Denis Mulleman
René-Marc Flipo
Richard Assaker
Claude-Alain Maurage
Patrick Chastanet
Vincent Ducoulombier
Xavier Deprez
Bernard Duquesnoy

Primary amyloidoma of the axis and acute spinal cord compression: a case report

Received: 7 November 2002
Revised: 11 April 2003
Accepted: 13 June 2003
Published online: 16 March 2004
© Springer-Verlag 2004

D. Mulleman (✉) · R.-M. Flipo
V. Ducoulombier · B. Duquesnoy
Department of Rheumatology,
Lille Teaching Hospital,
Hôpital Roger Salengro,
2 Avenue Oscar Lambret,
59037 Lille, France
Tel.: +33-3-20446120,
Fax: +33-3-20446110,
e-mail: d.mulleman@chu-tours.fr

R. Assaker
Department of Neurological Surgery,
Lille Teaching Hospital, Lille, France

C.-A. Maurage
Department of Pathology,
Lille Teaching Hospital, Lille, France

P. Chastanet
Department of Radiology,
Lille Teaching Hospital, Lille, France

X. Deprez
Department of Rheumatology,
Valenciennes General Hospital,
Valenciennes, France

Present address:
D. Mulleman
Department of Rheumatology,
Hôpital Trousseau, 37044 Tours, France

Abstract *Background.* Localized primary amyloidosis is a disease characterized by a single tumor and localized amyloid deposit (amyloidoma) with no evidence of generalized amyloidosis. The occurrence of an amyloidoma in the spine is rare and only three cases affecting the axis have been previously reported. We describe the case of a 79-year-old woman presenting with a mass involving the odontoid process, responsible for an acute tetraparesia. Diagnosis of local primary amyloidosis was made after surgical excision.

Results. Despite the critical presentation, outcome was excellent after total excision of the mass. This case can be classified as a primary localized amyloidoma. The patient did not exhibit any infection, tumor or inflammatory disease, and continued investigations failed to demonstrate other amyloid deposit after one-year follow-up.

Conclusions. Amyloidoma must be discussed in presence of a tumor-like mass of the odontoid process and may be responsible, as in our case, for spinal cord compression.

Keywords Primary amyloidoma · Spinal cord compression · Axis

Introduction

The generalized and localized amyloidoses are a group of diseases characterized by an extracellular deposition of β -pleated proteins. Amyloidosis is classified according to the biochemical type of deposit, which in turn may influence the geographic pattern of deposition [7].

An increasing number of case reports have revealed the possible occurrence of spine compression due to amyloid deposit. This can be separated into two different situations. First, the generalized amyloidosis, in which the spine is involved in a patient presenting with a predisposing disease (multiple myeloma, chronic inflammation, infectious diseases or renal insufficiency); second, the localized amyloid deposit (primary amyloidoma), which is

Fig. 3 Radiographically guided biopsy of the mass performed under general anesthesia

compact osseous tissue included in an eosinophilic hyaline matrix on hematoxylin–erythrosin–safran (HES) staining. The osteocartilaginous remnants were focally necrotic (Fig. 5a). The matrix was stained with Congo red dye and appeared birefringent under polarized light, consistent with amyloid deposition (Fig. 5b). No microorganisms were identified on HES, PAS or Ziehl–Nielsen staining. Lowenstein–Jensen cultures were negative. Immunostaining was negative for κ and λ immunoglobulin light chains but slightly positive for prealbumin/transthyretin.

In order to disclose a primary disease, further investigations including salivary gland, subcutaneous fat tissue and rectal biopsies were performed. None of them displayed amyloid deposits. Rheumatoid factor was negative. Chondrocalcinosis and pathologic destructive lesions were absent on X-rays focused on wrists and hands.

Tetraparesia and sphincter hypotonia were successfully treated by surgery. After a course of rehabilitation, the patient's neurological function improved remarkably and she returned home able to walk without aid. After careful follow-up for 1 year, the patient did not exhibit any infection, tumor or inflammatory disease and her neurological state remained stable.

Discussion

Several diagnoses should be discussed in patients with the presence of a tumor-like periodontoid process. Inflammatory diseases, bone soft tissue metastasis or plasmocytoma [23] and pyogenic or tuberculosis abscesses [24] are the most frequent causes. Primary tumors, e.g. osteoblastoma and osteosarcoma, rarely present in this fashion [16, 26].

