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Biochemical profile of multiple myeloma about 50 cases

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Abstract

Multiple myeloma (MM) is a clonal proliferation of plasma cells invading the bone marrow and secreting monoclonal immunoglobulin. In order to study the epidemiological and biological and biochemical characteristics of MM, we carried out a retrospective work on a cohort of 50 cases collected at the Avicenna Military Hospital in Marrakesh, during a period of 5 years (from January 2013 to December 2017). Our study included 32 men (64%) and 18 women (36%), with an average age of 60.6 years, with extremes at 44 and 87 years. The circumstances of discovery were dominated by bone pain and alteration in general condition, which are revealing in more than 65% of cases. Biologically: the sedimentation rate was accelerated in 86% of cases, a monoclonal peak appearance was revealed on serum proteins electrophoresis in 88%of cases, most often located in the γ zone (64%), a predominance of the Ig G isotype (64%), and kappa light chains in 60% of cases, Bence Jones protein (BJP) was found in 7 patients, i.e. 14% of cases, and plasmacytosis over 10% was found on the myelograms in 90 % of cases.

Keywords: Multiple myeloma; electrophoresis; monoclonal peak; Ig G; light chains; Bence Jones protein

1. Introduction

Multiple myeloma (MM) is a rare neoplastic disease of unknown aetiology characterized by proliferation and infiltration of clonal plasma cells into the bone marrow microenvironment, which produce and secrete monoclonal immunoglobulin that can be detected in patients' urine or serum [1].

This condition is also called Kahler's disease after the the Austrian physician, Otto Kahler (1849-1893), who first published a description of it in 1889.

The diagnosis of multiple myeloma is based primarily on:

- plasma cells infiltration of more than 10% of the nucleated cellsin the marrow;
- Characteristic bone lesions visible on x-ray;
- The presence of a monoclonal protein in serum and / or urine.

MM is the second most common hematologic malignancy after non-Hodgkin lymphoma. It presents 1% of all cancers and 10% of hematologic malignancies [2].

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Its incidence has increased in recent years and the involvement of environmental factors, particularly chemical ones, has been strongly mentioned in its genesis [3].

Multiple myeloma remains an incurable disease despite treatments.

The aim of this study is to study the epidemiological, clinical and biological characteristics of a serie of 50 cases of MM collected, in the biochemistry laboratory of the Avicenna Military Hospital in Marrakesh.

2. Material and methods

This is a retrospective study, over a period of 5 years (January 2013 to December 2017) on 50 cases of MM listed in the biochemistry laboratory of the Avicenna Military Hospital of Marrakesh.

In all cases, each patient presenting, an abnormality on serum and / or urine proteins electrophoresis, suggesting of MM (monoclonal peak, hypogammaglobulinemia, hypoprotidemia, etc.) was subject to a complementary biochemical exploration.

Our study included patients in whom the clinical, biochemical, cytological and radiological criteria led to diagnosis of MM.

For the diagnosis and the prognostic evaluation, the biological workup included: a protein assessment, including protidemia, serum proteins electrophoresis (SPE) (migration zone, monoclonal component level), serum immunotyping, weighted immunoglobulin (Ig) assay and detection and identification of Bence Jones proteinuria). Creatinine levels and 24-hour proteinuria. B 2 microglobulin, C - reactive protein (CRP) and lactate dehydrogenase (LDH) and a hematological workup: blood count, sedimentation rate (SR) and myelogram.

3. Results

The mean age at diagnosis of our patients was 60.6 years with extremes ranging from 44 to 87 years? A maximum frequency was observed in the age group between 60 and 69 years. The sex ratio (M / F) was 1.77 in favor of men (Figure 1).

