ISSN 2307-8960 (online)

World Journal of *Clinical Cases*

World J Clin Cases 2022 February 6; 10(4): 1140-1456

Published by Baishideng Publishing Group Inc

World Journal of Clinical Cases

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Thrice Monthly Volume 10 Number 4 February 6, 2022

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ABOUT COVER

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The *WJCC* is now indexed in Science Citation Index Expanded (also known as SciSearch®), Journal Citation Reports/Science Edition, Scopus, PubMed, and PubMed Central. The 2021 Edition of Journal Citation Reports® cites the 2020 impact factor (IF) for *WJCC* as 1.337; IF without journal self cites: 1.301; 5-year IF: 1.742; Journal Citation Indicator: 0.33; Ranking: 119 among 169 journals in medicine, general and internal; and Quartile category: Q3. The *WJCC*'s CiteScore for 2020 is 0.8 and Scopus CiteScore rank 2020: General Medicine is 493/793.

RESPONSIBLE EDITORS FOR THIS ISSUE

NAME OF JOURNAL

World Journal of Clinical Cases

ISSN

ISSN 2307-8960 (online)

LAUNCH DATE

April 16, 2013

FREQUENCY

Thrice Monthly

PUBLICATION DATE

February 6, 2022

World Journal of Clinical Cases

Submit a Manuscript: https://www.f6publishing.com

World J Clin Cases 2022 February 6; 10(4): 1423-1431

DOI: 10.12998/wjcc.v10.i4.1423

ISSN 2307-8960 (online)

CASE REPORT

Langerhans cell histiocytosis presenting as an isolated brain tumour: A case report

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Author contributions: Liang HX and Yang YL contributed to the conception and design; Liang HX, Yang YL, and Zhang Q contributed to the interpretation of imaging; Yang YL, Zhang Q, and Xie Z contributed to the interpretation of history, treatments, and histopathology; Liang HX and Liu ET contributed to the drafting of the manuscript; Liu ET and Wang SX contributed to the revised the manuscript.

Informed consent statement: Publication consent has been obtained from the patient in a written form.

Conflict-of-interest statement: All authors have completed the ICMJE uniform disclosure form. The authors have no conflicts of interest to declare.

CARE Checklist (2016) statement: The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).

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Abstract

BACKGROUND

Langerhans cell histiocytosis (LCH) is a rare proliferative histiocyte disorder. It can affect any organ or system, especially the bone, skin, lung, and central nervous system (CNS). In the CNS, the hypothalamic-pituitary is predominantly affected, whereas the brain parenchyma is rarely affected. LCH occurring in the brain parenchyma can be easily confused with glioblastoma or brain metastases. Thus, multimodal imaging is useful for the differential diagnosis of these intracerebral lesions and detection of lesions in the other organs.

CASE SUMMARY

A 47-year-old man presented with a headache for one week and sudden syncope. Brain computed tomography (CT) and magnetic resonance imaging showed an irregularly shaped nodule with heterogeneous enhancement. On ^{18}F-fluorodeoxyglucose (^{18}F-FDG) positron emission tomography/CT, a nodule with ^{18}F-FDG uptake and multiple cysts in the upper lobes of both lungs were noted, which was also confirmed by high-resolution CT. Thus, the patient underwent surgical resection of the brain lesion for further examination. Postoperative pathology confirmed LCH. The patient received chemotherapy after surgery. No recurrence was observed in the brain at the 12-mo follow-up.

Supported by Guangdong Medical Research Fund to Han-Xiang Liang, No. B2021084; Traditional Chinese Medicine Bureau of Guangdong Province to En-Tao Liu, No. 20211005; and High-level Hospital Construction Research Project of Maoming People's Hospital to Han-Xiang Liang, No. ZX2020014.

Country/Territory of origin: China

Specialty type: Medicine, research and experimental

Provenance and peer review: Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's scientific quality classification

Grade A (Excellent): 0
Grade B (Very good): B
Grade C (Good): C
Grade D (Fair): 0
Grade E (Poor): 0

Received: September 5, 2021
Peer-review started: September 5, 2021
First decision: October 22, 2021
Revised: November 3, 2021
Accepted: December 23, 2021
Article in press: December 23, 2021
Published online: February 6, 2022

P-Reviewer: Hashimoto K, Mukthinuthalapati VVPK
S-Editor: Fan JR
L-Editor: A
P-Editor: Fan JR

CONCLUSION
Multimodal imaging is useful for evaluating the systemic condition of LCH, developing treatment plans, and designing post-treatment strategies.

Key Words: Langerhans cell histiocytosis; Brain neoplasms; Lung; Computed tomography; Magnetic resonance imaging; Positron emission tomography/computed tomography; Case report

Core Tip: Langerhans cell histiocytosis (LCH) is a rare hematological disease characterized by a clonal proliferation of abnormal langerhans cells. It can affect any organ or system, especially the bone, skin, lung, and central nervous system (CNS). In the CNS, the hypothalamic-pituitary is predominantly affected, whereas the brain parenchyma is rarely affected. Cases of LCH involving the brain parenchyma and presenting as an isolated brain tumour have been reported, but all the reports lack complete multimodal imaging. In this manuscript, we have reported a case of LCH involving the brain parenchyma and bilateral lungs, which was assessed using computed tomography (CT), high-resolution CT, magnetic resonance imaging, and ^{18}F-fluorodeoxyglucose positron emission tomography/CT. Furthermore, we have reviewed the relevant literature.