Imaging of such tumor-like mass may be characteristic of inflammatory diseases. Calcified tissue surrounding the odontoid process (crowned dens) indicates pyrophosphate

Fig. 4 **a** Fragmented cartilaginous tissue included in an eosinophilic hyaline matrix on HES coloration ($\times 200$); **b** Congo red stain under polarized light demonstrating birefringence in tissue material consistent with the diagnosis of amyloidoma ($\times 100$)

Fig. 5 Postoperative picture

Table 1 Characteristics of odontoid process amyloidoma (*HES* hematoxylin–erythrosin–safran, *CR* Congo red, *I* immunological staining, *NA* not available)

Author	Age (years)/sex	Duration of symptoms	Image scanning	IRM	Macroscopic aspect	Histology		Outcome
						HES	CR I	
Dickman 1988	74/M	1 month	Destruction of C2; extension to soft tissue; central lucency; bubbly appearance of cortical shell	NA	Waxy	NA	+	Radicular pain lessened myocardial infarction 3 months later
Porchet 1998	73/M	6 years	Enhancing mass eroding base of odontoid with displacement of spinal cord	T1 isosignal; peripheral enhancement	Cheesy with cortical shell	Amorphous acellular eosinophilic	+	β-Amyloid
Moonis 1999	79/M	2 months	Periodontoid soft tissue mass; compression of upper cervical cord; no bony involvement	T1 and T2 isosignal with minimal gadolinium enhancement	Yellowish white	NA	+	β ₂ -Micro globulin
Personal case 2002	79/F	1 year	Tumor-like mass behind odontoid process; osseous erosion	T2 hyposignal and T1 isosignal; peripheral enhancement after gadolinium	Gelatinous; yellowish	Eosinophilic hyaline matrix	+	Prealbumin
								Able to walk at home after 9 months

dehydrated deposition (PPDD) disease [29], whereas inflammatory mass intensively enhanced by gadolinium injection is suggestive of rheumatoid arthritis (pannus) [20]. Spinal location of tophaceous gout is rare and appears dense on a CT scan [10].

In our patient, pain and neurological abnormalities were not influenced by intravenous glucocorticoid, which may be effective for patients with rheumatoid pannus or PPDD disease. For technical reasons, biopsy under radiographic control failed to specify the diagnosis because the specimen was too superficial. Given the patient's tetraparesis, removal of the tumor was performed using the trans-oral route, leading to the diagnosis of amyloid deposit.

Among the wide range of amyloidosis, the main types of abnormally folded proteins are κ and λ light chains (SAL), serum amyloid A (SAA), β_2 -microglobulin and prealbumin or transthyretin. SAL refers to B cell or plasma cell dyscrasia (primary amyloidosis) and occurs in patients with chronic inflammation (secondary amyloidosis), β_2 -microglobulin occurs in patients with renal failure, and prealbumin is related to senile amyloidosis. In our patient, there was no evidence of myeloma, infectious diseases or renal insufficiency. There was probably neither history of symmetrical swelling and stiffness of hands and wrists nor radiographic cartilage destruction or rheumatoid factors in serum.

The spine may be involved in generalized amyloidosis. Spinal cord compression may then result, as in our case. Likewise, patients receiving long-term hemodialysis are prone to develop pseudo-tumors of the cranio-vertebral junction – particularly those who have been treated for more than 10 years [9, 25].

There are a number of reports describing primary amyloidoma of the spine [1, 2, 3, 4, 5, 6, 8, 11, 12, 14, 15, 17, 18, 19, 21, 23, 28] but, to our knowledge, only four cases of primary upper cervical spine amyloidoma (including ours) have been reported (Table 1). The duration of symptoms may be extremely long (up to 6 years) but clinical deterioration may be rapid and severe. It appears that primary axis amyloidoma occurs in elderly people (73- to 79-year-old) [5, 15, 21] and may occasionally be associated with CTS [15, 21]. The fact that CTS is frequently associated with amyloidosis raises the question of whether or not generalized amyloidosis may be responsible of symptoms restricted to the carpal tunnel and the axis. Imaging and histological aspects are relatively similar among previously reported cases (Table 1).

Our patient was diagnosed as having polymyalgia rheumatica. Salvarani et al. have reported four cases of primary amyloidosis presenting with symptoms mimicking polymyalgia rheumatica, supporting the relationship between the two diseases. Because amyloidosis was primary and localized in our case, this association is probably coincidental [27].

As in other cases of spinal amyloidoma, resection of the mass, completed by stabilization when required, resulted in an excellent outcome. This is in accordance with the other reports of primary axis amyloidoma (Table 1).

To conclude, axis isolated amyloidoma may involve the spine and be responsible for acute tetraparesis. It is important to bear this diagnosis in mind in a patient with a tumor-like mass of the upper cervical spine. Surgical excision is required for treatment and often for diagnosis. Outcome seems to be excellent, as other cases have reported. Elderly patients are probably more likely to be af-

ected by primary amyloidoma, and CTS may also be linked to amyloid deposit.

Acknowledgements The authors thank Jean-Pierre Delattre and Gerard Espouy from the ICARE University of Medicine, Lille for their technical support and Dr Philippe Hainaut for kindly reviewing the manuscript.

