

CASE REPORT

Langerhans cell histiocytosis in monozygotic twins with central diabetes insipidus and hypophyseal masses

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ABSTRACT

Langerhans cell histiocytosis (LCH) is a systemic disease mainly affecting children and young adults. It can manifest as single system disorder or multi-system involvement. When the central nervous system is involved, the hypothalamic–pituitary axis is the most common location affected. Herein we report a rare case of Langerhans cell histiocytosis in monozygotic twins both with central diabetes and hypophyseal masses. This is the first report about LCH in monozygotic twins with hypophyseal lesions.

Key words: Diabetes insipidus, infundibulum, langerhans cell histiocytosis, twins

Introduction

Langerhans cell histiocytosis (LCH) is a systemic disease mainly affecting children and young adults. It can be manifested as a single system disorder or multi-system involvement. When the central nervous system (CNS) is involved, the hypothalamic–pituitary axis (HPA) is the most common location affected, which is often presented as central diabetes insipidus (DI). To the best of our knowledge, LCH in monozygotic twins with the same initial presentation of central DI and pituitary lesions have never been reported.

Case Report

The 8-year-old female, the younger sister of monozygotic twins, was brought to our hospital because of central DI for weeks. There were no visual field or other neurologic deficits identified on physical examination. Plasma antidiuretic hormone level was decreased to 0.18 pg/ml, and other hormone levels were within the normal limits. Magnetic

resonance imaging (MRI) demonstrated an enhancing lesion around the pituitary stalk [Figure 1]. Resection of the tumor was performed and LCH was confirmed by pathological examination and immunohistochemistry studies (tissue stained positive staining for S-100 protein and CD1a) [Figure 2]. Chemotherapy was begun postoperatively. Two suspicious skull lesions were identified on Tc-99m methylene diphosphonate (MDP) bone scan 10 months after

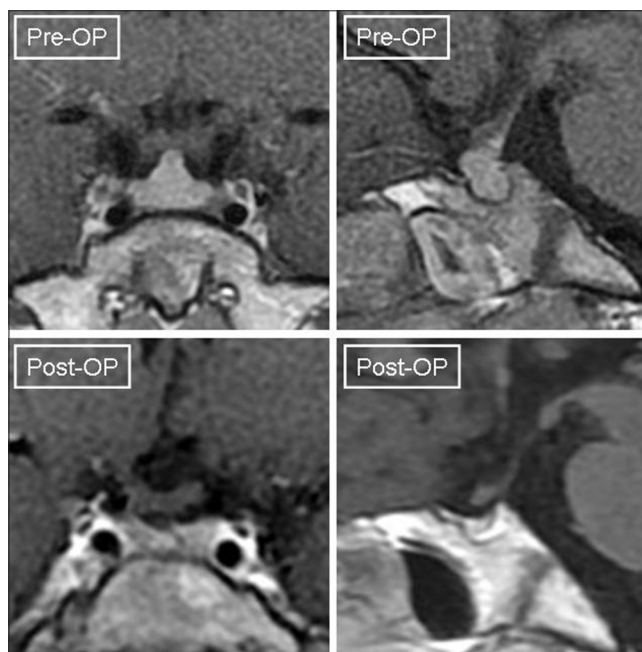


Figure 1: Case 1. Preoperative MR images showed an homogenous enhancing infundibular and sellar mass (upper panels). Three years after surgical excision and chemotherapy, follow-up MRI showed complete remission of the tumor (lower panels)

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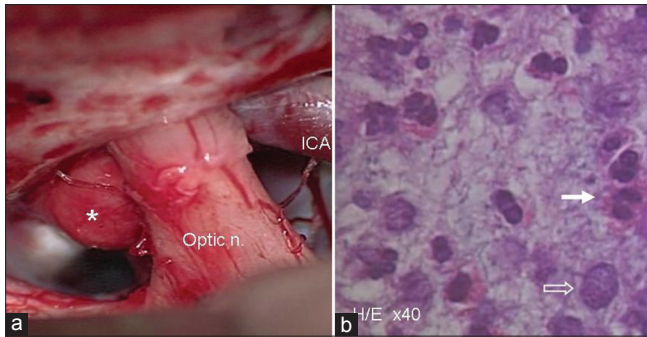


Figure 2: (a) Intra-operative view (via a right frontotemporal craniotomy) showed a round, reddish nodule over sella turcica (star). (b) Pathological examination (H and E stain, x40) showed many large, polygonal histiocytes (open arrow) infiltrated by numerous eosinophils (arrow)

surgery, but the lesions disappeared after the completion of chemotherapy.

One year later, her senior twin sister had the same presentation of central DI; however, a more disseminated systemic involvement of LCH was found. MRI showed a thickened, enhancing pituitary infundibulum [Figure 3]. Preoperative Tc-99m MDP whole body scan and single photon emission computed tomography (SPECT) of the head showed multiple lesions over the sternum, T4, T6 vertebrae, right scapula, and right middle rib cage. Surgical resection of the sellar lesion for tissue diagnosis was performed, and the pathological examinations confirmed the diagnosis of LCH. Postoperatively, she developed T1 and T5 pathologic fractures. A complete course of chemotherapy was administered.

Both the patients had panhypopituitarism and long-term hormone replacement with thyroxine and cortisol was required. They were followed for more than 3 years and no further disease progression was noted.