Citation: Liang HX, Yang YL, Zhang Q, Xie Z, Liu ET, Wang SX. Langerhans cell histiocytosis presenting as an isolated brain tumour: A case report. *World J Clin Cases* 2022; 10(4): 1423-1431
URL: https://www.wjgnet.com/2307-8960/full/v10/i4/1423.htm
DOI: https://dx.doi.org/10.12998/wjcc.v10.i4.1423

INTRODUCTION

Langerhans cell histiocytosis (LCH) is an uncommon disease characterized by clonal proliferation of myeloid precursors that differentiate into cluster of differentiation (CD)1a$^+$/CD207$^+$ (Langerin) cells in lesions[1,2]. It mainly affects children, with a reported incidence of 4-5 cases *per* million children aged < 15 years *per* year, while its incidence in adults is uncertain[3]. LCH may affect any organ or system, but it most frequently affects the bone, skin, pituitary, liver, spleen, hematopoietic system, lung, lymph nodes, and central nervous system (CNS)[4,5]. Cases of LCH involving the brain parenchyma and presenting as an isolated brain tumour have been reported, but all the reports lack complete multimodal imaging. Herein, we have reported a case of LCH involving the brain parenchyma and bilateral lungs, which was assessed using computed tomography (CT), high-resolution CT (HRCT), magnetic resonance imaging (MRI), and ^{18}F-fluorodeoxyglucose (^{18}F-FDG) positron emission tomography (PET)/CT. Furthermore, we have reviewed the relevant literature.

CASE PRESENTATION

Chief complaints

A 47-year-old man was referred to our hospital with a headache for one week and sudden syncope in the morning.

History of present illness

A 47-year-old man was referred to our hospital with a headache for one week and sudden syncope in the morning.

History of past illness

The patient had no history of polyuria or polydipsia. No other illnesses were observed.

Personal and family history
The patient had no known comorbidities or family history, but had a 15-year smoking history.

Physical examination
No rash or positive neurological signs were found on physical examination.

Laboratory examinations
Laboratory tests results showed increased in carcinoembryonic antigen (CEA) levels (7.03 ng/mL, reference: 0-5 ng/mL), with no other abnormal findings.

Imaging examinations
Non-contrast brain CT showed irregularly shaped nodular foci with isodensity at the left frontal corticomedullary junction. Large patches of hypodense edema were noted in the adjacent white matter (Figure 1A and B represent the lateral ventricular and basal ganglia levels, respectively). Contrast-enhanced brain CT showed significant heterogeneous enhancement in the left frontal foci (Figure 1C and D, the same level as the Figure 1A and B). Coronal and sagittal views of contrast-enhanced CT images showed irregular morphology of the lesion and poor demarcation with the adjacent skull (Figure 1E and F). Bone window CT showed no abnormalities in the adjacent skull (Figure 1G and H, the same level as the Figure 1E and F). Subsequently, the patient underwent a brain MRI. Axial T1-weighted images (T1WI) showed heterogeneous hypointense lesions in the left frontal lobe (Figure 2A). Axial T2-weighted images (T2WI) showed a heterogeneously mixed hyperintensity signals with hypointense areas in the left frontal lobe lesion (Figure 2B). After administration of gadolinium, the lesion showed heterogeneous enhancement on axial (Figure 2C), coronal (Figure 2D), and sagittal T1WI (Figure 2E). No abnormalities were found on sagittal T1WI of the sellar region (Figure 2F).

Considering the elevated CEA levels and CT and MRI manifestations, further investigation was required to rule out brain metastases. Therefore, ^{18}F-FDG PET/CT was performed. Maximum-intensity-projection imaging showed a focal increase in ^{18}F-FDG uptake in the right maxillary sinus and multiple foci of increased ^{18}F-FDG uptake in the bilateral lung fields (Figure 3A). Axial (Figure 3B-D) and coronal (Figure 3E-G) views of the selected PET, non-enhanced CT (NE-CT), and fused PET/CT images showed moderately increased ^{18}F-FDG uptake in the left frontal nodule [the maximum standardized uptake value (SUVmax) of the lesions and surrounding tissues are shown in Supplementary Figure 1]. No abnormal ^{18}F-FDG uptake was observed in the sellar region (Supplementary Figure 2). Axial (Figure 3H-J) views of the selected PET, NE-CT, and fused PET/CT images showed multiple cysts with peripheral exudation in the upper lobes of bilateral lungs, with slightly increased ^{18}F-FDG uptake. HRCT was performed to further evaluate the pulmonary lesions. Axial (Figure 4A), coronal (Figure 4B), and sagittal (Figure 4C and D, left and right lungs, respectively) views of HRCT images showed multiple scattered small thick-walled irregular cysts and small nodules. Sinusitis was diagnosed in the right maxillary sinus. Bilateral lung manifestations should be differentiated from pulmonary LCH, but brain nodules are more difficult to diagnose and should be differentiated from gliomas.

