Development and Evaluation of Immunoassays for Thyroid Peroxidase and Thyroglobulin Antibodies* on the Abbott ARCHITECT® Analyzer

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Abstract

Objective

The purpose of our evaluation was to determine the analytical and clinical performance characteristics of two immunoassays under development for thyroid peroxidase antibodies (TPO-Ab) and thyroglobulin antibodies (Tg-Ab) on the Abbott ARCHITECT analyzer.

Background

Measurement of TPO-Ab and Tg-Ab have clinical significance in a wide variety of situations. The presence of TPO-Ab is a risk factor for development of future hypothyroidism, miscarriage and post-partum thyroid disease, and increased risk of failure during *in vitro* fertilization. Measurement of Tg-Ab is important in the treatment of differentiated thyroid carcinoma, and may have application for detecting autoimmune thyroid disease in patients with nodular goiter in iodine deficient areas. The ARCHITECT TPO-Ab and Tg-Ab assays utilize chemiluminescent magnetic microparticle immunoassay (CMIA) technology and two-step assay formats. Both assays are standardized to their respective MRC International Reference Preparations.

Methods

Imprecision was measured over a five-day period using controls and human serum panels. Analytical sensitivity was determined using the 95% confidence method. Concordance versus the respective AxSYM TPO-Ab or Nichols Advantage Tg-Ab assay was also determined.

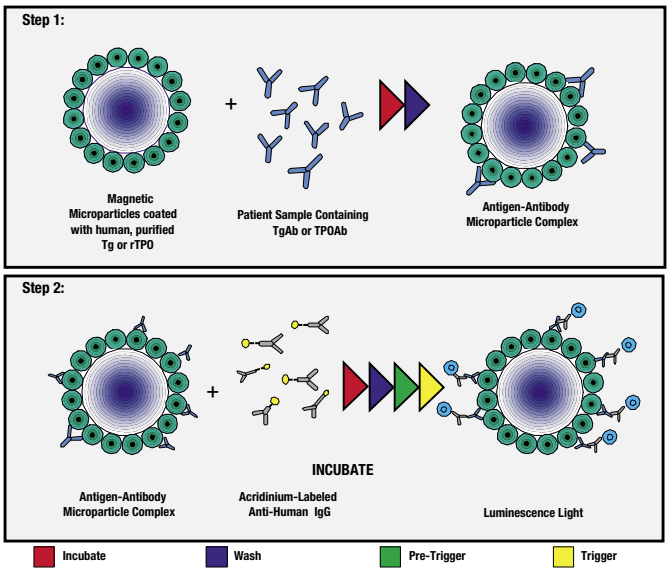
Results

For TPO-Ab, total imprecision was ≤ 9.1% CV for all levels. Analytical sensitivity was ≤ 0.16 IU/mL. Concordance to AxSYM (n = 197) was 100% co-positivity, 92.2% co-negativity, and 94.9% overall agreement. For Tg-Ab, total imprecision was ≤ 8.5% CV for all levels. Analytical sensitivity was ≤ 0.15 IU/mL. Concordance to Nichols Advantage (n = 157) was 86.1% co-positivity, 93.5% co-negativity, and 90.4% overall agreement. Conclusions: Based on these data, we conclude the ARCHITECT TPO-Ab and Tg-Ab assays in development have good sensitivity and precision, and compare well with currently available tests.

