CASE REPORT

Vertebra collapse due to primary amyloidosis causing neurological compromise

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SUMMARY

In primary amyloidosis (AL), a fibrillar protein (amyloid light chain) is deposited in many organs; however, it is rare to have involvement of the vertebral bodies. Multiple myeloma is a well-known systemic amyloid disease that frequently has vertebral involvement. However, the pathology of vertebral involvement of these two clinical entities differs significantly. We report a patient with L4 vertebral collapse because of primary AL, causing neurological compromise that improved with surgical treatment. Deposition of amyloid and following demineralisation caused the vertebral collapse. Primary AL needs to be taken into consideration as a cause of pathological vertebral fracture.

BACKGROUND

In primary amyloidosis (AL), a fibrillar protein (amyloid light chain) is deposited in many organs; however, it is rare to have involvement of the vertebral bodies. Multiple myeloma is a well-known systemic amyloid disease that frequently has vertebral involvement. However, the pathology of vertebral involvement of these two clinical entities differs significantly.

CASE PRESENTATION

A 58-year-old man presented with low back pain in the absence of a specific accident. He consulted an

orthopaedic clinic, where x-rays of his lumbar spine were taken. He was diagnosed with compression fracture of L4, for which he received brace treatment. However, the patient's L4 continued to collapse causing weakness of his right quadriceps because of invasion of the spinal canal. He was admitted for detailed diagnostic testing.

INVESTIGATIONS

Diagnostic testing results revealed weight loss, hepatomegaly and proteinuria of 1.5 g/day; however, monoclonal gammopathy was not identified either in urine and serum. MRI of the lumbar spine performed soon after admission showed collapse of the L4 vertebrae with compression of the spinal canal by the displaced vertebral posterior wall (figure 1A,B). The anterior superior edge of S1 was also collapsed. Gadolinium enhancement did not show staining of the area. Isotope bone scanning showed uptake in T5, L4 and the pelvis (figure 1C). A biopsy of the L4 vertebral body under light microscopy identified eosinophilic amorphous material that shows positivity in Congo red staining (figure 2A); however, plasmacytoma or obvious osteolytic change was not identified. Based on these findings, no definitive diagnosis could be made at that point. Surgical intervention was subsequently required because of further weakening of the right

Figure 1 (A, B) Sagittal MRI of the lumbar spine showing the collapse of L4 vertebrae with compression of the spinal canal owing to the displaced vertebral posterior wall (A: T1-weighted image, B: T2-weighted image). The anterior superior edge of S1 is also collapsed. (C) Isotope bone scan showing uptake in T5, L4, S1 and the pelvis.

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Figure 2 (A) Microscopic picture of L4 showing amyloid deposition with Congo red staining. (B) Immunohistochemical staining showing AL amyloid deposits (κ chain).

quadriceps; this entailed the posterior decompression and fusion of L3–5 (figure 3A,B). An autograft was taken from the iliac crest and part of it was sent to the pathological evaluation. Pathological analysis of the bone marrow showed slightly increased number of plasma cells (5% of nucleated cell in the bone marrow). Immunohistochemical staining showed AL amyloid deposits (κ chain) (figure 2B). Based on the patient symptoms of hepatomegaly, weight loss and proteinuria, and the histological findings, this patient was diagnosed with primary AL.

DIFFERENTIAL DIAGNOSIS

Multiple myeloma is a well-known systemic amyloid disease that frequently has vertebral involvement. Amyloid fibril has been identified in association with the variable region of the immunoglobulin light chain in both primary AL and AL complicating multiple myeloma¹; however, despite this similarity in the molecular structure of amyloid, the pathology of vertebral involvement of these two clinical entities differs significantly. Vertebral involvement in multiple myeloma is resulting from increased osteoclastic activity causing bone resorption and inhibition of osteoblastic bone formation, leading to focal lytic

lesions and pathological fractures. In contrast, vertebral involvement in primary AL is resulting from diffuse generalised demineralisation because of amyloid deposits.¹ In this case deposition of amyloid and following demineralisation caused the vertebral collapse.