Further diagnostic work-up
The patient underwent brain tumour resection. Gross examination showed that the specimen was a grey-brown solid tumour (Figure 5A) and the cut surface was grey-brown and grey-white (Figure 5B). Histopathological examination revealed mononucleated and multinucleated histocytes with abundant cytoplasm and slight staining (haematoxylin and eosin, magnification, × 200; Figure 5C). On immunohistochemistry, the specimen stained positive for S100, CD207 (Langerin), CD4, and CD1a, and negative for CD3 and CD20. Ki67 (MIB-1) index was slightly > 30%.

FINAL DIAGNOSIS
The final histological diagnosis was LCH.

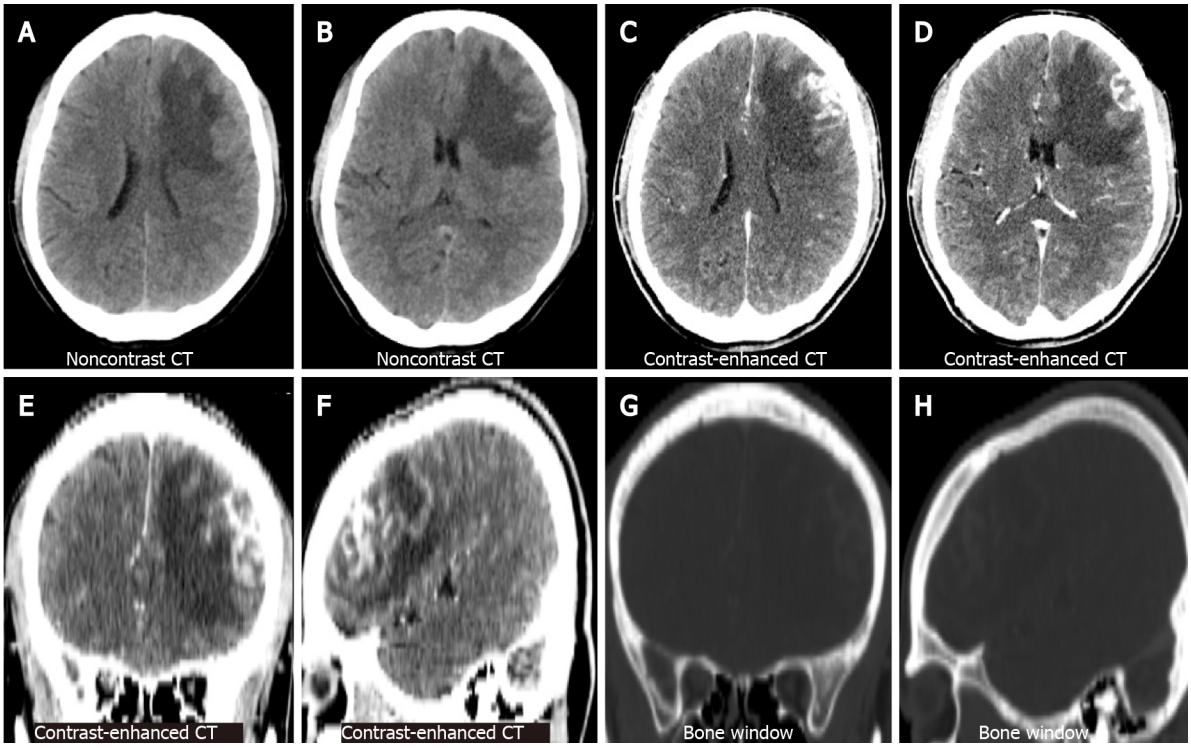

Figure 1 Brain computed tomography. A and B: Represent the lateral ventricular and basal ganglia levels on non-contrast computed tomography (CT), respectively. An irregularly shaped nodule is observed in the left frontal lobe with large perifocal low-density oedema; C and D: Represent the same level as the former on contrast-enhanced CT. The nodules are significantly enhanced heterogeneously; E and F: Represent the coronal and sagittal views of the contrast-enhanced CT; G and H: Represent the same level as the former, with no abnormalities in the adjacent skull. CT: Computed tomography.

