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The Contribution of Cytology to the Monitoring of Multiple Myelomas and/or the Diagnosis of Plasmacytic Leukemia: Two Case Studies

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ABSTRACT

The leukemic transformation of multiple myeloma (MM) is a rare phenomenon and warrants investigation, as it changes the prognosis of the disease. No specific biomarkers have been identified to predict the progression of MM to plasma cell leukemia (PCL). PCL, the most aggressive variant of monoclonal gammopathies, is defined by the International Myeloma Working Group (IMWG) as the presence of more than 5% plasma cells in the blood count. The blood count of patients with MM or PL sometimes shows "false" lymphocytosis, linked to the presence of plasma cells. Cytological monitoring of MM becomes necessary, through careful examination of blood smears, in order to detect rare circulating plasma cells and erythrocyte rollers at an early stage. Through these observations, we wanted to show the importance of qualitative analysis of blood counts or blood smears in monitoring patients with MM in order to diagnose early any possible progression to plasma cell leukemia.

Keywords

Multiple myeloma, Plasma cell leukemia, Blood smear, Case report.

Introduction

Multiple myeloma (MM) or Kahler's disease is the second most prevalent blood disorder in France. It accounts for 1 to 2% of all cancers and 10 to 12% of malignant blood disorders [1]. In Africa, prevalence is not uniformly documented and varies from region to region. This is a malignant plasma cell disorder of the bone marrow, associated with the secretion of a monoclonal immunoglobulin, which may progress to plasma cell leukaemia [2].

Plasma cell leukaemia (PCL), the most aggressive form of monoclonal gammopathy, is defined by the presence of more than 20% plasma cells in the blood count and an absolute count exceeding 2 G/L in peripheral blood [3,4]. It was redefined in 2021 by the International Myeloma Working Group (IMWG) as the presence of 5% or more circulating plasma cells (PCs) [5]. in patients otherwise diagnosed with multiple myeloma. A distinction is made between primary lymphoma (LPp), which arises de novo in a patient not being treated for multiple myeloma and LPs consisting

of the leukemic transformation of a previously known MM [6,7]. LP remains an incurable disease despite the emergence of new therapies combined with haematopoietic stem cell transplantation, which appear to offer promising avenues for improving patients' survival and quality of life [8]. The transformation of multiple myeloma into leukaemia is rare and warrants investigation, as it alters the prognosis of the disease. No specific biomarker has been identified to predict the progression of MM to plasma cell leukaemia [9].

The blood count of patients with MM or PL may show "false" lymphocytosis due to the presence of plasma cells. Cytological monitoring of MM requires careful examination of blood smears in order to detect rare circulating plasma cells and erythrocyte rolls at an early stage. The aim of this study is to highlight the importance of qualitative analysis of blood counts or blood smears in the monitoring of MM patients with a view to early diagnosis of potential progression to plasma cell leukemia

Patients and Observations

Observation

This was a 65-year-old male patient being treated for Biermer's disease, admitted to the emergency department (ED) of the main hospital in Dakar (HPD) for lower back pain associated with exertional dyspnea, asthenia, unexplained weight loss, and headaches.

Clinical

Clinical examination reveals a patient with normal temperature (T=36.7°C and BP=13/7), clear consciousness (Glasgow 15/15) and slightly colored, non-icteric mucous membranes. In addition, there were no signs of malnutrition, dehydration, organomegaly, or edema of the lower limbs. His gait was normal and his spine was not deformed, but he felt pain when pressure was applied to L1-L5.

Biological diagnosi

The blood count revealed a bicytopenia, normochromic normocytic anaemia at 6.3 g/dl and a leukopenia at 3.82 G/L. No plasma cells were observed in the blood smear. Biochemical tests revealed severe hypercalcaemia at 125 mg/l or 3.3 mmol/l, a beta-2-microglobulin level of 9.98 mg/L, with no evidence of liver or kidney involvement. Serum protein electrophoresis (SPE) revealed hypergammaglobulinaemia (54.5 g/l) of monoclonal appearance, with serum protein immunofixation confirming the presence of IgA Lambda immunoglobulin (Figure 1). The bone marrow examination showed a 56.2% infiltration of dysplastic plasma cells. A diagnosis of multiple myeloma was made and treatment was initiated.

