



## Case report

## Radiotherapy alleviates spinal cord compression caused by solitary bone plasmacytoma: A case report

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## ABSTRACT

**Introduction and importance:** Solitary bone plasmacytoma (SBP) is a hematopoietic malignancy occurring in bone tissue, which often causes bone destruction at the site of the lesion. When the lesion occurs in the spine and causes spinal stenosis and compression of the spinal cord, surgery is performed as an adjuvant treatment before radiotherapy.

**Case presentation:** A 36-year-old patient suffered from neck, shoulder and upper limbs pain for 3 weeks and the symptom worsened for 3 days after exercise. CT and MRI examination of the neck after emergency admission revealed C5 vertebral pathological fracture with associated spinal stenosis and spinal cord compression. PET-CT indicated a hypermetabolic soft tissue mass in the C5–6 vertebral body. Granulomatous lesions (tuberculosis) were considered, but neoplastic lesions were not ruled out. The primary diagnosis was cervical fracture caused by tuberculosis. Finally, a needle biopsy was performed at the lesion site and a diagnosis of SBP was made. Radiotherapy was immediately followed and the spinal cord compression was relieved a month later. After 6 months of follow-up, she is now in stable condition with no neck pain or neurological impairment.

**Conclusion:** For patients with SPB resulting in pathological fracture of the cervical vertebra with spinal stenosis and compression of the spinal cord, forgoing surgery and undergoing radiation therapy alone may be an option.

## 1. Introduction

Solitary bone plasmacytoma (SBP) is a kind of primary malignant tumors due to monoclonal plasma cell infiltrate and lesions, approximately 5% of all cases of plasma cell disorders (The incidence rates (IRs) is 0.34 per 100,000 person-years [1]) are SPB, which comprises 70% of all solitary plasmacytoma (SP) and occurs primarily in the red marrow-containing bones of the axial skeleton, the most common site is the thoracic spine, and the cervical spine is rare spine [2–6]. The most common symptom is pain and can also show compression of the spinal cord or nerve roots. Diagnosis is currently based on histopathological examination through tissue biopsy and radiological confirmation [7]. The treatment of SPB mainly includes radiotherapy, surgical treatment and adjuvant chemotherapy. Because SBP is highly sensitive to radiotherapy, which is the first choice for spinal SBP, surgery is needed when spinal lesions invade the spinal canal, causing compression of the spinal cord or nerve roots and resulting in limb dysfunction or paraplegia [8]. However, a recent study by Goyal Gaurav showed that the combination

of surgery and radiotherapy increased mortality compared with either treatment alone [9].

For the patient with spinal cord compression due to spinal fracture, the symptoms of spinal cord compression were relieved and the extent of the lesion was reduced after systematic radiotherapy.

This work has been reported in line with the SCARE criteria [10].

## 2. Patient information

## 2.1. Chief complaints

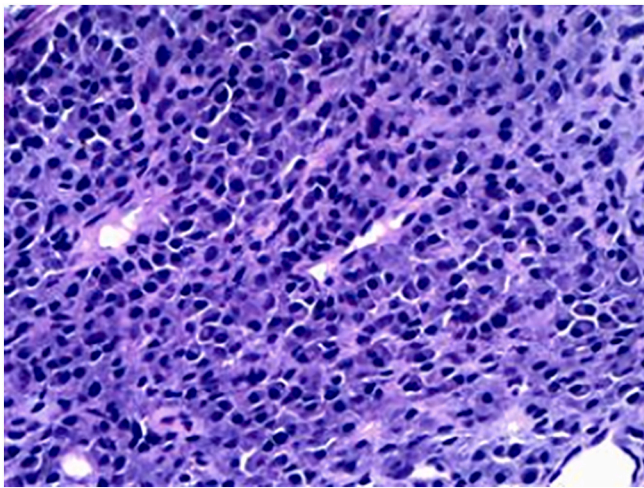
A 36-year-old patient complained of neck, shoulder and upper limbs pain for 3 weeks.

## 2.2. History of present illness

The patient developed neck, shoulder and upper limb pain after horizontal bar exercise without falling down or impact on her body 3

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**Fig. 1.** Puncture biopsy at the site of the lesion revealed a proliferation of abnormal plasma cells in the puncture tissue.

weeks ago, and the symptoms worsened 3 days ago, accompanied by numbness and weakness of upper limb.

### 2.3. History of past illness

The patient had no medical history.

