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ARCHIVES OF HELLENIC MEDICINE: ISSN 11-05-3992

CASE REPORT
ΕΝΔΙΑΦΕΡΟΥΣΑ ΠΕΡΙΠΤΩΣΗ

ARCHIVES OF HELLENIC MEDICINE 2026, 43(Suppl 1):127–131
ΑΡΧΕΙΑ ΕΛΛΗΝΙΚΗΣ ΙΑΤΡΙΚΗΣ 2026, 43(Συμπλ 1):127–131

Multiple myeloma with renal and bone involvement
A case emphasizing the importance of multimodal diagnosis

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Πολλαπλό μυέλωμα με νεφρική και οστική εντόπιση: Μια περίπτωση που τονίζει τη σημασία της πολυπαραγοντικής διάγνωσης

Περίληψη στο τέλος του άρθρου

The purpose of this report is to describe the clinical presentation of multiple myeloma with CRAB (hyperCalcemia, Renal impairment, Anemia, Bone lesion) manifestations and emphasize the importance of a multimodal evaluation. A 51-year-old male presented with complaints of fatigue, excessive sleepiness, chronic back pain, and pain in the right lower rib. Physical examination revealed pale conjunctiva, while vital signs were within normal limits. Laboratory findings showed normochromic normocytic anemia (hemoglobin [Hb] 11.4 g/dL), elevated urea (57 mg/dL) and creatinine (2.06 mg/dL), hypercalcemia (2.5 mmoL/L), as well as proteinuria and hematuria. Non-contrast thoracic computed tomography (CT) demonstrated multiple lytic lesions in the scapula, sternum, ribs, and spine, whereas abdominal CT revealed lytic lesions and osteopenia in the lumbosacral and pelvic bones. Immunological testing detected elevated free light chain kappa (329.88 mg/L) with a kappa/lambda ratio of 117.40. Bone marrow aspiration showed 90.5% plasmocyte dominance with immunohistochemistry positive for CD38, CD56, CD138, and kappa. Serum protein electrophoresis revealed an M-spike characteristic of multiple myeloma. In conclusion, this case illustrates that multiple myeloma may present with nonspecific symptoms, but diagnosis is established through a combination of laboratory, radiological, immunological, and histopathological evaluations. A multimodal approach is crucial for early detection and prevention of more severe organ complications.

Key words

Anemia
Hypercalcemia
Multiple myeloma
Plasma cell myeloma
Renal insufficiency

Submitted 27.8.2025
Accepted 20.9.2025

Multiple myeloma is a challenging hematologic malignancy due to its highly variable and often nonspecific clinical presentation.[1] The disease accounts for approximately 1% of all cancers and 10% of cases of hematologic malignancy, with incidence increasing with age and mortality remaining high in most countries.[2] The clinical course of multiple myeloma is influenced by genetic factors, bone marrow microenvironment, immune status, and target organ damage.[3] Among these, target organ damage –particularly involving the bones, kidneys, blood, and calcium metabolism– represents the main manifestations underlying diagnosis.[4] This highlights the importance of early identification of CRAB features (hyperCalcemia, Renal impairment, Anemia, Bone lesion) as specific clinical indicators in the disease course of multiple myeloma.[5]

By definition, multiple myeloma is a plasma cell malignancy characterized by clonal proliferation of plasma cells in the bone marrow and excessive production of monoclonal immunoglobulins.[5] This pathological process can affect multiple organs through various mechanisms, such as osteoclast activation leading to lytic bone lesions, secretion of light chains inducing nephropathy, and accumulation of abnormal immunoglobulins impairing immune function.[6] Epidemiological data show that more than two-thirds of patients present with bone abnormalities, one-third with renal impairment, and another third with hypercalcemia or anemia.[7] Nevertheless, wide clinical variability exists, and some patients may present without typical symptoms, leading to delayed diagnosis.[8,9] This delay underscores the gap between understanding the disease's fundamental mechanisms and the application of early diagnostic strategies in clinical practice.

The aim of this case report is to describe the clinical presentation of multiple myeloma in a 51-year-old patient with

manifestations of anemia, renal impairment, hypercalcemia, and multiple bone lesions. This report also emphasizes the importance of a multimodal diagnostic approach, including laboratory, radiological, immunological, and histopathological evaluations, to establish a comprehensive diagnosis. The proposed hypothesis is that early detection based on CRAB features may accelerate diagnosis, reduce delays in treatment, and ultimately improve clinical outcomes. Thus, this report is expected to provide practical insights to raise clinicians' awareness of the nonspecific manifestations of multiple myeloma and serve as a basis for developing more effective diagnostic strategies in the future.

