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Case Report

Myocarditis Caused by Primary Oxalosis in a 4-Year-Old Child

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Summary. We report a case of primary oxalosis in a 4-year-old boy with intensive deposition of calcium oxalate monohydrate crystals in the kidney and the myocardium. In addition severe fibroplastic inflammatory reaction in form of intensive myocarditis was found. It is an extremely rare complication at this age and represents a particularly rare case of oxalosis. Disorders of oxalate metabolism are discussed in relation to extrarenal deposition of oxalate crystals.

Oxalosis is a rare disease caused by a genetic enzymatic defect in oxalate metabolism accompanied by hyperoxaluria and depositing of oxalate crystals in various organs (Gasser and Wuketich, 1964; Hockaday *et al.*, 1964; Mohr and Hey, 1969; Wyngaarden and Elder, 1960). Calcium oxalate crystals in myocardium may be deposited in muscle fibres or in the walls of the blood vessels. This depositing is usually of slight intensity and is not accompanied by inflammatory reaction (Hockaday *et al.*, 1964; Beil *et al.*, 1969; Hahlweg and Orf, 1966; Kief, 1964; Zollinger and Rosenmund, 1952). However, there have been described also very rare cases of myocarditis caused by deposits of oxalate crystals with intensive fibroplastic proliferation known as "fibroplastische Myokarditis bei Oxalose" (Hahlweg and Orf, 1966). We have found in medical literature only 18 such cases. 17 cases were adults (Beil *et al.*, 1969; Dunn, 1955; Enger *et al.*, 1965; Hahlweg and Orf, 1966; Mohr and Hey, 1969). The other case, the patient described by Stauffer (1960), was a 13-years old girl.

In our case, myocarditis during primary oxalosis represents in our opinion an extremely rare case with regard to the age of the patient.

Case Report

Clinical Data. A 4-year-old boy was admitted to the Children's Hospital in uremic comma with hydrops and ascites. His weight at birth was 5.0 kg and he had grown normally for two years. Afterwards, he showed gradual decline in growth and the onset of anemia and temporary polydipsy with polyuria. One month before his admission oedema and clear anemia were found. His parents and the other three children in the family were healthy. In the first 24 hrs after admission diuresis was 200 ml, accompanied by slight proteinuria and occurence of many Ca-oxalate crystals, bacteria and leucocytes in the sediment. The kidney X-ray

showed concrements in dilated calices. Oxalosis was suspected, but soon after admission complete anuria ensued so that it was not possible to measure the daily elimination of oxalate and glycolic acid. Tachycardia (120/min), galope rhythmus and systolic murmur at the heart apex were found. The ECG showed low voltage with signs of coronary insufficiency. Arterial blood pressure was 85/40 mm Hg. Blood urea nitrogen amounted to 302 mg-% increasing tendency and some signs of mineral disequilibrium. He died after 15 days of treatment with signs of renal insufficiency.

Autopsy. The most prominent changes were discovered in the kidneys. These organs were diminished (weight of both kidneys with calculi 145 g, without calculi 90 g), with granulated and partly scarred surface with slightly adherent capsulas. The renal tissue was very firm with narrowed cortex. Calices and pyelons were dilated, containing numerous faceted, fine granular concrements, from the size of a bean to a small nut. On the cut surface the concrements consisted of transparent, needlelike yellowish crystals.

The heart was enlarged (weigh 210 g). The left ventricle wall was 10 mm thick, muscle pale reddish with numerous greyish-yellowish spots.

Microscopic examination of the kidneys showed many preserved glomeruli, but some of them showed increased glomerular cellularity, thickened basal membrane and proliferation of connective tissue in the Bowman's capsula. The proximal tubuli were dilated, with flattened epithelium and sometimes they contained protein cylindres. In the other dilated parts of tubuli the crystals mostly appeared as rosette accumulations. The crystals were very visible in the polarized light.

In the myocardium some sporadic areas of preversed myofibriles with visible cross stripes were found. Large areas were observed in which cardiac muscle fibers were destroyed and replaced by fibroplastic tissue with many inflammatory cells (Fig. 1). On the periphery of these areas were seen many sarcolems membranes. Using polarized light we observed double fragile crystals in the central parts of the fibroplastic areas (Fig. 2). In some of the preserved muscle cells single crystals were also visible.

Elsewhere, very slight deposits of the crystals were found only in the spleen and the lungs.

Identification of the described crystals was possible by the ferric ferricyanide reduction test (Lillie, 1954) and by the microincineration technique for calcium oxalates (Tompson, 1966). Investigation of heart muscle and kidney slides has shown that the crystals manifest the phenomenon of light polarisation. Since the above methods exclude persistence of Ca-carbonate or phosphate an X ray diphractometric analysis was made. This method proved the crystals from the heart and the kidneys to be identical with Ca-oxalate monohydrate.

