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Research Article

HYPOGLYCEMIC COMA CAUSED BY VACUOLAR SELLA SIGN WITH SECONDARY ADRENOCORTICAL INSUFFICIENCY: A CASE REPORT AND LITERATURE REVIEW

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ABSTRACT

Background: A case of secondary adrenocortical hypofunction caused by empty sella syndrome (ESS) with hypoglycemic coma was reported.

Objective: The course, clinical manifestation, laboratory examination, treatment and follow-up were reported.

Clinical case: The patient was admitted to the hospital because of "coma for 2 hours". After confirmed by laboratory and imaging examinations, he was treated with glucocorticoid and discharged. ESS, also known as arachnoid prolapse, is a disease in which the subarachnoid cavity protrudes into the sellar process, resulting in the compression and flattening of the pituitary gland and the extension of the pituitary stem. 25%-30% of the cases have endocrine dysfunction, which is often the co-existence of a variety of pituitary hormone deficiencies. It is rare to see a lack of adrenocorticotropic hormone (ACTH) alone.

Conclusion: This case reports a child with hypoglycemic coma caused by secondary adrenocortical hypofunction caused by vacuolar sella sign, which provides reference for clinical practice.

Key words: vacuolar sella, secondary adrenocortical insufficiency, ACTH syndrome alone, hypoglycemia, hypoglycemic coma

CASE REPORT

Patient was male with 10 years old. He was admitted to the hospital because of "coma for 2 hours". Acute onset, loss of consciousness, no fever, no vomiting. Emergency blood glucose examination was 1.2 mmol/l. Past history: normal health, fatigue in recent six months; Birth history: first birth, first birth, full-term birth, no history of asphyxia. Family history: no history of genetic metabolic system diseases. Physical examination: t 36.4 ° C, p116bpm, R 18bpm, BP 112/82mmhg, wt 32kg. Light comatose, pale complexion, low and blunt heart sound, cool ends and visible patterns, no other abnormalities. After admission, the relevant auxiliary examinations were improved. The blood glucose was checked in the emergency department at 1.2mmol/l, and the blood glucose was retested at 2.6mmol/l after intravenous glucose infusion; Blood gas analysis: pH 7.42, pCO2 33mmHg, PO2 125mmhg ↓, na+ 128mmol/l, k+ 3.6mmol/l, hco3- 21.4mmol/l, be -2.5mmol/l, SpO2 99%; Insulin 4.20 μ U/ml, C peptide 0.85ng/ml; Urine routine: ketone body +-0.5mmol/lp; Two items of blood glucose: β Hydroxybutyric acid 1.41mmol/l ↑, glucose 2.81mmol/l ↓; C peptide (fasting) 0.04ng/ml ↓, insulin (fasting) 0.10 μ U/mL↓； Perfect cortisol (8am) 0.01 μ G/dl ↓, circadian rhythm change of cortisol (Fig. 1): cortisol (8am) 0.10 μ G/dl ↓, cortisol (16pm) 0.10 μ G/dl ↓, cortisol (24pm) 0.01 μ g/dL ↓； ACTH 3.33pg/ml ↓; Recheck cortisol (8am) 0.00 μ g/dL↓, ACTH 2.97pg/mL ↓ ； 24h urine 17 hydroxycorticosteroid 2.41umol/24h, 17 ketosterol 1.19umol/24h ↓; C-reactive protein 4.06mg/l ↑, PCT 0.93ng/ml; Anti glutamic acid decarboxylase antibody, anti tyrosine phosphatase like protein antibody, anti insulin antibody and anti islet cell antibody were negative; Complete set of sex hormones, complete set of thyroid function, blood routine, coagulation function, liver and kidney function, myocardial zymogram, humoral immunity, cerebrospinal fluid routine, biochemistry, immunoglobulin, high-sensitivity troponin_ 1. No obvious abnormality was found in B-type brain urine sodium titanium and catecholamine hormones, and no bacteria, acid fast bacilli and fungi were found in cerebrospinal fluid. ECG: 1 Sinus rhythm, 2 Reverse clock transposition, 3 ST-T change. No obvious abnormality was found in cranium, bilateral maxillary sinusitis and ethmoid sinusitis on plain CT scan of head, and no obvious abnormality was found on plain CT scan of pancreas. Cardiac Ultrasonic examination report: a small amount of mitral regurgitation in the heart, and the left ventricular function is normal. Chest CT showed small fuzzy nodules in the dorsal segment of the lower lobe of the right lung, considering inflammatory lesions. No obvious abnormality was found on Mr plain scan of bilateral adrenal glands; MRI report of head + pituitary: inflammation of bilateral maxillary sinus and ethmoid sinus. Partially empty saddle (Fig. 2). The children were considered to be diagnosed as vacuolar sella syndrome, secondary adrenal hypofunction and hypoglycemic coma. By consulting Zhu Futang's Practical Pediatrics and references [1], the children had hypoglycemic coma. By detecting the changes of ACTH and cortisol circadian rhythm: the plasma cortisol content was < 3ug/dl and ACTH was < 7.2pg/ml, so the diagnosis basis was sufficient. After admission, the children were given glucose infusion for glucose supplementation, cefotaxime sodium sulbactam for anti infection, fructose diphosphate sodium injection for myocardial nutrition, and