Discussion

LCH is a clonal proliferative disorder that often presents either as single system disorder, such as a solitary osteolytic bone lesion, or as a widespread multi-system disorder.^[1] Bone and skin are the most common organs affected if only a single system is involved. The most common presentation of LCH in childhood is a single mass lesion on the skull. Any bone may be involved, except for those of the hands and feet. D'Ambrosia *et al.* reported that 54% of LCH patients had unifocal or multifocal craniofacial osseous involvement, which included the calvaria, skull base, and temporal and maxillofacial bones.^[2] The presentations of LCH vary widely, and depend on the involved locations.

Central DI is the end result of a number of diseases that affect the HPA. It is often caused by the destruction or degeneration of neurons that originate in the supraoptic and paraventricular

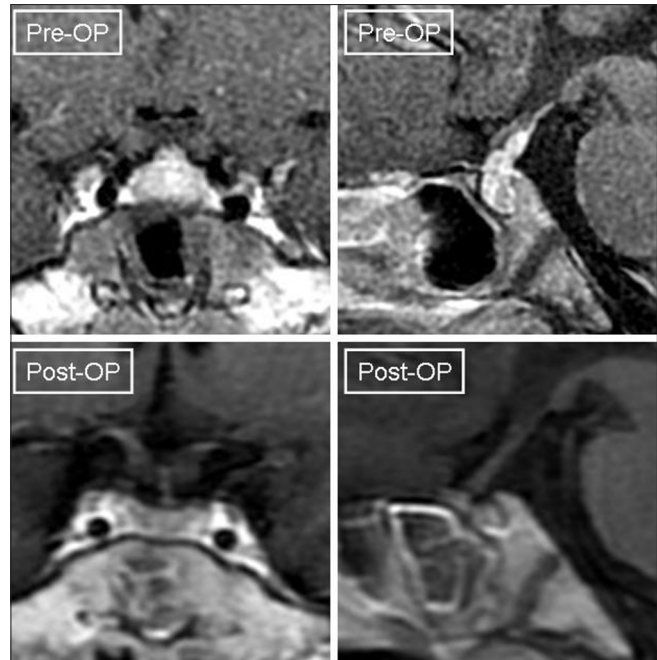


Figure 3: Case 2. Pre-operative coronal and sagittal MRI showed a thickened, enhancing hypophyseal infundibulum and enlarged sellar lesion (upper panels). Two years after surgical excision, no residual tumor was noted (lower panels)

nuclei of the hypothalamus. The known causes include germinoma or craniopharyngioma, LCH, local inflammatory, autoimmune, and vascular diseases, trauma, sarcoidosis, metastases, and cranial malformations.^[3] Among these causes, LCH is one of the common causes of central DI.

CNS involvement has been reported in 16% of patients with LCH, of which the most commonly affected areas are the HPA and cerebellum. Central DI is the most common disease-related endocrine manifestation of LCH, and is attributable to decreased secretion of antidiuretic hormone.^[2] Up to 40% of patients with DI have infiltration and thickening of the infundibular stalk or a sellar mass. Children with multi-system LCH are often referred to as having Hand-Schüller-Christian's disease.^[1,4] Although DI usually develops within a year following the diagnosis of LCH, it can occur at any time and can also be the presenting feature predating the diagnosis of LCH. Patients with multi-system disease and craniofacial involvement have a 4.6-fold relative risk for developing DI. Up to 51% of LCH patients with DI will develop other LCH manifestations within a year.^[4] MRI findings in central DI are characterized by the absence of the bright spot of the posterior pituitary on T1-weight images, which represent the vasopressin-containing vesicles of the neurohypophysis.^[1,2] The pathogenesis of DI has been attributed to either infiltration or scarring of the HPA, or to an autoimmune process involving antibodies against vasopressin.^[4] Established DI is generally irreversible, does not respond to any available treatment, and can only be treated symptomatically.^[4] Other anterior pituitary

hormone deficiencies are found in up to 20% of patients with LCH, and are almost always associated with central DI.

In the past, LCH was considered a non-hereditary disorder. In the literature, cases of LCH among monozygotic twins are rarely reported. In the reported cases, the condition often presents as disseminated lesions or single-system involvement, such as a bone or skin lesion only.^[2] Some twins have the same clinical features and some do not. The cases reported herein were the first monozygotic twins with LCH in whom central DI and sellar lesions were the initial presentation. The later diagnosis of the senior twin sister, who developed more advanced systemic involvement, may represent disease progression during the asymptomatic period. Early screening and intervention in monozygotic twin patients might lead to earlier diagnosis and better outcomes.

Until now, there was no satisfactory explanation of LCH that occurs in twins. Some authors postulate that genetic factors may play an important role. Betts *et al.* identified the chromosomal translocation t (7; 12) (q11.2; p13) in unsorted cells of LCH patients.^[5] They also reported an increased number of chromosomal breaks in tissue from LCH lesions, which result from exposure to genotoxic environmental agents or from a mutated genotype. These new findings suggest that LCH may result from a chain of genetic alterations including initial mutation followed by other events such as further mutation(s), exposure to infectious agents, or environmental exposure.^[5] The hypothesis may explain the variable presentation and clinical course of LCH, and provide some clue regarding

the pathogenesis of LCH among monozygotic twins. Other non-genetic risk factors for LCH, such as viral infections, maternal thyroid abnormalities, or exposure to solvents, may also play a role in etiology of LCH. However, there is no satisfactory theory, and further chromosomal studies including those with constitutional or lesional DNA are required.^[5]

In conclusion, LCH may represent an unknown hereditary disease and early screening is warranted, especially in an asymptomatic monozygotic twin.

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