

## Urinary stones in children – the culprits are pizza & chips

**A**lthough urinary calculi in children account for only 1 to 5 % of the total incidence of urinary stone disease, recent figures show a striking increase in this widespread pathology among children in Western civilisations. Our Western lifestyle, characterised by lack of exercise, overnutrition and insufficient fluid intake, is, in fact, one of the main causes of paediatric urolithiasis. Germany is not only one of the world's leaders in the automotive industry, but also ranks high in body weight reviews. Children tend to resemble their parents in many ways, and, indeed, love handles and increasing belly fat have been on an upward trend in pre-school children in recent years. According to an OECD study, 15 % of all children and adolescents between three and seventeen years of age are overweight. Among the principal culprits of excess body weight are a series of children's favourites such as fast food, pizza, chips, crisps and high-sugar beverages (cola!) (Fig. 1).

Owing to their exceptionally high relapse rate of about 40 % and the high risk of progressive loss of renal function, which would have a severe impact on the quality of life, urinary stone disease in children has become a significant issue in public health policy. In many cases, urolithiasis in childhood is the beginning of a lifelong syndrome.

Very often, the symptoms are less typical in children than in adults. Ureteral colics, frequently reported by urolithiasis patients, only occur in children of school age and older. Small children are more likely to experience unspecified stomach pain. Pathological urine should then cause doctors to examine their young patients for urinary stones.

The percentages of various urinary stone types found in children are also different from adult patients. Uric acid stones, though increasing in number, are less frequent in children than in adults, while there is a striking incidence of Weddellite stones (calcium oxalate dihydrate) and infection-induced calculi. Also, cystine stones, a typical example of an autosomal recessive hereditary disease, are relatively more frequent in children than in adults (Figs. 2 and 3). The high percentage of infection-induced calculi hints at a specific causal factor that is of great importance in childhood. In fact, urinary transport disturbance with consecutive infections plays a more significant role in children than in adults. In many cases, stone formation and infections are mutually conditional.

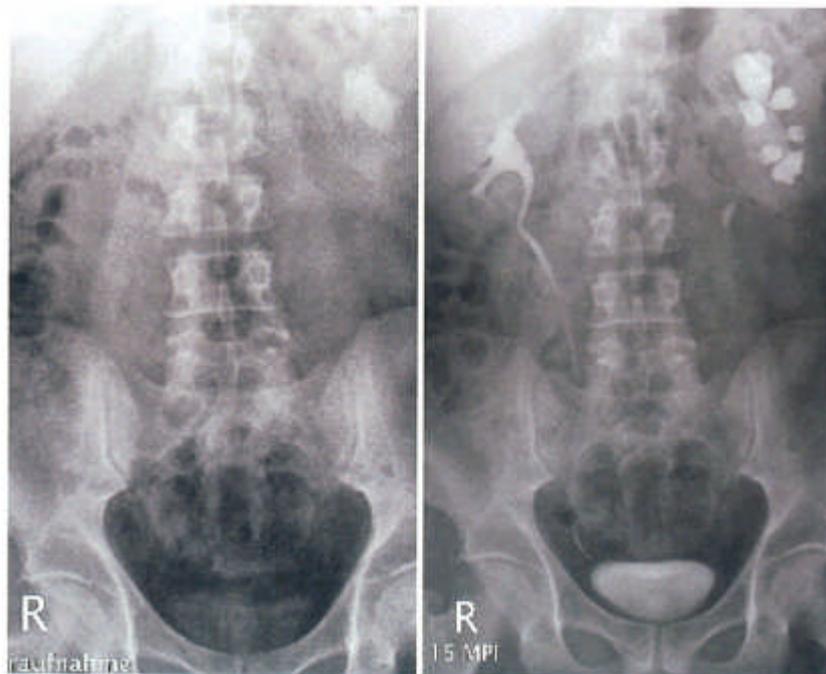


Infections with urease-positive germs may deteriorate the solubility of calcium and magnesium ammonium phosphate by shifting the urine pH and thus cause rapid stone growth within minimum time. Timely corrective surgery can eliminate the causes of this condition and thus prevent stone formation (Table 1).