Introduction

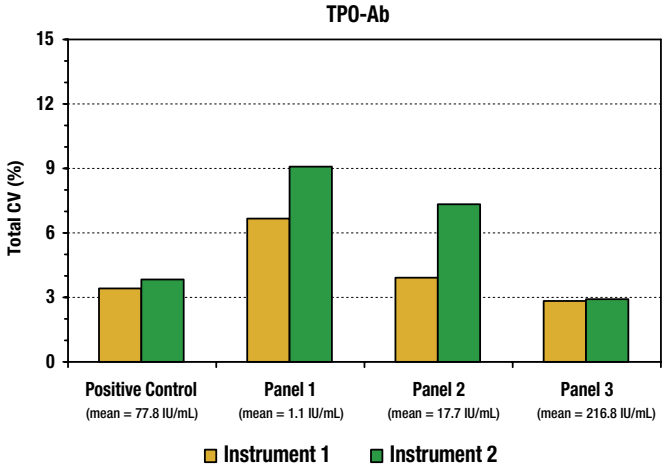
- Measurement of antibodies to thyroperoxidase (TPO-Ab) and thyroglobulin (Tg-Ab) have clinical relevance in a wide variety of situations:
  - TPO-Ab is a risk factor for miscarriage and post-partum thyroid disease. TPO-Ab have also been associated with increased rates of failure during assisted reproductive technology (ART) procedures.
  - Measurement of Tg-Ab is important in the treatment of thyroid differentiated thyroid carcinoma. Tg-Ab may also be useful in iodine deficient areas for detecting autoimmune thyroid disease in patients with nodular goiter.
- The purpose of our evaluation was to study the analytical and clinical performance characteristics of two immunoassays in development for TPO-Ab and Tg-Ab on the Abbott ARCHITECT® *i*2000® analyzer.

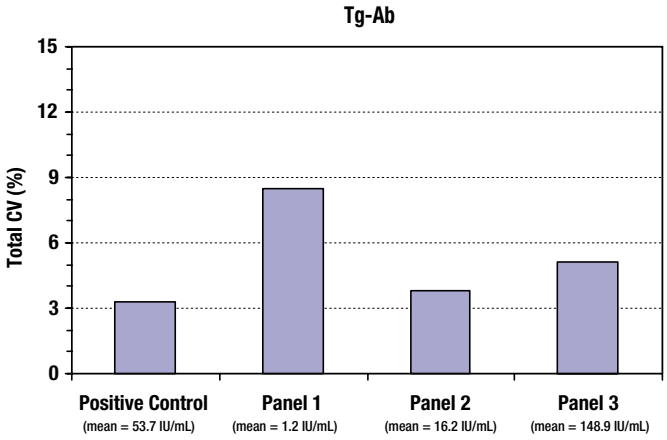
Assay Schematic



Imprecision

- Assay imprecision was evaluated over a five-day period using controls and human serum panels following NCCLS guidelines (EP5-A).





Concordance

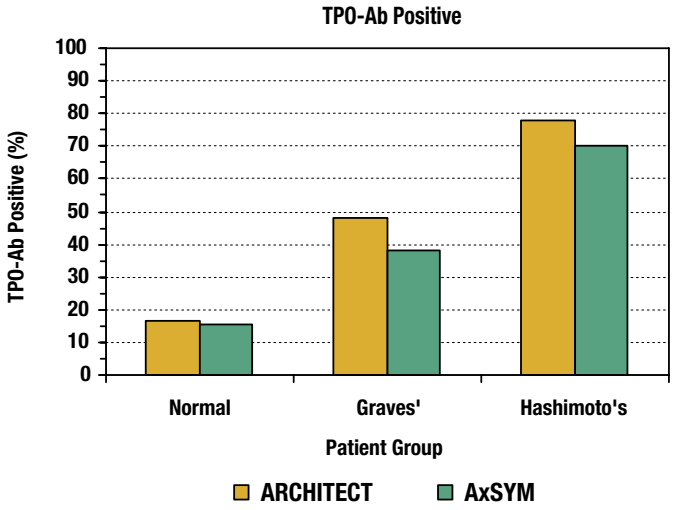
- For TPO-Ab concordance, 197 specimens (97 normal, 50 Hashimoto's, and 50 Graves' disease) were analyzed on the ARCHITECT and the Abbott AxSYM. For this study, an ARCHITECT TPO-Ab cut-off of 3.0 IU/mL was used.
- For Tg-Ab, 157 specimens (50 normal, 50 Hashimoto's, and 57 Graves' disease) were analyzed on the ARCHITECT and Nichols Advantage. For this study, an ARCHITECT Tg-Ab cut-off of 8.2 IU/mL was used.

