Kimura’s disease mimicking thoracic spine dumbbell neurogenic tumor: a case report and literature review

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Abstract

Background: Kimura’s disease is a rare, benign chronic inflammatory disease of unknown etiology that mostly affects Asians. The disease typically presents as subcutaneous masses in the head or neck region that are predominantly found in the preauricular and submandibular areas.

Case presentation: A 7-year-old boy presenting with paralysis of both lower extremities and a thoracic spine dumbbell mass was initially diagnosed with a neurogenic tumor, but the pathological and laboratory examinations confirmed the diagnosis of Kimura’s disease. The paralysis symptom disappeared rapidly, but the patient had developed a recurrent mass in the cervical vertebral canal at the 9-month follow-up.

Conclusion: To our knowledge, no prior published literature has revealed Kimura’s disease cases that mimic dumbbell neurogenic tumors. Here, we report such a case of Kimura’s disease for the first time and provide a brief review of the literature.

Keywords: Kimura’s disease, Eosinophilia, Immunoglobulin E, Lymphadenopathy, Thoracic spine dumbbell tumor

Background

Kimura’s disease is a rare chronic inflammatory disorder that was first reported in China by Kim and Szeto in 1937 [1] and became more widely known after a systematic description was published in 1948 by Kimura et al. [2]. Kimura’s disease mainly affects young Asian (Chinese and Japanese) men between 20 and 40 years of age, although sporadic cases have been described elsewhere [3–5]. Clinically, it typically presents as nontender subcutaneous single or multiple nodules in the head and neck regions, which are predominantly found in the preauricular and submandibular area. Masses in the orbit [6, 7], eyelid [8], epiglottis [9], earlobe [10], lacrimal gland [11], parotid gland [12, 13], groin [14], breast [15], and long bones [16] have also been reported. However, to our knowledge, there have been no reports of Kimura’s disease presenting as a posterior mediastinal dumbbell mass extending into the vertebral canal through the intervertebral foramen.

Case presentation

A 7-year-old boy was admitted to our hospital on April 2, 2018, with a complaint of paralysis in both lower extremities lasting for 4 days. Physical examination revealed that he could not move his lower extremities or control urination and defecation. His tendon reflex had disappeared completely in the lower extremities. Some enlarged lymph nodes were found in the neck region. The chest coronal magnetic resonance imaging (MRI) showed a dumbbell-shaped mass in the thoracic cavity between T3 and T5 that measured up to 5 cm in diameter (Fig. 1a). Horizontal MRI indicated that the mass...
extended to the spinal canal and paravertebral region through an enlarged intervertebral foramen. The spinal cord was compressed and obviously displaced (Fig. 1b). The mass was considered an extradural and paravertebral dumbbell-shaped neurilemmoma. On April 3, 2018, the patient underwent surgery for excision of the lesions using a posterior approach. Under general anesthesia, he was intubated with a double-lumen endotracheal tube and was placed in the right semilateral position. Initially, laminectomy was performed from the lower T3 to the upper T5 by making a vertical linear skin incision from T3-T5. An encapsulated yellowish tumor attached to the dura mater was observed through the left intervertebral foramen between T3 and T4. The mass was connected to the root of the third intercostal nerve, which was ligated and sheared. Subsequently, the chest surgeon induced the collapse of the lung and inserted a thoracoscope through the fifth intercostal space of the anterior chest wall. Under the thoracoscope, we separated the mass along with the capsule, carefully confirming the sympathetic nerve. As a result, the mass partially crumbled, but we were able to extract it from the pleural cavity. A chest tube was placed direct under vision, the lung was re-expanded, and the other three portals were closed. The duration of the operation was 3 h.

Histopathological examination of the excised tumor revealed numerous lymphoid follicles with hyperplastic germinal centers. There was massive and prominent infiltration of eosinophils with a few areas that were occupied by eosinophilic microabscesses (Fig. 2), which indicates the eosinophilic hyperplastic lymphogranuloma (Kimura’s disease). The results of laboratory examination were obtained after the operation due to the rapid progression of neurologic deficit and showed that the red
blood cell count was 4.09 × 10^12/L, hemoglobin was 111 g/L, the white blood cell count was 13.77 × 10^9/L, platelets were 280 × 10^9/L and the absolute eosinophil count was 5.78 × 10^9/L, and there was 42% eosinophilia. Serum immunoglobulin E (IgE) was increased to 572 IU/mL (normal < 250). The other results, including blood urea nitrogen (6.83 mmol/L), serum creatinine level (53.2 μmol/L), and urinalysis, were normal. Immunohistological staining (Fig. 3) was later performed, showing negative staining for CD1a, S-100, and CD34 and positive staining for CD31, Fli and Ki-67. These results confirmed the diagnosis of Kimura’s disease.

