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Case report

Spinal extranodal Rosai-Dorfman disease: A case report and literature review

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ABSTRACT

Introduction: Spinal extranodal Rosai-Dorfman disease (RDD) is extremely rare. In this paper, we reported successful management of spinal extranodal RDD and reviewed medical literature.

Case presentation: A 19-year-old male presented with progressive bilateral leg weakness and back pain for two months before admission. He denied weight loss, fever, night sweats, and lymph node enlargement. On examination, his muscle strength of both legs was grade I with hyperreflexia. Magnetic resonance imaging of the spine (MRI) showed a thoracic extradural mass at a level of T6-T9, which was a heterogeneous hyperintense on T2W, STIR, and isointense on T1W and enhanced contrast vividly. We resected the tumor totally and decompressed the spinal cord. Pathology revealed a histiocytic tumor. Immunohistochemical staining was S100 (+), CD68 (+), CD45 (+), and CD1a (−). Postoperatively, his muscle strength improved gradually to grade IV after four months. Postoperative MRI of the spine showed no residual tumor. No further adjuvant therapy was indicated.

Clinical discussion: Spinal extranodal RDD has no specific symptoms and pathognomonic imaging features. CT and MRI of the spine are still the essential tools for diagnosing RDD, but biopsy is often mandatory for definitive diagnosis. There have not been consensus guidelines for treating RDD of the spine because of its rarity. Surgical resection remained the mainstay of treatment (78.8%), with or without adjuvant therapies.

Conclusion: Surgery is the treatment of choice for most cases, while steroid therapy, radiotherapy, and chemotherapy should be adjuvant treatment and tailored individually.

1. Introduction

Rosai-Dorfman disease (RDD) is a rare non–Langerhans cell histiocytosis with a prevalence of 1:200,000 and an estimated incidence of 100 cases per year [1]. The majority of cases occurred in children and adolescents and had male predilection [2]. The classical clinical features of RDD are bilateral, massive, and painless cervical lymphadenopathy with or without intermittent fevers, night sweats, and weight loss [3–5]. Extranodal manifestations accounted for 43% of cases in which spinal involvement was reported in roughly 1% of cases [6].

Spinal extranodal Rosai-Dorfman disease has no typical clinical manifestation and imaging features. Indeed, it is usually confused with meningioma, extradural hematoma, and other primary or metastatic tumors. Therefore, histopathological examination is still the necessary diagnostic tool [6,7]. Treatment options include "wait-and-see," surgical resection, steroid therapy, radiotherapy, and chemotherapy. Until now, there has not been a consensus treatment of spinal extranodal Rosai-Dorfman disease. In this paper, we reported successful management of spinal extranodal Rosai-Dorfman disease and reviewed medical literature.

The work has been reported in line with the SCARE criteria [8].

Abbreviations: CT, Computed tomography; MRI, Magnetic resonance imaging; PET/CT, Positron emission tomography/computed tomography; RDD, Rosai-Dorfman disease.