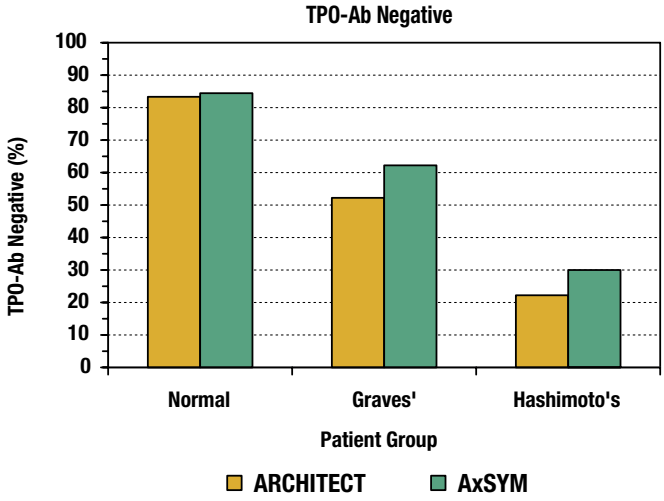
TPO-Ab	AxSYM Positive	AxSYM Negative
ARCHITECT Positive	69	10
ARCHITECT Negative	1	118

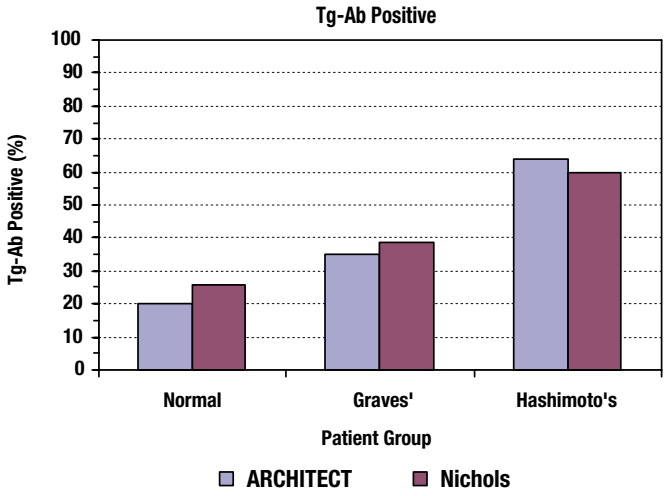
Co-positive	100 %
Co-negative	92.2 %
Overall agreement	94.9 %

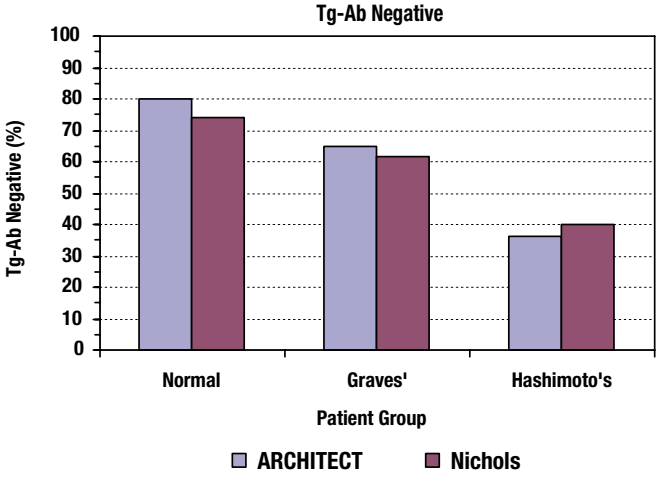
Tg-Ab	Nichols Positive	Nichols Negative
ARCHITECT Positive	56	6
ARCHITECT Negative	9	86

Co-positive	86.1 %
Co-negative	93.5 %
Overall agreement	90.4 %









Sensitivity

- Assay analytical sensitivity (AS) was analyzed by the 95th percentile method.
- For each run, the assay zero calibrator was run in replicates of ten; the assay "B" calibrator was run in replicates of four ("B" calibrator concentration for TPO-Ab = 2.5 IU/mL; for Tg-Ab = 4.5 IU/mL).
- For TPO-Ab, AS was determined on three instruments, four runs per system; for Tg-Ab, AS was determined on two instruments, four runs per system.

	ARCHITECT TPO-Ab (IU/mL)	ARCHITECT Tg-Ab (IU/mL)
Mean	0.108	0.046
SD	0.028	0.052
Mean + 2SD	0.163	0.150

Conclusions

- Based on our data, we conclude that the ARCHITECT TPO-Ab and Tg-Ab assays have good sensitivity and precision, and compare well with currently available tests.

*assays in development