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RESPONSIBLE EDITORS FOR THIS ISSUE
Production Editor: Hua-Ge Yu; Production Department Director: Xu Guo; Editorial Office Director: Jin-Lei Wang.

NAME OF JOURNAL
World Journal of Clinical Cases

ISSN
ISSN 2307-8960 (online)

LAUNCH DATE
April 16, 2013

FREQUENCY
Thrice Monthly

EDITORS-IN-CHIEF
Bao-Gan Peng, Ja Hyeon Ku, Maurizio Serati, George Kontogeorgos, Jerzy Tadeusz Chudek

EDITORIAL BOARD MEMBERS
https://www.wjgnet.com/2307-8960/editorialboard.htm

PUBLICATION DATE
September 16, 2022

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Imaging findings of immunoglobin G4-related hypophysitis: A case report

Kun Lv, Xin Cao, Dao-Ying Geng, Jun Zhang

BACKGROUND
Immunoglobin G4 (IgG4)-related hypophysitis (IgG4-RH) is a rare form of IgG4-related disease (IgG4-RD), which often manifests as a single organ disease and is easily misdiagnosed as a pituitary tumor clinically and by imaging. There are few reports of imaging findings of IgG4-RH. Therefore, we describe a case of IgG4-RH, which mimicked a pituitary macroadenoma, that was detected by computed tomography (CT) and magnetic resonance imaging (MRI), and review the previous literature in order to further the understanding of IgG4-RH.

CASE SUMMARY
A 47-year-old man presented with a history of blurred vision for more than 2 mo, without other symptoms. A preoperative unenhanced CT scan revealed a slightly hyperdense mass in the sellar region measuring 2.5 cm × 2.3 cm × 1.8 cm, with a CT value of 45 HU. T1-weighted imaging (T1WI) and T2-weighted imaging showed iso-hypointensity, and gadolinium contrast-enhanced T1WI showed obvious homogeneous enhancement. The MRI revealed involvement of the pituitary gland and stalk. Preoperative laboratory tests revealed abnormal pituitary hormone levels, including an increased prolactin level, and decreased levels of insulin-like growth factor, dehydroepiandrosterone, and testosterone. The lesion was surgically resected. Postoperative histopathological examination of a tissue sample and an elevated serum IgG4 level confirmed the diagnosis of...
IgG4-RH. The patient was treated with cortisone acetate postoperatively and made a good recovery without developing any neurological deficit.

**CONCLUSION**
An elevated serum IgG4 concentration is the main clue for diagnosis of IgG4-RD. Imaging combined with laboratory testing is useful for preoperative diagnosis of IgG4-RH.

**Key Words:** Immunoglobin G4-related disease; Pituitary; Macroadenoma; Inflammation; Hypophysitis; Case report

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**Core Tip:** Immunoglobin G4 (IgG4)-related hypophysitis (IgG4-RH) is a rare form of IgG4-related disease, which is easily misdiagnosed as a pituitary tumor. IgG4-RH commonly occurs in middle-aged and older men and is characterized by hypointensity on T2-weighted imaging and homogeneous and obvious enhancement on gadolinium contrast-enhanced T1-weighted imaging, accompanied by hypopituitarism. The imaging findings help to differentiate it from pituitary tumors. An elevated serum IgG4 level is the main clue to the diagnosis of IgG4-RH, and imaging, histopathology, or response to glucocorticoid therapy can be used to confirm the diagnosis.

**INTRODUCTION**
The most common immunoglobin G4 (IgG4)-related disease (IgG4-RD) is type I autoimmune pancreatitis, followed by head and neck lesions that usually involve the salivary gland, orbit, or thyroid. IgG4-RD of the central nervous system (CNS) is rare. IgG4-RD usually involves multiple systems, but can affect the CNS alone[1,2]. When IgG4-RD involves the CNS, it usually involves the pituitary gland and pituitary stalk, collectively referred to as IgG4-related hypophysitis (IgG4-RH)[3]. Although hypertrophic dura mater meningitis and hypophysitis are recognized as relatively common manifestations of involved CNS, there are few reports of imaging findings of IgG4-RH, making the noninvasive, definitive diagnosis more difficult. Although cases of intracranial IgG4-RD have been reported[4,5], reports of IgG4-RH are relatively rare, though there have been a few reports of head and neck IgG4-RD. IgG4-RH occurs predominantly in adults aged over 60 years (average age: 62 years), with a male preponderance (male:female ratio approximately 3:6:1)[6], and is easily misdiagnosed as a pituitary tumor, lymphoid tissue hyperplasia, or other types of hypophysitis (such as lymphocytic, granulomatous, and immune checkpoint inhibitor-related hypophysitis)[7]. It is important to differentiate IgG4-RH from these conditions because their treatment and prognosis are different. Imaging examination is an important method for noninvasive diagnosis, and magnetic resonance imaging (MRI) is the gold standard method for the diagnosis of pituitary diseases. Therefore, it is necessary to supplement knowledge of the imaging characteristics of IgG4-RH. We herein describe a case of IgG4-RH mimicking a pituitary macroadenoma that was detected by computed tomography (CT) and MRI, and review the previous literature.

