ACTH Stimulation Testing in Premature Neonates

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Background

- Secondary adrenal insufficiency is a major concern for premature neonates exposed to systemic corticosteroids. This can be assessed by adrenocorticotropin hormone (ACTH) stimulation tests to assess adrenal response.
- There are limited studies addressing ACTH stimulation testing in premature neonates. Therefore, there is no standardized protocol for ACTH stimulation testing timing, frequency, or interpretation in this population.

Objective

- Review very low birth weight preterm neonates receiving ACTH stimulation testing after the exposure of corticosteroids to note the incidence of adrenal suppression.

Methods

Study Design
- Retrospective chart review using electronic health records at St. Louis Children's Hospital

Collection Period
- July 1, 2021 to June 30, 2025

Inclusion Criteria
- Very Low Birth Weight (VLBW < 1500 grams) premature neonates
- ACTH stimulation test post systemic corticosteroid exposure

Exclusion Criteria
- No systemic corticosteroid exposure prior to ACTH stimulation test
- Incorrectly drawn/recorded cortisol levels

Primary Outcome
- Incidence of adrenal suppression

Secondary Outcomes
- Timing and frequency of ACTH stimulation test
- Total systemic corticosteroid exposure
- Survival to discharge
- Presence of systemic corticosteroids at discharge

Passing Criteria:
- Passing of the ACTH stimulation test was defined as a cortisol level of ≥ 18 mcg/dL after cosyntropin administration.

Results

Table 1. Baseline Characteristics

Patients Included, n	35
Gestational Age, weeks	26.3 (22.5 – 35.4)
Birth Weight, g	800 (410 – 1450)
Male Sex, n (%)	22 (63%)
Survival to Discharge, n (%)	34 (97%)
Discharged on Steroids, n (%)	2 (6%)
hydrocortisone	1 (50%)
prednisolone	1 (50%)
Total Prednisolone Equivalent Exposure (mg/kg)	38 (4 – 124)
Steroids Prior to Stimulation Test, n (%)	
hydrocortisone	6 (17%)
dexamethasone	2 (6%)
multiple	27 (77%)

*values reported as median unless otherwise noted

Table 2. ACTH Stimulation Tests

	Test 1	Test 2	Test 3
Number of Tests	35	9	1
Dose, n (%)			
1 mcg	8 (23%)	1 (11%)	0 (0%)
125 mcg	26 (74%)	8 (89%)	1 (100%)
250 mcg	1 (3%)	0 (0%)	0 (0%)
Route, n (%)			
IV	25 (71%)	7 (78%)	1 (100%)
IM	10 (29%)	2 (22%)	0 (0%)
Age at Test, days	137 (41 – 314)	188 (113 – 295)	195
Baseline Cortisol, mcg/dL	3.7 (0.2 – 21.1)	4.3 (0.9 – 9.6)	5.3
1st Repeat Change in Cortisol, mcg/dL	10.2 (-6.6 – 26.8)	11.6 (3.1 – 26)	12.2
2nd Repeat Change in Cortisol, mcg/dL	16.6 (-6.6 – 36.6)	16.7 (4 – 32)	14.6
3rd Repeat Change in Cortisol, mcg/dL	12.5 (0.4 – 32)	0	0
Time since Last Steroid Exposure, days	28 (0 – 156)	41 (0 – 99)	21

*values reported as median unless otherwise noted

Figure 1: ACTH Stimulation Test Results

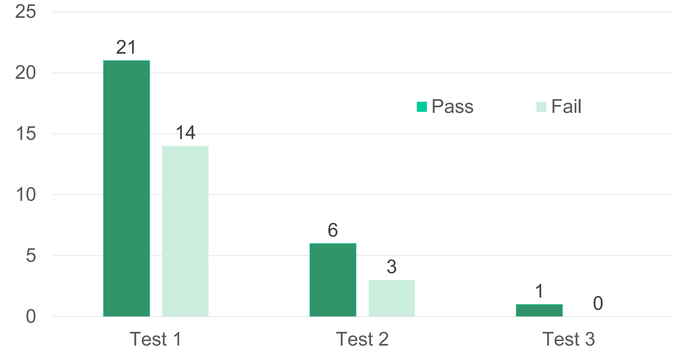
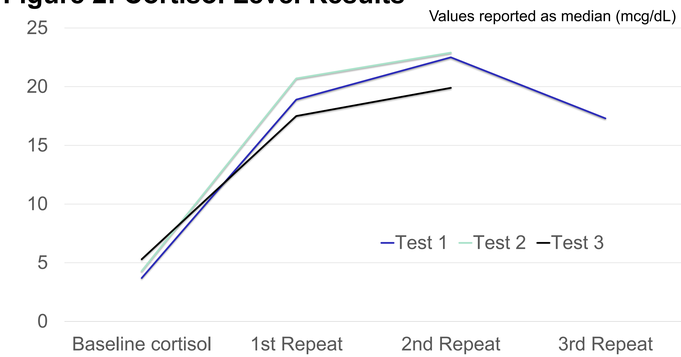


Figure 2: Cortisol Level Results



Discussion

- Preliminary assessment suggests the majority of patients pass ACTH stimulation testing after chronic exposure of one or multiple corticosteroids.
- The second repeat cortisol level was most often the peak level, passing the ACTH test.
- Limitations include retrospective, single-center study, and small sample size.

Conclusion

- Due to lack of research on ACTH stimulation testing in premature neonates, this data will be used to aid in the development of a protocol at St. Louis Children's Hospital.