Follow-up and progress

After being out of sight for several months, the patient was admitted to the HPD emergency department for very intense diffuse bone pain according to the visual analog scale (VAS: 10/10), predominantly in the lumbar region.

He presented with a WHO stage 3 deterioration in general health and poorly tolerated anemia. A complete blood count (CBC) showed hyperleukocytosis at 15,460 G/L (lymphocytes = 8320/mm^3), anemia at 7.3 g/dL, and thrombocytopenia at 118 G/L. The diagnosis of multiple myeloma (MM) transformation to plasma cell/plasmoblast leukemia, with 30% plasma cells and 28% plasmoblasts (Figure 2), was made based on a blood smear. The outcome was fatal, marked by his death after four courses of cyclophosphamide-thalidomide-dexamethasone treatment.

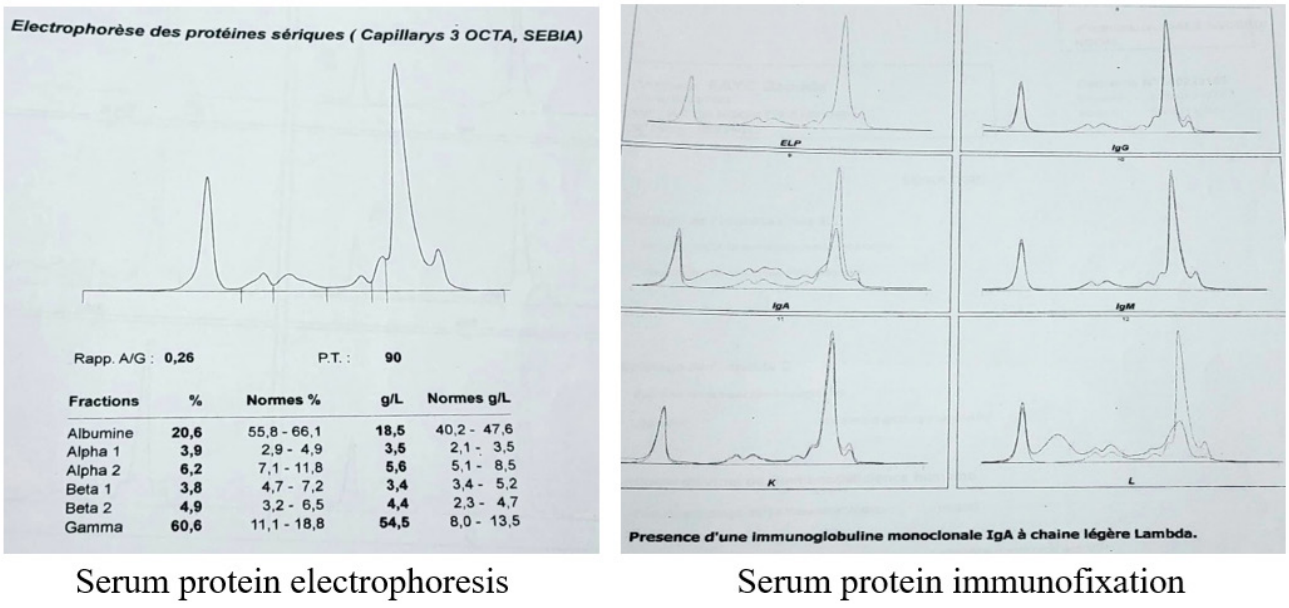


Figure 1: Electrophoresis and immunofixation of serum proteins.