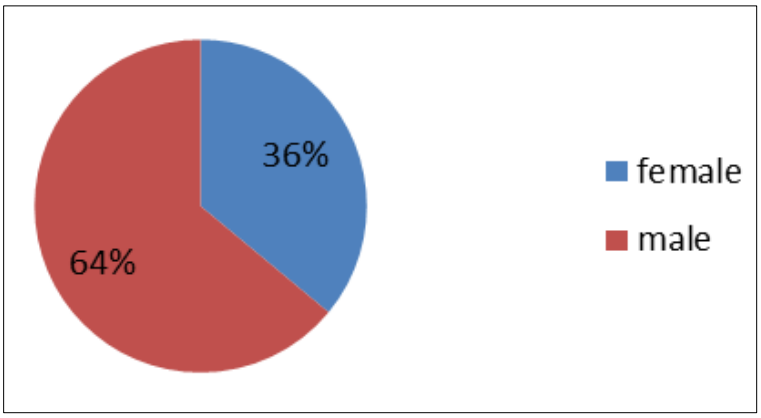

Figure 1 Distribution of patients by gender

Bone pain was the main reason for consultation in our study, it was found in 40% of patients with variable localization (sciatica, ~~lulbosciatica~~). Altered general condition and fever were found in 28% of cases. Hematological manifestations, dominated by the anemia syndrome, were present in 38% of the patients. 38% of the cases had an infectious syndrome with different localizations, represented mainly by pneumopathy and urinary tract infections. Renal manifestations were present in 14% of cases, dominated by renal failure (Figure 2).

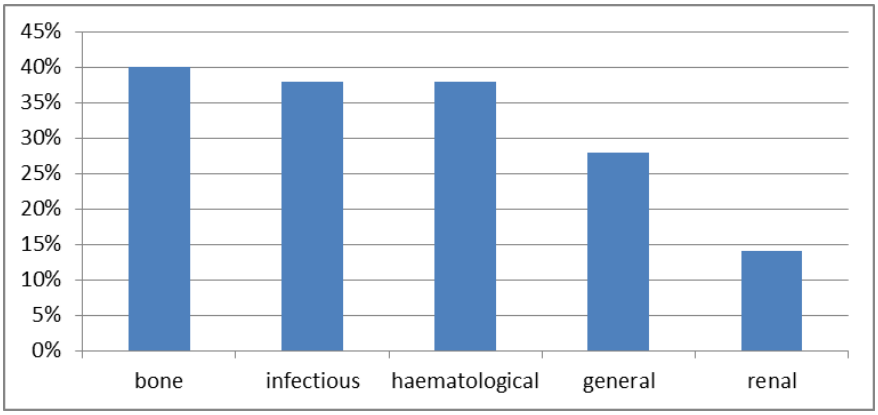

Figure 2 Distribution according to main clinical manifestations

The subjects in our study were divided according to the clinical form of MM into 3 categories: 41 cases of MM oh complete Ig or 82%, 7 cases of MM of light chain or 14% and two cases of non-excreting MM or 4%.

Biochemically, protidemia was increased in 48% of our patients. Serum proteins electrophoresis showing a peak, of variable importance was objectified in 43 patients, i.e. 86% of cases, of monoclonal appearance and mainly located at the level o the γ zone with a migration in decreasing order of frequency: 64 % γ globulins, 16% ß globulins, 6% α2 globulins. Serum protein electrophoresis was normal in 2 cases of MM, i.e. 4%. Hypogammaglobulinemia was encountered in 5 patients, i.e. 10%.

The Immunofixation of serum and urine proteins showing an isotypic distribution of MM cases according to class and type of monoclonal component, showed the predominance of the IgG isotype (64%), the IgA isotype (18%) and the Light chains (14%) (Table 1). Moreover,the γ zone is the preferred migration area for IgG in 90.6% of cases, while IgAmigrates very often in thetheβ zone in 55.5% of cases. In our study, the kappa light chain (60%) is more represented than the lambda light chain (36%) with a κ / λ ratio of 1.6 (Table 2)

Table 1 Distribution of patients according to the results of Serum Protein Immunofixation

Type of immunoglobulin	IgG	IgA	Light chains	Not excreting
Number of cases	32	9	7	2
Percentage (%)	64	18	14	4

