment demonstrated a high specificity (94%) and intermediate sensitivity (75%). Given that a retinal detachment is vision threatening and causes significant morbidity, this low to moderate sensitivity test with large confidence intervals (48%-93%) has an unacceptable risk of potentially missing a retinal detachment. Also the negative likelihood ratio of 0.27 (95%CI = 0.11-0.62) does not meet the typically desired <0.1 parameter in helping to rule out a disease. The specificity (94%) and positive likelihood ratio of 12.4 (95% CI= 5.4-28.3) may suggest that a positive POCUS for retinal detachment are highly suggestive of the disease and may help emergency physicians to rule in the disease. In summary, in a heterogenous group of EPs with varying ultrasound experience and a brief training session, POCUS is not sensitive enough to confidently rule out a retinal detachment and any patients presenting with new onset flashes or floaters should likely receive urgent Ophthalmology referral.