TREATMENT

Posterior decompression and instrumented fusion of L3–5 was performed (figure 3A,B).

OUTCOME AND FOLLOW-UP

His muscle weakness improved after surgery, and he underwent autologous stem cell transplantation treatment 2 months after surgery. At two and a half years after surgery, and despite additional compression fractures at L1 and L3, the patient could walk with the aid of a cane.

DISCUSSION

Primary AL is a rare disease with an estimated age-adjusted incidence of 5.1–12.8 cases per million person-years.² It is a systemic disease involving mainly the heart, tongue,

Figure 3 Postoperative lumbar x-ray showing an L3–5 posterior instrumented fusion with decompression (A: anteroposterior, B: Lateral).

gastrointestinal tract, peripheral nerves and skin with gross bone involvement a rare finding.^{1–3} It most commonly presents with non-specific fatigue and weight loss, which were seen in this patient.⁴ Symptoms referable to congestive heart failure (17%), nephrotic syndrome (28%) or malabsorption (5%) are all relatively common.⁵ Hepatomegaly is found in 25–30% of patients and macroglossia in about 10%.⁵ Vertebral involvement in primary AL is rare.⁶ A diagnosis of primary AL requires the histological demonstration of AL amyloid deposits, which is stained positively with Congo red.⁷ Blood counts are normal in the vast majority of patients.¹

Diagnosing vertebral involvement of amyloid deposits by primary AL by imaging is not straightforward. Plain radiographs show no specific diagnostic features if not collapsed⁸ while MRI demonstrates no specific feature that might differentiate amyloid infiltration from other causes of vertebral collapse such as tumour or osteoporotic fracture.⁶ Isotope bone scan shows increased uptake in primary AL and have also identified some, although not all, of the fractures or pathological regions seen on radiographs.^{1–6–9} In the present case, bone scanning revealed uptake in T5, L4, S1 vertebrae and the pelvis; in contrast, uptake was shown in L1, but not in L3 or in the lucent areas in the pelvis of Brzeski's case.⁶

Untreated patients with primary AL have a median survival of 10–14 months from the time of diagnosis.⁵ Extrahepatic manifestations, such as nephritic syndrome and congestive heart failure, reduce the median survival time to 9 months, with congestive heart failure and renal failure listed as the most common causes of death.⁵ Pathophysiology shared by primary AL and multiple myeloma has provided the rationale for chemotherapy treatment for primary patients with AL, which made median survival in primary AL approximately 18 months.¹⁰ Dispenzieri *et al*¹¹ reported that autologous stem cell transplantation increased overall survival in selected patients compared to rates with standard chemotherapy. In addition, the quality of life (QOL) data using a quantitative and well validated instrument shows that treatment with high-dose melphalan followed by an autotransplant improves QOL in nearly half the patients who survive 1 year after treatment.¹² In fact, our case was performed with chemotherapy and autologous stem cell transplantation after the surgical intervention and had been in good health condition for two and half years since the first manifestation of compression fracture. Thus, median survival is getting longer with an advent of new treatment and definitive treatment is necessary for the vertebral collapse.

Contributors KN and TT took care of the patient. MY assessed histology. HY wrote the manuscript. All authors contributed to the revisions of the text and approved the final version of this manuscript.

Competing interests None.

Patient consent Obtained.

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Learning points

- ▶ Primary AL can cause pathological vertebral fracture.
- ▶ Vertebral involvement in primary AL is resulting from diffuse generalised demineralisation because of amyloid deposits.
- ▶ In contrast, vertebral involvement in multiple myeloma is resulting from increased osteoclastic activity causing bone resorption and inhibition of osteoblastic bone formation, leading to focal lytic lesions and pathological fractures.
- ▶ Detailed examination with the haematology department is necessary to make a definite diagnosis.

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