The patient, therefore, was started on 40 mg/day prednisone and responded well after 1 week. The eosinophilia
| Authors                  | No. of patients | Year | Country | Male/ Female | Age at onset (year) | Size (cm) Location | Treatment                              | Nephrotic Syndrome | Blood eosinophil (%) | Serum IgE (IU/mL) | Recurrence | Reason for recurrence | Follow-up duration (month) |
|-------------------------|----------------|------|---------|--------------|---------------------|--------------------|---------------------|----------------------|---------------------|-----------------|------------------|-----------------------|--------------------------|
| Kung, I. T. [26]        | 21             | 1984 | /       | 18 Male/ 3 Female | 7–50               | 3–10 in diameter head, neck, groin, upper limb and chest wall | surgical excision  | no                  | 12%; 30%; others not clear | /                 | 5 recurrent cases | /                    | not clear                |
| Chow, L. T. [27]        | 8              | 1994 | /       | 7 Male/ 1 Female | 9–70               | 0.9 × 1.5; 1.0 × 2; 1.0 × 1.5; 3.0 × 2.5; 3.0 × 2.5; 1.0 × 1.0 × 3.0; others not clear | head and neck surgical excision, radiation therapy | no                  | /                 | /                | 2 recurrent cases | /                    | 6–48                    |
| Armstrong, W. B. [28]   | 2              | 1998 | Vietnamese | 2 Male       | 14; 48             | 1 × 2, 2 × 3 to 6 × 4; 5 × 7 | head and neck | prednisone, surgical excision yes (1) | 7.9 to 13%; 22% | /                 | 2 recurrent cases | /                    | 6; not clear            |
| Tsukadaia, A. [29]      | 1              | 1998 | /       | Male         | 70                 | 8 × 5, 1 × 2 | groin, buttock, bronchium, neck, popliteal | surgical excision | no                  | 8040/mL | 16,700 | recurrent | /                    | not clear                |
| Gumbs, M. A. [30]       | 1              | 1999 | /       | Female       | 55                 | 12 cm in diameter | head | surgical excision | yes 45% | /                | /                | recurrent | /                    | 180                    |
| Okami, K. [31]          | 1              | 2003 | Japanese | Male         | 14                 | /                | neck | CO2 laser excision, prednisolone of 30 mg | no                  | 16.4%              | 1260             | recurrent | /                    | 12                     |
| Chen, H. [32]           | 21             | 2004 | 7 Caucasians, 6 Blacks, 6 Asians, 1 Hispanic, and 1 Arabic | 18 Male/ 3 Female | 8–64 | 1.2–6.5 | posterior auricular, cervical, groin, and epitrochlear region | surgical excision, corticosteroid therapy, radiation therapy | no                  | /                | /                | 5 recurrent cases | /                    | 14.4–399.6              |
| Birol, A. [30]          | 1              | 2005 | Caucasian | Male         | 45                 | 3.4 × 2.5, 2.6 × 1.5, 4.2 × 3.5 | head | steroid, cyclosporine 5 mg/kg/day | no                  | 36%              | 1130             | recurrent | tapering of steroid or cyclosporine | 5                     |
| Chitapanarux, I. [33]   | 8              | 2007 | /       | 6 Male/ 2 Female | 24–54             | /                | head and neck | surgical excision, radiation therapy | no                  | /                | /                | 8 recurrent cases | /                    | 21–43                  |
| Klckisz, S. [34]        | 1              | 2007 | /       | Male         | 32                 | 5 × 5 | neck | surgical excision, prednisolone 1 mg/kg/day, radiation therapy | no                  | 6%               | 242              | recurrent | /                    | 31                     |
| Meningraud, J. P. [35]  | 2              | 2007 | Madagascar, Mauritis native | Male         | 29; 25 | 8.5 × 3.5 | head | surgical excision | no                  | /                | /                | 1 recurrent case | /                    | 12; 12                  |
| Shin, S. T. [36]        | 1              | 2007 | /       | Male         | 8                  | /                | head, arm and axillary region | surgical excision, steroid 60 mg/day, cyclosporine-A | no                  | 21%              | > 2000 | recurrent | /                    | 17                     |
| Authors                  | No. of patients | Year | Country | Male/ Female | Age at onset (year) | Size (cm) | Location          | Treatment                                                                                   | Nephrotic Syndrome | Blood eosinophil (%) | Serum IgE (IU/mL) | Recurrence | Reason for recurrence | Follow-up duration (month) |
|-------------------------|----------------|------|---------|-------------|---------------------|-----------|-------------------|---------------------------------------------------------------------------------------------|-------------------|----------------------|------------------|------------|----------------------|--------------------------|
| Wang, D. Y. [37]        | 1              | 2009 | Chinese | Male        | 6                   | 1.5 × 1.5  | neck              | 2 mg/kg/day, azathioprine 1.5 mg/kg/day, prednisolone 25 mg of prednisone                    | yes               | 32.0%                | > 400            | recurrent | /                    | not clear                |
