

# The Use of free water clearance to distinguish between SIADH and CSWS in hyponatremic patients' in neurosurgical ICU

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# INVESTIGATORS

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# Background to the study

- Hyponatremia is the most common electrolyte abnormality in neurosurgical ICU
- The biggest challenge is differentiating between (SIADH) and (CSWS) as the treatment of the 2 conditions are totally different.



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# Background to the study

- It takes up to 24 hours to make a definitive diagnosis of either SIADH or CSWS in our setting
- The study was undertaken to determine if the concept of free water clearance in one hour can reliably distinguish between SIADH and CSWS and allow early appropriate treatment to be instituted within one hour compared to twenty four hours) for use in our neurosurgical ICU



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# Aims and Objectives of the study

- To determine whether free water clearance can be used to differentiate between SIADH and CSWS.
- To determine whether the one hour free water clearance will give as reliable a result as the 24 hour free water clearance



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# Selection of subjects

## **Inclusion Criteria**

All hyponatremic patients' (serum sodium less than 135mmol/l) in neurosurgical ICU with intracranial pathology

## **Exclusion criteria**

- Patients' on diuretics, osmotherapy (e.g. mannitol and hypertonic saline) and steroids
- Patients' with known endocrinopathies



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# Methodology

- Prospective cross sectional study
- Volume status of the patient is assessed using, BP, skin turgor and capillary refill and then patient categorized as either hypovolemic or euvolemic
- 24 hour urine volume is measured and patients categorised as those with low urine output <1000ml and high urine output >1000ml
- Biochemical variables serum sodium, serum osmolality, urine sodium and urine osmolality are measured



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# Methodology

- All the above results are used to make a diagnosis of SIADH or CSWS
- To calculate both the 1 hour free water clearance and 24 hour free water clearance on the hyponatremic patients to diagnose SIADH with negative free water criteria and CSWS with positive free water clearance



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# Methodology

- The results from the traditional method of diagnosing SIADH or CSWS is compared to the free water clearance method
- The 1 hour free water clearance and the 24 hour free water clearance are compared for quality control and validation of the 1 hour free water clearance method
- To reach statistical significance the study requires 20 patients



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# Data Collection

- Clearance for the study was obtained from local ethics committee and the University Protocol Committee
- Free water clearance formula

- $Urine\ volume \left( 1 - \left[ \frac{urinary\ sodium + urinary\ potassium}{plasma\ sodium} \right] \right)$



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# Results

## Example 1

- Examples of the use of the concept above
- 53 yr old female patient post drainage of a subdural bleed
- BP 126/87 , P 86, cap refill<3 sec
- Serum Na 119 , Serum osmolality 270 , 24 hr urine Na 99 , urine K 29.5 , urine osmolality 801
- 1 hour urine volume 30ml, 1 hr urine Na100, K 46.9
- 24 hour urine volume 800ml
- Diagnosis from above data SIADH

## Example 1

- Using the Free Water Clearance concept
- $Urine\ volume \left( 1 - \left[ \frac{urinary\ sodium + urinary\ potassium}{plasma\ sodium} \right] \right)$
- $800 \left( 1 - \left[ \frac{100 + 46.9}{119} \right] \right)$
- Result -187 and negative free water clearance  
Diagnosis SIADH on the 24 hour urine sample
- $30 \left( 1 - \left[ \frac{99 + 29.8}{119} \right] \right) = -3.2$  negative free water clearance SIADH

# Results

## Example 2

- 40 year old female patient with aneurysmal SAH post coiling of an anterior communicating artery aneurysm
- BP 95/60 , P 102, cap refill>3 sec
- Serum Na 124 , Serum osmolality 290 , 24 hr urine Na 59 , urine K 35 , urine osmolality 607
- 1 hour urine volume 90ml, 1 hr urine Na 64, K 46.9
- 24 hour urine volume 1 960ml
- Diagnosis from above data CSWS

- $$\text{Urine volume} \left( 1 - \frac{[\text{urinary sodium} + \text{urinary potassium}]}{\text{plasma sodium}} \right)$$
$$1960 \left( 1 - \left[ \frac{59 + 35}{124} \right] \right) = +474.34$$

Result positive free water diagnosis Cerebral Salt wasting Syndrome

# Results

- For the results that we have so far 12 patients out of the required 20 patients to prove the concept can be used in our setting , the results from the traditional method of diagnosing SIADH and CSWS are correlating directly with both the 1 hour free water clearance and the 24 hour free water clearance .



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# Results

- If at the end of the study the results remain as they are we will have a supplementary method to help us differentiate between CSWS and SIADH and implement appropriate treatment quickly and efficiently for our hyponatremic patients in neurosurgical ICU



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Thank You