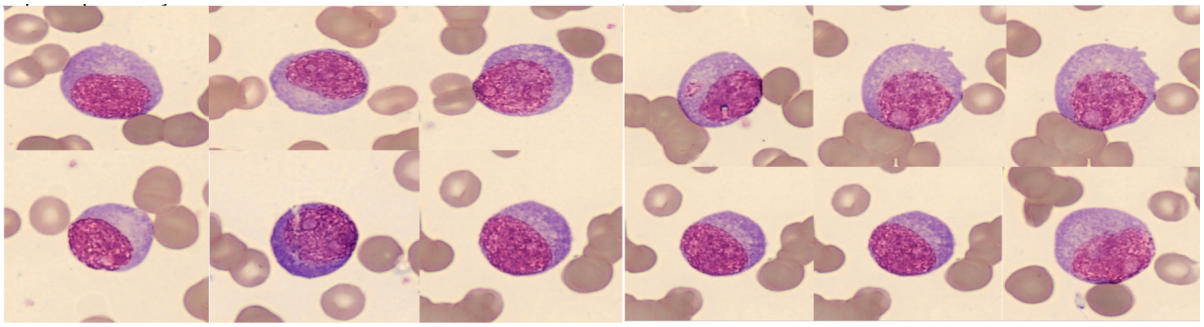


Figure 2: Plasmocytes and circulating plasmoblasts stained with MGG.

Observation

Presentation

A 64-year-old man with a history of thyroidectomy under levothyroxine and megadolichocolon, with a history of intensive herbal medicine use, has been followed since July 2020 for stage IIIA MM according to the Salmon and Durie classification and stage I ISS (International Staging System).

Clinical presentation

On examination, he presented with poorly tolerated anemia, diffuse bone pain, and a performance status (PS) of 2.

Biological diagnosis

Laboratory results revealed normochromic normocytic anaemia at 6.9 g/dL associated with thrombocytopenia at 41 G/L; no plasma cells on blood smear; bone marrow plasmacytosis at 39.3%; corrected calcium level of 2.29 mmol/L, creatinine level of 13.4 mg/L and a monoclonal-appearing electrophoretic peak in the beta zone at 45.6 g/L, characterised on immunofixation (IF) of serum proteins by a monoclonal band of the Immunoglobulin A kappa (IgA kappa) type. The 24-hour proteinuria was 0.25 g/L and immunofixation of urinary proteins revealed the presence of kappa light chains. The beta-2-microglobulin (β2m) level was 3.5 mg/L. No bone abnormalities were observed on the X-ray.

Treatment

The patient therefore received 12 irregular cycles of melphalan-prednisone-thalidomide chemotherapy, resulting in a partial response at 3 months (61.7%) followed by a 12.3% increase in the peak response rate at 6 months.

Follow-up and progression

The patient was hospitalised on several occasions and was readmitted in March 2022 to the Haematology-Oncology Department at HPD, presenting with a deterioration in general condition (PS 4), confusion (Glasgow Coma Scale 10/15) and poorly tolerated anaemia. The blood count revealed anaemia at 3 g/dL, thrombocytopenia at 29 G/L and leukocytosis at 17.9 G/L (lymphocytes = 7140/mm³) with 65% plasma cells present in the blood smear (Figure 3). The corrected serum calcium level was 2.75 mmol/L and the monoclonal peak in the beta zone on serum protein electrophoresis (SPE) was 35.6 g/L (Figure 4). The bone marrow smear revealed 57% plasma cells (Figure 5). A diagnosis of secondary plasma cell leukaemia was suggested. Unfortunately, the outcome was fatal, with the patient dying on day 9 of hospitalisation in the intensive care unit, presenting with symptoms of probable septic shock.

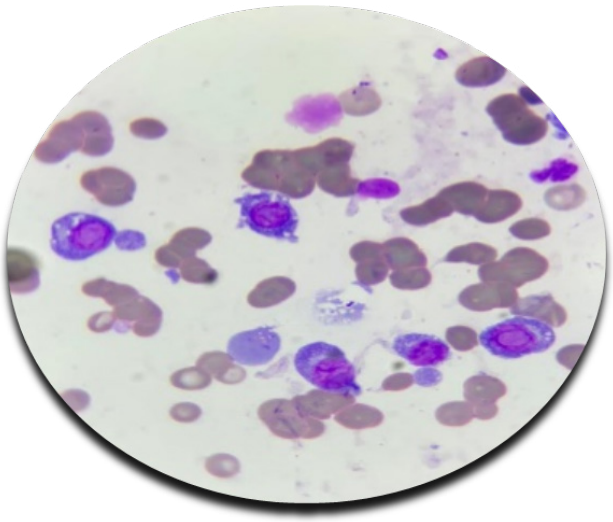
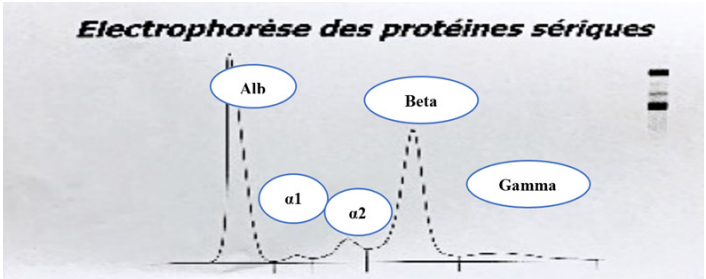


