Renal Symptom: Variants of Interpretation

Parents of a 3.5-year-old girl consulted a doctor due to the girl's unusual urine color. The day before the girl had been complaining of pains in the lower abdomen. The girl urinated at night; in the morning the father discovered that the urine was bright crimson (pic.).
From medical history: the girl had received an antihistamine (in red syrup form) 3 days before due to an aggravation of atopic dermatitis; she had also eaten beet salad 2 days before; the girl had been taking Lactofiltrum, Fenistil and 4 mg of dexamethasone (once) per os for the previous 2-3 days. The mother has photodermatosis.
On examination: satisfactory condition, no fever, no signs of intoxication, the patient was active; skin creases revealed erythematic and squamosal elements of dermatitis; no visceral abnormalities. Several urine samples taken at the clinic were less intensively colored, although the crimson tinge persisted. The urine color has normalized within the day. Clinical urine analysis revealed no alterations.

What is your diagnosis?
1. Urine coloration due to consumption of products and drugs containing coloring agents.
2. Renal injury due to a trauma.
3. Acute glomerulonephritis.
4. Porphyria.

Pic. Color of the urine at night

Correct answer: 4. Porphyria.

Urine coloration secondary to alimentary admission of food and medical coloring agents usually takes place during the first day. The patient consumed beet and bright red drugs 48-72 hours prior to the unusual intensive urine coloration. Hence, it is not likely that the unusual urine color was caused by coloring agents.

Renal injury constitutes 10% of all the nonpenetrating traumas of the abdomen. In 75% of cases children's renal injuries come together with other organs' injuries. One of the most frequent and essential symptoms of renal injuries is hematuria, the intensiveness and duration of which may vary. Hematuria intensity does not always correspond to severity of the renal parenchymal injury. There could be no evidence of hematuria when a vascular pedicle, pelvis or ureter are torn away, as well as in case of surface ruptures and even total crushing of parenchyma, when the ureter is jammed with clots. Usually hematuria occurs immediately after the injury; however, secondary or late hematuria may sometimes occur several hours, 1-2 weeks or more after the injury. The patient's parents completely deny the possibility of a girl's abdominal injury in the aforementioned period of time. Moreover, no signs of hematuria were present.

Acute glomerulonephritis, most frequently post-streptococcal, which occurs 1-3 weeks after the angina induced by a Group A betahemolytic streptococcus as a consequence of immune complex damage of the basal glomerular membrane, is characterized by acute onset with macro- or (less frequently) micro-hematuria, oliguria, proteinuria (most often up to 1 g per day), less frequently with leukocyturia (lymphomonocytic), cylindruria; progression of arterial hypertension and hyperazotemia is also possible. As a consequence of the complement system activation and development of immune complex inflammation due to intake of the C3-component of the complement, its reduction in blood serum is observed. No signs of urinary syndrome or any other aforementioned diseases were discovered in the process of the patient's examination; this rules out the possibility of nephritis.

Taking into account the characteristic color of urine and insufficient data on renal affection, we suspected porphyria. According to the biochemical urine analysis 2 days after the first visit (after normalization of the urine color), the urine level of ALA (δ-aminolevulinic acid) was 47 mcmol/GCR (the normal rate being 3.9-19.0 mcmol/GCR). The girl was examined by a geneticist; the urine color change was classified as a primary crisis characteristic of the onset of porphyria; genetic examination was highly recommended.

Porphyria or hematoporphyria (from Greek − Πορφύριος — vermilion, scarlet) is a group of hereditary diseases based on the deranged biosynthesis of heme, which leads to extensive accumulation of porphyrins and their precursors (namely, of porphobilinogen and δ-aminolevulinic acid) and their intensive discharge with urine and feces.

Porphyria manifests itself with photodermatosis, hemolytic crises, gastroenteric and neuropsychic disorders. Excess of these substances has a toxic effect on the body and causes the characteristic clinical symptoms. This disorder is caused by a mutation of the gene responsible for activity of one of enzymes involved in a multi-step synthesis of a heme. Depending on the enzyme the activity whereof is reduced, 7 types of porphyria are distinguished. They are further subdivided into two groups depending on the tissue with disturbed metabolism.

Group I — erythropoietic porphyria

- Congenital erythropoietic porphyria (Gunther's disease) is a rare disease resulting in the reduced activity of uroporphyrinogen-3-synthase.
- Erythropoietic protoporphyria is a deficiency of ferrochelatase activity.

Group II — hepatic porphyria

- Acute intermittent porphyria: decreased activity of porphobilinogen deaminase.
- Hereditary coproporphyria – reduction of coproporphyrinogen-3-oxidase.
- Variegated porphyria (cutanea tarda) – lack of protoporphyrinogen oxidase.
- Late (or chronic) porphyria cutanea – lack of uroporphyrinogen decarboxylase.
- Porphyria caused by dehydratase deficiency of δ-aminolevulinic acid.

Depending on clinical manifestations of porphyria, it is also subdivided into acute forms and the forms manifesting themselves with clinical manifestations of predominant skin lesion. Acute porphyria may only be hepatic. In case of an acute porphyria, the process of a genetic defect conversion into a disease is usually influenced by an initiating agent. Drugs (e.g., barbiturate soporifics), pesticides, fertilizers, infections, stresses and hormonal state changes (beginning of a menstrual period, pregnancy) may serve as initiating agents. Drugs could have been the trigger in this case either.

Clinically, the disease may manifest itself with severe abdominal pains, which can be mistaken for appendicitis or intestinal obstruction; red urine; autonomic disturbances (high blood pressure, palpitation, emesis); weakness, pains and sensory decrement in the limbs; mental disorders (agitation, delusions, hallucinations), seizures; fever.

Etiologic treatment of porphyria has not been developed yet. The following methods of therapy are used:

- Withdrawal of porphobilinogen drugs and prescription of a carbohydrate-rich diet;
- Protection from sun exposure;
- Painkillers and antihypertensive drugs;
- Adenosine monophosphate and inosine therapy;
- Prescription of chloroquine, which combines with skin porphyrins and discharges them with urine.

SUGGESTED READING

1. *Gematologicheskii nauchnyi tsentr RAMN* [Hematological Scientific Center of the Russian Academy of Medical Sciences]. Available at: http://porphyria.blood.ru/ctotakoe.htm
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3. Bonkovsky H. L., Balwani M., Anderson K. E. Available at: http://www.medscape.org/viewarticle/712889

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