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ACCESS hsTnI SCIENTIFIC LITERATURE

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A critical evaluation of the Beckman Coulter Access hsTnI: analytical performance, reference interval and concordance

Pretorius CJ, Tate JR, et al.

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Background: We investigated the analytical performance, outlier rate, carryover and reference interval of the Beckman Coulter Access hsTnI in detail and compared it with historical and other commercial assays.

Methods: We compared the imprecision, detection capability, analytical sensitivity, outlier rate and carryover against two previous Access AccuTnI assay versions. We established the reference interval with stored samples from a previous study and compared the concordances and variances with the Access AccuTnI+3 as well as with two commercial assays.

Results: The Access hsTnI had excellent analytical sensitivity with the calibration slope 5.6 times steeper than the Access AccuTnI+3. The detection capability was markedly improved with the SD of the blank 0.18–0.20 ng/L, limit of blank (LoB) 0.29–0.33 ng/L and limit of detection (LoD) 0.58–0.69 ng/L. All the reference-interval samples had a result above the LoB value. At a mean concentration of 2.83 ng/L the SD was 0.28 ng/L (CV 9.8%). Carryover (0.005%) and outlier (0.046%) rates were similar to the Access AccuTnI+3. The combined male and female 99th percentile reference interval was 18.2 ng/L (90% CI 13.2–21.1 ng/L). Concordance amongst the assays was poor with 16.7%, 19.6% and 15.2% of samples identified by all four assays as above the 99th, 97.5th and 95th percentiles. Analytical imprecision was a minor contributor to the observed variances between assays.

Conclusions: The Beckman Coulter Access hsTnI assay has excellent analytical sensitivity and precision characteristics close to zero. This allows cardiac troponin I (cTnI) measurement in all healthy individuals and the capability to identify numerically small differences between serial samples as statistically significant. Concordance in healthy individuals remains poor amongst assays.

Analytical evaluation of the new Beckman Coulter Access high sensitivity cardiac troponin I immunoassay

Lippi G, Ferrari A, et al.

Clin Chem Lab Med 2017; 27;56(1):157–161.

Background: This study was aimed to evaluate the analytical performance of the novel chemiluminescent and fully automated Beckman Coulter Access hsTnI high-sensitivity immunoassay for measurement of cardiac troponin I (cTnI).

Methods: The study, using lithium heparin samples, included assessment of limit of blank (LOB), limit of detection (LOD), functional sensitivity, linearity, imprecision (within run, between-run and total) and calculation of 99th percentile upper reference limit (URL) in 175 healthy blood donors (mean age, 36±12 years; 47% women) and comparison with two other commercial cTnI immunoassays.

Results: The LOB, LOD and functional sensitivity of Access hsTnI were 0.14, 0.34 and 1.35 ng/L, respectively. The within-run, between-run and total imprecision was 2.2%–2.9%, 4.6%–5.4%, and 5.4%–6.1%, respectively. The linearity was excellent in the range of cTnI values between 0.95 and 4195 ng/L (r=1.00). The 99th percentile URL was 15.8 ng/L. Measurable cTnI values were found in 173/175 healthy subjects (98.9%). Good agreement of cTnI values was found with AccuTnI+3 (r=0.97; mean bias, -9.3%), whereas less satisfactory agreement was found with Siemens Dimension Vista cTnI (r=0.95; mean bias -55%).

Conclusions: The results of our evaluation of the Beckman Coulter Access hsTnI indicate that the analytical performance of this fully automated immunoassay is excellent.

Evaluation of analytical performance of a new high-sensitivity immunoassay for cardiac troponin I

Masotti S, Prontera C, et al.

Clin Chem Lab Med 2018. 23; 56(3):492–501.

Background: The study aim was to evaluate and compare the analytical performance of the new chemiluminescent immunoassay for cardiac troponin I (cTnI) called Access hsTnI using the DxI platform, with the Access AccuTnI+3 method and the high-sensitivity (hs) cTnI method for the ARCHITECT platform.

Methods: The limit of blank (LoB), limit of detection (LoD) and limit of quantitation (LoQ) at 10% and 20% CV were evaluated according to international standardized protocols. For the evaluation of the analytical performance and the comparison of cTnI results, heparinized plasma samples were collected from healthy subjects, patients with cardiac diseases, and quality control samples distributed in external quality assessment programs.