Figure 3: Circulating plasma cells at relapse, observed in a blood smear under an optical microscope following Ma-Grünwald-Giemsa (MGG) staining, magnification ×100.



Fractions	%	Normes %	Conc.	Normes Conc.
Albumine	41	50,0 - 71,0	34,4	34,0 – 42,0
Alpha 1	1,9	1,4 - 2,9	1,6	1,0 - 3,0
Alpha 2	7,8	7,0 - 11,0	6,6	6,0 - 9,0
Beta	42,4	8,0 - 13, 0	35,6	4,0 - 9,0
Gamma	6,9	9,0 - 15,0	5,8	5,0 - 13,0

Commentaire : **Pic en zone beta. Immunofixation des protéines sériques à envisager.**

Figure 4: Electrophoretic peak in the beta zone at relapse on serum protein electrophoresis.

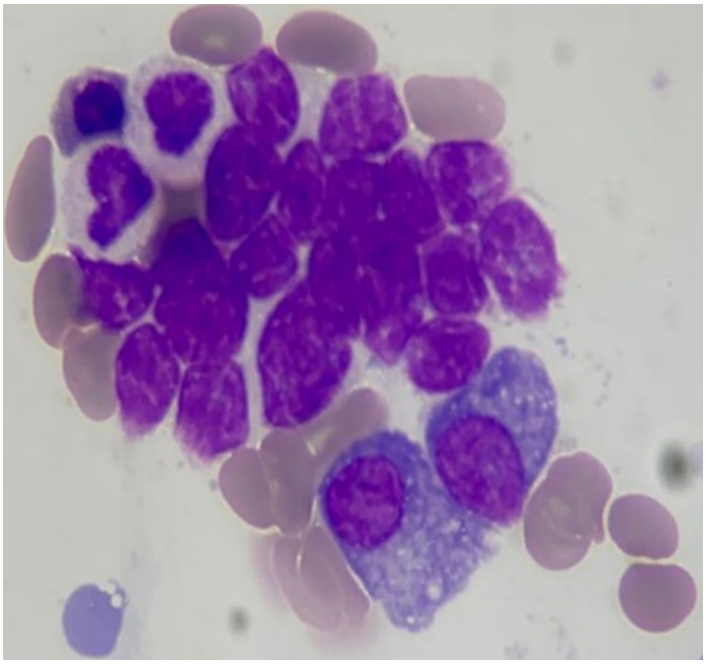


Figure 5: Dystrophic plasma cells in a bone marrow smear taken at the time of relapse, viewed under a light microscope following MGG staining, magnification ×100.

Discussion

Plasmacytoid leukemia (PL) is a rare, aggressive disease, first described over a century ago by GLUZINSKI and REICHENSTEIN [10], characterized by the proliferation of plasma cells. It is defined (Kyle criteria, 1974, adopted by the WHO in 2017) by a blood plasma cell count greater than 2 G/L and a plasma cell percentage greater than 20% of the white blood cell count [11]. In 2021, the IMWG established a new criterion for definition in the blood count, allowing a plasma cell count >5% of the white blood cell count [12]. Patients with blood plasmacytosis between 5 and 20% of the white blood cell count are eligible for "aggressive myeloma" treatments and clinical trials [13] definition was revised based on a summary of studies conducted on patients with myeloma or primary LP (pLP). In fact, it was found that patients with blood plThisasmacytosis ≥5% had a similar average survival rate to those with a rate ≥20%. This restriction has increased the sensitivity of early diagnosis of PLP and may lead to better management [5]. Plasma cell leukemia is considered a form of MM, with an incidence of approximately 0.3% of leukemias [14]. It accounts for nearly 2% of all plasma cell dyscrasias [15]. PL can be primary (60% of cases) and occur de novo, or secondary, indicating leukemization and the terminal progression of refractory or multi-relapsed myeloma [16]. Extramedullary involvement is more common in PPL than in PL secondary to MM [13]. The median age of onset of PL varies between 49.9 and 65 years, with a male-to-female ratio of 1.5 [17].