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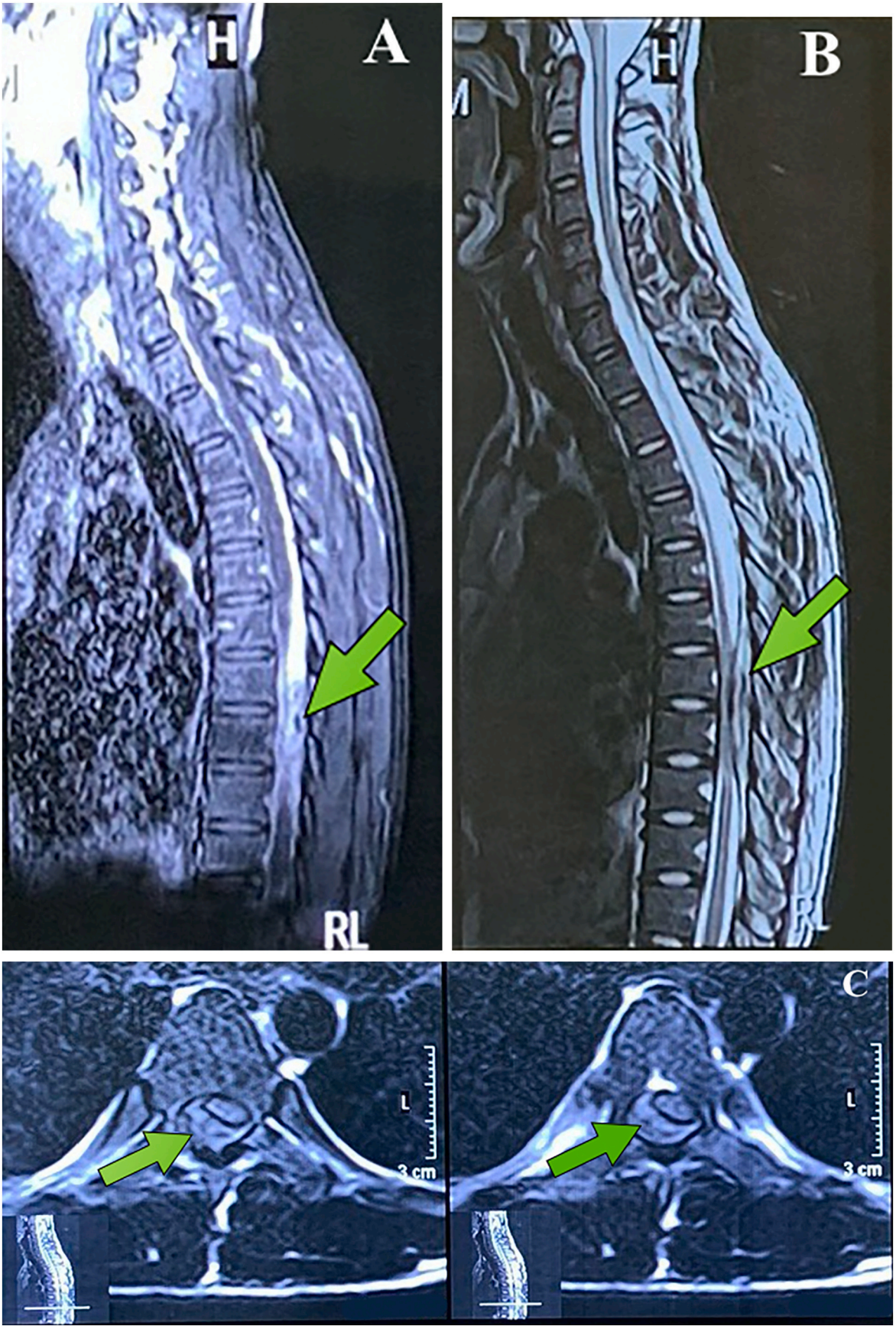

Fig. 1. Magnetic resonance imaging of the spine (MRI) showed the mass (green arrow) was a heterogeneous hyperintense on T2W, STIR, and isointense on T1W and enhanced contrast vividly.

