Plasma cellleukemiapresenting as a chestwallmass: a case report

Abstract :

Plasma cellleukemia (PCL) is an uncommonneoplasm of plasma cellswith an aggressiveclinical course and a pooroutcome, evenwith the current standard of care. It can occureither de novo (primary PCL) or as a progression of multiple myeloma (MM). This disease has unique diagnostic criteria, but certain genetic markers and clinicalfeaturesmayoverlapwith multiple myeloma (MM). Due to the lowprevalence of PCL, guidelines on its management are extrapolatedfrom the management of MM and are based on smallretrospectivestudies and case reports/series. We report the case of a sixty-nine-year-old man referred to the hematologydepartment for the diagnosis of pPCL, revealed by thoracicplasmacytomasmimicking a thoracicneoplasm. The diagnostic approach, management, and outcomes of PCL are discussed.

Key words:

Plasma cellsleukaemia, multiple myeloma, thoracic mass.

Introduction:

Multiple myeloma (MM) is a neoplasm of plasma cells, accounting for 10–15% of hematopoieticneoplasms. It is more prevalent in individuals of Africandescent, occurringtwice as frequentlycompared to Caucasians [1]. The term plasma cellleukemia (PCL) istypicallyusedwhenthereis a significantnumber of circulating plasma cells. PCL represents the mostaggressiveform of plasma cell dyscrasias, defined by the presence of > 2 X 10^9/L peripheralblood plasma cells or accounting for >20% of the differential white cell count, not arisingfrompre-existing multiple myeloma (MM). Secondary PCL is a leukemic transformation of end-stage MM. Itsprognosisisverypoor, with a medianoverallsurvival of only 7 monthswith standard chemotherapy.

The clinicalpresentationusuallyinvolvessymptomsattributed to end-organ damage seen in MM (hypercalcemia, renalfailure, anemia, and lyticbonelesions) or to leukemia (leukocytosis, thrombocytopenia, and

organomegaly). We report a case of PCL with an atypicalpresentation as a chestwall mass and discuss the diagnostic approach as well as treatment options.

Observation :

Wepresent the case of a 69-year-old patient, a smokerwith a history of 25 pack-years and no significantpastmedical issues.He wasreferred to ourhospital due to persistent right-sidedchest pain lasting over threemonths, accompanied by apyrexia and a decline in the general state. Uponphysicalexamination, mucocutaneouspallorwasnoted, alongwith a hard and painful mass in front of the 3rd right intercostal space. The mass, measuring 8 cm x 5 cm, showed no inflammatorysigns and wasfixed to the deep plane.

The chest X-ray revealed the presence of a low-densitypulmonaryopacity in the right basal region (Figure 1), while the chestcomputedtomographyidentified a large parietalosteolytic mass centered on the 4th costal arch, with an endothoracicdevelopmentmeasuring 75 x 51 x 39 mm (Figures 2 and 3).

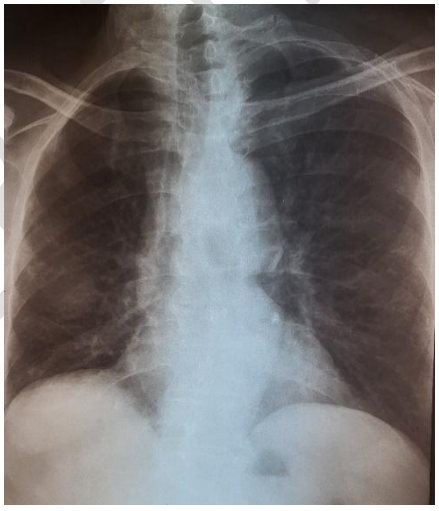

Figure 1: Frontal chest radiograph depicting a low-density pulmonary opacity in the right basal region.

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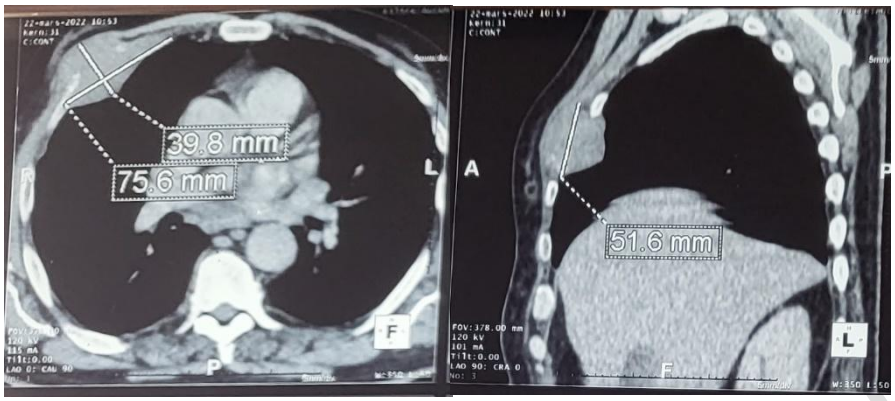

