Journal of IMAB - *Annual Proceeding (Scientific Papers)* 2007, vol. 13, book 2

AMYLOID ARTHROPATHY IN HAEMODIALYSIS PATIENTS – RADIOLOGICAL FINDINGS

Silvia B. Tsvetkova[1], B. Blagov[2], A. Batalov[3]
1) Department of Radiology, Department of Dental Medicine
2) Nephrology, Haemodialysis clinic,
3) Department of Rheumatology,
Medical University, Plovdiv, Bulgaria

SUMMARY

Dialysis-related amyliod arthropathy is an osteoarticular condition, that is due to amyloid beta-2-microglobulin deposits in the bones and joints of patients on long-term haemodialysis treatment. The radiological findings of amyloid arthropathy have been studied in 32 patients receiving haemodialysis for more than 5 years. Plain radiographs of hands, knees, shoulder, pelvis and spine revealed cystic lesions in 11 patients (34,38%) , the distribution being: 72,73 % shoulder, 54,55% carpal bones, 27,27% pelvis, 18,18% femur and 18,18% knees.Discitis was found in 12 patients (36,36%). The study focuses on the radiographic appearance and the high incidence of these lesions as a complication of long-term haemodialysis and discusses the differential diagnosis of the lesions in other pathological conditions.

Key words: amyliod arthropathy, haemodialysis, dialysis-related amyloidosis

INTRODUCTION

Patients with chronic renal failure and maintenance haemodialysis treatment often present an osteoarticular pathology that is called renal osteodystrophy. This pathology includes signs of secondary hyperparathyroidism, osteoporosis, osteosclerosis and osteomalacia (2). Besides this another osteoarticular condition is described and it is called dialysis-related amyliod arthropathy. This condition is due to amyloid beta-2-microglobulin deposits in the bones and joints of patients on long-term haemodialysis treatment (1, 3). Beta 2-microglobulin ($Я_2$M) was first described by Gejyo G., et al (4) in 1985 and it is the main component in dialysis-associated arthropathy. $Я_2$M is a glycosylated polypeptide that is present on the surface of most nucleated cells and in most biologic fluids, including urine and synovial fluid. In the normally functioning kidney the substance is filtered by the glomerulus and catabolized by the proximal tubules. In dialysis patients, serum levels of this substance are 10 to 60 times higher than normal. Retention and accumulation of this type of amyloid protein is the main pathogenic process of $Я_2$M amyloidosis. It is not known, however, why the amyloid forms fibrils and is deposited within tissues, particularly in the musculoskeletal system, where it has a strong predilection for synovial membranes (6)and why in contrast to other types of amyloidosis, visceral manifestations are rare and are usually discovered on postmortem examination.

From a radiological point of view amyliod arthropathy shows special characteristic features different from these of renal osteodystrophy. On plain radiographs it appears as lytic bone lesions in the juxta-articular areas most often in shoulder, carpal bones, pelvis and knees as well as nodular soft-tissue swelling and juxta-articular osteoporosis (2). The lytic bone lesions of amyloid arthropathy usually are multiple and well-defined, can be multiloculated, and may or may not have sclerotic edges (2). They can show a progressive enlargement and in some cases produce a destructive arthropathy (6).

The radiological findings in 32 patients receiving haemodialysis for more than 5 years are presented with special reference to amyloid arthropathy. The frequence of the condition is discussed according to the degree of secondary hyperparathyroidism and general factors as age, sex and length of time on dialysis.

MATERIALS AND METHODS

The study includes 32 patients - 14 males (43,75%) and 18 females (56,25%) who had been on haemodialysis with polyethersulfone membranes for periods of more than 5 years. Patients in which the renal failure was due to primary or secondary amyloidosis and multipal myeloma were not included in the study.

The mean age of patients was 54,88 years (range 33-71 years). The duration period of dialysis varied from 61 to 192 months, mean 109,5 months.

All the patients underwent antero-posterior radiographs of the shoulders, knees, pelvis and hands and lateral radiographs of the cervical and lumbar spine using conventional methods. The following radiological signs were evaluated: **1.** lytic lesions more than 4 mm in epiphyseal areas **2.** acroosteolysis **3.** erosive arthropathy **4.**

subperiosteal resorbtion **5.** discitis 6.periarticular calcifications **7.** spinal osteosclerosis

The degree of secondary hyperparathyroidism was established using the level of serum immunoreactive parathyroid hormone which was determined in all patients. They were classified into two groups: group I - 14 patients (43,75%) with slight or non existent hyperparathyroidism and group II - 18 patients (56,25%) with moderate or severe hyperparathyroidism.