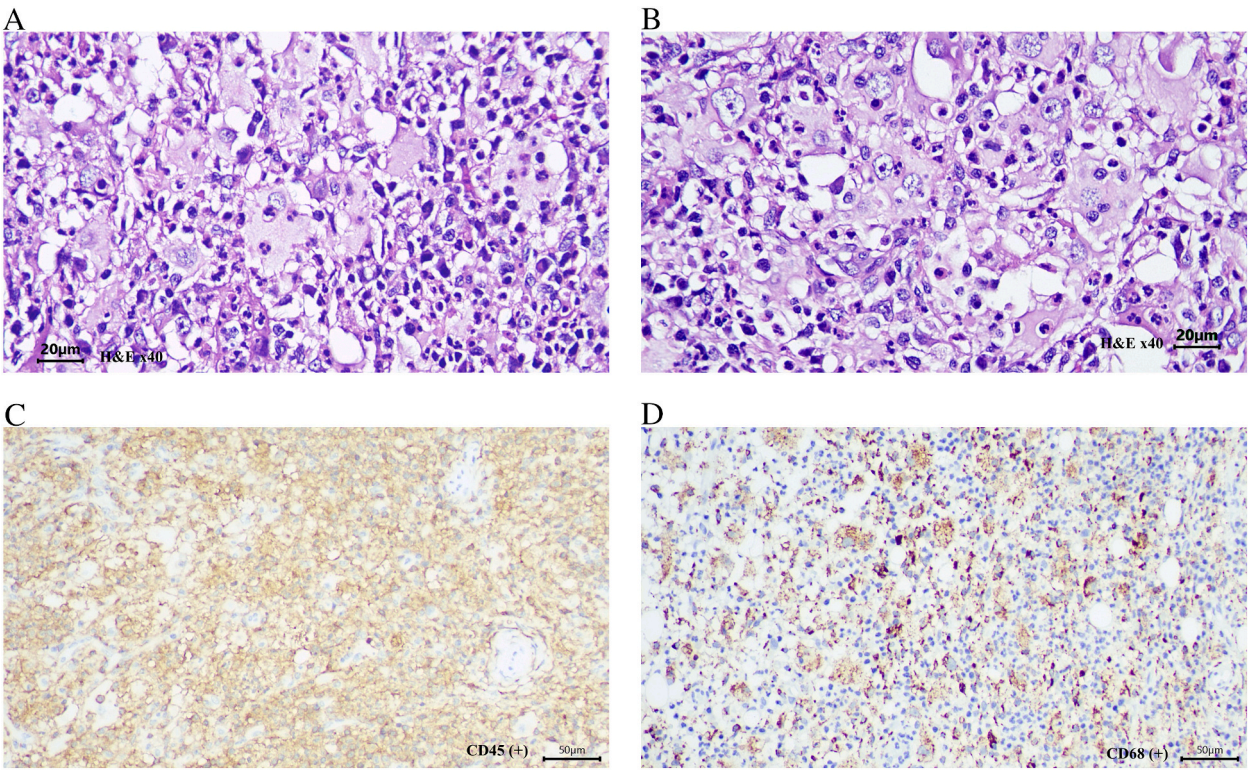

Fig. 2. Immunohistochemical staining of the tumor was S100 (+), CD68 (+), CD45 (+), CD1a (−), CD138 (−) and GFAP (−).

2. Presentation of case

A 19-year-old male with a healthy history was presented with a progressive bilateral leg weakness for two months before admission. He had dull persistent back pain and gradual paralysis of both legs. His numbness was described from the above umbilicus to both legs. He also had urinary retention and constipation. He denied weight loss, fever, night sweats, and lymph node enlargement. On examination, he was alert and oriented. Muscle strength of both legs was grade I. Patellar and ankle reflex was hyperreflexia. His sensation of both legs was decreased. He denied cranial nerve palsies, lymphadenopathy, and sinusitis. Other physical examinations were intact. Magnetic resonance imaging of the spine (MRI) showed an extradural mass, which was heterogeneous hyperintense on T2W, STIR, and isointense on T1W and enhanced contrast vividly. The spinal cord at the level of T6-T9 was compressed and edematous (Fig. 1). Thyroid, and abdomen ultrasound, chest X-rays were normal. Complete blood count, coagulation parameters, and chemistry panels were normal.

The patient was indicated laminectomy and tumor resection. A dose of preoperative prophylaxis antibiotic (cefotaxime 1 g, intravenous injection) was given. Intraoperatively, the extradural tumor measuring 2 × 7 cm was yellowish, fragile, and invaded ligamentum flavum and dura. We extirpated the tumor and decompressed the spinal cord. Immunohistochemical staining of the tumor was S100 (+), CD68 (+), CD45 (+), CD1a (−), CD138 (−) and GFAP (−) (Fig. 2).

After the operation, the patient received antibiotic (cefotaxime 1 g, intravenous injection three times per day), analgesics (acetaminophen 1 g, intravenous administration three times per day and ketorolac 30 mg, intravenous administration twice per day), saline solution (sodium chloride 1000 ml per day) and muscle relaxant (eperison 50 mg, PO three times per day). Postoperatively, the patient had no new neurological deficits. His muscle strength improved gradually to grade III (Frankel grading system) after two months and grade IV after four months. Postoperative MRI of spine showed no residual tumor (Fig. 3). No further adjuvant therapy was indicated. He returned to her daily activities and still was followed up closely.

3. Discussion

3.1. Epidemiology, etiology and natural history

Rosai-Dorfman disease (RDD) was first described in 1965 by a French pathologist, Pierre Paul Louis Lucien Destombes [6]. He documented four children and young adults with lymphadenopathy and sinus histiocytosis. Later, in 1969, based on analyzing 34 similar cases, Juan Rosai and Ronald Dorfman coined the term “sinus histiocytosis with massive lymphadenopathy” [3]. The prevalence of RDD is modest at 1:200,000. Spinal involvement as a sole manifestation of RDD is unique (<1%) [7,9]. In a recent systematic review, Baeesa et al. showed the mean age of spinal RDD was 34.7 years (range, 2.5–78 years) with a male predominance (61%, male-to-female ratio = 2:1) [3]. The thoracic spine segment was the most common involved level (41.7%), followed by the cervical segment (30.6%) and multiple segments (16.7%) [3].

For now, the etiology of RDD remains unclear. Previous studies illustrated that RDD is associated with viral infections, such as human herpes viruses 6, Epstein-Barr virus, parvovirus B19, cytomegalovirus, and HIV [10–12]. Recently, NRAS, KRAS, MAP2K1, and ARAF mutations were shown to occur in patients with RDD.