Table 2 Distribution of patients by light chain type

Light chain type	Kappa type			Lambda type			Kappa / Lambda report
Number of cases	IgG	IgA	LC	IgG	IgA	LC	1.66
	20	5	5	12	4	2	
Total	30			18			
Percentage (%)	50			36			1.66

The immunoglobulin mass was quantified in 35 patients of our series, and showed a significant increase (> 30g / l) in IgG (40%) with extremes ranging from 2.31g / l to 146g / l and IgA (> 20g / l) in 10% with extremes from 0.35g / l to 68g / l, respectively in IgG and IgA myeloma.

The 24-hour proteinuria and the urinary Bence Jones proteinuria (BJP) were investigated in our patients. Proteinuria was pathological in 17 cases (34%). BJP was positive in 7 cases (14%) and negative in 43 cases (86%).

Hypercalcemia was noted in 11 cases, i.e. 22%, of which 4 had a calcemia greater than 120mg/l. Hypoalbuminemia was found in 44% of patients. All the subjects included in our study were tested for beta-2 microglobulin, a significant increase was found in 18% of the patients.

LDH was greater than 200 in 50% of patients and 5 cases had LDH greater than 460. In 24% of patients, creatinine was above 20mg/l. CRP was higher than 10mg in 10 patients (20%). Hyperuricemia was found in 8% of cases.

Hematologically, the sedimentation rate at the first hour was accelerated in 86% of cases. Anemia was observed in 66% of patients. This anemia was normochromic normocytic aregenerative in 28 cases, i.e. 56%, normochromic macrocytic in 1 case, i.e. 2%, and hypochromic microcytic in 4 cases, i.e. 8%.20% of the cases showed hyperleukocytosis, 2% leukopenia. Thrombocytosis was found in 26% of patients. Blood smears were performed in 60% of patients, showing red blood cells in rolls. The myelogram was performed in all our patients. It was conclusive with plasma cells above 10% in 90% of cases.

4. Discussion

Although MM has seen significant progress in the management of patients in recent years, it remains an incurable hemopathy with a median survival of four to five years, which tends to increase in recent years [4-5]. In the present study, we studied the clinical and biological characteristics of 50 cases of MM, collected in the biochemistry laboratory of the Avicenna Military Hospital in Marrakesh.

The mean age of our population was 60.6 years with 40% of the patients between 60 and 69 years, which is consistent with the literature [6-7]. The predominance of males was noted in our study, which is consistent with most series [6-8].

The symptoms of MM are polymorphic, dominated by bone pain in our work (93.3%) and in other publications that report frequencies exceeding 80% [9-10-11]. The alteration of general state is frequent [10-11] and the complications often revealing MM [9-12-13], particularly renal failure (14%) described in 20-40% of cases [13-14]. Other infectious and metabolic complications are not exceptional [9-12-13].

In the present cohort hyperprotidemia was noted in 24 cases i.e. 48%. This joins the study of Ndomocrah.A et al [7].

The protein electrophoresis showed a monoclonal peak in 88% of cases: 64% in the γ -globulin area, 16% in the β-globulin area. In accordance with the literature, our series shows the predominant migration of IgM in gamma zone followed by IgM migrating in beta [3-6]. The predominant place occupied by IgG in our series (64%) is also found in all series [8]. The distribution of patients according to the type of light chains shows a predominance of the Kappa type light chain (60% of cases against 36% of lambda type light chains). This predominance is also found in other studies [6-8]. In our cohort, BJP was positive in 14% of MM cases. This percentage is lower than what was reported in other studies [6].

Hypercalcemia is due to osteoclastic resorption and represents a medical emergency. It is considered the major cause of renal failure in MM [15]. In our study hypercalcemia was found in 11 patients, i.e. 22%, of which 4 cases had major hypercalcemia (above 120mg/l).

