

# Renal failure

**Renal failure**<sup>[1]</sup> is a condition in which the kidneys insufficiently fulfill their function of **maintaining a constant internal environment** and their excretory function.

## Distribution of renal failure

Traditionally, kidney failure is divided into three types<sup>[1]</sup>:

- **prerenal failure** – kidney function is damaged by insufficient blood supply to the kidneys (dehydration, shock),
- **renal failure** – the kidneys do not perform their function due to damage to the glomeruli or tubules,
- **postrenal failure** – this is an obstruction in the urinary tract that prevents the outflow of urine.

On the basis of pre-renal failure, if it lasts for a long time, renal failure itself may develop. Physiologically, only 10% of the blood supply goes into the tubular system, and the tubules are **very energy-intensive** due to metabolism, therefore **acute tubular necrosis** can develop when the blood supply is reduced, which then combines pre-renal and renal failure<sup>[1]</sup>.

In terms of time, kidney failure is divided into<sup>[1]</sup>:

- **acute renal failure** and
- **chronic renal failure**.

 For more information see *Acute renal failure*.

 For more information see *Chronic kidney disease*.

## Differential diagnosis

The cause of renal failure is determined from the **anamnesis, medical history, physical examination, biochemical examination of blood and urine, and sonography of the kidneys**<sup>[1]</sup>. Before any diagnosis of renal failure, it is **necessary to rule out both prerenal and postrenal failure**. Eliminating the cause of prerenal and postrenal failure can save the patient from dialysis<sup>[1]</sup>.

### Prerenal failure

We think of prerenal failure if **the urine sediment is normal, no proteinuria and  $EFNa < 1\%$** <sup>[1]</sup>. We look for **reduced intravascular volume** or **closure of the renal vessels**<sup>[1]</sup>. Prerenal failure can also arise as a purely functional blockage of the kidney's blood supply by increased intra-abdominal pressure<sup>[1]</sup>.

The therapy is **replenishment of the intravascular volume**. If patients start to urinate afterwards, even with high creatinine and urea values, it is possible to treat them conservatively and under observation. If there is no indication for other reasons (e.g. hypercalemia), they can thus save themselves unnecessary dialysis<sup>[1]</sup>. On the contrary, if they do not start to urinate, the cause must be looked for elsewhere and at the same time the excess supply of fluids must be stopped (- then even dialysis, which was initially unnecessary, could now be necessary for pulmonary edema)<sup>[1]</sup>.

In case of anuria (acute renal failure), urine cannot be examined - it is not material. It is then necessary to do without urine results.

### Renal failure

After **anamnesic detection of toxins, nephrotoxic drugs** (often aminoglycosides, e.g. gentamicin) or in the case of **myoglobinuria** or **hemoglobinuria**, we think of **acute tubular necrosis**. This can arise as a result of tubule ischemia even after long-lasting prerenal failure.<sup>[1]</sup>

In the presence of **swelling, involvement of other organs, hypertension, abnormal sediment, proteinuria**, we think of these units<sup>[1]</sup>:

- **acute interstitial nephritis (AIN)**,
- **acute glomerulonephritis (AGN)**,
- **vasculitides**,
- **hemolytic uremic syndrome / thrombotic thrombocytopenic purpura (HUS/TTP)**.

In AGN and vasculitides, it is desirable to have a **kidney biopsy**. For unclear cases of AIN as well. In HUS/TTP as well, but due to the bleeding state, biopsy may not be feasible.<sup>[1]</sup>

### Postrenal failure

For postrenal failure, it is necessary to demonstrate urinary tract obstruction (sono of the kidneys, dilatation of the calicopelvic system). Obstruction of one ureter, however – if it is not in a solitary kidney – will not cause renal failure. (In single ureter obstruction and renal failure, another cause should be sought.)

## Links

### Related articles

- Acute renal failure • Acute renal failure (pediatrics) • Treatment of acute renal failure
- Chronic kidney disease • Chronic kidney function disorders (pediatrics)
- Renal failure (neonatology)

### References

1. ČERTÍKOVÁ CHÁBOVÁ, Věra. *Diferenciální diagnostika renálního selhání* [lecture for subject Interna předstátnicová stáž, specialization Všeobecné lékařství, 1. lékařská fakulta Univerzita Karlova]. Praha. 27.5.2014.



Ultrasound of a kidney with a kidney stone in the pyeloureteric junction