**CASE PRESENTATION**

**Chief complaints**
In July 2021, a 47-year-old man presented with a history of blurred vision for more than 2 mo.

**History of present illness**
The patient had developed blurred vision more than 2 mo previously without any obvious precipitating factor, and had subsequently experienced progressive worsening of the symptoms. He did not report any dizziness, headache, nausea, vomiting, limb weakness, loss of consciousness, facial changes, or sexual dysfunction. His mood was normal and he reported a healthy appetite, normal sleeping pattern, normal bowel movements, and no weight loss.
History of past illness
The patient did not have any past illnesses of note.

Personal and family history
The patient had no special personal and family history.

Physical examination
Physical examination revealed decreased visual acuity, without any other abnormal neurological signs.

Laboratory examinations
Preoperative laboratory examination showed an increased prolactin level (49.96 ng/mL; normal range: 3.86–22.80 ng/mL); decreased levels of insulin-like growth factor: 25.3 μg/L; normal range: 94.0–284.0 μg/L), dehydroepiandrosterone (DHEA: 0.1 μmol/L; normal range: 1.91–13.40 μmol/L), and testosterone (0.09 μmol/L; normal range: 9.90–27.8 μmol/L); and levels of thyroid-stimulating hormone (TSH), growth hormone, and adrenocorticotropic hormone within the normal range. Postoperative laboratory tests revealed a decrease in the prolactin level (20.86 ng/mL) to within the normal range, and decreased levels of TSH (0.16 mLU/L; normal range: 0.550–4.780 mLU/L), DHEA (0.03 μmol/L), and testosterone (0.09 μmol/L). A serological IgG4 examination was subsequently performed. The serum IgG4 level was elevated (2.98 g/L; normal range: 0.03–2.01 g/L).

Imaging examinations
An unenhanced CT scan revealed a slightly hyperdense mass in the sellar region measuring 2.5 cm × 2.3 cm × 1.8 cm with a CT value of 45 HU (Figure 1). This was followed by an MRI scan (Figure 2). T1-weighted imaging (T1WI) and T2-weighted imaging (T2WI) revealed iso-hypointensity with an hourglass-shaped mass (“hourglass sign”), and gadolinium contrast-enhanced T1WI showed obvious homogeneous enhancement, without hyperintensity of the posterior lobe of the pituitary gland. The MRI findings indicated involvement of the pituitary gland and stalk. The mass was protruding upward and compressing the optic chiasm.

FINAL DIAGNOSIS
Based on the above findings, the patient was diagnosed with IgG4-RH.

TREATMENT
The pituitary lesion was resected, and the patient was treated with cortisone acetate postoperatively.

OUTCOME AND FOLLOW-UP
Postoperative histopathological examination (Figure 3) of the lesion showed abundant plasma cells and lymphocyte infiltration with local fibrosis. Immunohistochemistry revealed IgG4 (+)/IgG (+) > 40%, and IgG4 (+) cells > 10/high-powered field (HPF). The patient’s postoperative recovery was good, and he did not develop any neurological deficit. He had not experienced a recurrence at the time of his most recent follow-up in March 2022.

DISCUSSION
IgG4-RD is a benign, immune-mediated disease, involving multiple organs, which has features in common with several malignancies, infections, and inflammatory diseases. The histopathological findings are consistent in a wide range of organ systems[7]. The three main pathological features of IgG4-RD are lymphoplasmacytic infiltration, storiform fibrosis, and obliterator phlebitis. Eosinophil infiltration is common, but neutrophil infiltration is rare[8]. Storiform fibrosis, in which collagen fibers are arranged radially, is a typical feature of IgG4-RD, but may not be detected in biopsy tissue due to patchy distribution. In addition, there is some organ-specific variability in its manifestations, such as a lack of storiform fibrosis in the lacrimal glands and lymph nodes, and a low incidence of obliterator phlebitis in the salivary glands[8,9]. IgG4-RD usually has a subacute presentation, with symptoms and organ dysfunction existing for months or even years before diagnosis. In specific organs, the disease may progress slowly, occasionally resolves spontaneously, and may temporarily improve or remain...
Figure 1 Imaging findings of immunoglobulin G4-related hypophysitis on computed tomography. A: Axial unenhanced computed tomography (CT) scan; B: A well-defined, homogeneous, mild hyperdense mass measuring 2.5 cm × 2.3 cm × 1.8 cm in the sellar region, without bone destruction; C: Coronal CT showing the “hourglass sign” (arrow).