Figure 2: Axial and sagittal sections of a thoracic CT scan revealing a large parietal osteolytic mass centered on the 4th costal arch.

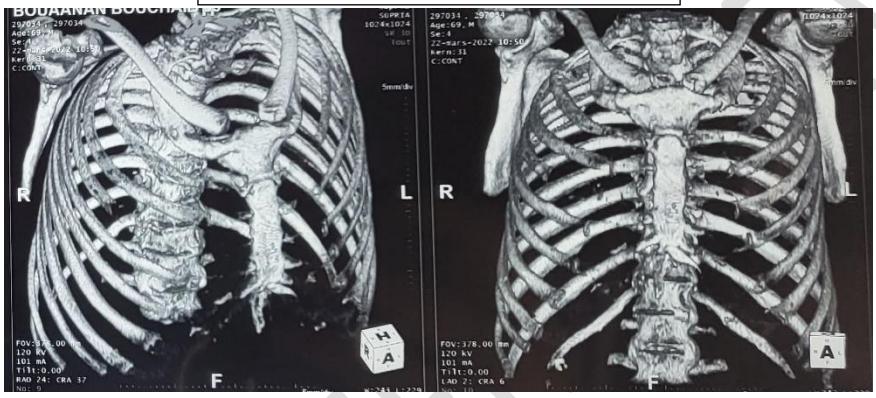

Figure 3: Bone window CT scan displaying lysis of the anterior arch of the 4th rib.

A transmural ultrasoundbiopsy of the chest mass revealed a diffusemonotonous population of small to medium-sized lymphocytes withplasmacytoidfeatures. The tumorcellstested positive for CD138 and MUM1, displaying monoclonal Kappa restriction by in situ hybridization. Additionally, a high proliferation index wasobservedwith Ki67 (60%). The cells, however, testednegative for CD20 and CD79a. A diagnosis of high-grade plasma cellneoplasminvolving soft tissue wasestablished.

Laboratoryevaluationrevealed a white bloodcell count of 22 × 10^9/L, microcyticanemiawith a hemoglobinlevel of 9.9 g/dl, and thrombocytopenia at 82 × 10^9/L. The peripheralbloodsmearexhibited 79% circulatingatypical lymphocytes withplasmacytoidfeatures, confirmed as neoplastic plasma cellsthrough flow cytometry, consistent with PCL.

Blood chemistryindicated an inflammatory syndrome, with an elevated CRP of 170 mg/L and hyperproteinemia at 100 g/L, withoutevidence of

tumorlysissyndrome. Serumproteinelectrophoresis and immunofixation revealed a monoclonal spike withIgA Kappa. The bonemarrowbiopsydemonstrated diffuse infiltration with 90% atypical plasma cells, confirming the diagnosis of PCL withextramedullary (chestwall) involvement.

A PET/CT scan wasperformed, revealingfluorodeoxyglucose (FDG) avidity in the parietal mass and otherbonylocalizations, including costal, humeral, pelvic, vertebral, and femoral sites (Figure 4)

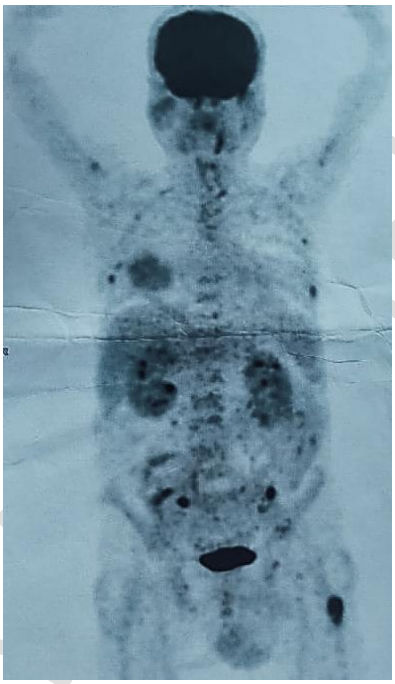

Figure 4:Maximum intensity projection image of PET/CT displaying a hypermetabolic process centered on the anterior arch of the 4th right rib, exhibiting a lytic appearance. Multiple bone locations with increased metabolic activity are evident, including the thoracic spine (T10), humeral, costal (2nd, 6th, 5th, and 7th ribs), pelvic, and left femoral regions.

