Original Article

Langerhans-cell histiocytosis of the cervical spine in an adult patient: Case report and review of the literature

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ABSTRACT

Objective: Langerhans-cell histiocytosis (LCH) is a rare, benign bone tumor, usually occurring in children and younger adults under 20 years old. Only a few cases of solitary bone lesions of the adult spine are reported in literature, therapeutic guidelines or treatment regimens for lesions of the adult spine are not established yet to our knowledge.

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The purpose of this work was both the demonstration of the clinical relevance of LCH of the adult spine, as well as to summarize the therapeutic options as described in literature. Furthermore, we present a surgical treatment strategy based on the case of a patient treated for a solitary lesion of the fifth cervical vertebra.

A complete remission of both pain and the neurologic deficit could be achieved with this technique, no reoccurrence of the tumor could be detected until final follow-up.

1. Introduction

Langerhans-cell histiocytosis (LCH) has various manifestations which can clinically be divided into three groups including unifocal, multifocal unisystem, and multifocal multisystem LCH. The most common is the localised form, an often solitary bone lesion that occurs predominantly in children.^{1,5} LCH may either be a self-limiting condition, as observed mainly in children and younger adults, or may lead to local destruction of the bone, which can cause local pain or even neurological deficits if it is localised in the spine.^{16,17} But especially the adult spine is a region where LCH is rarely observed and therefore hardly suspected, a fact which may lead to delayed diagnosis and complicated, challenging treatment.^{11,14}

Therapeutic guidelines or treatment regimens for lesions of the adult spine are not described in current literature to our knowledge. Particularly literature focussing on surgical treatment options for LCH of the spine is rarely available, detailed information or guidelines regarding surgical approaches and techniques in adults seem to be not established as yet.

2. Material and methods

We present a case of a 36-year-old woman who complained about a localised pain in the cervical spine. Initially interpreted as tensions in the neck-shoulder area due to her work as a nurse she has been treated with massages and additional analgetic therapy (NSARD) for 12 weeks. After temporarily good treatment response, the symptoms returned and persisted over 6 weeks, additionally the patient reported on recent intermittently occurring weakness of the left upper extremity and numbness along the dermatome C5 on the left side. In response, further diagnostic imaging (MRI) was performed. Subsequently, the patient visited our department for further diagnosis and treatment. Her case history showed a melanoma in situ on the left lateral thigh which has been removed from healthy tissue 5 years ago. She had undergone regular after-care examinations and had remained free of recurrence until now. Apart from that, she had no medical conditions or further surgery. On physical examination, the patient was afebrile and with stable vital signs. She complained about a progressive left-sided neck pain (VAS 7) which could not be controlled with NSARD and opioid analgetics. A left-sided cervical paravertebral myogelosis could be

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Fig. 1. MRI scan of the cervical spine showed diffuse, contrast-enhanced infiltration of the medullary cavity of the fifth cervical vertebra with an additional osteolytic soft-tissue component on the left side of the vertebra with a maximum diameter of 15 mm.

palpated. On neurologic testing, her left biceps was 4/5 in strength, additionally the biceps reflex was weakened. On sensory examination, she had diminished sensation reaching from the lateral side of the antecubital fossa and forearm to the thumb.

MRI of the cervical spine revealed a diffuse, contrast-enhanced infiltration of the medullary cavity of the fifth cervical vertebra with an additional osteolytic soft-tissue component on the left side of the vertebra with a maximum diameter of 15 millimeters and partial infiltration of the left intervertebral foramen (Fig. 1). In order to improve the assessment of bony destruction a CT was performed additionally. It revealed a lytic lesion of the fifth vertebra, impacting almost the half of the vertebral body, with cortical interruption of the vertebral upper plate and the lateral wall in the sense of a pathologic fracture (Fig. 2). The differential diagnosis included a giant cell tumor, Langerhans cell histiocytosis, chordoma, infection or malignant processes such as primary bone tumors (Ewing sarcoma) or metastasis. To establish the diagnosis, we decided to perform an open biopsy via ventrolateral approach.

3. Results

The histological examination of the biopsy material showed a corticospongiosal bone fragment with signs of bone remodelling and histiocytic cells within the fibrous stroma. The supplementary immunohistochemical examination showed a reaction of the histiocytic cells with CD1a and S100. These findings confirmed the diagnosis of LCH of the fifth cervical vertebra (Fig. 3).