Results: LoB, LoD and LoQ at 20% and 10% CV values of the Access hsTnI method were 0.6, 1.3, 2.1 and 5.3 ng/L, respectively. The Access hsTnI method showed analytical performance significantly better than that of the Access AccuTnI+3 method and similar results to those of the hs ARCHITECT cTnI method. Concentrations measured with the Access hsTnI methods showed close linear regressions with both Access AccuTnI+3 and ARCHITECT hs-cTnI methods, although there were systematic differences between these two. There was no difference between cTnI values measured by Access hsTnI in heparinized plasma and serum samples, whereas there was a significant difference between cTnI values respectively measured in EDTA and heparin plasma samples.

Conclusions: Access hsTnI has analytical sensitivity parameters significantly improved compared to those of the Access AccuTnI+3 method and is similar to those of the high-sensitivity method using ARCHITECT platform.

"Beckman Coulter's high-sensitivity cardiac troponin I assay can measure very low cardiac troponin concentrations with excellent precision. This test may help physicians for both the early diagnosis of myocardial infarction and for future risk stratification in and outside the acute coronary syndrome setting."

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Analytical comparison of three different versions of a high-sensitivity cardiac troponin I assay over 10 years

Kavsak PA, Worster A, et al.
Clin Chim Acta 2017; 475:51–55

Background: Concerns have been raised about the long-term analytical performance of high-sensitivity cardiac troponin (hs-cTn) assays, with respect to different reagent formulations, lots and instrumentation. Our goal for the present study was to compare three different versions of an hs-cTnI assay in two different study populations to evaluate if assay reformulation over 10 years has also affected the analytical results.

Methods: Beckman Coulter's CE marked Access hsTnI assay (2017 version) was tested in 100 lithium heparin plasma samples which had prototype hs-cTnI assay results from 2007 and in 100 serum samples which had enhanced hs-cTnI assay results from 2011 with comparison performed by Passing-Bablok regression. The Beckman Coulter troponin results from 2017 and 2011 from the serum samples were also compared to the Abbott ARCHITECT i1000 hs-cTnI results (2013) with threefold differences used to identify possible outliers. Freeze/thaw stability testing (-20°C) was also performed on normal cTnI (Beckman Coulter=4.0ng/L; Abbott=5.3ng/L) and high cTnI concentration (Beckman Coulter=77.6ng/L; Abbott=126.1ng/L) lithium heparin plasma pools for both hs-cTnI assays.

Results: After three freeze-thaws the Beckman Coulter Access hsTnI assay yielded minor decreases in concentrations (normal pool -0.7ng/L and high pool -12.6ng/L lower). Regression analyses yielded the following relationship between the Beckman Coulter's hs-cTnI versions: 2017 hs-cTnI=2.0*(2007 prototype hs-cTnI)-5.1ng/L and 2017 hs-cTnI=1.04–(2011 enhanced hs-cTnI)-2.5ng/L. Compared to the Abbott 2013 hs-cTnI results, the 2011 Beckman Coulter enhanced version had eight results threefold higher, with the 2017 Beckman Coulter version yielding six results threefold lower.

Conclusions: The 2017 Beckman Coulter hs-cTnI version (Access hsTnI) is closely aligned with the previous enhanced hs-cTnI assay and appears to have reduced the frequency of aberrantly high results.

Macrocomplexes and discordant high-sensitivity cardiac troponin concentrations

Kavsak PA, Roy C, et al.

Ann Clin Biochem 2017 November. [Epub ahead of print]

Background: Analytical comparisons between different high-sensitivity cardiac troponin (hs-cTn) assays are important for reassurance of results performed with different methodologies and to identify potential interferences or confounders to result interpretation.

Objective: Our objective in the present study was to compare Beckman Coulter's latest Access hsTnI assay to Abbott's hs-cTnI assay and to assess agreement between results.

Methods: Two hundred EDTA plasma samples that had clinically reported hs-cTnI results from the Abbott ARCHITECTi2000 that spanned the analytical range were stored (median = 4 h), re-centrifuged and retested for hs-cTnI on the Abbott ARCHITECTi1000 and Beckman Coulter Access2 analyzers. Passing-Bablok regression and fold differences were evaluated, with differences approximately threefold between results further subjected to Roche hs-cTnT testing and polyethylene glycol precipitation.

Results: The Beckman Coulter and Abbott hs-cTnI concentrations were correlated (r = 0.95) with Beckman Coulter yielding proportionally lower concentrations (slope = 0.78; 95%CI: 0.74-0.85). There were 12 samples that yielded Abbott hs-TnI concentrations ≥ threefold higher than the Beckman Coulter Access hsTnI concentrations, of which nine samples from seven different patients had sufficient quantity for additional testing. All seven patients had macrocomplexes, as determined with polyethylene glycol precipitation, which affected the Abbott hs-cTnI assay. One patient with Abbott hs-cTnI results > 1,300 ng/L had polyethylene glycol, heterophile antibodies and creatine kinase-MB testing performed, which confirmed that a macrocomplex most likely affected the Abbott and Roche (hs-cTnT = 65 ng/L) assays but not the Beckman Coulter (hs-cTnI = 12 ng/L) assay.