Statistical analysis included Student's t-test and Chi-square test. The statistical significance level was set at 5% ($p<0, 05$). Values were expressed as means ± standard deviation and percentages.

RESULTS

The radiological findings for the 32 patients on long term haemodialysis are presented in table 1. The most frequent findings in all patients were the radiological signs of hyperparathyroidism. Acroosteolysis was found in most of the patients while subperiosteal resorbtion was found in 56,25% of cases and erosive arthropathy of the hands in 50%. 11 patients showed osteolytic lesions of the skeleton of at least one site, most commonly affecting carpal bones and shoulder and less frequently seen in hips. In 12 patients (37,50%) there were signs of destructive spondylo-arthropathy (discitis). Most were located in the cervical spine, affecting C5/6, C4/5 and C6/7 - 10 patients and in 3 patients affecting lumbar spine (in 2 patients only the lumbar spine and in 1 patient associated with cervical discitis). In our patients we did not find pathological fractures.

Table 1: Radiological findings of the patients on long term haemodialysis

	N	%
1. Lytic lesions	11	34,38
2. Acroosteolysis	31	96,88
3. Erosive arthropathy	16	50
4. Subperiosteal resorbtion	18	56,25
5. Discitis	12	37,50
6. Periartricular calcifications	8	25
7. Spinal osteosclerosis	5	15,63

Figures 1 - 3 show some of the described leasions.

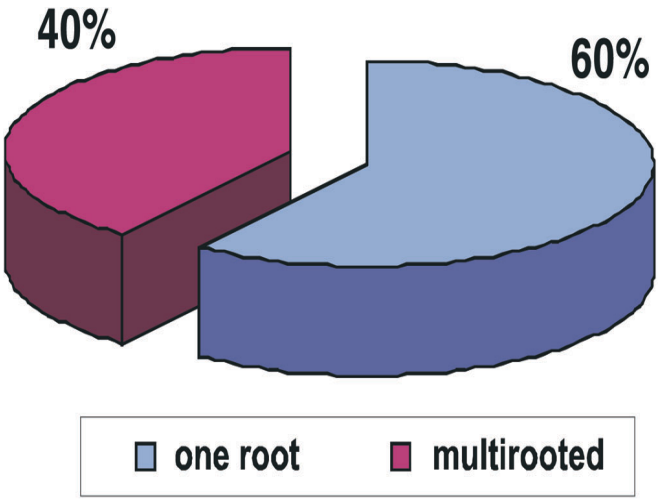

Fig. 1. AP radiograph of the right shoulder of a patient with 9 years on dialysis, showing well defined lytic lesions in the right humeral head.

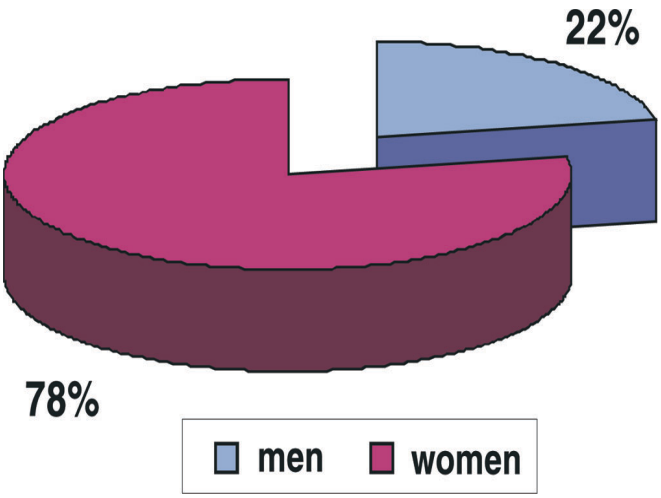

Fig. 2. 70-year old patient, 15 years on haemodialysis treatment with multiple lytic lesions in the carpal bones and nodular soft tissue swelling

Adress for corespondense:
Dr Silvia Bogdanova Tsvetkova;
Sector of Radiology, Department of Dental Medicine, MU - Plovdiv
24, Veliko Tarnovo Str. 4000 Plovdiv, Bulgaria; Email: sts2001@abv.bg