Modern therapy procedures, most of all ESWL, URS and PNL, have revolutionised the treatment options for urinary stone management (Fig. 4). Paediatric therapy modalities are the same as those used in the treatment of adults. Despite the miniaturisation of endoscopic instruments, ESWL has been used much more frequently in children than in adults during the last few years as it is better tailored to accommodate the smaller anatomy of children.



Fig. 4: ESWL of a school-age child under spasmo-analgesia with ultrasound localisation (STORZ Modulith SLK with in-line US scanner)



Far left, Fig. 1: Overweight in early childhood

Figs. 2 and 3: Plain X-ray and intravenous urogram of a 21-year-old man with left renal pelvis calyx stone. The young man had been suffering from cystine lithiasis since the age of 10 and had discontinued medication-based metaphylaxis at the onset of puberty.

Table 1: Paediatric urinary stone types and incidence

Urinary stone type	Incidence in percent
Calcium oxalate stones	>70%
Whewellite stones (calcium oxalate monohydrate)	>30%
Weddellite stones (calcium oxalate dihydrate)	40%
Infection-induced stones	>20%
Struvite stones (magnesium ammonium phosphate)	8%
Carbonate apatite stones (calcium phosphate)	13%
Uric acid, xanthine and 2,8-dihydroxyadenine stones	5%
Cystine stones	4%

Third-generation lithotripters can even be used in the treatment of infants without any significant restrictions.

In many cases, children are able to spontaneously pass astonishing amounts of stone fragments. The higher elasticity of the urinary tract in children obviously plays a decisive role here. Most children, at least those of pre-puberty age, require general anaesthesia for treatment. If the child is above twelve years of age, treatment can also be performed with analgesic sedation, provided the child is able to cooperate sufficiently during the procedure. Whenever possible, children should not be exposed to ionising radiation. Ultrasound localisation of urinary stones is the method of choice in ESWL. Many patients require repeated therapy sessions at minimum intervals of about five days.

In the treatment of adult patients, ESWL seems to have sunken into oblivion in many therapy centres as endourological stone manipulation is becoming increasingly popular.