| Soeria-Atmadja, S. [38] | 2              | 2011 | Philippine, Bangladesh | Male 17; 9 | 4 × 5; 2 × 3      | head and neck | surgical excision | prednisolone 1 mg/kg/day, cyclosporine 4 mg/kg/day; prednisolone 2 mg/kg/day, cyclosporine | yes               | 4.4 × 10^9 / L; 8.3 × 10^9 / L | < 5000 kU/L; < 5000 kU/L | recurrent | tapering of prednisolone | 9; not clear             |
| Shahryari, J. [24]      | 1              | 2012 | Iran    | Male        | 45                  | 6 × 4 × 1.5 | head              | surgical excision, prednisone 25 mg/day, CSA 3 mg/kg/day                                  | no                | 23%                  | 100              | recurrent | /                    | not clear                |
| Beccastrini, E. [3]     | 1              | 2013 | Italian | Male        | 40                  | 9 in diameter | trunk, elbow, wrist and hip | prednisone, ciclosporine 1 mg/kg/day, cyclosporine 4 mg/kg/day, prednisolone 2 mg/kg/day, cyclosporine | no                | 1900 /mL             | 1578 KU/L        | recurrent | tapering of CSA | 113                      |
| Wang, Z. [39]           | 1              | 2014 | Chinese | Male        | 53                  | 1.7 × 1.1 × 1.1 | neck              | surgical excision, PTA, Cilostazol 50 mg, Pentoxifylline 400 mg, prednisolone 1 mg/kg/day, Cetirizine 5 mg twice a day | no                | 1.01 × 10^9 / L | 5372             | recurrent | /                    | 68                       |
| Hsu, S. N. [40]         | 1              | 2015 | Chinese | Male        | 33                  | /                     | head, lower extremity (edema) | surgical excision, PTA, Cilostazol 50 mg, Pentoxifylline 400 mg, prednisolone 1 mg/kg/day, Cetirizine 5 mg twice a day | no                | 34 to 51%             | 12,400-17, 200 | recurrent | /                    | not clear                |
| Ye, X. [41]             | 1              | 2015 | Chinese | Male        | 47                  | 5 in diameter  | cervical, subaxillary and inguinal region | prednisone 0.5 mg/kg/day, thalidomide 50 mg/day                                    | no                | 26.11%               | 1081.34          | recurrent | tapering of prednisolone | 36                       |
| Wang, H. [42]           | 1              | 2016 | Chinese | Male        | 72                  | /                     | head              | surgical excision, Chinese herbal remedies, cetirizine hydrochloride and olmesartan 20 mg/day, gamma immunoglobulin 10 g/day for 5 days, intravenous pulse methylprednisolone therapy 500 mg for 3 days, hydroxychloroquine 0.4 g/day, prednisone 50 mg/day, a single dose of intravenous cyclophosphamide 500 mg | yes               | 35%                  | 149,000          | recurrent | /                    | 43                       |
| Matsuo, T.              | 1              | 2017 | Japanese | Male        | 42                  | /                     | head              | surgical excision, Chinese herbal remedies, cetirizine hydrochloride and olmesartan 20 mg/day, gamma immunoglobulin 10 g/day for 5 days, intravenous pulse methylprednisolone therapy 500 mg for 3 days, hydroxychloroquine 0.4 g/day, prednisone 50 mg/day, a single dose of intravenous cyclophosphamide 500 mg | yes               | 9.40%                | 735              | recurrent | tapering of prednisolone | 82                       |
| Authors               | No. of patients | Year | Country | Male/Female | Age at onset (year) | Size (cm) | Location | Treatment | Nephrotic Syndrome | Blood eosinophil (%) | Serum IgE (IU/mL) | Recurrence | Reason for recurrence | Follow-up duration (month) |
|-----------------------|----------------|------|---------|-------------|---------------------|-----------|----------|-----------|---------------------|----------------------|-------------------|-------------|-----------------------|-----------------------|
| [11]                  |                |      |         |             |                     |           |          |           |                     |                      |                   |             |                       |                       |
| Chakraborti, C. [43]  | 1              | 2019 | /       | Female      | 23                  | 2.5 × 2.5 × 1  | head and neck | prednisolone 40 mg/day, cyclosporine 75 mg/day | no                   | 30%                | 262.64      | recurrent            | 2                     |
| Li, X. [44]           | 1              | 2019 | Chinese | Male        | 48                  | 15 × 10 × 3, 5 × 5 × 2, 4 × 3 × 2, 4 × 3 × 1 | head and neck | prednisolone 40 mg | no                   | 0.55%               | 27,100       | recurrent            | 0.5                   |
| Zhang, G. [45]        | 24             | 2020 | /       | 20 Male/4 Female | 5–65               | /          | head and neck | surgical excision, 25 mg prednisone twice daily | no                   | 11 to 51%           | /           | 11 recurrent cases    | 6–113                 |
| Siwei, B.(current)    | 1              | 2020 | Chinese | Male        | 7                   | 5          | thoracic cavity | prednisolone 40 mg/day | no                   | 42%                | 572          | recurrent            | 9                     |