CASE PRESENTATION

A 51-year-old male presented to Tembagapura Hospital with complaints of fatigue, excessive sleepiness, chronic low back pain, and right lower rib pain for the past three months. The pain worsened with coughing, sneezing, or changing position from lying to sitting, with a pain score of 6, and was relieved by analgesics. The patient had a history of lumbosacral CT examination at another hospital, which established a diagnosis of spondylosis and was treated with regular physiotherapy. Physical examination revealed pale conjunctiva, while vital signs were within normal limits, with a blood pressure of 121/79 mmHg, pulse rate of 81 beats per minute, respiratory rate of 20 breaths per minute, oxygen saturation of 98% on room air, temperature of 36.5 °C, and body weight of 57 kg.

Laboratory findings revealed normochromic normocytic anemia, with hemoglobin decreasing from 13.3 g/dL in February 2025 to 11.4 g/dL in April 2025 and hematocrit at 32.4%. Renal function showed deterioration, with urea increasing to 57 mg/dL and serum creatinine rising from 0.98 mg/dL in February 2025 to 2.03–2.06 mg/dL in May 2025. In addition, hypercalcemia was noted with calcium levels ranging from 2.7–2.5 mmoL/L. Urinalysis was consistent with proteinuria (+2) and hematuria (+2).

Radiological examination with non-contrast thoracic CT and 3D reconstruction demonstrated multiple lytic bone lesions involving the bilateral scapulae, sternum, all ribs, and the lower cervical, thoracic, and proximal lumbar spine. Abdominal CT showed multiple lytic bone lesions with osteopenia in the lumbosacral and pelvic bones (fig. 1A and 1B).

Immunological testing revealed an elevated free light chain kappa level of 329.88 mg/L with a decreased lambda level of 2.81 mg/L, resulting in an increased kappa/lambda ratio of 117.40, consistent with monoclonal gammopathy. Bone marrow examination demonstrated plasmocyte dominance of 90.5% with suppression of nearly all other hematopoietic lineages. Immunohistochemistry showed positive expression for CD38, CD56, CD138, and kappa. Serum protein electrophoresis revealed an M-spike characteristic of multiple myeloma.