The median age of onset of pPLP is between 52 and 65 years, which is 10 years younger than the median age of onset of MM [18]. Our patients are male, aged 64 and 65 years, which fits perfectly within the diagnostic range.

From a pathophysiological perspective, the bone marrow microenvironment and the accumulation of cytogenetic disorders lead to changes in the expression of adhesion molecules, differentiation molecules, chemokine receptors, and surface antigens, thereby promoting apoptosis inhibition and immune escape of cell clones [17]. Disruption of these mechanisms could be responsible for the development of PL [13]. A number of adhesion molecules are involved in the passage of plasma cells into the blood stream. Thus, the absence of the CD56 antigen, a neuronal cell adhesion molecule, alters the anchoring of myeloma cells (MCs) to the bone marrow stroma and thereby facilitates their entry into the blood stream. Furthermore, reduced expression of this molecule leads to weaker interactions between myeloma cells and increased secretion of matrix metalloproteinase-9 (MMP-9). The latter degrades the extracellular membrane (ECM) and facilitates the invasion of tumor cells [19]. Negative regulation of CD106 and activated CD29, as well as decreased expression of HLA-1 and CD40 surface molecules in LP compared to MGUS, has also been noted [20]. High expression of CD54 on CMs has also been shown to facilitate extramedullary migration of CMs and lead to tumor dissemination. Other factors are involved in the development of PLP, such as high expression of VLA-4, low expression of chemokine receptors (CCR1, CCR2, and CXCR4), and exposure to thalidomide and its derivatives [21]. Cytokines are also involved in PL, particularly interleukin-6 (IL-6). An increase in the expression of CD27, which plays a role in the activation of anti-apoptotic pathways and the activation of nuclear factor kB, which has a crucial role in the survival of malignant plasma cells, has been reported [13]. Conversely, often significant plasma cell tissue infiltration can be explained by the increased affinity of these cells for certain tissues (cutaneous, pulmonary plasmacytoma, etc.) [22]. Fas/Apo1 expression has been described in all plasma cell leukemias, particularly those associated with extramedullary involvement. CD28, a marker of MM tumor progression, was detected in 92% of secondary PL cases and in only 33% of primary PL cases [4,6]. Chromosomal instability (CIN) in tumor cells is also affected by the tumor microenvironment [9].

The most common clinical signs are those of bone marrow failure: asthenia associated with anemia, infections indicative of neutropenia and immunosuppression, and even cutaneous-mucosal hemorrhagic syndrome in cases of severe thrombocytopenia [23]. PL can also manifest as extramedullary involvement: hepatic and splenic involvement found in 52% and 40% of PLp cases, respectively, and in less than 20% of PLs cases [24]. Lymph node, pleuropulmonary, digestive, neurological, and cutaneous involvement have also been reported [4,13]. In our series, anemia and diffuse bone pain were the main clinical manifestations. Anemia and thrombocytopenia are constant. Anemia, found in 90% of LP cases, is most often normochromic normocytic or macrocytic aregenerative [25]. All of our patients had normocytic aregenerative anemia (3 and 7.3 g/dL) associated with thrombocytopenia (29 and 118 G/L). Quantitative blood count analysis showed "false"

lymphocytosis, exacerbated by plasma cells.