Referred to the diagnosis, a staging-examination was required and performed via PET-CT which delivered inconspicuous results in terms of further lesions apart from the described one in the fifth cervical vertebra. Subsequently, the case and further treatment options were discussed in our multidisciplinary tumor-board. The involved oncologists suggested the intralesional infiltration of corticosteroids and, if appropriate, postinterventional radiotherapy, followed by close follow-up examinations. From surgical point of view, the extension of the defect and the expected risk of instability or aggravating neurological symptoms due to major

Fig. 2. a, b: Axial and coronar CT-scan shows the osteolytic lesion with breakage of the right lateral cortex and the upper plate of C5.

cortical destruction and the huge soft-tissue mass of the tumor as well as the patient's presentation of radiculopathy including motoric and sensory deficits, it seemed to be rather an indication for surgical decompression and stabilisation. The patient was informed about both options of treatment. With regard to her cancer history and the progressive increase of symptoms, she decided on the surgical procedure. So we performed corporectomy and bridging spondylodesis by the use of a titanium cage and plate. First, the removal of the posterior longitudinal ligament was performed via ventral left-sided anterior approach. Then, after corporectomy, an expandable titanium cage was placed into the defect. Stabilization was done via bridging spondylodesis by the use of an anterior plate (T2 Altitude, Medtronic Sofamor Danek, Memphis, TN) (Figs. 4 and 5).

Afterwards, a complete remission of both the motoric and sensible deficit could be observed immediately postoperative, as well as during last follow-up after 9 months. Furthermore, there was no detection of tumor recurrence until last follow-up. Postoperative 6-weeks radiographs (Fig. 4) are comparable to

Fig. 3. a The histological study revealed a piece of corticospangiosa with signs of bone-remodelling. The bone marrow showed histiocytes in fibrous stroma. b The diagnosis of eosinophilic granuloma was confirmed by histochemical (S100 and CD1a positive) studies.

those acquired 9 months after surgery, the implants had maintained in situ.

4. Discussion

Langerhans cell histiocytosis is a rare, non-neoplastic disease of unknown etiology, usually found in patients younger than 20 years. It is characterized by a clonal proliferation of specialized dendritic cells (Langerhans histiocytes).^{2,13,15,18}

Although uncommon especially in adults, LCH may be accompanied by the potential risk of associated complications, depending on location and spread of the lesions. The accumulation of Langerhans-cells in a bone causes the classic lytic bone lesions, which may lead to neurological deficits additionally to the almost always existing local pain if they are localised in the spine.^{3,4,7,8,12} LCH has a predilection for the thoracic spine, followed by the lumbar spine and the cervical spine. In adults, solitary lytic lesions in the cervical spine are rare and seem to have a predilection for the cervical spine.^{6,8–10} They may be associated with spinal deformity or epidural soft-tissue extension.³ In most cases, it involves the vertebral body, the posterior column is rarely affected.¹ Vertebral plana is the typical imaging feature in children and adolescent patients but seldom in adults as it did not occur in our patient. Neurologic deficits seem to be more frequent in adult patients.⁸

Although there are several treatment strategies for LCH described in the current literature, a standard treatment pathway seems not to be defined clearly. Therapeutic options for solitary lesions of the spine are dependent on location, symptoms and the presence or absence of neurological malfunction and range from

Fig. 4. a, b: Anterior cervical cage and – plate following corpectomy of the fifth cervical vertebra. Plain lateral and antero-posterior radiography six weeks postoperatively.

clinical/radiological monitoring to cervical or lumbar orthoses, CT-navigated intralesional infiltration of corticosteroids, surgical curettage and bone grafting, or even radical surgical options such as the resection of the affected bone.^{3,14} Conservative treatment

Fig. 5. Intraoperative situs following corpectomy and implantation of an expandable titanium cage.

options, such as observation, bracing or immobilization seem to have a positive impact on the outcome especially in paediatric patients without neurologic deficit. Furthermore, LCH is often observed to be a self-limited disease in children.^{6,10}

Monalti et al. reported on a quick recovery from pain in two patients treated with corticosteroid infiltrations for solitary EG of the spine, however, postinterventional imaging did not correspond to clinical features in those patients. CT scans revealed a decreased size of the lesion in one and no reduction or changes in shape of the vertebral lesion in the other patient.¹⁴ However, data regarding reoccurrence-rates following any kind of conservative treatment options for LCH do not exist to our knowledge.

Indications for radical surgical procedures on the other hand have not been clearly defined nor do exist defined guidelines for practical application as well. Furthermore, the natural history of the disease is still uncertain, especially in adults. Therefore, and in conjunction with the presence of radiculopathy including motoric and sensory deficits and the radiological findings of a tumor-induced pathologic fracture and soft tissue extension we decided on a radical surgical procedure in our patient. A corpectomy of C5 was performed, the defect was reconstructed by the use of a titanium cage and an anterior plate.

