

AMMONIUM CHLORIDE LOADING TEST

INTRODUCTION

Renal tubular acidosis is characterised by a hyperchloraemic acidosis with a normal anion gap. The diagnosis is already established if there is alkaline urine (pH > 5.5) despite a metabolic acidosis (plasma bicarbonate < 17.5 mmol/L) in the presence of a normal GFR. The ammonium chloride is converted in the liver to urea with the consumption of bicarbonate. The bicarbonate is normally replaced by renal synthesis with excretion of hydrogen ions. This test stresses the ability of the kidneys to excrete acid and any failure will result in a metabolic acidosis with urine pH less than 5.2. In the commoner and more severe form of Renal tubular acidosis (distal RTA, type I) there is failure of hydrogen ion (H⁺) excretion by the distal renal tubules, leading to metabolic acidosis. In the rarer form (proximal RTA, type II), there is excessive loss of bicarbonate from the proximal renal tubules with a subsequent fall in serum bicarbonate. However, this test does not differentiate satisfactorily between these two forms of renal tubular acidosis and should be used to confirm the diagnosis of distal RTA (type I) only.

CONTRAINDICATIONS AND SIDE EFFECTS

- This test is potentially very dangerous and must be undertaken with great care.
- It should NOT be performed if the urine is alkaline in the presence of a metabolic acidosis (as above), or in metabolic acidosis due to any obvious cause.
- It is contraindicated in patients with liver disease.
- This test should not be performed if the patient is taking alkali replacement.
- Bacterial urine infection may give a falsely high pH due to urea hydrolysis.
- This test should not be performed in hypokalaemia or hypercalcaemia as these conditions interfere with tubular function and may mimic RTA

PATIENT PREPARATION

The patient should receive nil by mouth for the 8 hours preceding the test.

PROTOCOL

1. Collect minimum 5ml of venous blood for serum bicarbonate estimation (SST tube – yellow top).
2. The first urine pass should be collected for pH- a value of <5.5 excludes almost all subjects with type 1 RTA.
3. Ammonium Chloride (100mg/kg body weight) is given orally with breakfast disguised with syrup or jam. The total dose should be taken over a period of 2 hours to reduce the degree of gastric irritation. If the total dose cannot be consumed note the exact quantity on the request card. It will be necessary to repeat test if the patient vomits all/the majority of the ammonium chloride.
4. Urine samples are collected every hour, for six hours, into a plain universal. Each urine sample should be sent **immediately** to the Clinical Biochemistry Department for pH measurement.
5. After **4 hours** collect a further 5ml blood for serum bicarbonate (SST tube–yellow top).

INTERPRETATION

Normal response: The urine pH should fall to <5.2 in at least one specimen, and the serum bicarbonate should remain unchanged.

In patients with proximal RTA (type II) and those with generalised renal tubular damage, the urine pH falls to <5.2 at some point during the test ie. a normal response.

In patients with distal RTA (type I), the urine pH remains above 6.0 indicating an inability to acidify the urine in spite of a low serum bicarbonate concentration.

CONTACTS

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