CSA Cyclosporine A, PTA Percutaneous transluminal angioplasty
and IgE were stabilized with 5 mg of prednisolone. Two weeks later, the patient could move his lower extremities in the bed. One month later, he could walk with his mother’s help. At the 6-month follow-up, the patient was symptom-free and did not demonstrate any sign of recurrence (Fig. 1c, d). At the 9-month follow-up, the patient had developed a recurrent mass in the cervical vertebral canal with the tapering of medication. However, the patient refused further treatment, and further information is not available.

Discussion and conclusions
We report the case of a 7-year-old boy who complained of paralysis in both lower extremities who had a dumbbell mass in the postmediastinum after MRI examination. The clinical picture initially indicated a neurogenic tumor. Biopsy and histological examination, however, finally identified Kimura’s disease.

Histopathologically, the mass associated with Kimura’s disease is usually characterized by the formation of multiple lymphoid follicles with prominent germinal centers, many of which are infiltrated by eosinophils. Eosinophilic infiltration is massive, with the formation of eosinophilic abscesses [17, 18]. This feature can distinguish Kimura’s disease from angiolymphoid hyperplasia with eosinophilia (ALHE), in which lymphoid infiltration is more diffuse and lymphoid follicles and eosinophilic abscesses are only occasionally observed [17, 18]. In addition, in contrast to those in patients with ALHE, peripheral blood eosinophil counts and serum IgE levels are markedly elevated in patients with Kimura’s disease, which was also found in our case. Nephrotic syndrome is also a common presentation, occurring in up to 60% of patients [19]; however, it was not observed in our case. Our patient had normal levels of urea and creatinine and normal urinalysis results. Few studies have focused on the immunohistochemical examination of tissues in patients with Kimura’s disease. Birol et al. showed the positive expression of CD68, CD34, leukocyte common antigen (LCA) and S-100 [20]. Sun et al. reported the presence of LCA, vimentin (VIM), CD3, CD45RO, CD20, CD79a, CD31, CD34, F8, c-Kit, and platelet-derived growth factor receptor (PDGFR)-α in Kimura’s disease [21]. However, our results revealed positivity for CD31, Fli and Ki-67 but negativity for CD1a, S-100, and CD34, which were chosen to exclude Langerhans cell granulomatosis [22]. Tumors were considered to originate from Langerhans cells when the neoplastic cells expressed CD1a and S-100 [23].