## 3. Clinical findings

### 3.1. Physical examination

The Visual Analogue Scale (VAS) of her upper limbs was 7. There were about 20 degree losses in flexion and extension range of the neck with aggravated pain during movement. The muscle strength of bilateral triceps brachii and extensor carpi dorsi was level 4. Hypoesthesia was detected in the limbs below the nipple. The muscle strength of bilateral quadriceps femoris muscle, tibial anterior muscle and great toe dorsal extensor muscle was level 4. The muscle tone of bilateral lower limbs rosed. The abdominal wall reflex and anal reflex decreased while bilateral knee tendon reflex was hyperactive. Bilateral Hoffman sign and Babinski sign were positive.

### 3.2. Laboratory examinations

A puncture biopsy of the lesion site indicated that a class of abnormal plasma cells was diffuse in the puncture tissue. The cell body is medium to large, and the cytoplasm is rich and slightly basophilic. The nucleus is round or slightly irregular and slightly deviated, some nucleoli are obvious, and mitosis is rare. Interstitial sclerosis was accompanied by hyperplasia of small vessels and scattered lymphocytes (Fig. 1).

Immune globulin IgG0.0212 g/ml, IgM0.00234 g/ml, IgE228.000 IU/ml.

### 3.3. Imaging examinations

MRI and CT showed C5 vertebral fracture, C5–6 spinal cord compression (Fig. 2), PET-CT suggested granulomatous lesions (tuberculosis), and neoplastic lesions were not excluded (Fig. 3).

## 4. Diagnostic assessment

The patient was diagnosed with SBP by puncture biopsy.

## 5. Therapeutic intervention

The patient received radiotherapy at a total dose of 50 Gy (1.8 Gy per day) for four weeks immediately after the diagnosis was confirmed.

## 6. Follow-up and outcomes

After four weeks of radiotherapy, the patient's CT scan showed a reduction in lesion size and relief of spinal cord compression. The patient got obviously remission of her pain and the VAS of upper limb and neck decreased to 2. The muscle strength of all limbs returned to normal. The range of hypalgesia reduced to dorsum of left foot. The reflexes of four limbs returned to normal (Fig. 4).

The patient's condition was stable with no neurological dysfunction and no leakage occurred during the 3 years of follow up.

## 7. Discussion

Solitary bone plasmacytoma (SBP) is a hematopoietic malignancy occurring in bone tissue [8]. As a single lytic lesion caused by infiltration of monoclonal plasma cells, solitary spinal plasmacytoma accounts for the highest proportion and usually occurs in the middle-aged and elderly [11]. The absence of typical symptoms in the early stages of SBP is usually characterized by pain, soft tissue swelling, or pathological fracture, sometimes leading to obvious neurological symptoms when the axial skeleton is affected [12]. For young patients with cervical fracture without trauma history, the possibility of SBP should be vigilant. Among patients with SBP, especially those with a small amount of myeloid plasmacytosis, the risk of symptomatic multiple myeloma is higher: approximately 50% of patients with SBP and 30% of patients with isolated plasmacytoma develop MM within 10 years of initial diagnosis [13–15].

The absence of typical symptoms in the early stages of SBP is usually characterized by pain, soft tissue swelling, or pathological fracture, sometimes leading to obvious neurological symptoms when the axial skeleton is affected [12]. For young patients with cervical fractures without trauma history, the possibility of SBP should be vigilant. For such a young patient with cervical fracture without trauma history, the possibility of pathological fracture should be considered first, the most common being tuberculosis and tumor, and the results of PET-CT also support the above two possibilities. Because the patient didn't have any tuberculosis symptoms and the tuberculosis spot test was negative, so the lesion tended to be neoplastic. A needle biopsy of the fracture site for further diagnosis suggested SBP. The current diagnostic criteria for SBP are the following [16]: (1) A single area of bone damage due to clonal plasma cell hyperplasia. (2) Histologically normal marrow aspirate and trephine (plasma cell <5%). (3) Normal results on the skeletal survey, including radiology of long bones. (4) No anemia, hypercalcemia, or renal impairment due to plasma cell dyscrasia. (5) Absent or low serum or urinary level of monoclonal immunoglobulin (>20 g/l suspicious of MM). (6) No additional lesions on MRI scan of the spine. According to the consensus statement and guidelines from the International Myeloma Working Group, to better assess both the extent of the local tumor and the revealing of occult lesions elsewhere, MRI is recommended in all patients with an SPB and helpful in the initial staging of SBP [17,18].