The natural history of a spinal RDD is still not fully understood because of the rarity of the cases. However, RDD is usually a self-limiting disease with a benign course in general. Indeed, the majority of the case (70%) has a stable and permanent disease. One-fifth of patients showed spontaneous and permanent remission, and a modest 10% experienced progressive and generalized disease, with extranodal RDD having a poorer prognosis than the nodal type [10].

3.2. Diagnosis

Spinal extranodal RDD has no specific symptoms and pathognomonic imaging features. The typical clinical manifestations are back/

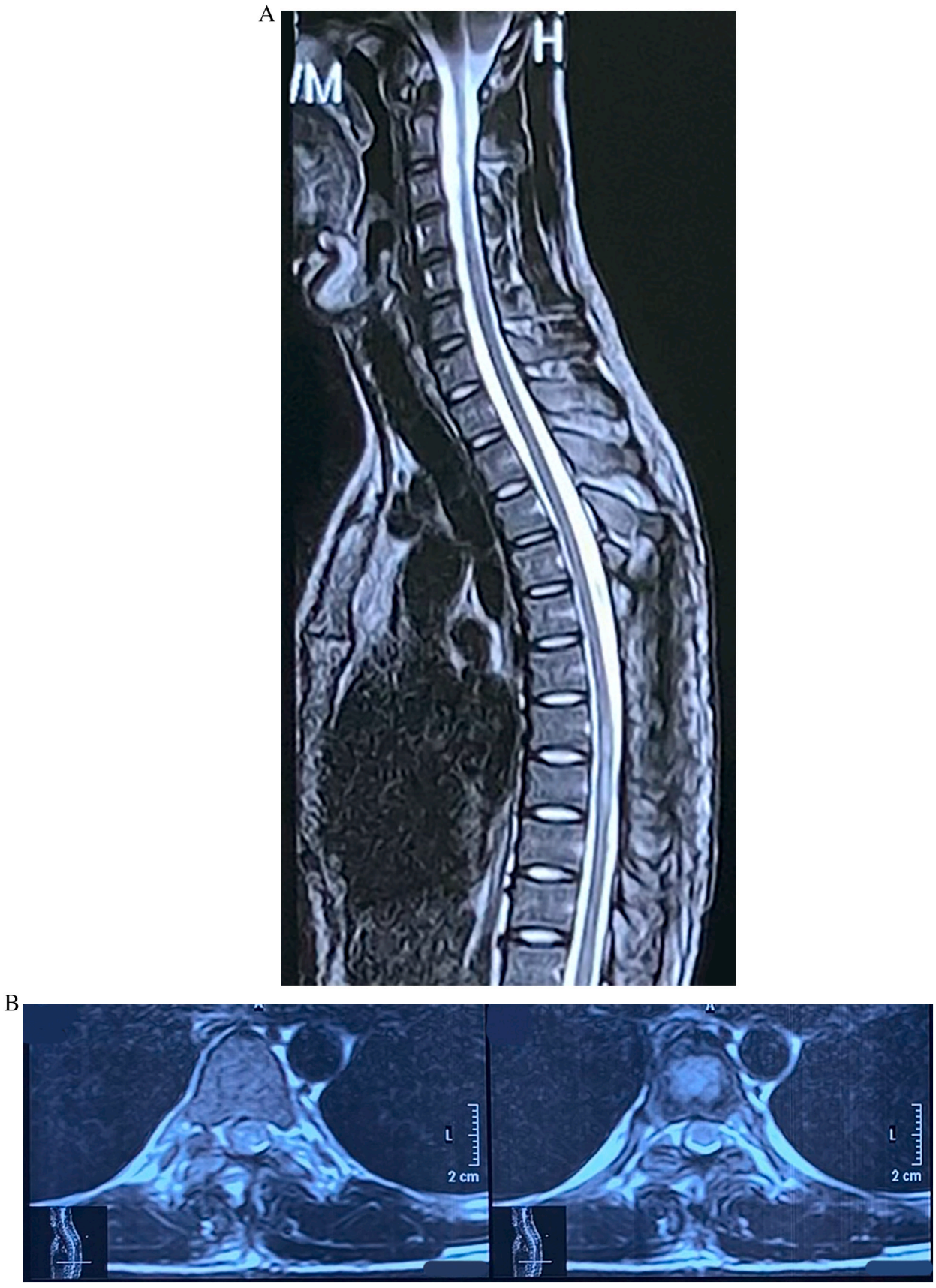

Fig. 3. Postoperative MRI of spine showed no residual tumor.

neck pain, radiculopathy or myelopathy, unstable gait, or cauda equina syndrome due to the compression of the spinal cord. In diagnostic imaging, a high proportion of RDD (62.9%) is dura-based lesions. CT and MRI of the spine are still essential tools for the diagnosis of RDD. But, it is challenging to make a differential diagnosis with other spinal conditions, such as meningioma, lymphoma, metastatic tumors, extradural hematoma, and spinal infections [10]. In the Mayo Clinic histiocytosis working group consensus statement for diagnosing and evaluating adult patients with histiocytic neoplasms, positron emission tomography/computed tomography (PET/CT) is recommended to exclude systemic lesions, especially the involvement of superior lymph nodes [7,13].