The patient wasreferred to the hematologydepartment, whereheunderwent induction chemotherapywith VTD-PACE (Velcade, thalidomide, dexamethasone, cisplatin, doxorubicin, cyclophosphamide, etoposide), administered in 28-day cycles for a total of 6 cycles.

After the 3rd cycle, the patient showedsignificantimprovementmarked by completeremission, indicated by the absence of circulatingblood plasma cells, a plasma cell rate in the bonemarrow of 1%, negativeelectrophoresis of plasma proteins, and no extra medullarylocalizationsobserved in the PET scan (Figure 5).

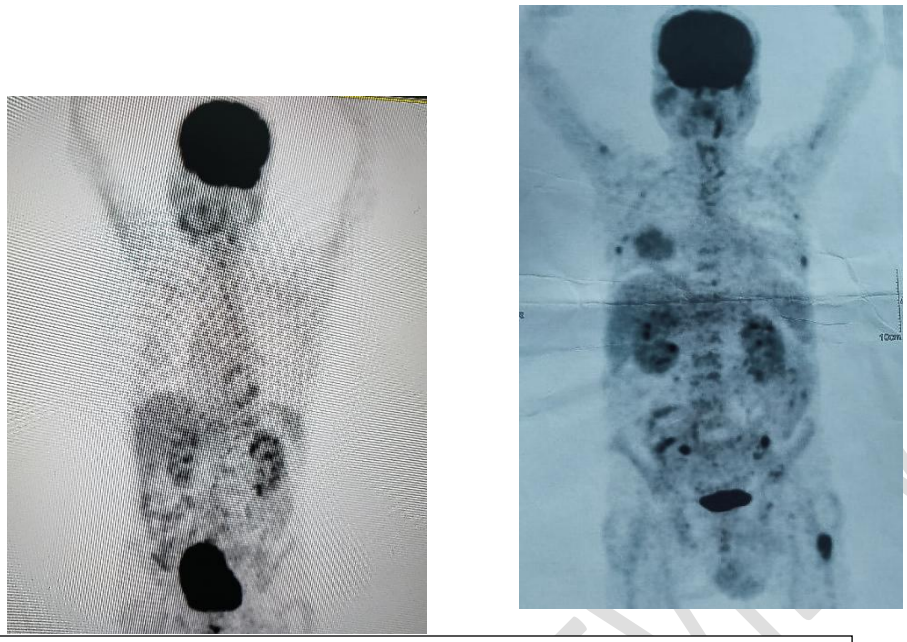

Figure 5: The maximum intensity projection image of PET/CT performed after the 3rd cycle of chemotherapy reveals a favorable response to treatment, demonstrating complete metabolic regression in the costal, humeral, pelvic, and femoral bone locations.

Discussion:

Plasma cellleukemia (PCL) is an aggressive type of plasma cellneoplasmthataccounts for only about 3% of all plasma cellneoplasm cases. PCL istermedprimary PCL (pPCL) whenit arises in patients with no history of MM. Approximately 60% to 70% of PCL cases are primary. Secondary PCL can occur due to leukemic progression in patients previouslytreated for MM [1].

Patients with plasma cellleukemia (PCL) typicallypresentwithnonspecificsymptomsthatmay not immediatelysuggest plasma cell dyscrasia. In a study by Rakhee Kar, five pPCL patients exhibitedsymptomssuch as fatigability, loss of appetite, fever, abdominal distension, and pedaledema. The duration of illnessrangedfrom one week to twomonths [2]. Due to similarities in clinical and laboratoryfindings, these conditions can sometimesbemisdiagnosed as multiple myeloma. However, there are distinguishingfeatures of the disease, as observed in ourclinical case.Patients with PCL are generallyyounger, with a medianage of 55, compared to 65 for MM patients [3]. Their performance status at diagnosisisoftenworse, possiblylinked to the more advanceddisease stage [4]. PCL typicallypresentswithextramedullaryinvolvement and minimal boneinvolvement. Literaturereview has identified cases presenting as

lymphadenopathy, hepatomegaly, splenomegaly, leptomeningealmyelomatosis, and soft tissue tumors [5].