Hypoalbuminemia less than 30g/L is indicative of advanced disease. In MM, β 2 microglobulin levels reflect both tumormass and renal function [16]. A correlation between serum β 2 microglobulin levels and patient survival is confirmed by many authors [17]. In the present study, this parameter was measured in our patients. Its level was higher than 6 mg/l in 9 cases or 18%. Produced by proliferating cells, the LDH level has a prognostic value in MM [18]. The interest of LDH measurement seems to be particularly important in certain rapidly evolving MM without elevation of the monoclonal component [19].

The prevalence of renal involvement in MM is 30-50% depending on the series. Renal failure worsens the prognosis of myeloma and is associated with higher mortality and morbidity [15]. Nephropathy is mainly related to the precipitation or deposition of Ig light chains in the various structures of the kidney (distal or proximal tubules, glomeruli). Renal failure was observed in 24% of patients with MM, a percentage close to that of the study by Ngoné and al [3]. CRP is a prognostic factor related to the intrinsic malignancy of the clone. Its serum concentration correlates with survival and proliferative activity of myeloma cells [20]. In our study, CRP was elevated in 20% of the cases without any infection.

Hematologically, the sedimentation rate (SR) is often elevated (>50 mm), which is directly related to the presence of the monoclonal protein. The SR may be normal in cases of light chain MM, or no-secretory MM, or when the monoclonal

protein behaves as a cryoglobulin and precipitates at low temperature [24]. In our series, 86% of patients had an accelerated SR, which is consistent with several studies [3]. Anemia is the most common hematological manifestation in MM. It was present in 66% of our patients. Our results are similar to those reported in other multicenter studies [6]. Anemia results mainly from bone marrow failure due to infiltration of the bone marrow by malignant plasma cells, hemodilution due to hyperproteinemia, and decreased erythropoietin secretion due to renal failure [22]. Leukopenia and thrombocytopenia are rare (8-10%) but worsen the prognosis, reflecting a large tumor mass [22]. In our series, neutropenia and thrombocytopenia were respectively found in 2% and 26% of our patients.

The quantitative and qualitative assessment of bone marrow plasma cell disease is a crucial step in the diagnosis of multiple myeloma [23]. However, it is essential to compare the results of the myelogram with the results of other clinical and paraclinical investigations. A medular plasmacytosis between 10 and 30% corresponds to a minor criterion for the diagnosis of multiple myeloma, greater than 30% to a major criterion. In our series, the myelogram showed a rich marrow, invaded to more than 10% of plasma cells in 90% of patients, of which 84% had dystrophic plasma cells.

5. Conclusion

Multiple myeloma is a hematologic malignancy characterized by monoclonal plasma cell proliferation invading the bone marrow. This work, carried out on a cohort of 50 MM cases, allowed us to confirm certain particularities:

The high prevalence of MM in the elderly with a remarkable male predominance,

The predominance of the IgG/κ isotype,

The absence of a monoclonal peak on protein electrophoresis should not rule out the diagnosis of MM,

Bone manifestations are commonly revealing the myeloma,

The diversity of clinical and biological manifestations makes MM a multidisciplinary condition, which implies a close collaboration between biologists and clinicians for a better management.

Compliance with ethical standards

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Disclosure of conflict of interest

Authors declare no conflict of interest.

References

[1] Palumbo A, Anderson K. Multiple myeloma. N Engl J Med. 17 mars 2011;364(11):1046.60.

[2] Kumar S. Multiple myeloma - current issues and controversies. Cancer Treat Rev. mai 2010;36 Suppl 2:S3-11.

[3] Gùeye N. Multiple myeloma clinical and evolutionary aspects (About 22 observations collected at the Medical Clinic 1 CHU Aristide Le Dantec). Medicine thesis. 2001 Aug 13;16:101.

[4] Rajkumar SV, Buadi F. Multiple myeloma: new staging systems for diagnosis, prognosis and response evaluation. Best Pract Res Clin Haematol. déc 2007;20(4):665.80.

