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CASE REPORT

Growth and weight deficiency due to the battered child syndrome during the SARS-CoV-2 pandemic

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ABSTRACT

During the SARS-CoV-2 pandemic, most visits to primary care clinics were limited to teleconsultations. A 10-year-old boy was referred to the gastroenterology department for abdominal pain and weight loss with a history of behavioural disturbances and pica reported by the parents. On admission, the child had significant growth and weight deficiency. The patient was initially diagnosed with acute mild pancreatitis. Standard treatment resulted in rapid clinical improvement and weight gain. Next, the diagnosis of short stature was extended. Proper nutrition led to a significant increase in height and weight. The cause of all the child's disorders was chronic malnutrition resulting from the conscious, inappropriate behaviour of the caregivers. Finally, the boy was placed in foster care. Restricting health care only to teleconsultations, which does not allow physical examination of the child and assessment of his relationship with the caregivers, can result in an erroneous assessment of the patient's condition.

KEY WORDS:
battered child syndrome, chronic malnutrition, short stature, teleconsultations.

INTRODUCTION

During the SARS-CoV-2 pandemic, due to the requirement to limit direct interpersonal contact (lockdown), the organisation of work at medical clinics was changed. Most visits to primary care clinics were limited to teleconsultations, during which only an interview and laboratory tests were performed. In the case of children, consultations were sometimes limited to collecting an interview from parents or caregivers in a telephone conversation, without direct contact with the patient.

Abdominal pain and weight loss are typical symptoms of gastrointestinal diseases. The most common causes of acute abdominal pain are of non-surgical origin and include gastroenteritis, extra-abdominal infections, and various functional gastrointestinal disorders Special attention should be paid to "surgical" causes of acute abdominal pain that include appendicitis, intussusception, testicular or ovarian torsion, incarcerated inguinal hernia, urolithiasis, and cholelithiasis. In children presenting with chronic abdominal pain, in addition to a number of organic diseases, functional disorders (disorders of gut brain interaction), including those related to psychosocial problems, should be considered [1]. In the differential work-up of a child with chronic or recurrent abdominal pain the presence of the potential "alarm symptoms" increases the probability of its organic aetiology. It is noteworthy that the alarm symptoms include not only the gastrointestinal disorders (persistent right upper or right lower quadrant pain, dysphagia, odynophagia, persistent vomiting, gastrointestinal blood loss, nocturnal diarrhoea, family history of inflammatory bowel disease,

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coeliac disease, or peptic ulcer disease) but also extraintestinal and general symptoms like arthritis, involuntary weight loss, deceleration of linear growth, or delayed puberty. Malnutrition may also be caused by anorexia nervosa or improper feeding restrictions. Long-term nutrient deficiencies can inhibit growth. Malnutrition is the most common cause of underweight and restricted growth in developing countries, whereas in developed communities, it rarely contributes to a short stature.

CASE REPORT

A 10-year-old boy, referred by a primary care physician due to suspected pancreatitis, was admitted to hospital in January 2022. Before hospitalisation, a teleconsultation with the child's mother took place due to recurrent gastrointestinal complaints, eating disorders (pica), and weight loss of 3 kg within one month. Pancreatic amylase level assessed 3 days prior to hospitalisation was 454 U/l (reference range: 28–100 U/l). His medical history revealed also dietary restrictions implemented by the parents. Fourteen days before the hospitalisation, a psychiatrist during teleconsultation prescribed him risperidone therapy due to hyperactivity and aggression reported by his parents.

He was born from full-term delivery, by caesarean section, with a birth weight 2450 g and Apgar score of 10; the parents were unrelated and healthy. During the first years of life, his development was normal, with no chronic diseases, and he was vaccinated according to the calendar.

The patient had home schooling provided by his mother, who was an early childhood education teacher, justified by the necessity of ensuring an appropriate diet.

Upon admission, the patient was in a fairly good general condition, but physical examination showed short stature, malnutrition – Cole index 68% (90–110%), enlarged abdominal circumference, and dehydration.