It is a fact that biopsy and pathological examination are often mandatory for definitive diagnosis of spinal RDD, even with advanced imaging modalities. On the microscopic image, the hallmark of RDD is emeripolesis, the active penetration of 1 cell by another that remains intact [10]. Immunohistochemical stains of RDD cells are characterized by cytoplasmic and nuclear S100 and fascin positivity, with CD68 and variable CD163 and CD14 positivity, but CD1a is typically negative [6,7].

3.3. Treatment and prognosis

There have not been consensus guidelines for treating Rosai-Dorfman disease of the spine because of its rarity. The treatment options consist of surgery, steroid therapy, radiation therapy, chemotherapy, and even "wait-and-see."

Surgical resection remained the mainstay of treatment (78.8%), with or without adjuvant therapies [13]. The surgery varies from total tumor removal to biopsy only. In 44.2% of cases, complete resection was achieved, while decompressive surgery with or without subtotal resection occurred in 55.8% [13].

Steroid therapy can be used either alone or as an adjuvant treatment of surgery. The basis of steroid therapy is based on exaggerated immunologic dysfunction, which is thought to be the primary pathophysiologic mechanism of RDD [14,15]. Steroid therapy can suspend the progression of the disease or even reduce the tumor size to facilitate total tumor removal. As a result, steroid therapy improves the symptoms [10]. However, the radiologic disappearance of lesions and risk of recurrence after steroid withdrawal are still doubtful. In previous studies, the steroid agents, dose, and duration are controversial. Therefore, the choice of steroid therapy should be tailored case-by-case based on weighing both benefit and harm and modify agents and doses according to the appearance of side effects.

Radiotherapy and chemotherapy are usually used as adjuvant treatments of surgery. Radiotherapy was proved to provide reasonable locoregional control in recurrence and progressive diseases, while chemotherapy was preserved for life-threatening systemic cases [10,13]. The standard radiation dose for spinal RDD has not been reported in the literature. Similarly, chemotherapy regimens were usually prescribed based on personal experience rather than high-level evidence, and its outcome was varied in most patients [13]. Vinblastine, cladribine, etoposide, 6-mercaptopurine plus low-dose methotrexate are the reported chemotherapy agents with mixed results.

In recent systematic reviews, Hu et al. and Baeesa et al. proposed their initial flowcharts for the diagnosis and treatment of spinal RDD. Regarding diagnosis, they emphasized the crucial role of CT and MRI, while PET/CT was only recommended in case of superior lymphadenopathy involvement. Besides, a biopsy is usually required for a definitive diagnosis. Surgery is still the mainstay treatment for symptomatic patients with progressive neurological deficits and refractory local pain. In contrast, observation or conservative treatment with steroid therapy is the treatment of choice for patients without or with mild neurological deficits. Radiotherapy was provided in recurrent cases after surgery, while chemotherapy was restricted in cases of multiple organs involvement or life-threatening systemic conditions [10,13].

4. Conclusion

Spinal extranodal Rosai-Dorfman disease is extremely rare. CT, MRI, and biopsy are the essential tools for definitive diagnosis. Surgery is the treatment of choice for most cases, while steroid therapy, radiotherapy, and chemotherapy should be adjuvant treatments and tailored individually.

Ethical approval

The study was approved by the Research Ethics Committee of Vietnam Military Medical University. The procedures used in this study adhere to the tenets of the Declarations of Helsinki.

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CRediT authorship contribution statement

- **Phuong Xuan Nguyen:** Conceptualization, Methodology, Investigation, Writing - Review & Editing, Data collection, Resources, Supervision
- **Nghi Van Nguyen:** Conceptualization, Methodology, Writing - Original Draft, Writing - Review & Editing, Visualization, Data collection, Resources
- **Tam Duc Le**: Conceptualization, Methodology, Investigation, Writing - Original Draft, Writing - Review & Editing, Visualization, Data collection

Guarantor

Phuong Xuan Nguyen

Research registry

Not applicable – this is a single case report, not a systematic review or meta-analysis. Moreover, we attest that it is not a 'first in man' study, either.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Declaration of competing interest

None.

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Nothing to declare.

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