

Can 9am serum cortisol levels be used to predict patient's response to the insulin tolerance test?

N Kyriakakis, E Appleton, J Andrew, RD Murray
Leeds Centre for Diabetes & Endocrinology

Introduction/Aim

The insulin tolerance test (ITT) is a dynamic test to assess the ACTH/cortisol and growth hormone (GH) reserve in patients with hypothalamo-pituitary disease. Contraindications for the test include history of epilepsy, ischaemic heart disease and age >65 years. The aim of this study is to evaluate if the 09.00am (pre-test) cortisol levels can be predictive of the patient's response to hypoglycaemia, minimizing the use of the ITT as it is a labour, intensive investigation and unpleasant for the patient.

Methods

This is a retrospective study of 110 ITTs performed at the Endocrine Unit of St James's University Hospital, Leeds, between January 2010 and July 2013. The test was performed on patients (age range 16-66) with a previous history of cranial surgery and/or radiotherapy for a variety of intracranial tumours, using the Trust's ITT protocol. For the results to be interpreted, hypoglycaemia of less than 2.2mmol/l had to be achieved. Blood samples for cortisol and glucose levels were taken at 0 minutes (basal cortisol) and at 30, 45, 60, 90 and 120 minutes following insulin administration. A peak cortisol level:

- ≥ 500 nmol/l was considered as a normal response
- 400-499 nmol/l was considered a suboptimal response
- < 400 nmol/l was considered as a failed response

Results

Table 1 shows a breakdown of the patients' response to hypoglycaemia in association with their baseline cortisol levels.

Baseline cortisol (nmol/l)	Positive ITT (peak cortisol ≥ 500 nmol/l)	Suboptimal response (peak cortisol 400-499)	Negative ITT (peak cortisol < 400 nmol/l)
<50	----	----	4
50-99	----	----	2
100-149	1	----	2
150-199	6	9	3
200-249	9	6	8
250-299	6	3	4
300-349	13	6	----
350-399	6	3	1
400-449	5	4	----
450-499	3	----	----
≥ 500	5	1	----
Total Number:110	54	32	24

Table 1: Patients' response to hypoglycaemia in association with their baseline cortisol levels

Results (continued)

- Six patients had basal cortisol < 100 nmol/l. All of them (100%) failed to respond to hypoglycaemia.
- 57 had basal cortisol between 100-299nmol/l. 22 (38.6%) of them had a normal ITT, 18 (31.6%) had a suboptimal response and 17 (29.8%) had an inadequate response.
- The remaining 47 patients had baseline cortisol ≥ 300 nmol/l. 32 of them (68.1%) responded normally, 14 (29.8%) had a suboptimal response and 1 (2.1%) failed the ITT.