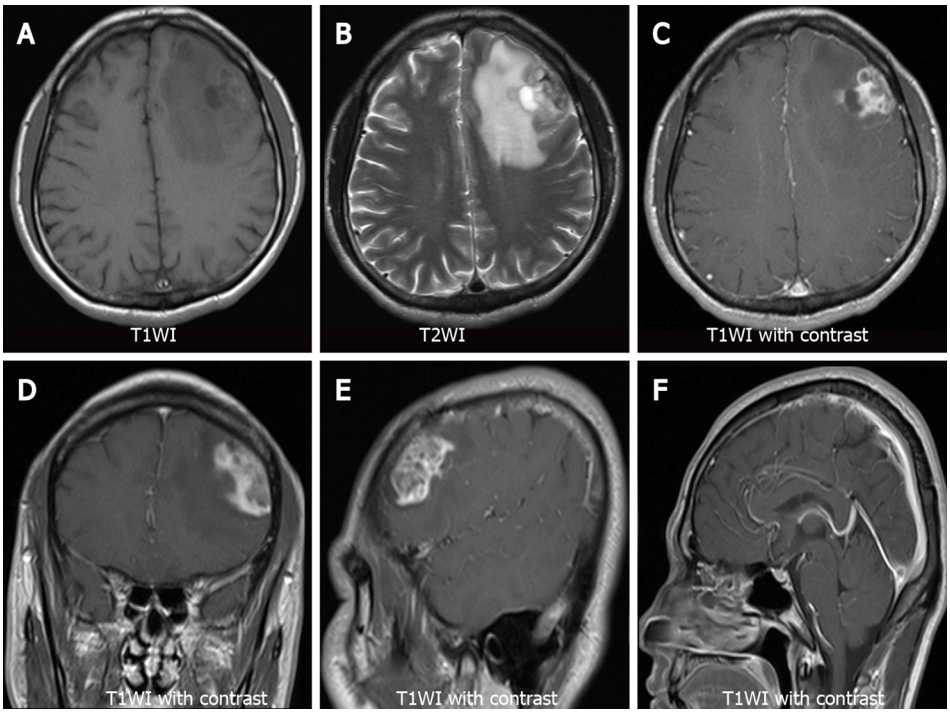

Figure 2 Brain magnetic resonance imaging. A: Axial T1-weighted images (T1WI) show heterogeneous hypo-intensity of the left frontal lobe lesion; B: Axial T2-weighted images (T2WI) show heterogeneously mixed signal of hyperintensity with hypointense areas of the left frontal lobe lesion; C-E: Axial, coronal, and sagittal views of T1WI with contrast agent administration show heterogeneous enhancement of the lesion; F: Sagittal T1WI show no abnormality in the sellar region. T1WI: T1-weighted images; T2WI: T2-weighted images.