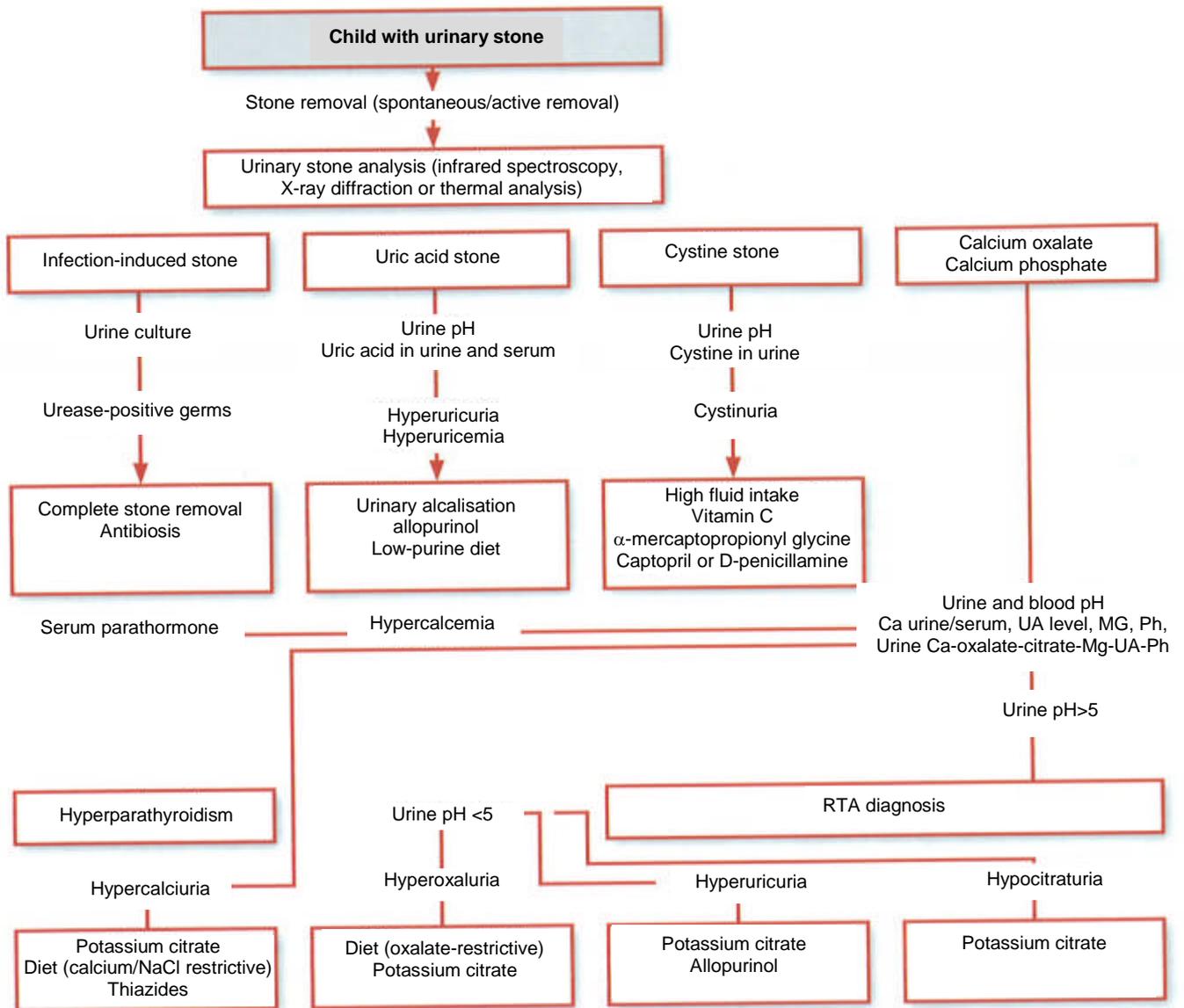
Table 2: Limit values of urinary excretion of lithogenous and therapy-relevant inhibitory substances in children as an indication of medication-based metaphylaxis

Lithogenous substances	Urinary excretion (mmol/kg/d)
Calcium	>0.1
Oxalic acid (oxalate)	>0.0063
Uric acid (UA)	>0.63
Phosphate	>0.483
Cystine	
heterozygous	0.0058-0.0117
homozygous	>0.024
<b>Crystallisation inhibitor</b>	
Citrate	<0.01
Magnesium	<0.045

As far as children are concerned, this trend should be viewed with great caution. Especially in small children, retrograde instrumental stone removal should only be performed for very specific indications because instrumental manipulation of the urinary tract in children involves a high risk of damage to the male urethra. Older children, similarly to adults, can be treated by performing ureteroscopy with laser technology.

Today, open surgery for stone removal is only required in very rare cases, for instance, when urinary tract abnormalities need to be corrected at the same time. However, the availability of minimally invasive therapy procedures of modern stone therapy – above all ESWL as the method of choice – has caused metaphylaxis (Table 2) to be neglected in many cases. The important principle, according to which a urinary stone is only the symptom of a disease, but not its cause,

Table 3: **Organigram of metabolic diagnosis and medication-based therapy/metaphylaxis of paediatric urolithiasis (modified to EAU Guidelines)**



has often been forgotten. Consequently, it has to be stated that despite our excellent standard of medical care in Germany, not all problems associated with urinary stone disease, including and above all paediatric urolithiasis, have been solved.

The simple fact that a urinary stone is only a symptom whose cause needs to be identified and, where possible, eliminated is of decisive importance for the future quality of life of young patients.

From this it follows that, by definition, children must always be considered high-risk stone formation candidates. In practice, this means that urinary stones in children always need to be thoroughly diagnosed to identify possible metabolic or anatomical

causes or pathological habits that may favour stone formation in order to initiate suitable therapies for lifelong prophylaxis (Table 3).



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