Figure 1. summarizes the above results

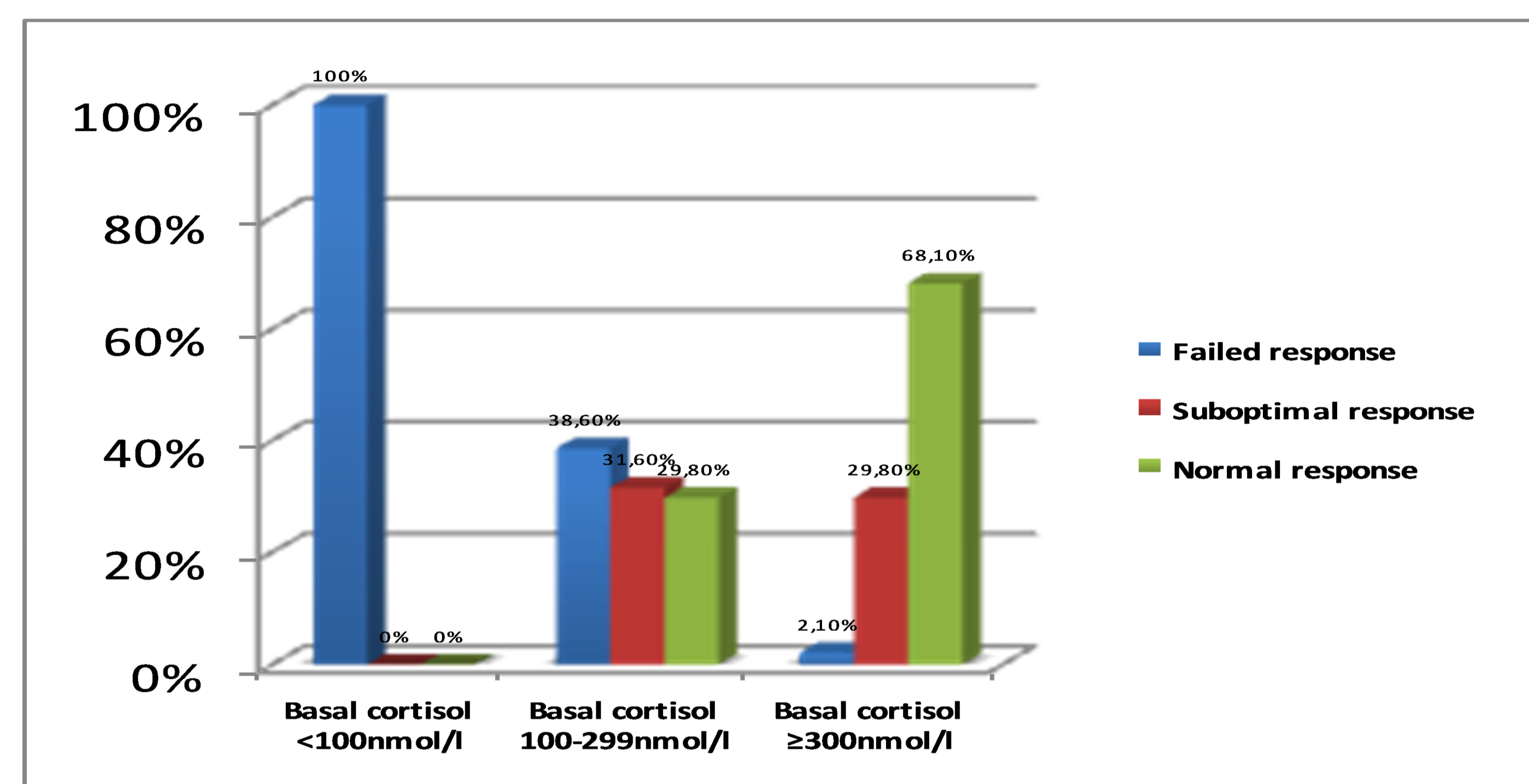


Figure 1: ITT outcomes according to baseline cortisol

Conclusions

Measurements of basal serum cortisol can identify patients for whom the ITT may not be necessary. Basal cortisol < 100 nmol/l indicated HPA axis insufficiency, whereas levels ≥ 300 nmol/l suggest an at least suboptimal response to hypoglycaemia. In both groups the ITT could be avoided, as it would not alter patients' management. In our study 49.2% fall into this category. On the contrary, baseline cortisol between 100-299nmol/l (51.8% of our patients) cannot be used to predict patient's response to hypoglycaemia, therefore dynamic tests for the HPA axis assessment should be performed. Figure 2 summarizes our recommendations.

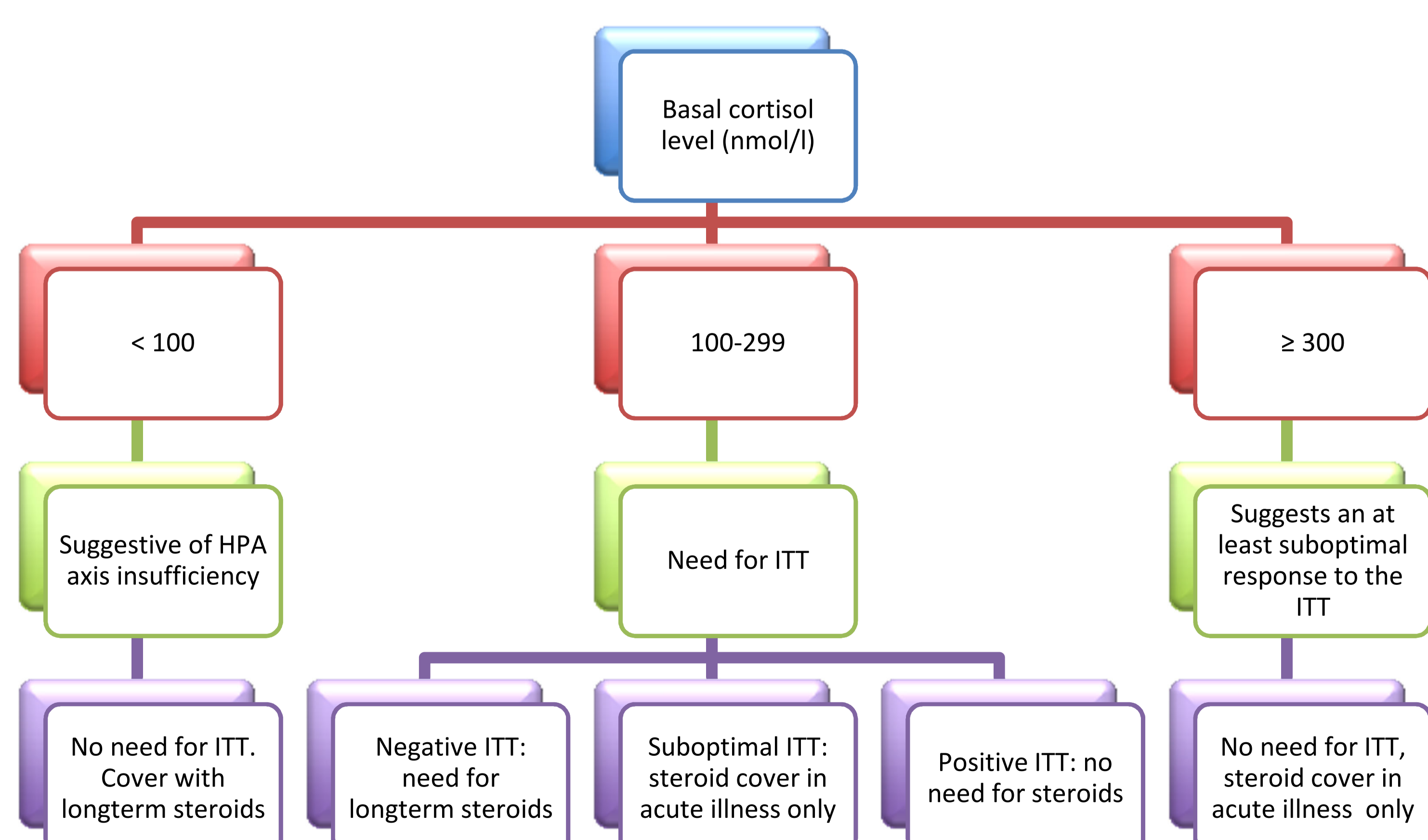


Figure 2: Algorithm with our recommendation about using the basal cortisol levels as a guide to decide upon the need for ITT and treatment options