[5] Masson E. Monoclonal gammopathy and multiple myeloma: what's new? what prospects? Revu Med Interne 2007;28:667—9.

[6] El Mezouar I. Multiple myeloma (about 58 cases). Medicine Thesis. 2010 apr 12;60:199.

[7] Ndomocrah A, Ouavene JO, Mobima T, Yakelendji BY, Gosta A, Lefaou A. Epidemiological-clinical-radiological, therapeutic and evolutionary aspects of multiple myeloma at BANGUI's friendship hospital. J Afr Imag Méd 2013; (5), 3: 159-163.

[8] Koffi K.G, Sanogo I., Trazo D.,Toure A H , Tolo A., N'Guessan K, Danho NC, Kouakou N. , Sangare A. Characteristics of black African multiple myeloma Experience from the Ivory Coast Retrospective analysis of 50 Black African Medicine files. 2000; 47(10): 431-435.

[9] Nnonyelum ON, Anazoeze MJ, Eunice NO, Emmanuel OO, Stella AT, Marcus AI, et al. Multiple myeloma in Nigeria: a multi-centre epidemiological and biomedical study. Pan Afr Med J. 24 nov 2015;22:292.

[10] Kakpovi K, Oniankitan O, Houzou P, Koffi-Tessio VES, Tagbor KC, Fianyo E et al. Profile of Multiple Myeloma of the bones in rheumatology consultation in Lomé (Togo). Rev Mar Rhum. 2014; 27: 48-53.

[11] Ngolet LO, Kocko I, Galiba Atipo FO, Guelongo Okouango Ova JD, Ntsiba H, Elira Dokekias A. Symptomatic multiple myeloma in Brazzaville: report of 40 cases. Ann Univ M Ngouabi.; 2016; 16(1): 1-7

[12] El Husseiny NM, Kasem N, El Azeeim HA, Mattar MW. Multiple myeloma: a descriptive study of 217 Egyptian patients. Ann Hematol. janv 2014;93(1):141. 5.

[13] Younes M. Prognostic factors for survival in multiple myeloma. Tunis Med. 2014 Jun; 92(6): 399-405.;

[14] Gavriatopoulou M, Terpos E, Kastritis E, Dimopoulos MA. Current treatments for renal failure due to multiple myeloma. Expert Opin Pharmacother. nov 2016;17(16):2165.77.

[15] Masson E. Renal damage during malignant hemopathies. Diagnostic strategy. Rev Med Interne 2010; 31(10): 685–696

[16] Paule B. Prognostic factors of multiple myeloma. Annal of Internal Medicine;1997; 148 (8) : 534-541.

[17] Cuzick J, De Stavola BL, Cooper EH, Chapman C, MacLennan IC. Long-term prognostic value of serum beta 2 microglobulin in myelomatosis. Br J Haematol. août 1990;75(4):506.10.

[18] Dimopoulos MA, Barlogie B, Smith TL, Alexanian R. High serum lactate dehydrogenase level as a marker for drug resistance and short survival in multiple myeloma. Ann Intern Med. 15 déc 1991;115(12):931.5.

[19] Bauduer F. Prognostic factors of multiple myeloma. Literature paper. Cancer Bulletin, 1993, 80 : 1035-1042.

[20] Chombart B. Prognostic factors for multiple myeloma which can be used in current practice: ten-year follow-up of 148 patients over 55 years of age. Rheumatism Review 2005 ; 72 : 1299-1305.;

[21] Raab MS, Podar K, Breitkreutz I, Richardson PG, Anderson KC. Multiple myeloma. Lancet. 25 juill 2009;374(9686):324.39.

[22] Bladé J, Rosiñol L. Renal, hematologic and infectious complications in multiple myeloma. Best Pract Res Clin Haematol. 2005;18(4):635.52.

[23] Grogan TM. Plasma cell myeloma marrow diagnosis including morphologic and phenotypic features. Seminars in diagnostic Pathology 2003;20:211–25.