Currently, the main treatment methods of SPB include: (1) Radiotherapy: as the preferred treatment for SBP, local control rates can be achieved in 80–90% of cases with radiation therapy alone [3]. There is no conclusive consensus about the dose and extent of radiotherapy, currently the commonly used radiation dose range is 30–60Gy, the specific radiation dose is controversial, and it has been reported that the radiation dose greater than 40Gy is helpful to improve the survival of patients [7,19]. The local control rate was 94% when the radiation dose exceeded 40Gy, but was less than 70% when the delivery dose was less than 40Gy [20]. (2) Adjuvant chemotherapy: The role of adjuvant chemotherapy in the treatment of SP after radiotherapy is still

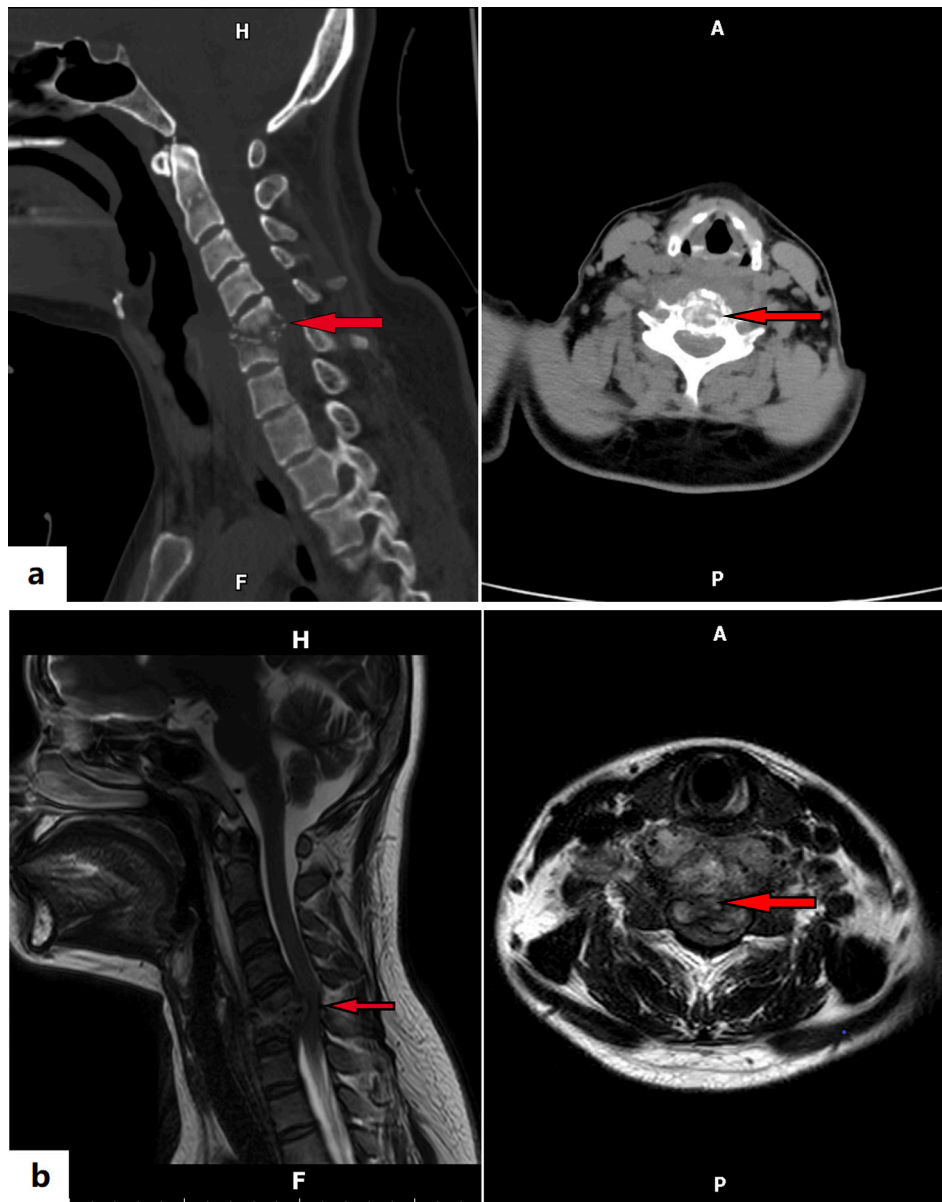


Fig. 2. (a-b) CT and MRI showed C5 vertebral fracture, C5–6 spinal cord compression. (A: Anterior, P: Posterior, H: Head, F: Foot).