5. Conclusion

We believe that our technique of corpectomy, cage implantation and plating via direct, anterior approach to the cervical vertebrae may be an effective method to relieve pain and obtain stability and function especially for lesions of the cervical spine with major cortical bone destruction and related neurologic deficit. Given the fact, that these findings are based on a single case, further investigations with more rigorous study designs will be

necessary to establish generally accepted indications and practices for surgical treatment of LCH of the adult cervical spine.

Conflict of interest

The authors have none to declare.

Informed consent statements

The presented patient gave her informed consent prior to her inclusion in the study.

References

1. Azouz EM, Saigal G, Rodriguez MM, Podda A. Langerhans' cell histiocytosis: pathology, imaging and treatment of skeletal involvement. *Pediatr Radiol*. 2005;35:103–111.
2. Bollini G, Jouve JL, Gentet JC, et al. Bone lesions in histiocytosis X. *J Pediatr Orthop*. 1991;11:469–477.
3. Cantu MA, Lupo PJ, Bilgi M, Hicks MJ, Allen CE, McClain KL. Optimal Therapy for Adults with Langerhans Cell Histiocytosis Bone Lesions. *PLoS One*. 2016;7(8): e4325710.1371/journal.pone.0043257.
4. Capanna R, Springfield DS, Ruggieri P, et al. Direct cortisone injection in eosinophilic granuloma of bone: a preliminary report on 11 patients. *J Pediatr Orthop*. 1985;5:339–342.
5. Cotran Ramzi, Kumar Vinay, Abbas Abul, Fausto Nelson, Robbins Stanley. *Robbins and Cotran Pathologic Basis of Disease*. Mo: Elsevier Saunders; St. Louis; 2005:701.
6. Denaro L, Longo UG, Papalia R, Di Martino A, Maffulli N, Denaro V. Eosinophilic granuloma of the pediatric cervical spine. *Spine*. 2008;33:936–941.
7. Egeler RM, Thompson RC, Voute PA, Nesbit ME. Intralesional infiltration of corticosteroid in localized Langerhans' cell histiocytosis. *J Pediatr Orthop*. 1992;12:811–814.
8. Huang WD, Yang XH, Wu ZP, et al. Langerhans cell histiocytosis of spine: a comparative study of clinical, imaging features, and diagnosis in children, adolescents, and adults. *Spine J*. 2013;9:1108–1117.
9. Khung S, Budzik JF, Amzallag-Bellenger E, et al. Skeletal involvement in Langerhans cell histiocytosis. *Insights Imaging*. 2013;4:569–579.
10. Levine SE, Dormans JP, Meyer JS, Corcoran TA. Langerhans' cell histiocytosis of the spine in children. *Clin Orthop Relat Res*. 1996;323:288–293.
11. Lü GH, Li J, Wang XB, Wang B, Phan K. Surgical treatment based on pedicle screw instrumentation for thoracic or lumbar spinal Langerhans cell histiocytosis complicated with neurologic deficit in children. *Spine J*. 2014;14:768–776.
12. McClain KL, Allen CE. Inflammatory and malignant histiocytosis. *Hematology*. New York: McGraw Hill Medical. 2010;1047–1064.
13. Mesfin A, Buchowski JM, Mehrad M, Xu J. Neck pain in a 27-year-old man. *Clin Orthop Relat Res*. 2013;471:1763–1768.
14. Montalti M, Amendola L. Solitary eosinophilic granuloma of the adult lumbar spine. *Eur Spine J*. 2012;21(4):441–S444.
15. Puigdevall M, Bosio S, Hokama J, Maenza R. Langerhans cell histiocytosis of the atlas in the pediatric spine: total reconstitution of the bone lesion after nonoperative treatment. A report of two cases. *J Bone Joint Surg Am*. 2008;90(9):1994–1997.
16. Simanskia C, Bouillona B, Brockmann M, Tilinga T. The Langerhans' cell histiocytosis (eosinophilic granuloma) of the cervical spine: a rare diagnosis of cervical pain. *Magn Reson Imaging*. 2004;22:589–594.
17. Sivendran S, Harvey H, Lipton A, Drabick J. Treatment of Langerhans cell histiocytosis bone lesions with zoledronic acid: a case series. *Int J Hematol*. 2011;93(6):782–786.
18. Stull MA, Kransdorf MJ, Devaney KO. Langerhans cell histiocytosis of bone. *Radiographics*. 1992;12:801–823.