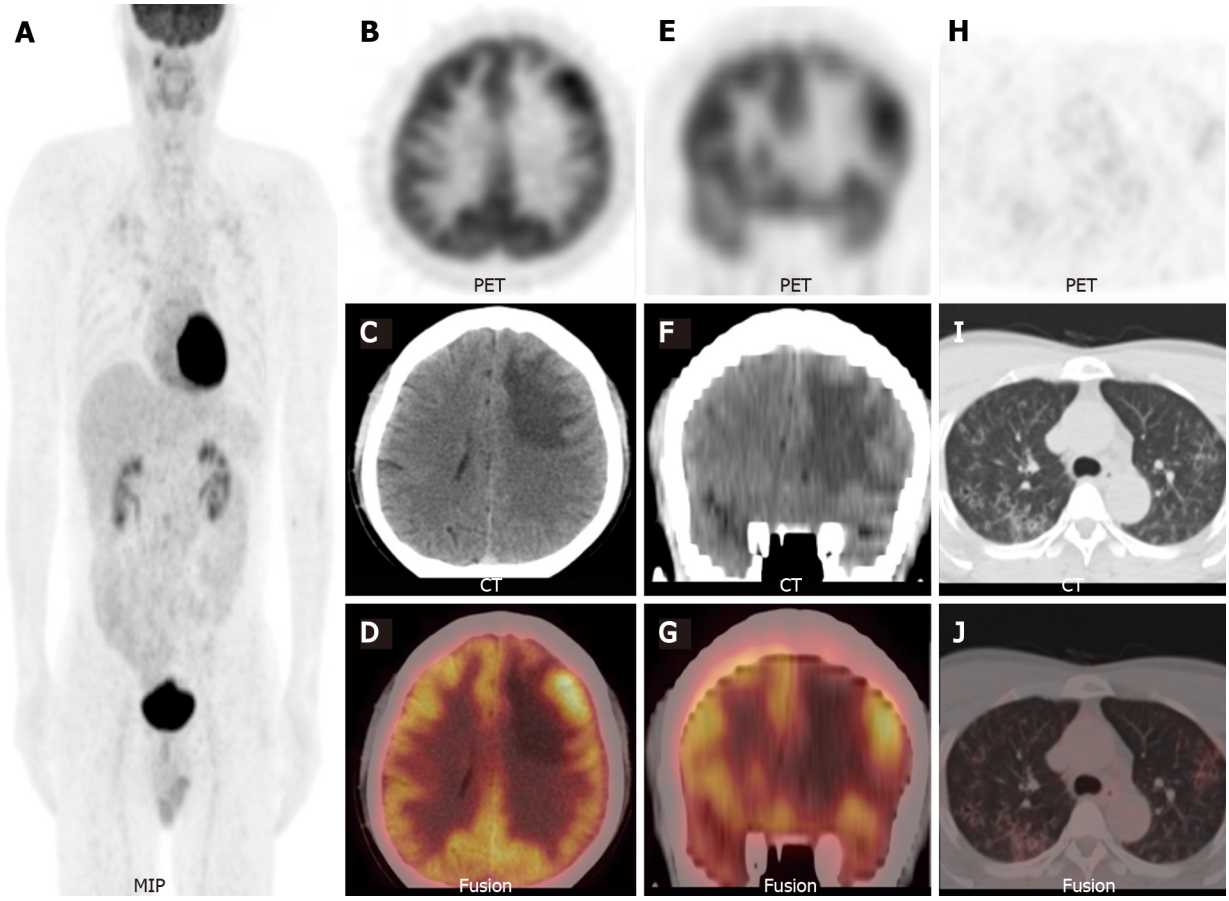

Figure 3 ^{18}F-fluorodeoxyglucose positron emission tomography/computed tomography. A: Maximum-intensity-projection show a focal ^{18}F-fluorodeoxyglucose (^{18}F-FDG) uptake lesion in the right maxillary sinus and multiple foci with ^{18}F-FDG uptake in the bilateral lung field; B-G: Axial and coronal views of the selected positron emission tomography (PET), non-enhanced computed tomography (NE-CT), and fused PET/CT images show the left frontal lesion with ^{18}F-FDG uptake (SUVmax 9.5, arrowheads); H-J: Axial views of the selected PET, NE-CT, and fused PET/CT images show multiple cysts with peripheral exudation in the upper lobes of bilateral lungs, with slightly increased ^{18}F-FDG uptake (SUVmax 3.2). MIP: Maximum-intensity-projection; PET: Positron emission tomography; CT: Computed tomography.

TREATMENT

The patient received chemotherapy (vindesine and prednisone acetate) after surgery.

OUTCOME AND FOLLOW-UP

No recurrence was observed on brain MRI at the 12-mo follow-up (Supplementary Figure 3).

DISCUSSION

LCH involving the hypothalamic-pituitary or skull is not uncommon, but involvement of the brain parenchyma, such as the frontotemporal lobe, is rare. As of January 2019, fewer than 30 cases have been reported in the PubMed database (Table 1)[6-8]. We reviewed the relevant PubMed literature from 1990 to May 2021 and found 16 cases of brain parenchymal LCH with imaging data. The mean age was 31 years (95% confidence interval: 21.5-41.2). The male-to-female ratio was 14:2, which is consistent with that reported in previous literature reviews of intracerebral LCH, but higher than that in children with LCH[3,9,10]. The lesions were mostly located in the fronto-temporal lobe (14 cases), particularly in the frontal lobe. The clinical presentation of LCH is non-characteristic and varies depending on the site. Most cases showed non-specific symptoms of mass effect such as headache, seizures, hemiparesis, and/or sensory disturbances. MRI findings without contrast were also largely non-specific.

Table 1 Summary of 16 cases with brain parenchymal langerhans cell histiocytosis with imaging data

Ref.	Age/sex	Diameter (cm)[1]	Location (Lobe)	MRI Finding			^{18}F-FDG PET/CT finding
				T1WI	T2WI	T1WI with contrast	
Caresio *et al* [20], 1991	29/Male	3.0	Right temporal lobe	Hypointense	Hyperintense	Ringlike enhancement	NA
Itoh *et al*[21], 1992	7/Male	NA	Right frontal lobe	Hypo-/iso-intense	Hyperintense	Intense enhancement	NA
Bogaert *et al* [22], 1994	40/Female	NA	Left parietal lobe	Hypointense	Hyperintense	Intense enhancement	NA
Vital *et al*[23], 1996	32/Female	NA	Right insula lobe	NA	Hyperintense	Intense enhancement	NA
Grant *et al*[24], 1999	20/Male	3.5	Right temporal lobe	NA	NA	Intense enhancement	NA
Katati *et al*[25], 2002	36/Male	NA	Left temporal lobe	Hypointense	NA	Intense enhancement	NA
Cagli *et al*[9], 2004	24/Male	1.5	Left temporal lobe	Hypointense	NA	Intense enhancement	NA
Yamaguchi *et al*[26], 2004	2/Male	NA	Multiple lesions/bilateral frontal and temporal lobes	NA	NA	Intense enhancement	NA
Rodríguez-Pereira *et al* [10], 2005	30/Male	5.0	Left frontal lobe	NA	NA	Gyral enhancement	NA
Rodríguez-Pereira *et al* [10], 2005	65/Male	2.5	Left parietal lobe	NA	NA	Peripheral enhancement	NA
Dieter[27], 2017	4/Male	2.0[1]	Multiple lesions, right frontal, and parietal lobe	Iso-/hyper-intense	Hypointense	Uniform enhancement	NA
Cai *et al*[6], 2014	23/Male	4.1	Right frontal lobe	Hypo-/iso-intense	Iso-/hyper-intense	Moderate to intense homogeneous enhancement	NA
Dardis *et al* [28], 2015	64/Male	NA	Multiple lesions, left frontal and right temporal lobe, and brainstem	NA	Hyperintense	Patchy enhancement	NA
Kim *et al*[7], 2018	36/Male	3.0	Right frontal lobe	Isointense	Hyperintense	Heterogeneous enhancement	NA
Bärtschi *et al* [8], 2019	42/Male	NA	Right insular lobe	NA	Hyperintense	Intense enhancement	NA
Current case	47/Male	3.6	Left frontal lobe	Hypointense	Hyperintensity with hypointense areas	Heterogeneous enhancement	Lesion SUVmax 9.5 and contralateral SUVmax 8.1

[1]The largest lesion.

NA: Not available; PET: Positron emission tomography; CT: Computed tomography; T1WI: T1-weighted images; T2WI: T2-weighted images; MRI: Magnetic resonance imaging.