Thoracicextramedullaryplasmacytomas can manifest in six differentpatterns:lung mass, pulmonary nodules, myelomatous infiltration of lymphaticswithamyloiddeposition, thoraciclymphadenopathy, pleural effusion with pleural-based nodules, and tracheobronchialinfiltrates [6]. Primarythoracicinvolvementis rare, occurring in lessthan 1% of cases. In comparison to MM, lyticbonelesions are lesscommon due to impairedretention of clonal plasma cells in the bonemarrow, secondary to the absence of adhesionmolecules like CD56 [6].

In our case, the patient presentedwiththoracic pain and a tumormimicking an extensive chestboneneoplasia. Tumor investigation revealed infiltration by plasma cellswithperipheralbloodinvolvement.

The diagnosis of PCL relies on laboratoryparameters, as outlined in the consensus statement by the International MyelomaWorking Group [7]. PCL isdefined by the presence of >20% circulating plasma cells and/or an absolute plasma cell count >2 × 10^9/L. A peripheralbloodsmearoftenreveals an atypicalappearance of white bloodcells.

Flow cytometry in plasma cellleukemiatypically expresses CD38 and CD138, similar to MM. However, thereis a reduced expression of CD56, CD117, CD71, and HLA-DR antigenscompared to MM. PCL is more likely to express CD20, CD45, CD19, CD27, and CD23 [8].

In the presence of organomegaly, soft tissue mass, and hypercalcemia, obtainingserum and urine proteinelectrophoresiswith immunofixation is crucial for identifying a monoclonal immunoglobulin. Skeletalsurveysaid in establishingboneinvolvement. A bonemarrowbiopsywithcytogeneticsshouldbeperformed in all patients diagnosedwith PCL. Anyidentified soft tissue mass shouldbebiopsied to assess possible extramedullaryinvolvement.

PCL is a highlyaggressivetumorcharacterized by a substantialdiseaseburden and a high proliferation index. Consequently, a feared and potentially fatal complication istumorlysis syndrome. Whilethis has been reportedafterinitiatingchemotherapy [9], itmayalsooccur, as observed in our patient, evenbefore the commencement of chemotherapy. Given the rarity of PCL, treatmentdecisions for primary PCL are largelybased on data

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extrapolatedfromsmall prospective and retrospectivestudies, as well as from MM trials.

The treatment of PCL typicallyinvolves an aggressive induction therapy phase incorporatingbothproteasomeinhibitors and immunomodulatorydrugs. Amongproteasomeinhibitor-basedregimens, bortezomib has shown the highestoverallresponse rate, rangingfrom 69% to 79%, whilelenalidomide, amongimmunomodulatorydrugs, exhibits an overallresponse rate of up to 60% [6].

Following induction therapy, eligible patients usuallyundergoautologous stem cell transplantation. However, despitethis intervention, PCL isassociatedwith short remissions and early relapse, necessitatingearly maintenance therapy. Agents like lenalidomide, bortezomib, and thalidomide are commonlyemployed for maintenance.

The medianoverallsurvival for patients withpPCL has graduallyincreasedfrom 3 to 4 months in the early 1980s to 13 months, thanks to improvedmalignancydetection and enhancedchemotherapyregimens [6]. In our case, the patient received induction chemotherapywith VTD-PACE (Velcade, thalidomide, dexamethasone, cisplatin, doxorubicin, cyclophosphamide, etoposide), achievingcompleteremissionafter the 3rd cycle.

Conclusion:

Wepresent a case of PCL with an uncommonpresentation. Swift diagnostic assessment of a chestwall mass, coupledwithperipheralsmearevaluation, facilitated the prompt diagnosis of PCL, enablingearly initiation of therapy. Given the diverse clinicalpresentations of PCL, heightenedawareness and comprehensiveevaluation, withspecific attention to the peripheralsmear, are crucial for accuratediagnosis.Given the lowprevalence of PCL, chemotherapyregimensemployed are largelybased on thoseutilized for MM. It isimperative to report outcomes of thesetherapies to contribute to the establishment of guidelines for PCL management, especially in the absence of randomizedclinical trials. Earlyreferral to a bonemarrow transplant center isadvisable for patients, as combinedchemotherapyfollowed by hematopoietic stem cell transplantation offers a higherlikelihood of achieving and maintainingcompleteremission.

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