COMMENTS

This case reports a 51-year-old male presenting with

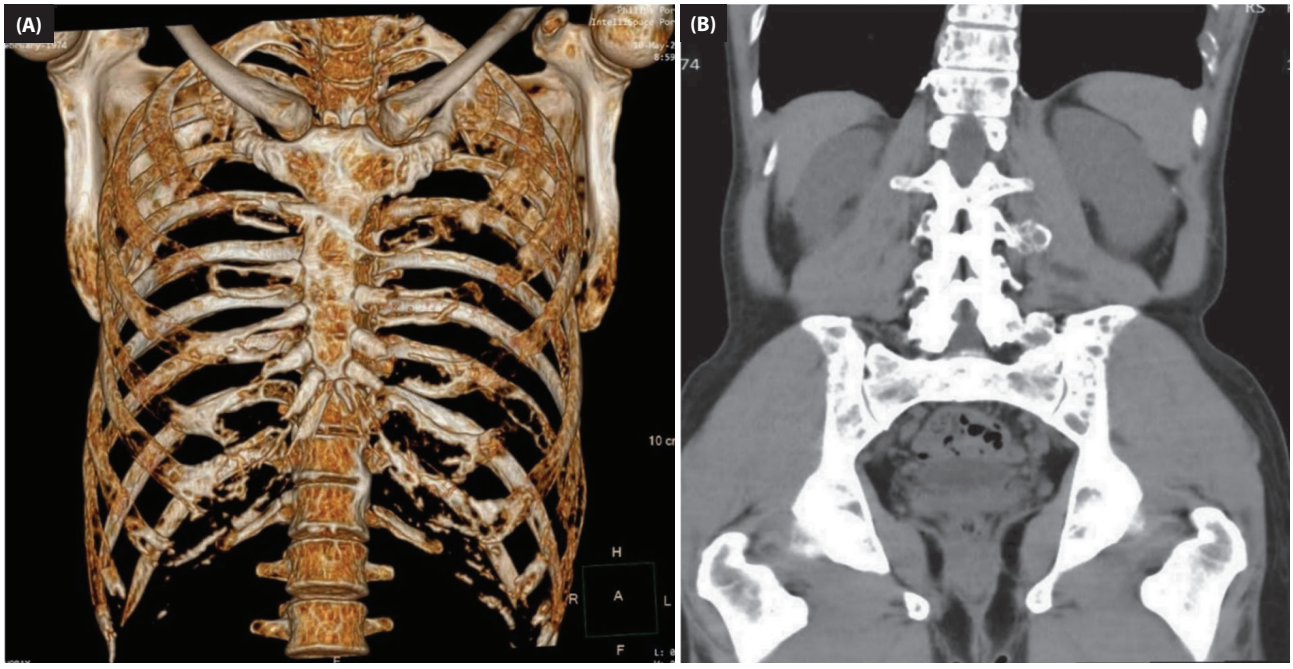

Figure 1. Computed tomography (CT) scan images showing multiple bone lesions. **(A)** Chest CT without contrast (3D reconstruction) demonstrates multiple lytic bone lesions involving the bilateral scapula, sternum, ribs, and spine (lower cervical, thoracic, and proximal lumbar regions). **(B)** Abdominal CT scan reveals multiple lytic bone lesions and osteopenia affecting the lumbosacral spine and pelvic bones.

chief complaints of weakness, excessive sleepiness, chronic back pain, and pain in the right lower rib. Laboratory findings showed normochromic normocytic anemia, worsening renal function, hypercalcemia, as well as proteinuria and hematuria. Radiological imaging revealed multiple lytic lesions in the scapula, sternum, ribs, spine, and pelvis (fig. 1A and 1B). Immunological examination demonstrated a significantly elevated kappa/lambda ratio (117.40), bone marrow aspiration revealed 90.5% plasmocytes with immunohistochemistry positive for CD38, CD56, CD138, and kappa, and serum protein electrophoresis showed an M-spike. These findings were consistent with a diagnosis of multiple myeloma fulfilling CRAB criteria.[10] Our findings are consistent with other studies reporting that more than 80% of multiple myeloma patients present with bone involvement in the form of multiple lytic lesions.[11] Furthermore, other studies have shown that a free light chain ratio ≥100 combined with bone marrow involvement is a strong diagnostic marker of myeloma.[12,13] A direct factor explaining this condition is plasma cell infiltration of the bone marrow and monoclonal immunoglobulin production causing organ dysfunction, while indirect factors include calcium metabolism disturbances and protein deposition in the kidneys.[14] Thus, this case highlights the importance of a multimodal approach (laboratory, radiology, immunology, and histopathology) in establishing the diagnosis of multiple myeloma.

Renal involvement in this patient was particularly significant, as indicated by elevated serum creatinine up to 2.06 mg/dL, consistent with literature reporting that approximately 20–40% of multiple myeloma patients are initially detected through renal failure.[15] In patients with hypercalcemia, prognosis is generally poorer, as this condition is one of the CRAB markers most strongly associated with disease progression.[16,17] Other studies have also demonstrated that the presence of multiple bone lesions combined with hypercalcemia at diagnosis increases the risk of musculoskeletal complications and accelerates decline in quality of life.[18] A direct factor explaining this condition is increased bone resorption due to osteoclast-activating cytokines, while indirect factors include reduced osteoblast activity and impaired mineral homeostasis.[19] Accordingly, renal and bone involvement in this patient not only support the diagnosis but also emphasize the need for early detection of organ-specific complications.

The pathophysiology of multiple myeloma is closely related to abnormal monoclonal plasma cell proliferation.[5] The clonal evolution theory explains that plasma cell clones with specific genetic mutations can dominate the bone marrow and produce excessive monoclonal immunoglobulins.[20] The main pathway of bone destruction occurs through osteoclast stimulation by proinflammatory cytokines, resulting in lytic bone lesions.[21] Renal damage occurs through two mechanisms: light chain deposition (cast nephropathy) and hypercalcemia, which further exacerbates nephropathy.[22] Other studies have also confirmed that an imbalance between osteoclast and osteoblast activity underlies the development of multiple lytic lesions.[23] These mechanisms explain why the patient in this report presented with the characteristic combination of anemia, renal failure, hypercalcemia, and multiple bone lesions.

