MAYO CLINIC LABORATORIES

Test Definition: GAL2

Probability of HCC

Overview

Useful For

Calculation of the probability for patients with chronic liver disease to develop hepatocellular carcinoma

Method Name

Only orderable as part of a profile. For more information see HCCGS / Hepatocellular Carcinoma Risk Panel with GALAD Score, Serum

Calculation

NY State Available

Yes

Specimen

Specimen Type

Serum

Specimen Required

Only orderable as part of a profile. For more information see HCCGS / Hepatocellular Carcinoma Risk Panel with GALAD Score, Serum

Container/Tube:

Preferred: Red top

Acceptable: Serum gel

Specimen Volume: 0.5 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	OK

Specimen Minimum Volume

0.25 mL

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum	Frozen (preferred)	90 days	
	Refrigerated	5 days	

Clinical & Interpretive

Clinical Information

Biomarkers of hepatocellular carcinoma (HCC) include alpha fetoprotein (AFP), third electrophoretic form of lentil lectin-reactive AFP (AFP-L3), and des-carboxy-prothrombin (DCP). The GALAD model combines these three biomakers with the patient's gender and age to estimate the probability of HCC in patients with chronic liver disease based on the following equation Z = -10.08 + 0.09 x age + 1.67 x sex + 2.34 log(10)(AFP) + 0.04 x AFP - L3 + 1.33 x log(10)(DCP),where sex = 1 for males, 0 for females. The probability estimate of HCC is calculated as follow Pr(HCC) = exp(Z)/(1 + exp[Z]). The GALAD model has been demonstrated to have higher diagnostic accuracy for the detection of HCC when compared to the use AFP, AFP-L3, and DCP markers alone or in combination. The performance of the GALAD score has also been reported to be superior to ultrasound for HCC detection.

Reference Values

Only orderable as part of a profile. For more information see HCCGS / Hepatocellular Carcinoma Risk Panel with GALAD Score, Serum

Not applicable

Interpretation

The probability of the presence of hepatocellular carcinoma (HCC) is estimated from the GALAD model score. Higher GALAD model scores correlate with increased risk of HCC. The area under the curve (AUC) of a receiver operating characteristic (ROC) curve of the GALAD score was 0.95 for all HCC detection, and 0.92 for the detection of early stage HCC. Additionally, the AUC of the GALAD score (0.95) was higher than that of ultrasound alone for all HCC detection (AUC of 0.82, *P* <0.01).

The sensitivity and specificity performance characteristics of the GALAD score for HCC will be influenced by the selected GALAD score cut-off. For example at an optimal AUC cutoff of 0.76, the GALAD score had 91% sensitivity and 85% specificity for HCC detection. At a more specific GALAD score cutoff of 0.88, the observed sensitivity was 80% for HCC detection with an observed specificity of 97%.

The GALAD model was developed and validated in patient cohorts with a prevalence of HCC ranging from 35% to 49%. The performance of the model may be altered in populations with different HCC prevalence. In addition, the clinical performance of the GALAD score varies by etiology of HCC and therefore may be different in different regions of the world.

Cautions

The total alpha-fetoprotein (AFP) and AFP-L3 test values must be obtained using the uTASWako i30 in the GALAD score calculation.

Test results cannot be interpreted as absolute evidence for the presence or absence of malignant disease. Total AFP and AFP-L3 values are not interpretable during pregnancy for the investigation of malignant disease.

Des-gamma-carboxy prothrombin (DCP) producing tumors other than hepatocellular carcinoma (HCC) can show elevated DCP values.

Medication containing vitamin K preparations may cause a negative bias with DCP values. Medication containing vitamin K antagonist or antibiotic may cause a positive bias with DCP values.

Some patients who have been exposed to animal antigens, either in the environment or as part of treatment or imaging procedures, may have circulating anti-animal antibodies present. These antibodies may interfere with the assay reagents to produce unreliable results. Whenever the test results do not fit the clinical picture, the laboratory should be consulted regarding possible assay interference.

Clinical Reference

1. Johnson P, Pirrie S, Cox T, et al: The detection of hepatocellular carcinoma using a prospectively developed and validated model based on serological biomarkers. Cancer Epidemiol Biomarkers Prev 2014 Jan;23(1):144-153

2. Berhane S, Toyota H, Tada T, et al: Role of the GALAD and BALAD-2 serologic models in diagnosis of

hepatocellular carcinoma and prediction of survival in patients. Clin Gastroenterol Hepatic 2016 Jun;14(6):875-886

3. Yang JD, Addissie BD, Mara KC, et al: GALAD Score for Hepatocellular Carcinoma Detection in Comparison with Liver Ultrasound and Proposal of GALADUS Score. Cancer Epidemiol Biomarkers Prev 2019 Mar;28(3):531-538 doi: 10.1158/1055-9965

4. Leerapun A, Suravarapu S, Bida JP, et al: The utility of serum AFP-L3 in the diagnosis of hepatocellular carcinoma: Evaluation in a U.S. referral population. Clin Gastroenterol Hepatol 2007;5(3):394-402

5. Durazo FA, Blatt LM, Corey WG, et al: Des-gamma-carboxyprothrombin, alpha-fetoprotein and AFP-L3 in patients with chronic hepatitis, cirrhosis and hepatocellular carcinoma. J Gastroenterol Hepatol 2008;23:1541-1548

6. Chaiteerakij R, Addissie BD, Roberts LR: Update on biomarkers of hepatocellular carcinoma. Clin Gastroenterol Hepatol 2015 Feb;13(2):237-245 doi: 10.1016/j.cgh.2013.10.038

Performance

Method Description

Testing for total alpha-fetoprotein (AFP), AFP-L3, and des-gamma-carboxy prothrombin (DCP) is performed using the uTASWako i30 instrument and the test system reagents.(Package insert: uTASWako i30 DCP. Wako Diagnostics, Richmond, VA. V 11.03.08K02)

The GALAD model is a statistical model for estimating the likelihood of hepatocellular carcinoma (HCC) in patients with chronic liver disease. The GALAD score is calculated based on gender, age, and measured concentrations of AFL-L3, AFP, and DCP.

PDF Report

No

Specimen Retention Time

12 months

Performing Laboratory Location

Rochester

Fees & Codes

Test Classification

Not Applicable