However, careful cytological examination of the qualitative study or blood smear is a crucial step in diagnosing PL. The plasma cells found in the blood smear are generally cells with a rounded, monolobed nucleus, moderately basophilic cytoplasm, and a size similar to that of lymphocytes. The bood count of our patients showed hyperleukocytosis at 15,640 and 17,900/mm^3, increased by lymphocytes at 8,320/mm^3 and 7,140/mm^3. Blood smears performed on these two patients showed peripheral plasmacytosis greater than 20%, leading to a diagnosis of plasma cell leukemia according to the 2017 WHO criteria. PL plasma cells have an immunophenotypic profile similar to that of MM, with overexpression of the surface antigens CD38 and CD138. The absence of CD56 expression on tumor plasma cells has been considered the hallmark of PL. Its profile is therefore CD38+, CD56±, CD19- [4]. The most important prognostic factor in PPL as in MM is related to cytogenetic abnormalities found in clonal plasma cells, which are predictive of greater aggressiveness [26]. The data in the literature are often scattered, with a remarkable summary by AVET-LOISEAU in 2018 (Myeloma Genomics Laboratory) [27,28].

PPL is most often characterized by hypodiploidy and complex cytogenetics, combining several abnormalities. Five high-risk entities should be sought, with additional FISH testing:

Del(17p), which causes the loss of TP53, the "guardian of the genome" protein.

The t(4;14)(p16;q32) translocation: this translocation is unique among the t(14;q32) translocations observed in B-cell hematological malignancies, and is specific to PPL and MM. It deregulates two genes located at 4p16, FGFR3 and MMSET, promoting oncogenesis. The MMSET gene has histone methyltransferase properties, leading to epigenetic modifications (changes in chromatin conformation and deregulation of its accessibility). The presence of this abnormality is thought to be predictive of the anti-tumor activity of PIs. The French Myeloma Institute (IFM) has shown that the poor prognostic value of t(4;14) should be interpreted in relation to its association with other chromosomal abnormalities, particularly those involving chromosome 1; thus, abnormalities found on 1, del(1p32) or 1q increase its adverse impact.

Del(1p32) is also associated with a poor prognosis. It targets two genes, FAF1 and CDKN2C.

The fourth high-risk abnormality concerns gains in 1q, which is a very large chromosomal region: this abnormality is not specific to B-cell hematological malignancies, and the molecular target is unknown, although studies are focusing on CK1SB in 1q21, based on older studies from 2006.

Finally, the fifth high-risk cytogenetic abnormality concerns rearrangements and dysregulation of the *c-myc* gene, which are always associated with increased tumor cell survival [29]. Due to a lack of resources, the two patients were unable to benefit from these specialized analyses (flow cytometry and cytogenetics).

Conclusion

Plasma cell leukemia is a rare, incurable, and rapidly fatal malignant blood disorder. Qualitative analysis of the blood count or blood smear remains the defining criterion for plasma cell leukemia, according to the WHO and IMWG. However, careful examination of blood smears must be carried out as part of the monitoring of myeloma or any lymphocytosis, in order to detect the presence of plasma cells in the peripheral blood at an early stage.

References

1. LAGET MARGOT. High cytogenetic risk in multiple myeloma diagnosis management and prognosis. Thesis. 2024; 11-14.
2. Fall S, Dieng F, Diouf C, et al. Diagnostic and clinical course of multiple myeloma in Senegal a single-centre study from 2005 to 2016. Pan Afr Med J. 2017; 27.
3. Messaoudi N, Chakour M, El Ktaibi A, et al. Primary plasma cell leukaemia a rare form of leukaemia and plasma cell proliferation. Francophone Journal of Laboratories. 2009; 2009: 7-10.
4. Moatemri W, Bouatay A, Ben Youssef Y, et al. Plasma cell leukaemia a case report. Immunoanalysis & Specialised Biology. 2013; 28: 358-361.
5. Khermach A, Sabia M, Douzi N, et al. Plasma cell leukaemia new diagnostic and therapeutic approaches based on five clinical cases. Pan Afr Med J. 2025; 50: 19.
6. Manier S, Leleu X. Multiple myeloma clinical diagnosis and treatment outlook. Recommendations from the International Myeloma Working Group IMWG. Immuno-analyse & Biologie Spécialisée. 2011; 26: 125-136.
7. Guièze R, Moreau S, Dupire S, et al. Plasma cell leukaemia. Haematology. 2005; 11: 217-225.
8. Eddou H, Mahtat EM, Zahid H, et al. Plasma cell leukemia three case-reports and review of literature. Ann Biol Clin. 2013; 71: 698-702.
9. Gueye MW, Dieng N, Ndoye M, et al. From Myeloma to Plasma Cell Leukemia Persistent Inequalities. Open Journal of Blood Diseases. 2023; 13: 4.
10. Gluzinski A, Reichenstein M. Myeloma and leucaemia lymphatica plasmocellularis. Wiener klinische Wochenschrift. 1906; 19: 336-339.
11. Jung SH, Lee JJ. Update on primary plasma cell leukemia. Blood Res. 2022; 57: S62-S66.
12. Rojas EA, Gutiérrez NC. Genomics of Plasma Cell Leukemia. Cancers. 2022; 14: 1594.
13. Fernández de Larrea C, Kyle R, Rosiñol L, Paiva B, et al. Primary plasma cell leukemia consensus definition by the International Myeloma Working Group according to peripheral