This study provides several benefits and clinical implications. First, this case demonstrates the importance of serial laboratory monitoring to detect disease progression, particularly hemoglobin, renal function, and calcium levels. Second, CT scanning has proven to be more sensitive than conventional radiography in detecting multiple bone lesions, underscoring its importance in initial evaluation. Third, free light chain testing and serum protein electrophoresis provide critical information regarding the presence of monoclonal immunoglobulins that may not be detected through routine testing. Fourth, bone marrow aspiration with immunohistochemical analysis serves as a key examination to establish a definitive diagnosis. Fifth, this case report reinforces that diagnosing multiple myeloma requires a multimodal approach to avoid delays that could result in more severe organ complications.

This study has several limitations. First, it is based on a single case report, and thus the findings cannot be generalized to the entire population of multiple myeloma patients. Second, there are no long-term follow-up data on the patient's therapeutic response, so clinical outcomes cannot be fully assessed. Third, as a medical record-based case report, there is potential for information bias. Fourth, further cytogenetic and molecular testing was not performed, leaving the patient's genetic risk status unknown. Fifth, the patient's quality of life was not quantitatively evaluated, so long-term functional outcomes cannot be determined.

In conclusion, this case highlights that multiple myeloma may initially present with nonspecific symptoms such as bone pain and weakness, yet laboratory, radiological, immunological, and histopathological examinations reveal characteristic findings including anemia, renal impairment, hypercalcemia, multiple lytic lesions, elevated kappa/lambda ratio, plasmocyte dominance, and an M-spike on serum protein electrophoresis. A multimodal approach is crucial for establishing an early diagnosis and preventing more severe organ complications.

ΠΕΡΙΛΗΨΗ

Πολλαπλό μυέλωμα με νεφρική και οστική εντόπιση: Μια περίπτωση που τονίζει τη σημασία της πολυπαραγοντικής διάγνωσης

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Αρχεία Ελληνικής Ιατρικής 2026, 43(Συμπλ 1):127–131

Περιγράφεται κλινική εικόνα του πολλαπλού μυελώματος με εκδηλώσεις CRAB και τονίζεται η σημασία μιας πολυπαραγοντικής αξιολόγησης. Ένας 51χρονος άνδρας προσήλθε αιτιώμενος κόπωση, υπερβολική υπνηλία, χρόνιο πόνο στην πλάτη και πόνο στο δεξιό κάτω μέρος του θώρακα. Η κλινική εξέταση αποκάλυψε ωχρούς επιπεφυκότες, ενώ τα ζωτικά σημεία ήταν εντός των φυσιολογικών ορίων. Τα εργαστηριακά ευρήματα έδειξαν ορθόχρωμη ορθοκυτταρική αναιμία (Hb 11,4 g/dL), αυξημένη ουρία (57 mg/dL) και κρεατινίνη (2,06 mg/dL), υπερασβεστιαιμία (2,5 mmoL/L), καθώς και πρωτεϊνουρία και αιματουρία. Η αξονική τομογραφία θώρακος χωρίς σκιαγραφικό ανέδειξε πολλαπλές λυτικές βλάβες στην ωμοπλάτη, στο στέρνο, στις πλευρές και στη σπονδυλική στήλη, ενώ η αξονική τομογραφία κοιλίας αποκάλυψε λυτικές αλλοιώσεις και οστεοπενία στα οσφυοϊερά και πυελικά οστά. Οι ανοσολογικές εξετάσεις ανίχνευσαν αυξημένες ελεύθερες ελαφρές αλυσίδες κ (329,88 mg/L) με λόγο κ/λ 117,40. Η παρακέντηση μυελού των οστών έδειξε 90,5% διήθηση από πλασματοκύτταρα με ανοσοϊστοχημεία θετική για CD38, CD56, CD138 και κ. Η ηλεκτροφόρηση λευκωμάτων ορού αποκάλυψε Μ κλάσμα πολλαπλού μυελώματος. Η περίπτωση αυτή καταδεικνύει ότι το πολλαπλό μυέλωμα μπορεί να εμφανιστεί με μη ειδικά σημεία και συμπτώματα, αλλά η διάγνωση τίθεται μέσω ενός συνδυασμού εργαστηριακών, ακτινολογικών, ανοσολογικών και ιστοπαθολογικών αξιολογήσεων. Μια πολυτροπική προσέγγιση είναι ζωτικής σημασίας για την έγκαιρη ανίχνευση της νόσου και την πρόληψη σοβαρότερων επιπλοκών από τα προσβεβλημένα όργανα.

Λέξεις ευρετηρίου: Αναιμία, Νεφρική ανεπάρκεια, Πολλαπλό μυέλωμα, Υπερασβεστιαιμία, Υπερπλασία πλασματοκυττάρων

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