A Comparison of IGF-1 Assays for Assessment of Growth Hormone Disorders

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BACKGROUND

- Serum IGF-1 is used to screen for acromegaly and growth hormone deficiency (GHD).
- The decision to perform dynamic testing is influenced by IGF-1 levels.
- A number of assays exist from various vendors with different detection methods, reference intervals, and resulting values (Table; Fig.1).

Acronym	Assay	Vendor
ICMA	Immunochemiluminometric Assay	Labcorp
BL RIA	Blocking Radioimmunoassay with Acid:Alcohol Extraction	Labcorp Endocrine Sciences/Esoterix
LC/MS	Liquid Chromatography/Mass Spectroscopy	Quest
ICMA	Immunochemiluminometric Assay	ARUP
LC/MS	Liquid Chromatography/Mass Spectroscopy	Mayo Clinic

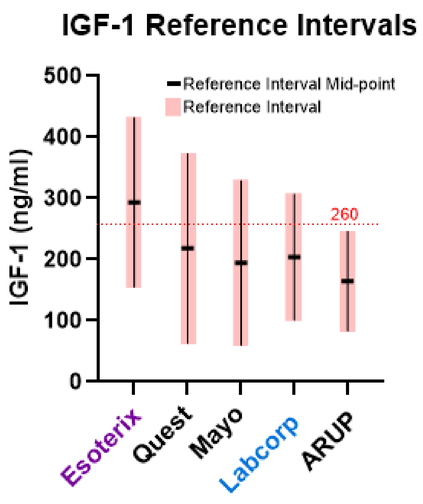

Fig. 1. IGF-1 reference intervals of five different assays (male, age 20-30). An example value of 260 ng/ml is demonstrated across the various assays.

RESEARCH NEED

- Variance in commercially available IGF-1 assays may complicate clinical decisions to perform dynamic testing.
- Various IGF-1 assays should be compared.
- Performance of two assays (Labcorp ICMA & Labcorp Esoterix BL RIA) are compared in adults undergoing the glucagon stimulation test (GST) for suspected adult GHD.

METHODS

- Blood samples from 74 subjects were processed using both Esoterix and Labcorp IGF-1 assays to compare results.
- Screening test performance was assessed with respect to GST results (Esoterix, n=88; Labcorp, n=76).

RESULTS

- There was a mean positive bias of 22 ng/mL (19%) for the Labcorp assay across all samples.
- Incongruence between assays influenced the decision to perform GST based on IGF-1 SDS< 0, with Esoterix identifying all GHD cases and LabCorp missing 25% of cases.
- An IGF-1 level of > 157 ng/mL (Esoterix), or > 187 ng/mL (Labcorp) excluded all cases of GHD, independent of age and sex.
- The Esoterix assay (IGF-1 < 157 ng/ml) had sensitivity of 100% (95% CI: 75.75-100%) and specificity of 29% (95% CI: 19.22-41.29%) (Fig. 4A).
- The Labcorp assay (IGF-1 < 187 ng/ml) had sensitivity of 100% (95% CI: 75.75-100%) and specificity of 19.35% (95% CI: 11.43-30.85%) (Fig. 4B).
- There were significant Pearson correlations for Esoterix, age and IGF-1 ($r(86) = -0.51$, $p = <.001$), Labcorp, age and IGF-1 ($r(74) = -0.53$, $p = <.001$), and BMI and IGF-1($r(72) = -0.32$, $p = .005$).
- In multiple linear regression, significant correlations were found between age and IGF-1 for both the Esoterix assay (B=-0.52, p<.001) and the Labcorp assay (B=-0.5, p<.001), and between BMI and IGF-1 for the Labcorp assay (B=-0.29, p=.007).

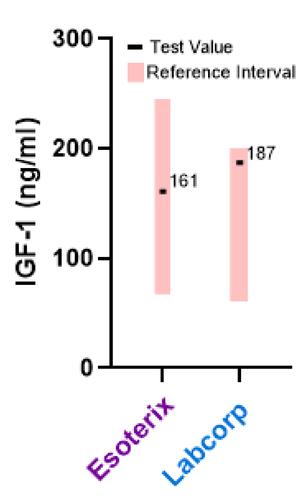

Fig. 2. IGF-1 test value and reference interval for comparison of two separate assays from the same blood sample. (Reference interval, male, age 51-60)

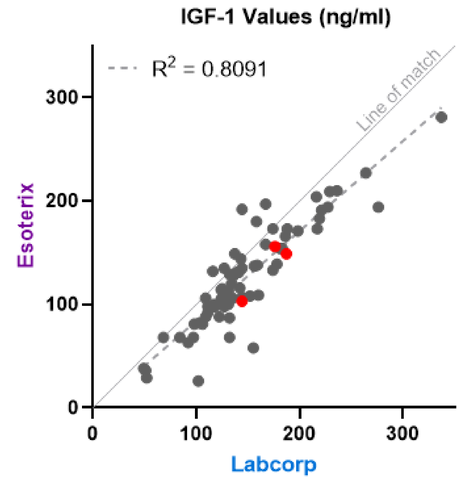

Fig. 3. Comparison of Esoterix and Labcorp assays. Red symbols represent individuals with confirmed GHD that qualified for Glucagon Stimulation Testing based on an IGF-1 SD <0.0 on the Esoterix, but not Labcorp assay.

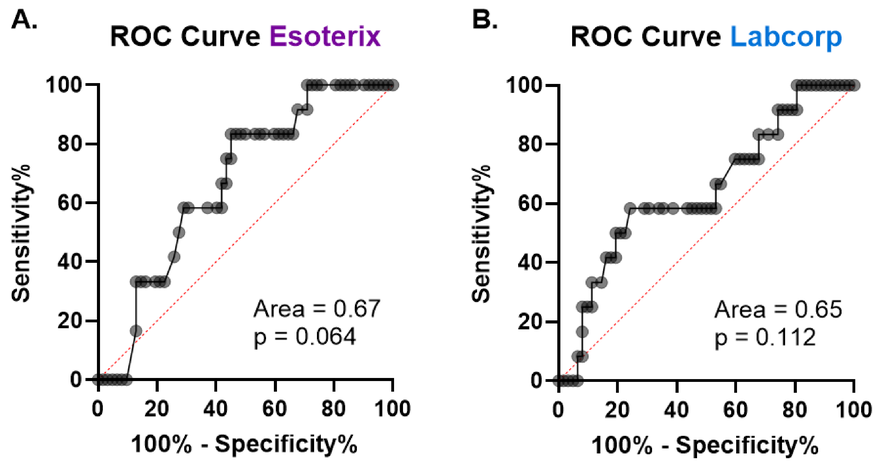

Fig. 4. ROC curves for Esoterix (A) and Labcorp (B) assays to predict growth hormone deficiency.

CONCLUSIONS

- Variance in IGF-1 reference intervals complicate decisions to perform dynamic testing in suspected acromegaly and GHD.
- The Esoterix BL RIA is a sensitive screening assay to exclude GHD when applying consensus algorithms.
- Both Esoterix BL RIA and Labcorp ICMA are sensitive screening assays to exclude GHD when using referenced specific cut-points, independent of age and sex.
- Clinicians should evaluate their chosen IGF-1 assay performance against dynamic test results to evaluate suspected GH disorders.

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