ICE Test Name: Hypertonic Saline Infusion

**This test is potentially dangerous and must be undertaken with great care. Patients unable to conserve water may rapidly become severely hypertonic during this test. This test requires a doctor to be present throughout.**

**Principle**
This test is designed to stress the integrity of the renal-AVP axis, in order to assess posterior pituitary function, providing reliable information regarding the relation between plasma osmolality and AVP. The infusion of hypertonic saline raises plasma osmolality and ensures maximal stimulation of AVP secretion. The failure of maximal renal concentration of urine does not help differentiate which organ is performing sub-optimally. The diagnosis can be seen by comparing the response of plasma AVP to plasma osmolality using the Newcastle chart (Prof P.H. Baylis).

**Indication**
- This test is performed if the results of the water deprivation test are equivocal: the test can be useful in differentiating partial forms of diabetes insipidus and to demonstrate normal osmoregulation in patients with primary polydipsia. This test is also indicated when investigating patients with adipsic or hypodipsic hypernatraemia. A subjective thirst score maybe performed at the same time and requires copies of the unit-less 100 mm linear visual analogue scale.

**Precautions**
- Contraindicated in patients with epilepsy, cerebral or cardiovascular disease.

**Side Effects**
- There is a serious risk of dehydration in patients with DI
- The hypertonic saline may induce thrombophlebitis at the site of infusion.

**Preparation**
The laboratory MUST be notified AT LEAST 24 hrs before the test, ideally with more notice. Osmolality results are required as soon as possible after the specimens have been collected.

- Overnight food fast from midnight the day before the test
- Only water maybe drunk until the time of the test; other drinks are not permitted after midnight.
- No smoking during period of food fast
- Absolute food/fluid fast during the infusion period
- Assess to exclude the presence of any confounding factor e.g. hypercalcaemia, hypokalaemia, glycosuria or any other cause of a dilute solute diuresis, prior to commencing the test.
- Cortisol insufficiency must be treated prior to doing a water deprivation test as it interferes with the ability to excrete water and can mask DI.

**Protocol**
1. Patient instructed to empty bladder. Measure urine volume and osmolality
2. Weigh patient
3. Patient to lie supine where they will remain for the remainder of the test.
4. Insert cannula into antecubital veins of both arms. Allow patient to rest for 30 min.
5. Blood pressure monitored every 5 min during the 30 min preceding the test and throughout the infusion period.
6. Take blood for Co-peptin and osmolality
7. Repeat blood sample after 15 min
8. Begin infusion of 5% (0.85 mol/L) saline at 0.05 mL/kg/min for 2 hours into non-blood sampling arm via an indwelling cannula for a max of 3 hrs or until a plasma osmolality of 300 mmol/kg is achieved.
9. Take blood samples at 30 min intervals for Co-peptin and osmolality
10. Measure volume and osmolality on all urine passed.

**Note time at which thirst is noted - if patient very thirsty during test, give ice chips**
11. Take final blood sample 15 min after completion of infusion.
12. Record blood pressure, urine volume, blood sampling, patients comments
13. Allow patient to drink after test. Avoid ingestion of large fluid volumes.

**Samples**

- **Plasma osmolality**: 1 mL lithium heparin blood (orange top)
- **Co-peptin**: 1 mL lithium heparin blood (orange top)

**Interpretation**

Patients with primary polydipsia or nephrogenic diabetes insipidus have normal AVP and Co-peptin release in response to the hyperosmolar state induced by this procedure. Patients with cranial diabetes insipidus have little or no rise in AVP and Co-peptin.

**A. Newcastle Chart: Relation between plasma arginine vasopressin (AVP) and plasma osmolality following hypertonic 5% saline infusion**

The shaded area shows the response of a normal individual. The hatched area is those individuals with cranial DI.

**B. Correlation of Co-peptin levels with plasma osmolality**

**References**