Laboratory tests performed on admission to the Department of Paediatric Allergology, Gastroenterology, and Nutrition showed elevation of amylase (over 3 times above upper limit of normal range) with slightly increased lipase concentration, hypokalaemia, and hypoglycaemia. White blood cell and C-reactive protein (CRP), liver and renal biochemistry, and blood gases were normal. Abdominal ultrasound did not show features of pancreatitis. Coeliac disease, inflammatory bowel diseases, and bacterial and viral infections were excluded by appropriate tests.

After initial oral feeding and rehydration, the boy presented with anaemia and signs of refeeding syndrome (hypophosphatemia, hypocalcaemia, hypomagnesaemia) and slight hypoalbuminaemia without urinary protein excretion and enteropathy.

Fluid and electrolyte therapy together with 20% albumin infusion led to normalisation of laboratory test results (Table 1).

Hormonal tests showed reduced free triiodothyronine (FT3) with normal thyrotropin (TSH) and free thyroxine (FT4) levels. Circadian rhythm of cortisol secretion was maintained. There was no physiological growth hormone (GH) peak after falling asleep, while the concentration of IGF-1 (the major peripheral mediator of GH) was within low-normal range (Table 2). Magnetic resonance (MR) of the head showed slight neural tissue atrophy, subarachnoid space enlargement, and slightly decreased width of the ventricular system.

TABLE 1. Results of selected biochemical tests relevant to diagnosis and treatment

Test	Reference range	Hospitalisation day			
		1	3	8–10	15–16
Glucose [mg/dl]	70–99	56	67	–	69
Insulin [µIU/ml]	6–25	–	3.7	–	13.2
Total protein [g/dl]	6.0–8.0	7.7	–	5.6	–
Albumin [g/dl]	3.8–5.4	5.1	–	3.5	4.1
Amylase[U/l]	28–100	319	122	95	81
Lipase [U/l]	13–60	82	35	35	23
ALT [U/l]	0–41	20	–	–	–
AST [U/l]	0–40	27	–	–	–
Total bilirubin [mg/dl]	0–1.3	0.38	–	–	–
Potassium [mmol/l]	3.5–5.1	3.3	–	3.6	4.1
Total calcium [mg/dl]	8.8–10.8	9.3	–	8.2	9.0
Inorganic phosphorus [mg/dl]	–	–	–	1.9	5.1
Magnesium [mg/dl]	1.8–2.5	2.28	–	1.49	2.37
Iron [µg/dl]	–	–	–	19	58

TABLE 2. Hormonal tests relevant to diagnosis and treatment

Test	Reference range	Time after first admission		
		1–2 day	1 month	10 months
TSH [μIU/ml]	0.51–4.82	3.406	2.569	3.075
FT4 [ng/dl]	0.84–1.47	1.14	0.98	0.89
FT3 [pg/ml]	2.85–4.44	2.33	3.31	3.99
Cortisol at 8 a.m. [μg/dl]	5–25	12.3	6.0	
IGF-1 [ng/ml]	55–222	61.8	91.7	342***
GH peak after falling asleep [ng/ml]*	–	0.091	–	–
GH peak in stimulation tests** With clonidine [ng/ml] With glucagon [ng/ml]	–	–	 0.901 0.440	–

** GH peak during 3 hours after falling asleep, normal values >10.0 ng/ml*
*** GH peaks in both tests interpreted together, normal values >10.0 ng/ml*
**** Change of reference range (29–424)*

Initially, the boy demonstrated increased appetite and consumed about 3600 kcal/day (including foods sneaked from other patients), with vomiting after larger meals. A recovery was observed after reduction of caloric intake. He did not report any gastrointestinal complaints and passed normal stools once a day. A standard 2000 kcal diet allowed for a fast weight gain, i.e. 7 kg within 24 days. His initial tendencies to pick up and collect food disappeared when the boy made sure he got enough food.

Due to significant deficit of height (125.0 cm, at first centile for age and sex), the patient was admitted to the Department of Paediatrics, Endocrinology, Diabetology, and Nephrology after several days' home stay when he lost 1.4 kg. The parents declared following recommended food limitations, while such restrictions were not established.