controversial and there is no clear recommendation. (3) Surgical treatment: Due to the development of modern spinal internal fixation systems in the last decade, surgical treatment is a viable and successful option for patients with pain caused by vertebral structural injury, vertebral instability, nerve injury, or a combination of the above factors. In this case, the patient was treated with radiation instead of surgery for spinal cord compression caused by a cervical spine fracture caused by SPB. The symptoms caused by spinal cord compression were significantly reduced after 50 Gy dose of systemic radiotherapy, and CT scans showed a

reduction in the area of the lesion. It has been reported that patients with plasma cell tumors aged 40 years or younger are often associated with large focal plasma cell myeloma and often with SP. [21] Studies have shown that patients in this age group have good clinical outcomes [22]. Therefore, accurate diagnosis is particularly important for these young patients. If there are bone lesions, no matter how patients' age, stressed hematology referral and diagnosis of plasma cell tumors.

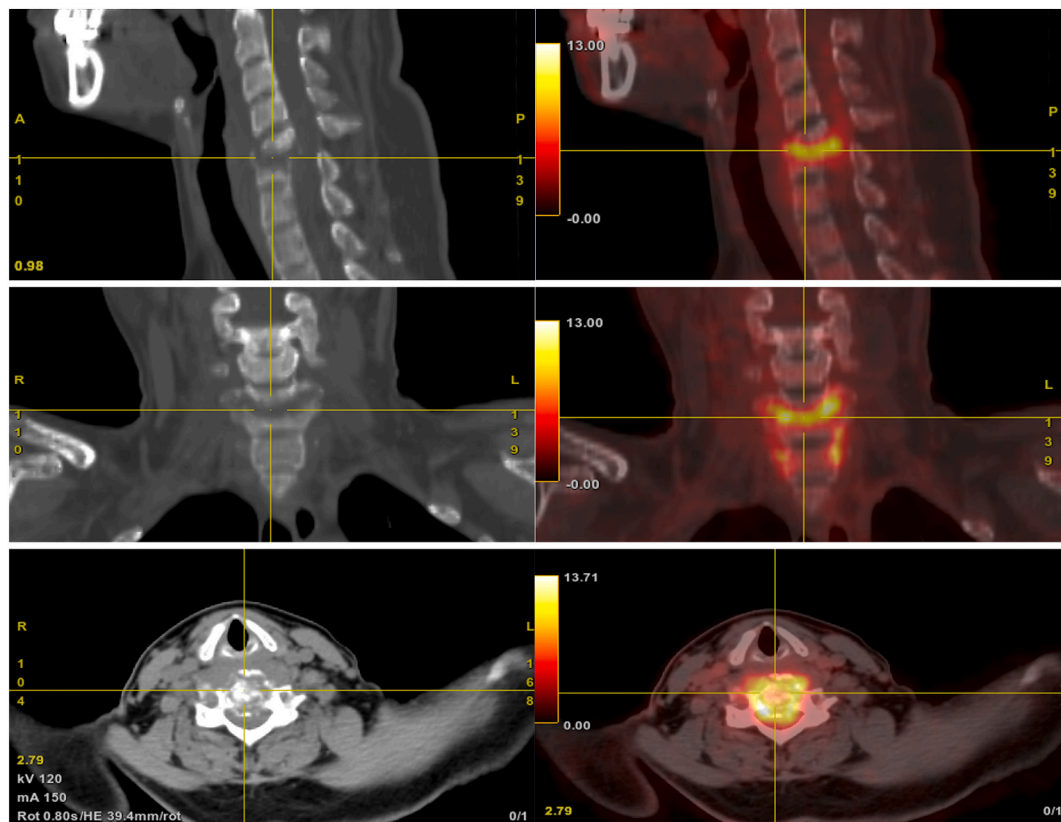


Fig. 3. PET-CT indicated that the C5 vertebral hypermetabolic biological target lesion was the biopsy target.

## 8. Conclusion

We have described a case finally diagnosed as SPB with symptom of spinal cord compression caused by cervical vertebra fracture. Because the patient is a young woman with no history of trauma, the pathological fracture was considered first. After a series of examinations, the patient was finally diagnosed as SPB. For the spinal cord compression symptoms caused by fracture, we chose radiotherapy instead of surgery. The symptoms were relieved after systematic radiotherapy, and the patient's life basically returned to normal. Due to the short follow-up time in this study, long-term follow-up is needed to demonstrate the efficacy and safety of the treatment regimen.