Therapies for Kimura’s disease include surgical excision, steroids, radiation, and immunosuppressive agents (e.g., cyclosporine). Although they can reduce the size of the lesion and delay disease progression, recurrence is common [24, 25]. In the present case, the patient was treated with a combination of resection of the lesion and oral steroids. Although the patient’s clinical symptoms improved remarkably immediately after the surgery, the patient developed a recurrent mass in the cervical vertebral canal after a 9-month follow-up since the tapering of medication. We planned to prepare for another surgery, radiotherapy, and cyclosporine treatment for the patient, but his parents refused further treatments owing to financial difficulty. Through our search of the PubMed database, we summarized all recurrent Kimura’s cases (Table 1). Notably, there were no neurologic syndrome noted in all the previously published recurrent Kimura’s cases and all the reported reasons for recurrent were tapering of medication.

In conclusion, we reported our experience managing a rare case of Kimura’s disease presenting as a posterior mediastinal dumbbell mass. Although the short-term outcome was good, the patient experienced recurrence at 9 months after surgery. Therefore, additional studies are still warranted to develop an optimal management regimen for rare disease entities.

Abbreviations
VIM: Vimentin; PDGFR: Platelet-derived growth factor receptor; LCA: Leukocyte common antigen; ALHE: Angiolymphoid hyperplasia with eosinophilia; MRI: Magnetic resonance imaging; IgE: Immunoglobulin E

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Authors’ contributions
SB: conception of the work; analysis and interpretation of data; draft of the manuscript. JG: conception of the work; analysis and interpretation of data; draft of the manuscript. CH: design of the work; the acquisition and interpretation of data; substantively revision. All authors have read and approved the manuscript.

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Availability of data and materials
All data supporting the conclusions of this study are included in this published article.

Ethics approval and consent to participate
Informed consent was obtained for publication of this case report and accompanying images.

Consent for publication
Written informed consent was obtained from the patient’s parent or guardian for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor of this journal.

Competing interests
The authors declare that they have no competing interests.
References
1. Kim H, Sztco C. Eosinophilic hyperplastic lymphogranuloma, comparison with Mikulicz's disease. Chin Med J. 1937;23(6):700.
2. Kimura T, Yoshimura S, Ishikawa E. On the unusual granulation combined with hyperplastic changes of lymphatic tissue. Trans Soc Pathol Jpn. 1948; 37(2):179–80.
3. Beccastani E, Emgi G, Chiou M, Di Paolo C, Silvestri EB, Massi D, et al. Kimura's disease: case report of an Italian young man and response to oral cyclosporine A in an 8 years follow-up. Clin Rheumatol. 2013;32(1):55–7.
4. Osuch-Wójcikiewicz E, Brzuzeliezewicz A, Lachowska M, Warselwika A, Niemczyk K. Kimura's disease in a Caucasian female: a very rare case of lymphadenopathy. Case Rep Otolaryngol. 2014;2014:415865.
5. Rush ML, Mauro A, Bhansali P. Kimura disease: a case report of a rare illness associated with membranoproliferative glomerulonephritis. Eur J Dermatol. 2009;19(6):626–8.
6. Lee JH, Kim JH, Lee SU, Kim SC. Orbital mass with features of both Kimura disease and immunoglobulin G4-related disease. Ophthalmic Plast Reconstr Surg. 2018;34(4):e121–3. https://doi.org/10.1097/IOP.0000000000001135.
7. Ting SL, Zuilamaaen M, Than TA. Diagnostic dilemma of kimura disease of the breast - a previously undescribed entity. Breast J. 2016;22(4):545–9. https://doi.org/10.1002/bj.25708.
8. Birol A, Bözoğlu Ó, Keleğ H, Kızıyıldız M, Bagci Y, Kara S, et al. Kimura's disease in a Caucasian male treated with cyclosporine. Int J Dermatol. 2005; 44(12):1059–60.
9. Sun QF, Xu DZ, Pan SH, Ding JG, Xue ZQ, Miao CS, et al. Kimura disease: review of the literature. Intern Med J. 2008;38(8):668–72.
44. Li X, Wang J, Li H, Zhang M. Misdiagnosed recurrent multiple Kimura's disease: a case report and review of the literature. Mol Clin Oncol. 2019;10(3):352–6. https://doi.org/10.3892/mco.2018.1793.

45. Zhang G, Li X, Sun G, Cao Y, Gao N, Qi W. Clinical analysis of Kimura's disease in 24 cases from China. BMC Surg. 2020;20(1):1. https://doi.org/10.1186/s12893-019-0673-7.

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