Conclusion: The hs-cTnI concentrations obtained from EDTA plasma between the Beckman Coulter and Abbott assays are highly correlated, with large differences in concentrations (≥3-fold) between Abbott and Beckman Coulter assays possible due to macrocomplexes impacting the Abbott hs-cTnI assay.

Assessing matrix, interferences and comparability between the Abbott Diagnostics and the Beckman Coulter high-sensitivity cardiac troponin I assays

Kavsak PA, Malinowski P, et al.

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Background: Analytical evaluation of high-sensitivity cardiac troponin (hs-cTn) assays, with particular attention to imprecision, interferences and matrix effects, at normal cTn concentrations, is of utmost importance as many different clinical algorithms use concentration cutoffs <10 ng/L for decision making.

Objective: The objective for the present analytical study was to compare the new Beckman Coulter hs-cTnI assay (Access hsTnI) to Abbott's hs-cTnI assay in different matrices, and for different interferences, with a focus on concentrations < 10 ng/L.

Methods: The limit of blank (LoB) and the limit of detection (LoD) were determined in different matrices for the Beckman Coulter Access hsTnI assay. Passing-Bablok regression and difference plots were determined for 200 matched lithium heparin and EDTA plasma samples for the Beckman Coulter assay and 200 lithium heparin samples for the Abbott assay. Both EDTA and heparin plasma samples were also evaluated for stability under refrigerated conditions, for endogenous alkaline phosphatase interference, and for hemolysis and icterus.

Results: The Beckman Coulter Access hsTnI assay LoB was 0.5 ng/L with the following range of LoDs = 0.8–1.2 ng/L, with EDTA plasma yielding lower concentrations as compared to lithium heparin plasma (mean difference = −14.9%; 95% CI = −16.9 to 12.9). Below 10 ng/L, lithium heparin cTnI results from the Beckman Coulter assay were on average 1.1 ng/L (95% CI = 0.7 to 1.5) higher than the Abbott results, with no difference between the methods when using EDTA plasma (mean difference = −0.1 ng/L; 95% CI = −0.3 to 0.2). Low cTnI concentrations were less effected by interferences in EDTA plasma.

Conclusions: The Access hsTnI method can reliably detect normal cTnI concentrations with both lithium heparin and EDTA plasma being suitable matrices.

"High-sensitivity assays such as Beckman Coulter's Access hsTnI have enabled emergency clinicians to make significant changes to assessment practices for patients with suspected ACS. The value of adopting this new assay into clinical care may be realized by using validated, accelerated diagnostic protocols, which have been shown to safely improve patient care."

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High-sensitivity cardiac troponin I immunoassay reduces the chance of patient misclassification in the emergency department

Lippi G, Sanchis-Gomar F, et al.

J Lab Precis Med 2017; 2:93.

Background: Recent evidence attests that high-sensitive (HS) cardiac troponin I (cTnI) immunoassays have practical and organizational advantages for managing patients presenting to the emergency department (ED) with suspected acute myocardial infarction (AMI). Nevertheless, the clinical advantages of these techniques over the former contemporary-sensitive (CS) methods remain elusive. This study was designed to verify whether a HS cTnI immunoassay may decrease the chance of patient misclassification upon ED admission.

Methods: The study population consisted of 57 consecutive patients admitted to the ED of the University Hospital of Parma (Italy) with suspected AMI. Blood samples were collected immediately upon ED presentation and cTnI was measured with both CS (Beckman Coulter AccuTnI+3) and HS (Beckman Coulter Access hsTnI) immunoassays. The best cutoff for diagnosing AMI was derived from receiver operating characteristic (ROC) curves. The imprecision at the assay-specific cutoffs was calculated for both immunoassays by measuring scalar dilutions of a sample with high cTnI value serially diluted until reaching a virtually unmeasurable cTnI value. The potential impact on patient misclassification was then estimated as the sum of potential false-positive and false-negative results, expressed as percentages.

Results: A final AMI diagnosis was made in 9/57 (16%) patients. The area under the curve (AUC) was not significantly different between CS (AccuTnI+3) or HS (Access hsTnI) immunoassays (0.89 vs. 0.90; P=0.393). The best diagnostic cutoffs were 20 and 18 ng/L for CS cTnI and HS cTnI, respectively. The assay imprecision was 22.0% at 20 ng/L for CS cTnI and 3.4% at 18 ng/L for HS cTnI, which were then associated with 3.2% and 0.5% chance of patient misclassification, respectively.