hydrocortisone 10mg/bid. After reexamination, cortisol was 5.4ug/dl, fasting blood glucose was 5.83mmol/l. The children had mild mental reaction, no fatigue and weakness, and were discharged after improvement.

DISCUSSION

Empty sella syndrome (ESS), also known as arachnoid prolapse, is a disease in which the subarachnoid space protrudes into the sella process segment, resulting in pituitary compression, flattening and pituitary stem extension [2]. Endocrine dysfunction occurs in 25%-30% of cases, which is often the co-existence of a variety of pituitary hormone deficiencies. Adrenocorticotropic hormone (ACTH) deficiency alone is rare. The clinical manifestations of ACTH deficiency alone are nonspecific, including fatigue, anorexia, weakness, hypoglycemia and loss of consciousness. In the diagnosis of hypoglycemia, adrenocortical insufficiency cannot be ignored, and the hypoglycemia associated with adrenocortical insufficiency is considered to be more common in newborns and children than in adults.

EES is a primary or secondary disease caused by various reasons (intracranial hypertension, postpartum hemorrhage, pituitary surgery, radiation, pituitary stroke, infection, trauma, inflammation, etc.). It is usually found through pituitary imaging examination. It is reported that the total incidence of EES in children's imaging examination is about 1%-48%, and the male to female ratio is about 1.4:1[3-5], ESS is divided into primary empty sella syndrome (PES) and secondary empty sella syndrome (SES). The etiology of PES is not clear, which may be caused by sellar septal insufficiency and intracranial hypertension. Sellar septal insufficiency is the flexion of dura mater, which makes cerebrospinal fluid partially or completely fill the sellar cavity, resulting in pituitary flattening to the sellar floor. In extreme cases, sellar floor bone erosion and cerebrospinal fluid leakage may occur, thus increasing the risk of meningitis [4, 6, 7]. When intracranial pressure increases, cerebrospinal fluid circulation and dynamics may be damaged, Studies have shown that up to 77% of PES patients have confirmed that cerebrospinal fluid absorption is impaired at the arachnoid villi, resulting in increased cerebrospinal fluid pressure. Subsequently, the meninges and cerebrospinal fluid protrude through the incompetent sellar diaphragm [6]. SES is more common, which is related to various pathological processes in the sellar region. Among various reasons, surgery, radiotherapy and pituitary atrophy after pituitary adenoma stroke are the common causes of secondary empty sella. Similarly, postpartum pituitary necrosis, pituitary infection, pituitary inflammation and traumatic brain injury may also lead to pituitary atrophy [8], leading to the formation of vacuolar sella.

EES is considered to be one of the causes of hypopituitarism. It is reported that 25%-30% of cases have endocrine dysfunction. After diagnosis, the whole pituitary axis needs to be examined, especially hyperprolactinemia and growth hormone deficiency. Hyperprolactinemia exists in 10% to 17% of cases, which may be caused by microprolactinoma or functional hyperprolactinemia. Growth hormone deficiency accounts for 4% to 60%, Gonadotropin deficiency is found in 2% to 32% of cases, while the incidence of adrenocortical hormone, thyroid stimulating hormone and antidiuretic hormone deficiency is low, about 1% per case [4]. The order of hormone deficiency is determined by the anatomical position of growth promoting, gonadotropic,

thyroid stimulating and adrenocorticotropic cells, and it is uncertain whether the empty sella follows this order [9]. In the reported case, the child first showed adrenocortical hormone deficiency and temporarily had no abnormal levels of other hormones.