Nonetheless, MRI showed hypointensity on T1WI and hyperintensity on T2WI in most cases. After administration of gadolinium, most cases showed intense homogeneous or heterogeneous enhancement. Another characteristic feature is sulcal enhancement around the lesion[6,7]. MRI images showed leptomeningeal involvement near the lesions in several cases, as reported by Kim *et al*[7]. This may be a characteristic sign of brain parenchymal LCH, but it needs to be confirmed in more cases.

There are no previous reports of ^{18}F-FDG PET/CT for assessing the metabolic activity of brain parenchymal LCH. To our knowledge, our case report is the first with a PET/CT description. The SUVmax of the brain lesion was approximately 9.5, which was similar to the SUVmax of LCH lesions involving other regions reported in the literature[11]. Additional bilateral lung lesions were found, and pulmonary manifestations were decisive for diagnosis[12]. As 30% patients with LCH present with multi-organ system involvement, it is important to detect involvement of other tissues (such as the bone, soft tissue, the CNS, or the lungs)[3,13]. Single or isolated brain lesions

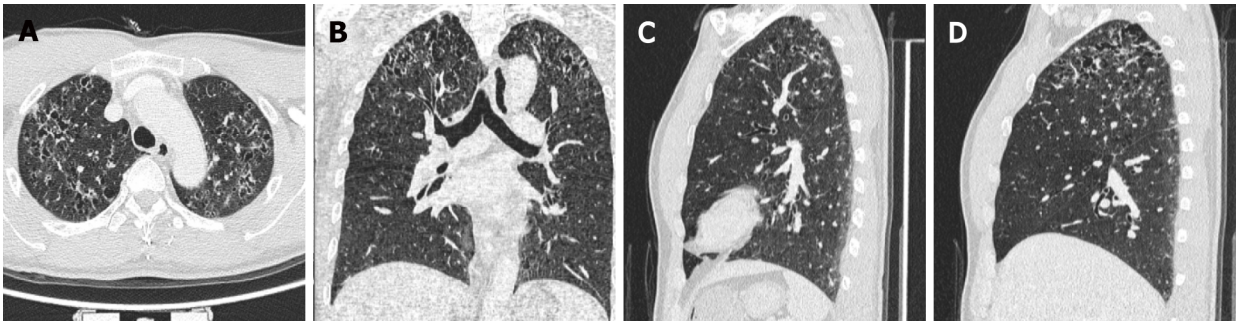

Figure 4 High-resolution computed tomography of the lung. Axial, coronal, and sagittal (the left and right lungs, respectively) views of high-resolution computed tomography images show multiple scattered small thick-walled irregular cysts as well as small nodules. A: Axial; B: Coronal; C: Left lungs; D: Right lungs.

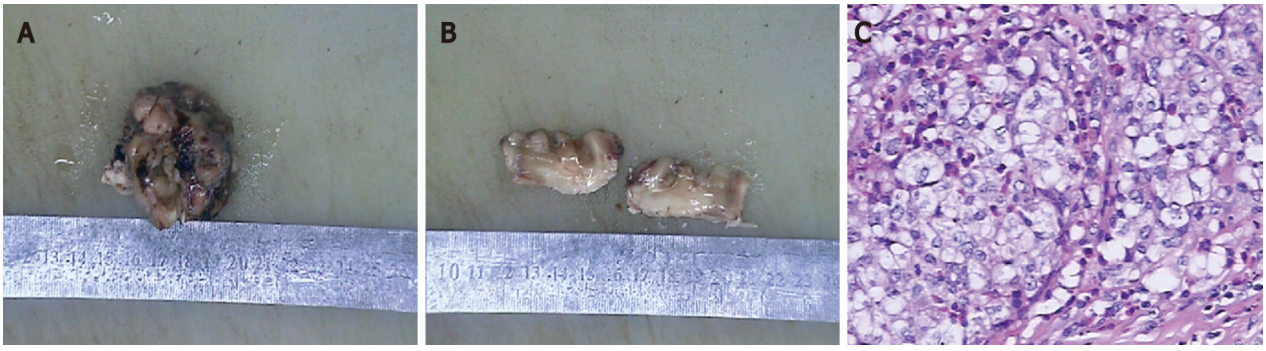

Figure 5 Histopathological images. A: The specimen is a greyish brown and greyish dark solid tumour; B: The cut surface is greyish brown and greyish white; C: Histopathological examination reveal mononucleated and multinucleated histocytes with abundant cytoplasm and light staining (haematoxylin and eosin, magnification, × 400).

have previously been reported based on only brain CT or MRI, without whole-body scans[6,7]. Without whole-body evaluation, reports of isolated brain lesions may be non-rigorous or biased. More recent studies that performed whole-body evaluations have identified a higher rate of focal LCH lesions than that previously reported[14,15]. Therefore, PET/CT or PET/MRI seems to be more appropriate for evaluating this disease[16]. This is especially true for combined bone and lung lesions as some case without obvious symptoms are incidentally detected; they may be missed by relying solely on radiography or CT[8]. Several studies have confirmed the diagnostic value of systemic scans, such as PET/CT or PET/MRI for LCH[14,15,17,18]. The diagnostic evaluation of LCH plays a crucial role in treatment planning. PET/CT or PET/MRI can be used to assess multiple foci throughout the body, guide biopsy sites, and assist with post-treatment strategies.