A diagnosis of GH deficiency was confirmed by low GH peak in stimulation tests. The patient was not qualified to GH therapy due to the requirement to document a slow growth rate for 6 months. Also, an increase of IGF-1 level and normalisation of the thyroid function were observed.

Due to episodes of hypoglycaemia, oral glucose tolerance test (OGTT) and measurement of glycated haemoglobin (HbA_{1c}) were performed at the beginning of the first hospitalisation and after one month. Glucose concentrations were low in the first test, while normal in the second one. Also, HbA_{1c} increased from 3.78 to 5.0%, which corresponded to mean glycaemia of 62 mg/dl and 97 mg/dl, respectively (according to https://cukrzycapolska.pl/narzedzia-kalkulatory/kalkulator-hba1c/).

A follow-up head MR with pituitary-targeted scans showed a normalisation of the width of sulci and depth of curves; scans of the hypothalamic-pituitary region were normal.

During hospitalisation, the patient did not demonstrate aggressive behaviour. He made efforts to behave properly and even imposed self-punishment for behaviours that his parents might have considered inappropriate. Due to the child's behaviour and the potential side effects of risperidone, including increased appetite, the drug was discontinued. However, no changes in the patient's behaviour were observed.

A psychiatric consultation revealed a regime introduced by the parents, involving serving limited amounts of food as a punishment for the boy's bad behaviour. The child attempted to steal food and consumed inedible products (toothpaste, cosmetics) to satisfy his desire for sweet flavour and hunger. A direct observation of the relationships between the child and his parents was difficult due to SARS-CoV-2 pandemic restrictions and the rare visits of parents in the hospital (the mother explained that she had to stay at home with a younger child).

In a telephone interview, a primary health care doctor confirmed that during a health check for 4-year-olds the patient was tall and weighed 18 kg. At the age of 5 years, his weight was 21 kg. Before the pandemic, the family had changed a primary health care centre several times. Frequent abdominal pains and upper respiratory tract infections were reasons for numerous consultations of the child in the last 2 years. Unfortunately, due to the SARS-CoV-2 pandemic, all of them took place online.

Currently, by decision of the Family Court, the boy is in foster care. He has good relationships with his caregivers and is monitored in Outpatient Clinics of Gastroenterology and of Endocrinology. His appetite is normal, he does not require any dietary management or pharmacological treatment, and he does not cause any problems at school. In the last 10 months, he has grown over 12 cm and his body height is normal (Figure 1). The patient is gradually gaining weight, and the results of follow-up examinations are normal.

DISCUSSION

The incidence of acute pancreatitis (AP) in the paediatric population is estimated at 3.6–13.3 cases per 100,000. To diagnose the disease, 2 of 3 criteria must be met:

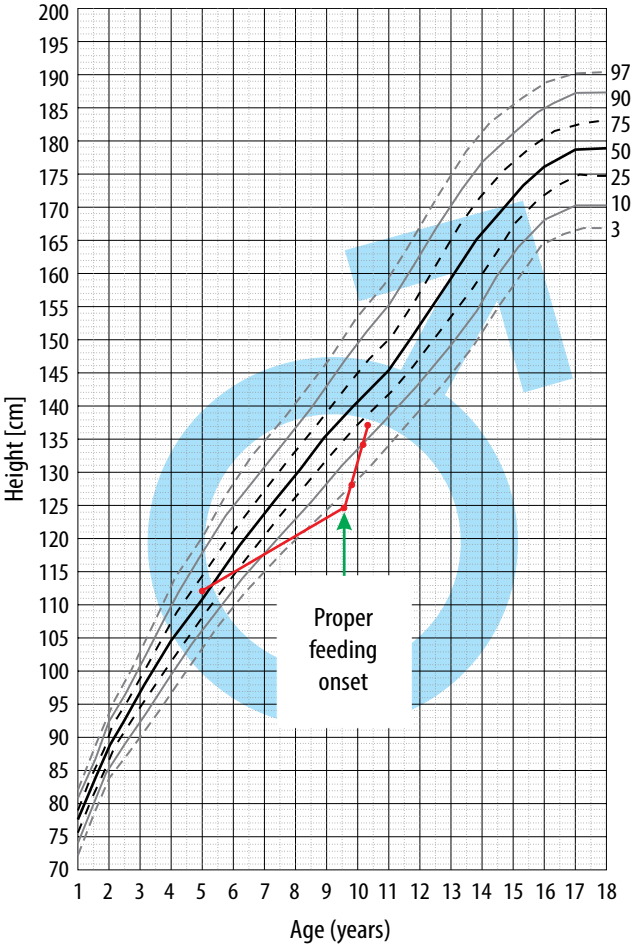

FIGURE 1. Patient's growth curve on centile chart for Polish boys [2]