Figure 2 Imaging findings of immunoglobulin G4-related hypophysitis on magnetic resonance imaging. A and B: Coronal T2-weighted imaging (A) and sagittal T1-weighted imaging (B) showing an iso-hypointensity mass with an “hourglass sign” in the sellar region; C and D: Sagittal (C) and coronal (D, arrow) contrast-enhanced T1-weighted imaging showing obvious homogeneous enhancement.

Figure 3 Histological features of immunoglobulin G4-related hypophysitis. A: Hematoxylin and eosin staining showed abundant plasma cell and lymphocyte infiltration with local fibrosis (×400); B: Immunohistochemical analysis showed immunoglobulin G4 (IgG4) (+)/IgG (+) > 40%, and IgG4 (+) cells > 10/high-powered field (IgG, ×400); C: Immunohistochemical staining for Ki-67 showing cellular proliferation (×100).

dormant for long periods[7]. The clinical manifestations may differ according to the site. IgG4-RH is characterized by dysfunction of the anterior and posterior pituitary lobes and hormonal disturbances. When the anterior pituitary is involved, it often manifests as hyposexuality, hypogonadism, hypothyroidism, and adrenal hypofunction. When the posterior pituitary or pituitary stalk is involved, it often manifests as polyuria and polydipsia. According to previous reports, hypopituitarism and diabetes insipidus are present in 83% and 72% of cases, respectively, and both syndromes are present in 59% of cases with pituitary involvement[10,11]. It has also been reported that the disease may manifest as normal pituitary function in the early stages of onset[12]. Large lesions involving adjacent structures can cause corresponding symptoms, such as visual impairment when the optic nerve/chiasm is
Lv K et al. A case of IgG4-related hypophysitis

Drug therapy is the first choice for the treatment of IgG4-RD. Glucocorticoids are the first-line drug for the majority of patients and most symptoms rapidly improve following the administration of glucocorticoid treatment. The response of IgG4-RD to glucocorticoids is related to the affected organs and the degree of fibrosis. They usually respond to glucocorticoids in the inflammatory stage, but relapse and refractory cases are not uncommon. Therefore, early diagnosis and treatment are important. In addition, other diagnoses should be considered if the condition does not respond to glucocorticoids. Conventional steroid-sparing agents, such as azathioprine, mycophenolate mofetil, and methotrexate, can also be used for IgG4-RD, but comparative studies with glucocorticoids have not been conducted. Patients who do not respond to glucocorticoids and conventional steroid-sparing agents may respond to rituximab, but its efficacy and side effects need further study.

CONCLUSION

The incidence of IgG4-RH is much lower than that of pituitary adenoma. IgG4-RH occurs most
frequently in middle-aged and older men and is characterized by hypopituitarism, hypointensity on T2WI, and obvious homogeneous enhancement on gadolinium contrast-enhanced T1WI. These findings should alert clinicians to the possibility of IgG4-RH. Overall, a diagnosis of IgG4-RD requires a comprehensive workup, including histology, imaging, serology, search for other organ involvement, and assessing the response to glucocorticoid therapy.

**FOOTNOTES**

**Author contributions:** Geng DY designed the outline of the case report; Lv K wrote the first draft of the manuscript; Cao X edited the manuscript for important intellectual content; Zhang J and Lv K revised and edited the final version of the manuscript; all authors contributed to this article and approved the submitted version.

**Supported by** National Key R&D Program of China, No. 2019YFC0120602; Clinical Research Plan of SHDC, No. SHDC2020CR3020A; Research Startup Fund of Huashan Hospital, Fudan University, No. 2021QD035; Shanghai Municipal Commission of Science and Technology, No. 22SS1905300; and Greater Bay Area Institute of Precision Medicine (Guangzhou), No. KCH2310094.

**Informed consent statement:** Informed written consent was obtained from the patient for publication of this report and any accompanying images.

**Conflict-of-interest statement:** All the authors report no relevant conflicts of interest for this article.

**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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**S-Editor:** Fan JR

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**REFERENCES**


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