Based on prospective trials, the combination of vinblastine plus prednisolone is the most commonly used induction chemotherapy regimen and is administered over six weeks[19].

CONCLUSION

As a systemic disease, LCH has the potential to involve the brain parenchyma, and its diagnosis is extremely challenging. The use of multimodal imaging or whole-body imaging, combined with the manifestation of lesions at other sites, can be helpful in the diagnosis of this disease. Moreover, multimodality imaging is useful for assessing the systemic status of LCH, developing treatment plans, and evaluating post-treatment strategies.

REFERENCES

1 **Rodriguez-Galindo C**, Allen CE. Langerhans cell histiocytosis. *Blood* 2020; **135**: 1319-1331 [PMID: 32106306 DOI: 10.1182/blood.2019000934]

2 **Allen CE**, Beverley PCL, Collin M, Diamond EL, Egeler RM, Ginhoux F, Glass C, Minkov M, Rollins BJ, van Halteren A. The coming of age of Langerhans cell histiocytosis. *Nat Immunol* 2020; **21**: 1-7 [PMID: 31831887 DOI: 10.1038/s41590-019-0558-z]

3 **Krooks J**, Minkov M, Weatherall AG. Langerhans cell histiocytosis in children: History, classification, pathobiology, clinical manifestations, and prognosis. *J Am Acad Dermatol* 2018; **78**: 1035-1044 [PMID: 29754885 DOI: 10.1016/j.jaad.2017.05.059]

4 **Grois N**, Pötschger U, Prosch H, Minkov M, Arico M, Braier J, Henter JI, Janka-Schaub G, Ladisch S, Ritter J, Steiner M, Unger E, Gadner H; DALHX- and LCH I and II Study Committee. Risk factors for diabetes insipidus in langerhans cell histiocytosis. *Pediatr Blood Cancer* 2006; **46**: 228-233 [PMID: 16047354 DOI: 10.1002/pbc.20425]

5 **Haupt R**, Minkov M, Astigarraga I, Schäfer E, Nanduri V, Jubran R, Egeler RM, Janka G, Micic D, Rodriguez-Galindo C, Van Gool S, Visser J, Weitzman S, Donadieu J; Euro Histio Network. Langerhans cell histiocytosis (LCH): guidelines for diagnosis, clinical work-up, and treatment for patients till the age of 18 years. *Pediatr Blood Cancer* 2013; **60**: 175-184 [PMID: 23109216 DOI: 10.1002/pbc.24367]

6 **Cai S**, Zhang S, Liu X, Lin Y, Wu C, Chen Y, Hu J, Wang X. Solitary Langerhans cell histiocytosis of frontal lobe: a case report and literature review. *Chin J Cancer Res* 2014; **26**: 211-214 [PMID: 24826063 DOI: 10.3978/j.issn.1000-9604.2014.02.12]

7 **Kim JH**, Jang WY, Jung TY, Moon KS, Jung S, Lee KH, Kim IY. Magnetic Resonance Imaging Features in Solitary Cerebral Langerhans Cell Histiocytosis: Case Report and Review of Literature. *World Neurosurg* 2018; **116**: 333-336 [PMID: 29929024 DOI: 10.1016/j.wneu.2018.06.060]

8 **Bärtschi P**, Luna E, González-López P, Abarca J, Herrero J, Costa E, Paya A, Sales J, Moreno P. A Very Rare Case of Right Insular Lobe Langerhans Cell Histiocytosis ($CD1a^+$) Mimicking Glioblastoma Multiforme in a Young Adult. *World Neurosurg* 2019; **121**: 4-11 [PMID: 30261373 DOI: 10.1016/j.wneu.2018.09.093]

9 **Cagli S**, Oktar N, Demirtas E. Langerhans' cell histiocytosis of the temporal lobe and pons. *Br J Neurosurg* 2004; **18**: 174-180 [PMID: 15176561 DOI: 10.1080/02688690410001681055]

10 **Rodríguez-Pereira C**, Borrás-Moreno JM, Pesudo-Martínez JV, Vera-Román JM. Cerebral solitary Langerhans cell histiocytosis: report of two cases and review of the literature. *Br J Neurosurg* 2005; **19**: 192-197 [PMID: 16120527 DOI: 10.1080/02688690500145944]

11 **Agarwal KK**, Seth R, Behra A, Jana M, Kumar R. 18F-Fluorodeoxyglucose PET/CT in Langerhans cell histiocytosis: spectrum of manifestations. *Jpn J Radiol* 2016; **34**: 267-276 [PMID: 26759026 DOI: 10.1007/s11604-016-0517-7]

12 **Vassallo R**, Harari S, Tazi A. Current understanding and management of pulmonary Langerhans cell histiocytosis. *Thorax* 2017; **72**: 937-945 [PMID: 28689173 DOI: 10.1136/thoraxjnl-2017-210125]

13 **Albano D**, Bosio G, Giubbini R, Bertagna F. Role of ^{18}F-FDG PET/CT in patients affected by Langerhans cell histiocytosis. *Jpn J Radiol* 2017; **35**: 574-583 [PMID: 28748503 DOI: 10.1007/s11604-017-0668-1]

