

**COMPARISON BETWEEN FRACTIONAL EXCRETION OF
SODIUM AND FRACTIONAL EXCRETION OF UREA
FOR DIFFERENTIATING RENAL FROM PRERENAL
AZOTEMIA IN CRITICALLY ILL PATIENTS WITH
CIRCULATORY SHOCK**

Thesis Submitted by

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Summary

Acute kidney injury (AKI) is a frequent complication of hospitalization that is associated with substantial morbidity and mortality. (*Michael et al., 2009*).

Early detection of prerenal azotemia and exclusion of renal azotemia and so early initiation of renal replacement therapy was associated with mortality reduction of 28% as a recent meta-analysis found. (*Fieghen et al., 2009*).

Relying solely on the patient's response to fluid challenge in order to differentiate prerenal azotemia from renal azotemia, although it is beneficial in the former, may lead to massive fluid overload in the latter. (*Daryoosh Fahimi et al, 2009*) .

Despite the numerous laboratory investigations that are used for differentiating renal from prerenal azotemia , they have many pitfalls and lack reasonable sensitivity and specificity. (*Krutzik & Foster, 2006*).

The fractional excretion of sodium (FENa); which is the percentage of the filtered sodium that is excreted in urine has been used to differentiate prerenal from renal azotemia with reasonable sensitivity and specificity since its description by *Espinell et al, 1980*.

But there are many drugs and medical conditions that interfere with FENa utility. Recently other solutes rather than sodium, including urea, have been recently suggested to improve the diagnostic ability in clinical situations where the fractional excretion of sodium is known to be unreliable.

The objectives of our study were to compare fractional excretion of sodium (FENa) and fractional excretion of urea (FEurea) for differentiating

renal from prerenal azotemia in critically ill patients complicating circulatory shock, and to evaluate the effect of use of frusemide diuretics on their clinical significance.

Fourty consecutive patients with acute kidney injury complicating circulatory shock admitted to the ICU were included in the study and divided into two groups:

Group I: Included 26 patients who had prerenal impairment, furtherly this group was subdivided into two subgroups (Ia and Ib) as follow:

Group Ia: Included 12 patients who had prerenal azotemia and did not receive diuretics in the last 24 hours.

Group Ib: Included 14 patients who had prerenal azotemia and received diuretics, in the last 24 hours.

Group II: Included 14 patients who had acute renal azotemia.

Acute kidney injury was diagnosed according to RIFLE criteria in oliguric patients. Prerenal versus renal azotemia diagnosis was settled using the criteria adopted from *carvounis et al.2002*, abdominal ultasound and routine kidney function tests and regular biochemical and hemodynamic assessments were performed.

Both FENa and FEurea showed significant accuracy for differentiating renal from prerenal azotemia between the study groups. The cut of points below

which prerenal azotemia diagnosis was settled was 35% for FEurea($p<0.001$) and 1% for FENa($p<0.05$), while values above these ensures diagnosis of renal azotemia.

The patients in group II “renal azotemia” showed higher need for mechanical ventilation($p<0.05$), higher need for renal replacement therapy($p<0.001$) and higher mortality($p<0.05$) than patients in group I “prerenal azotemia”.

Estimation of RIFLE criteria showed significant difference of FENa and FEurea, with increase severity of renal affection with the increase of FENa ($p<0.05$) and FEurea ($p<0.05$).

There was a significant correlation between FENa and FEurea ($r =0.67$, $p<0.05$), but our study showed FEurea has better sensitivity (78.1 % versus 71.4%) , better specificity (88.5% versus 69.4%) than FENa, and better overall accuracy (85% versus 67.5%) for differentiating renal from prerenal azotemia.

Also, with the use of diuretics, FEurea was almost not affected (with diuretics use; sensitivity, specificity, overall accuracy were 78%, 92%, 85%, and without diuretics 78%,88%,85% respectively). The use of frusemide affected FENa and caused a decrease of sensitivity (64% versus 71%) ,specificity (58% versus 70%) and accuracy (59% versus 69%) respectively.

From that we conclude; FEurea is better than FENa for differentiating renal from prerenal azotemia in critically ill patients complicating circulatory shock, especially with the use of diuretics.