Conclusion: The improved diagnostic accuracy represents an additional aspect in favor of introducing HS immunoassays for accurate triage of patients admitted to the ED with suspected AMI, especially in those displaying nondiagnostic cTnI values at presentation.

Diagnostic accuracy of a new high-sensitivity troponin I assay and five accelerated diagnostic pathways for ruling out acute myocardial infarction and acute coronary syndrome

Greenslade J, Carlton EW, et al.

Ann Emerg Med 2018; 71(4):439-451.

Objective: This diagnostic accuracy study describes the performance of five accelerated chest-pain pathways, calculated with the new Beckman Coulter Access hsTnI assay.

Methods: High-sensitivity troponin I was measured with presentation and 2-hour blood samples in 1,811 patients who presented at an emergency department (ED) in Australia. Patients were classified as being at low risk according to five rules: modified accelerated diagnostic protocol to assess patients with chest pain symptoms using troponin as the only biomarker (m-ADAPT), the Emergency Department Assessment of Chest Pain Score (EDACS) pathway, the History, ECG, Age, Risk Factors, and Troponin (HEART) pathway, the No Objective Testing Rule, and the new Vancouver Chest Pain Rule. Endpoints were 30-day acute myocardial infarction and acute coronary syndrome. Measures of diagnostic accuracy for each rule were calculated.

Results: Data included 96 patients (5.3%) with acute myocardial infarction and 139 (7.7%) with acute coronary syndrome. The new Vancouver Chest Pain Rule and No Objective Testing Rule had high sensitivity for acute myocardial infarction (100%; 95% confidence interval [CI] 96.2% to 100% for both) and acute coronary syndrome (98.6% [95% CI 94.9% to 99.8%] and 99.3% [95% CI 96.1% to 100%]). The m-ADAPT, EDACS, and HEART pathways also yielded high sensitivity for acute myocardial infarction (96.9% [95% CI 91.1% to 99.4%] for m-ADAPT and 97.9% [95% CI 92.7% to 99.7%] for EDACS and HEART), but lower sensitivity for acute coronary syndrome (≤95.0% for all). The m-ADAPT, EDACS, and HEART rules classified more patients as being at low risk (64.3%, 62.5%, and 49.8%, respectively) than the new Vancouver Chest Pain Rule and No Objective Testing Rule (28.2% and 34.5%, respectively).

Conclusions: In this cohort of patients with a low prevalence of acute myocardial infarction and acute coronary syndrome—using the Beckman Coulter's Access hsTnI assay with the new Vancouver Chest Pain Rule or No Objective Testing Rule—enabled approximately one-third of them to be safely discharged after 2-hour risk stratification with no further testing. The EDACS, m-ADAPT, or HEART pathway enabled half of ED patients to be rapidly referred for objective testing.

Evaluating rapid rule-out of acute myocardial infarction by use of a high-sensitivity cardiac troponin I assay at presentation

Greenslade J, Cho E, et al.

Clin Chem 2018 February. [Epub ahead of print]

Background: Low concentrations of cardiac troponin (cTn) have been recommended for rapid rule-out of acute myocardial infarction (AMI). We examined the Beckman Coulter Access high-sensitivity cardiac troponin I (Access hsTnI) assay to identify a single test threshold that can safely rule out AMI.

Methods: This analysis used stored samples collected in two prospective observational studies. In all, 1,871 patients presenting to a tertiary emergency department with symptoms of acute coronary syndrome had blood taken for measurement of cTnI on presentation. The end point was type 1 myocardial infarction (T1MI). Sensitivity and negative predictive value (NPV) were calculated for hs-cTnI values below the 99th percentile.

Results: Ninety-eight patients had T1MI (5.2%), and 638 (34.1%) patients had an hs-cTnI <2 ng/L (limit of detection), with sensitivity of 99.0% (95% CI, 94.4%–100%) and NPV of 99.8% (95% CI, 99.1%–100%). No hs-cTnI value above a concentration of 2 ng/L achieved sensitivity of 99%. However, an NPV of 99.5% was achieved at values < 6 ng/L. A cutoff <6 ng/L enabled 1,475 (78.8%) patients to be ruled out on presentation with sensitivity of 93.9% (95% CI, 87.1%–97.7%).

Conclusions: A single baseline cTn < 2 ng/L measured with the Access hsTnI assay performed well for rule-out of AMI. This cutoff concentration identified 99% of patients with AMI and could reduce the number of patients requiring lengthy assessment. A cutoff of <6 ng/L yielded a high NPV but missed more cases of AMI than would be acceptable to clinicians.

NOTES

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