14 **Ferrell J**, Sharp S, Kumar A, Jordan M, Picarsic J, Nelson A. Discrepancies between F-18-FDG PET/CT findings and conventional imaging in Langerhans cell histiocytosis. *Pediatr Blood Cancer* 2021; **68**: e28891 [PMID: 33442960 DOI: 10.1002/pbc.28891]

15 **Huynh KN**, Nguyen BD. Histiocytosis and Neoplasms of Macrophage-Dendritic Cell Lineages: Multimodality Imaging with Emphasis on PET/CT. *Radiographics* 2021; **41**: 576-594 [PMID: 33606566 DOI: 10.1148/rg.2021200096]

16 **Hashimoto K**, Nishimura S, Sakata N, Inoue M, Sawada A, Akagi M. Treatment Outcomes of Langerhans Cell Histiocytosis: A Retrospective Study. *Medicina (Kaunas)* 2021; **57** [PMID: 33917120 DOI: 10.3390/medicina57040356]

17 **Obert J**, Vercellino L, Van Der Gucht A, de Margerie-Mellon C, Bugnet E, Chevret S, Lorillon G, Tazi A. ^{18}F-fluorodeoxyglucose positron emission tomography-computed tomography in the management of adult multisystem Langerhans cell histiocytosis. *Eur J Nucl Med Mol Imaging* 2017; **44**: 598-610 [PMID: 27645693 DOI: 10.1007/s00259-016-3521-3]

18 **Sher AC**, Orth R, McClain K, Allen C, Hayatghaibi S, Seghers V. PET/MR in the Assessment of Pediatric Histiocytoses: A Comparison to PET/CT. *Clin Nucl Med* 2017; **42**: 582-588 [PMID: 28604476 DOI: 10.1097/RLU.0000000000001717]

19 **Gadner H**, Minkov M, Grois N, Pötschger U, Thiem E, Aricò M, Astigarraga I, Braier J, Donadieu J, Henter JI, Janka-Schaub G, McClain KL, Weitzman S, Windebank K, Ladisch S; Histiocyte Society. Therapy prolongation improves outcome in multisystem Langerhans cell histiocytosis. *Blood* 2013; **121**: 5006-5014 [PMID: 23589673 DOI: 10.1182/blood-2012-09-455774]

20 **Caresio JF**, McMillan JH, Batnitzky S. Coexistent intra- and extracranial mass lesions: an unusual manifestations of histiocytosis X. *AJNR Am J Neuroradiol* 1991; **12**: 82 [PMID: 1899525]

21 **Itoh H**, Waga S, Kojima T, Hoshino T. Solitary eosinophilic granuloma in the frontal lobe: case report. *Neurosurgery* 1992; **30**: 295-298 [PMID: 1372112 DOI: 10.1227/00006123-199202000-00030]

22 **Bogaert J**, Verschakelen JA, d'Haen B, Dom R, Wilms G. Diagnosis of atypical intracerebral Langerhans cell histiocytosis suggested by concomitant lung abnormalities. A case report. *Rofo* 1994; **161**: 369-371 [PMID: 7948986 DOI: 10.1055/s-2008-1032547]

23 **Vital A**, Loiseau H, Kantor G, Vital C, Cohadon F. Primary Langerhans' cell histiocytosis of the central nervous system with fatal outcome. Case report. *J Neurosurg* 1996; **85**: 1156-1160 [PMID: 8929511 DOI: 10.3171/jns.1996.85.6.1156]

24 **Grant GA**, Kim DK, Shaw CM, Berger MS. Solitary eosinophilic granuloma of the temporal lobe: case report and review of the literature. *Brain Tumor Pathol* 1999; **16**: 55-59 [PMID: 10532425 DOI: 10.1007/BF02478903]

25 **Katati MJ**, Martin JM, Pastor J, Arjona V. Isolated primary Langerhans' cell histiocytosis of central nervous system. *Neurocirugia (Astur)* 2002; **13**: 477-478 [PMID: 12529777 DOI: 10.1016/s1130-1473(02)70575-7]

26 **Yamaguchi S**, Oki S, Kurisu K. Spontaneous regression of Langerhans cell histiocytosis: a case report. *Surg Neurol* 2004; **62**: 136-40; discussion 140 [PMID: 15261507 DOI: 10.1016/j.surneu.2003.10.003]

27 **Dieter S**. Letter to the Editor Re: Zeidman LA, Stone J, Kondziella D. New revelations about Hans Berger, father of the electroencephalogram (EEG), and his ties to the Third Reich. J Child Neurol. 2014;29:1002-1010. *J Child Neurol* 2017; **32**: 680-681 [PMID: 28511629 DOI: 10.1177/0883073817696813]

28 **Dardis C**, Aung T, Shapiro W, Fortune J, Coons S. Langerhans cell histiocytosis in an adult with involvement of the calvarium, cerebral cortex and brainstem: discussion of pathophysiology and rationale for the use of intravenous immune globulin. *Case Rep Neurol* 2015; **7**: 30-38 [PMID: 25873887 DOI: 10.1159/000380760]

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