- abdominal pain,
- elevated serum lipase or amylase level, at least 3 times above the highest reference value,
- characteristic changes in imaging examinations.

Intensive fluid therapy and early oral feeding are essential in the treatment of pancreatitis [3].

The most common aetiological factors of acute pancreatitis in children include biliary, traumatic, drug-induced, systematic disease-associated, cystic fibrosis, pancreatic anomalies, and idiopathic. In most cases the condition is self-limited without severe complications, including growth retardation. In contrast to AP, chronic pancreatitis, manifested by destruction of the pancreas and its exocrine or endocrine dysfunction, can contribute to malnutrition [4]. Our patient met the first 2 diagnostic criteria for AP and responded well to a standard regimen.

It seems, however obvious, that pancreatitis was not the actual cause of growth inhibition observed in the child. Resolution of the symptoms and the dynamic weight gain after introduction of a standard hospital diet without any specific pharmacotherapy indicated that these symptoms were closely related to starvation.

Electrolyte abnormalities observed after initiation of normal oral feeding are characteristic of refeeding syndrome, being an acute electrolyte deficiency with water retention in chronically malnourished patients after returning to normal diet [5]. The syndrome was first described by Schnitker *et al.* [6] shortly after the end of World War II during the liberation of Japanese soldiers from prisoner camps in areas of Pacific warfare. Child abuse and starvation may also be causes of refeeding syndrome, being treated with intravenous glucose infusions, management of electrolyte balance, and elimination of hypoalbuminaemia [7]. Gradual implementing oral feeding should prevent this syndrome. However, it did not occur in the presented case, as the boy initially consumed food belonging to other children.

The significantly reduced glycated haemoglobin level is indicative of low mean glycaemia over the past 3 months, which may be related to a long-term caloric deficit leading to frequent hypoglycaemia.

Atrophic changes in the brain and their resolution after refeeding suggest an association with chronic malnutrition. Nogal and Lewinski described similar disorders in girls with anorexia nervosa [8].

In the initial period of hospitalisation, nonthyroidal illness syndrome (impaired conversion of thyroxine to triiodothyronine to reduce energy expenditure) was observed. Such disorders are observed in the course of diseases not primarily related to the thyroid gland and in malnourished patients [9]. Normalisation of FT3 concentration during weight recovery confirms its relationship to nutritional status in our patient.

Determination of IGF-1 concentrations is crucial in the diagnosis of GH deficiency, but reduced IGF-1 concentrations are also observed in the patients with malnutrition or hepatic diseases. Malnutrition is generally assumed as a state of reduced sensitivity to GH, leading to increased GH secretion [10]. However, less recent studies reported reduced GH response to stimulation in patients with coeliac disease [11] and with protein malnutrition [12], which normalised with improved nutritional status. The reduced GH secretion in our patient could be a consequence of chronic malnutrition. This can also be confirmed by an increase of IGF-1 and improvement in growth rate, correlating with improved nutritional status.

The prolonged hospitalisation (116 days) was required not only to exclude somatic and psychiatric diseases in the child, but above all, to clarify his psychosocial (family) situation and take appropriate action.

CONCLUSIONS

Child neglect or even child abuse do not always manifest with physical violence or occur in a pathological family but can be masked by apparent concern and care of the child.

Despite obvious benefits of the development of telemedicine, a direct physical examination and observation of the child's behaviour and relationships with parents are highly important elements of diagnostics that should not be neglected or replaced exclusively by online care.

DISCLOSURES

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4. Conflicts of interest: None.

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