Comments

The existence of a primary oxalosis was confirmed without any doubt in our case. There is no information at all about ethylene-glycol and other substance intoxication that can produce secondary oxalosis (Bankl and Regele, 1967; Bednar *et al.*, 1961; Friedmann *et al.*, 1962; Largiader and Zollinger, 1960). The histotopography of the changes, especially in kidneys, is not characteristic of secondary oxalosis.

Cases can be found in the medical literature in which some other organs or systems are involved besides the kidneys. Thus, Mohr and Hey (1969) have described intensive deposits of oxalate crystals in the media of the blood vessels

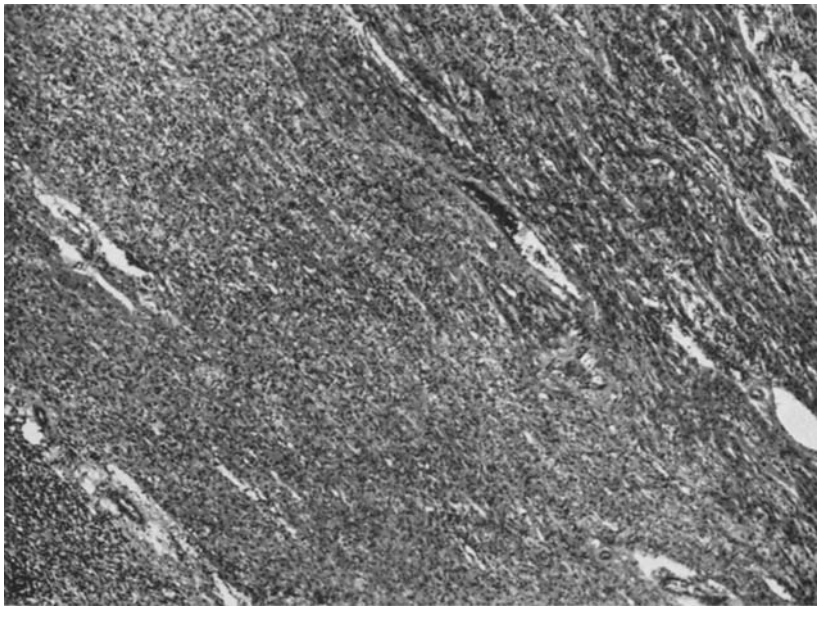

Fig. 1. Section of the myocardium showing intensive inflammatory infiltration in areas with destroyed cardiac muscle fibers (HE ×150)

Fig. 2. Section of the myocardium in half-crossed Nicol prisms. Multiple oxalate crystals in inflamed area and muscle fibers (HE ×150)

in various organs, Beil *et al.* (1969), Doerr (1971), Enger *et al.* (1965) in myocardium, Coltrat and Hudson (1971) and Keiser (1962) in the myocardial conductive system, Hahlweg and Orf (1966) in the myocardium, with intensive inflammatory infiltration and fibroplastic proliferation. In our case it is interesting to note that besides kidneys only the myocardium is significantly involved and that deposits in the other organs are insignificant. Scowen *et al.* (1959a, b) beleve that the extrarenal deposition of oxalate crystals is a consequence of renal insufficiency and uremic acidosis. In 1948 Trampetti and Vantaggi-Cozzari described the possibility that the heart muscle cells may convert glycine into glyoxil and oxalic acid. That indicates that the enzymatic defect may persist even in the myocardium. Depositing of oxalate crystals is connected with disorders of metabolism in the organ itself. Recently, Gibbs and Watts (1967) described normal liver metabolism of glyoxyl in patients with hyperoxaluria.

Fisher and Watts (1968) found that there was no difference in oxalate metabolism in the erythrocytes of patients with oxalosis and those of healthy persons. This statement leads to a conclusion that the enzymatic defect is not universal and that it is very often limited to certain organs and even in them it may be variable in intensity.

Of course, if we have deposits in the myocardium with an intensive inflammatory infiltration, with presence of fibroplastic tissue, we must consider the early occurrence of myocarditis with eventual secondary oxalate deposits. This hypothesis is not possible in our case as we found the oxalate crystals in the preserved heart muscle cells. Some authors noted that oxalate crystals are very rare in the scar tissue (Halhweg and Orf, 1966; Largiader and Zollinger, 1960; Zollinger and Rosenmund, 1952). It is important to mention that Doerr (1949) proved experimentally that oxalic acid also damages heart muscle and the liver, as well as the kidneys. It is very credible that oxalate crystals have a mechanical as well as a toxic influence in the myocardium.

Beil *et al.* (1969), in analysing cases from the literature with intensive deposit of oxalate in myocardium due to primary oxalosis, came to a conclusion that they dealing with a disease exlusively affecting adults. Whether it is a particular form of oxalosis or not remains an open, question, but our case and Stauffer's case (1960) do not confirm this hypothesis.

We belive, as we mentioned earlier, that primary oxalosis of younger and older persons is a general disease and that all variations of oxalate crystal deposits in various organs depend on the degree of the metabolic disorder.

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