Examination of concentration ability of the kidneys

Impairment of the kidney's ability to concentrate is one of the first signs of renal disease. When investigating it, we proceed as follows:

- First we examine the **osmolality in the morning urine sample**. A healthy person should produce urine with an osmolality of **around 600 mmol/kg** after nocturnal fluid withdrawal. This value indicates a good concentration ability of the kidneys, and if it is reached, we do not proceed with further investigation.
- The **adiuretin test** reflects the ability of the distal tubule and collecting duct to respond to adiuretin (vasopressin) by producing concentrated urine. After nighttime withdrawal of liquids, we apply 10 µg (2 drops) of 1-deamino-8-D-arginine vasopressin (DDAV) to each nostril, which is a synthetic analogue of adiuretin. It is characterized by an intensified antidiuretic effect, while other pharmacological effects are suppressed. The patient collects urine in four one-hour intervals and the osmolality of individual urine samples is measured. If it exceeds the value shown in the table, it indicates a good concentration ability of the kidneys and we end the experiment. At the same time as urine, blood is collected, in which serum osmolality is examined. From the values of osmolality in urine and serum, we calculate the osmotic index (U_{osm}/S_{osm}), which more accurately reflects the concentrating ability of the kidneys.

Physiological values of urine osmolality and osmotic index after administration of adiuretin

Age	$U_{mmol/kg\ H_2O}$	U_{eight}/S_{eight}
15-20	970	3.34
21–50	940	3.24
51–60	830	2.86
61–70	790	2.72
71–80	780	2.69

Another possibility is the assessment of urine osmolality under conditions of varying duration of fluid withdrawal, which is currently rarely performed.

The kidney's ability to concentrate is impaired mainly in diseases affecting the renal tubules and interstitium, where the countercurrent concentration gradient is disrupted. It is also possible to examine the *dilution capacity of the kidneys* after a load of distilled water. The test reflects the ability to produce urine whose osmolality is significantly lower than serum osmolality.