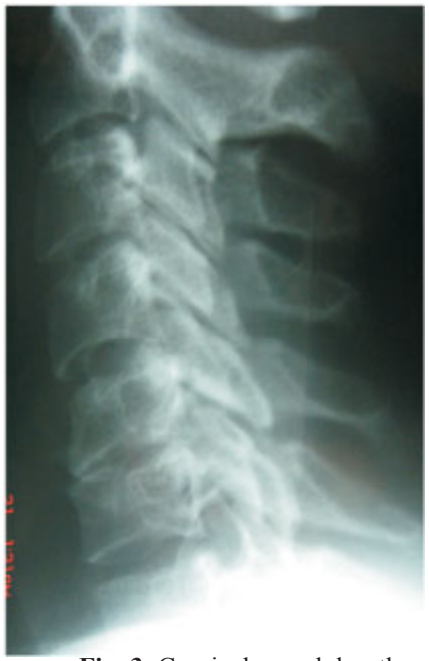

Fig. 3. Cervical spondyloarthropathy with narrowing of intervertebral disc C5/6

The presence of osteolytic lesions and discitis according to the degree of secondary hyperparathyroidism is shown in table 2 and the radiological findings in relation to the age of the patients is shown in table 3. The frequency of osteolytic lesions was significantly higher in patients with moderate or severe hyperparathyroidism (group II) and also there was a significant difference in age between the patients with osteolytic lesions and discitis and without these radiological findings.

Table 2. Relation between radiological findings of amiloyd arthropathy and secondary hyperparathyroidism

	Group I (n=11)	Group II (n=21)	p*
Discitis	3(27,27%)	9(42,86%)	NS
Lytic lesions	1(9,09%)	10(47,62%)	0,05

P - Chi-square test

Table 3. Radiological findings inrelation with age

		Age (years)	P*
Discitis	Yes	55,4	0,038
	No	46,2	
Lytic lesions	Yes	55,9	0,08
	No	45,4	

(P- student‘s t-test)

DISCUSSION

The most characteristic radiological findings associated with amyloid arthropathy are the lytic bone lesions, wich were frequent in our group of patients on long term haemodialysis treatment, affecting one third of them. These lesions were most frequent in the carpal bones and in the shoulders.

Such lytic lesions can also be present in many other pathological conditions – metastatic bone disease, brown hyperparathyroid tumours, rheumatoid and psoriatic arthritis, degenerative osteoarthritis etc. Apart from the clinical features the differential diagnosis is established also on the basis of the morphology and distribution of the lesions wich in each condition is different.

Brown hyperparathyroid tumours occur in the long bones, preferentially in diaphyseal zones (5) . One of our patients presented this type of lesion in the forearm (radius), none of our patients presented clinical data in accordance with the other above-mentioned processes.

Destructive spondyloarthropathy in haemodialysis patients has multi-factorial pathogenesis, that includes crystal deposition, amyloid deposition and hyperparathyroidism. In our study discitis was not related to the degree of secondary hyperparathyroidism neither to other pathologic conditions such as infection, chondrocalcinosis, ankylosing spondylitis etc. and most probably has complex pathgenesis.

At the present time neither the etiology nor the epidemiology of amyloidosis in dialysis patients is clearly understood. Treatment consists of finding dialysis filters to increase the absorption of the amyloid beta-2-microglobulin and the symptomatic treatment of this disorder. The prompt identification of this entity should assist in determining what follow-up is necessary and should contribute to the formation of an appropriate clinical treatment plan.

REFERENCES:

1. Михайлова Х, В. Николов, Лицево-челюстни промени при хемодиализно лечение и вторичен хиперпаратиреоидизъм. Проблеми на стоматологията, 1999-2000, XXVII, 59-64.

2. Arakawa M, Gezyo F. B2-microglobulin-associated amyloidoses. J Intern Med. 1992;232:531-532.

3. Camacho C, Melendes A, Valenzuela A. et al. Radiological findings of amyloid arthropathy in long-term haemodialysis. Eur.Radiol. ,1992, 2, 305-309.

4. Danesh F, Ho LT. Dialysis-related amyloidosis: History and clinical manifestations. Semin Dialysis. 2001; 14: 80-85.

5. Gejyo G, Yamada T, Odani S, et al. A new form of amyloid protein associated with chronic hemodialysis was identified as B2-microglobulin. Biochem Biophys Res Commun. 1985;129:701-706.

6. Gielen JL, van Holsbeeck MT, Hauglustaine D, et al. Growing bone cysts in long-term hemodialysis. Skeletal Radiol, 1990;19:43-49.

7. Goldman AB, Bansal M. Amyloidosis and silicone synovitis. Radiol Clin N Am. 1996;34:375-394.