Adrenocortical hormone deficiency is mostly caused by adrenal insufficiency. According to its source, it can be diseases, secondary insufficiency of ACTH secretion caused by pituitary diseases, and tertiary deficiency of corticotropin releasing hormone (CRH) caused by hypothalamic diseases [10]. According to the imaging examination in this case, we know that the lesion of the child is located in the pituitary gland, i.e. the vacuolar sella sign. The ACTH and cortisol are decreased. Only the ACTH hormone is deficient, and the thyroid hormone, growth hormone and sex hormone are normal. Therefore, it is considered that the child is secondary adrenal insufficiency (SAI) [11]. Sai often coexists with other hormone deficiencies secreted by other anterior pituitary lobes [12], while ACTH deficiency alone is very rare. It is characterized by secondary adrenal insufficiency, low or non-existent cortisol production, and normal secretion of pituitary hormones other than ACTH [13, 14]. ACTH deficiency alone usually occurs after taking exogenous glucocorticoids or successfully curing endogenous Cushing's syndrome. According to literature review, EES can be accompanied by ACTH deficiency alone [15-18].

The average age of patients with ACTH alone is 50 years old, the male to female ratio is 1.2-3.6:1, and the male incidence rate is higher [19]. Its clinical manifestations are nonspecific, including fatigue, anorexia, weakness, hypoglycemia and loss of consciousness [14, 20-24]. Therefore, the diagnosis is extremely difficult, and it is easy to be misdiagnosed as a nervous system disease. In this case, the family member complained that the child usually likes to sleep and is not easy to wake up, but the blood glucose test was not performed. We can only speculate that the child's usual symptoms were caused by hypoglycemia, and the hypoglycemic coma was related to ACTH deficiency alone.

Hypoglycemic episodes are a clinical syndrome in which hypoglycemic levels lead to neurogenic (adrenergic and cholinergic) or neurogenic hypoglycemia. Although hypoglycemia can be caused by a variety of causes, hypoglycemic drugs are the main cause [25]. Although hypoglycemia can be quickly restored by supplementing glucose in most cases, it is very important whether there is a potential cause in patients without diabetes. Adrenal insufficiency may be a potential cause and may be a life-threatening cause [26, 27]. Cortisol is a catabolic hormone that affects carbohydrate, lipid and protein metabolism. Lack of cortisol will increase insulin sensitivity in patients with adrenal insufficiency and is considered to be related to hypoglycemia [28]. Hypoglycemia associated with adrenal insufficiency is thought to be more common in newborns and children than in adults [29, 30]. Through literature review, there are cases of hypoglycemia caused by low ACTH and cortisol in ESS patients [26, 27, 31].

CONCLUSION

To sum up, in this case report, the patient was hospitalized due to coma and was urgently examined for hypoglycemia. We considered that the patient's coma was caused by hypoglycemia. Through improving the relevant examinations, we found that the child's ACTH and cortisol were low, or even undetectable, and the

levels of thyroid hormone, sex hormone and growth hormone were normal. Therefore, we considered that the patient's hypoglycemia was caused by a single ACTH deficiency in secondary adrenocortical insufficiency, Through the improvement of pituitary and head MRI examination, only the presence of vacuolar sella was found. Therefore, it is considered that the secondary adrenocortical insufficiency caused by vacuolar sella leads to hypoglycemic coma. Therefore, the root of the treatment is the problem of ESS, and hormone replacement therapy is the first choice. The hormone replacement therapy of ESS needs to screen each hormone and supplement it according to the appropriate time sequence [5, 6]. The surgical treatment is only for progressive visual acuity decline Patients with cerebrospinal fluid rhinorrhea and persistent intracranial hypertension have significant short-term effect, but the long-term effect is still uncertain. Vacuolar sella syndrome is a rare case with occult onset and difficult diagnosis. However, with the popularization of imaging, the examination rate has increased significantly, and its symptoms and development speed are different. However, early diagnosis and treatment are closely related to the prognosis of patients.

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