References

- Bauer WH, Kuzma JF (1949) Solitary "tumors" of atypical amyloid (paramyloid). *Am J Clin Pathol* 19:1047–1112
- Bruninx G, Nubourgh Y, Cornut P et al. (2001) Amyloïdome solitaire idiopathique du sacrum. Un diagnostic différentiel important. *J Radiol* 82:495–497
- Cloft HJ, Quint DJ, Markert JM et al. (1995) Primary osseous amyloidoma causing spinal cord compression. *AJNR Am J Neuroradiol* 16:1152–1154
- Dee CH, Missirian RJ, Chernoff IJ (1998) Primary amyloidoma of the spine. A case report and review of the literature. *Spine* 23:497–500
- Dickman CA, Sonntag VKH, Johnson P et al. (1988) Amyloidoma of the cervical spine: a case report. *Neurosurgery* 22:419–422
- Griffin M, Parai M, Fernandez D et al. (1995) Amyloid tumor of the sacrum. A case report. *Acta Cytol* 39:503–506
- Husby G (1993) Nomenclature of amyloid and amyloidosis. WHO-IUIS Nomenclature Sub-Committee. *Bull World Health Organ* 71:105–112
- Hwang SS, Park YH, Kim JY et al. (2000) Primary amyloidoma of the cervical spine. *AJNR Am J Neuroradiol* 21:601–603
- Itio M, Abumi K, Takeda N et al. (1998) Pathologic features of spinal disorders in patients treated with long-term hemodialysis. *Spine* 23:2127–2133
- Jacobs SR, Edeiken J, Rubin B et al. (1985) Medically reversible quadriplegia in tophaceous gout. *Arch Phys Med Rehabil* 66:188–190
- Leeson MC, Rehtine GR, Makley JT et al. (1985) Primary amyloidoma of the spine: A case report and review of the literature. *Spine* 10:303–306
- Mandl J (1924) Ueberlokales Amyloid im Bereiche der Brustwirbelsäule. *Virchows Arch (A)* 253:639–655
- McAnena OJ, Feely MP, Kealy WF (1982) Spinal cord compression by amyloid tissue. *J Neurol Neurosurg Psychiatry* 45:1067–1069
- Mizuno J, Nakagawa H, Tsuji Y et al. (2001) Primary amyloidoma of the thoracic spine presenting with acute paraplegia. *Surg Neurol* 55:378–382
- Moonis G, Savolaine ER, Anvar SA et al. (1999) MRI findings of isolated Beta-2 microglobulin amyloidosis presenting as a cervical spine mass. Case report and review of the literature. *Clin Imaging* 23:11–14
- Mori Y, Takayasu M, Saito K et al. (1998) Benign osteoblastoma of the odontoid process of the axis: a case report. *Surg Neurol* 49:274–277
- Mullins KJ, Meyers SP, Kazee AM et al. (1997) Primary solitary amyloidosis of the spine: a case report and review of the literature. *Surg Neurol* 48:405–408
- Parker JR, Powell S, Chevez-Barrios P et al. (2001) Aspiration biopsy findings in amyloid tumor of the cervical vertebra. A case report. *Acta Cytol* 45:399–403
- Pawar S, Kay CJ, Anderson HH et al. (1982) Primary amyloidoma of the spine. *J Comput Assist Tomogr* 6:1175–1177
- Pettersson H, Larsson EM, Holtas S et al. (1988) MR imaging of the cervical spine in rheumatoid arthritis. *AJNR Am J Neuroradiol* 9:573–577
- Porchet F, Sonntag VKH, Vrodos N (1998) Cervical amyloidoma of C2. Case report and review of the literature. *Spine* 23:133–138
- Prasad BK, Andrews K, Dutton J et al. (1981) Localised amyloid deposit producing paraplegia. *Br Med J (Clin Res Ed)* 283:1087
- Prasad VS, Raju BS, Sundaram C (1998) Plasmacytoma of dens as a cause of atlanto-axial instability. *Spinal Cord* 36:661–663
- Resnick D (1988) Osteomyelitis, septic arthritis, and soft tissue infection. In: Resnick D, Niwinmayam G (eds) *Diagnosis of bone and joint disorders*, 2nd ed, Saunders, Philadelphia, p 2673
- Rousselin B, Helenon O, Zingraff J et al. (1990) Pseudotumor of the cranio-cervical junction during long-term hemodialysis. *Arthritis Rheum* 33:1567–1573
- Sar C, Eralp L (2001) Transoral resection and reconstruction for primary osteogenic sarcoma of the second cervical vertebra. *Spine* 26:1936–1941
- Savarani C, Gabriel SE, Gertz MA et al. (1994) Primary systemic amyloidosis presenting as giant cell arteritis and polymyalgia rheumatica. *Arthritis Rheum* 37:1621–1626
- Villarejo F, Pérez Diaz C, Perla C et al. (1994) Spinal cord compression by amyloid deposits. *Spine* 19:1178–1181
- Zunkeler B, Schelper R, Menezes AH (1996) Periodontoid calcium pyrophosphate dihydrate deposition disease: "pseudogout" mass lesions of the cranio-cervical junction. *J Neurosurg* 85:803–809