Iso-osmotic hyponatremia

The confusing treachery of iso-osmolarity

(serum osmolarity around 275-290 mOsm)

This weirdness is the result of measurement artefact.

When you order an EUC

The plasma sample is taken to the biochem lab, and is diluted to 1/10th.

Then, this diluted result is run through either a flame emission spectrophotometer (i.e. it gets burned and the emission spectra measured), or run through an indirect ion-sensitive electrode.

Either way, the WHOLE PLASMA is used, not just the water fraction.

The amount of sodium found in this way is then “diluted” by calculation, with the assumption that it comes from a sample which originally consisted of 93% water.

Obviously, if you have 20% protein in that sample (e.g. in multiple myeloma) then this assumption is false.

So, anything that causes there to be less water in your sample than the assumed 93%, will cause the test to show a falsely decreased sodium.

Iso-osmotic pseudohyponatremia

The abovedescribed measurement problem will confuse sodium measurements in the following conditions:

- High triglycerides (most common)
- High paraprotein (e.g. multiple myeloma)

Post- TURP iso-osmotic hyponatremia: “TURP syndrome”

This bizarre complication can occur in as many as 5-10 TURP cases. It is due to absorption of irrigant solution through the distended urethra.

- In the course of a trans-urethral prostatectomy, small prostatic veins are cut. To keep the view clear, the irrigant solution needs to pump at pressure higher than venous pressure.
- THIS SOLUTION IS ISO-OSMOLAR: but it can’t be conductive, or the monopolar diathermy won’t work.
- The solution is made iso-osmolar by addition of glycine or sorbitol.
- As much as 6 litres of this crap gets infused into the periprostatic veins as the TURP is conducted.
- The bloodstream is thus inundated with glycine or sorbitol; these act in the same way as high lipids and high paraprotein, confusing the indirect ion-sensing electrode.
- This is a thing of the past: nowadays, progressive urologists use normal saline to irrigate, and a bipolar diathermy probe which doesn’t care how conductive your irrigant is.

From "Basic Assessment and Support in Intensive Care" by Comersall et al, as well as "The Washington Manual of Critical Care" by Kollef et al, chapter 23, "Renal and Electrolyte Disorders" by Schrier and this eMedicine article.