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## Ethical approval

This paper as a case report, therefore does not require ethics approval.

## Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

## Author contribution

Zheng Chen: investigation, manuscript drafting, writing, literature search.

Shengrong Lin: investigation, editing, critical review.

Zheng Chen and Shengrong Lin made equal contributions to the work.

Hongwei Zhu: critical review, supervision, final approval.

## Registration of research studies

None.

## Guarantor

Hongwei Zhu.

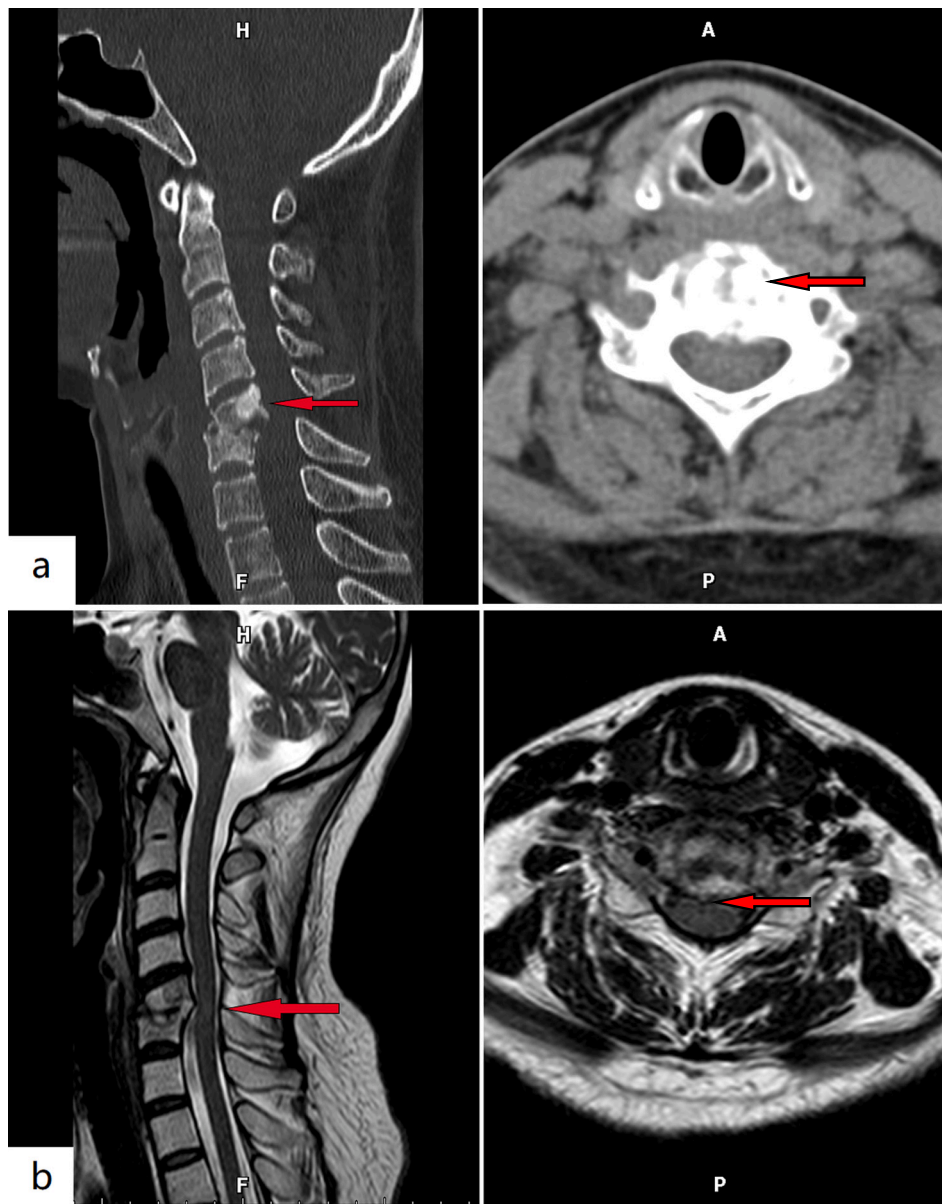


Fig. 4. (a-b) CT and MRI after chemotherapy showed relief of spinal cord compression. (A: Anterior, P: Posterior, H: Head, F: Foot).

#### Provenance and peer review

Not commissioned, externally peer-reviewed.

#### Declaration of competing interest

This work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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