blood plasma cell percentage. Blood Cancer J. 2021; 11: 192.

14. Fernández de Larrea C, Kyle RA, Durie BGM, et al. Plasma cell leukemia consensus statement on diagnostic requirements response criteria and treatment recommendations by the International Myeloma Working Group. Leukemia. 2013; 27: 780-791.
15. Brink M, Visser O, Zweegman S, et al. First-line treatment and survival of newly diagnosed primary plasma cell leukemia patients in the Netherlands a population-based study 1989-2018. Blood Cancer J. 2021; 11: 22.
16. Visme AD. Primary plasma cell leukaemia a case report. Literature review Life Sciences. 2022.
17. Ravinet A, Bay JO, Tournilhac O. Plasma cell leukaemia. Cancer Bulletin. 2014; 101: 1048-1058.
18. Tuazon SA, Holmberg LA, Nadeem O, et al. A clinical perspective on plasma cell leukemia current status and future directions. Blood Cancer J. 2021; 11: 23.
19. Parmo-Cabañas M, Molina-Ortiz I, Matías-Román S, et al. Role of metalloproteinases MMP-9 and MT1-MMP in CXCL12-promoted myeloma cell invasion across basement membranes. J Pathol. 2006; 208: 108-118.
20. Kraj M, Kopeć-Szlęzak J, Pogłód R, et al. Flow cytometric immunophenotypic characteristics of 36 cases of plasma cell leukemia. Leuk Res. 2011; 35: 169-176.
21. Oliveira AM, Maria DA, Metzger MA, et al. Thalidomide treatment down-regulates SDF-1a and CXCR4 expression in multiple myeloma patients. Leuk Res. 2009; 33: 970-973.
22. Costello R, Chaïbi P, Rousselot P. Plasma cell leukaemia a specific form of multiple myeloma. Haematology. 1996; 2: 296-300.
23. Rodriguez C, Pont JC, Gouin-Thibault I, et al. Plasmacytoma leukaemia. Annals of Clinical Biology. 2005; 63: 535-539.
24. Aissa W, Bouatay A, Gouta M, et al. Plasma cell leukemia report of 5 cases report. African Medical Journal. 2019; 12: e3367-e3376.
25. Tiedemann RE, Gonzalez-Paz N, Kyle RA, et al. Genetic aberrations and survival in plasma cell leukemia. Leukemia. 2008; 22: 1044-1052.
26. Nandakumar B, Kumar SK, Dispenzieri A, et al. Clinical Characteristics and Outcomes of Patients With Primary Plasma Cell Leukemia in the Era of Novel Agent Therapy. Mayo Clin Proc. 2021; 96: 677-687.
27. Avet-Loiseau H. The Biology of Multiple Myeloma Clinical Relevance. Bulletin of the National Academy of Medicine. 2018; 202: 923-934.
28. Avet-Loiseau H, Gerson F, Magrangeas F, et al. Rearrangements of the c-myc oncogene are present in 15% of primary human multiple myeloma tumors. Blood. 2001; 98: 3082-3086.
29. Corre J, Munshi NC, Avet-Loiseau H. Risk factors in multiple myeloma is it time for a revision. Blood. 2021; 137: 16-19.