

Solitary Plasmacytoma of the Sternal Stalk: A Case Report and Literature Review.

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Case report

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Abstract

Background: It has been reported that sternal neoplasms are a rare disease, accounting for about 1% of primary bone neoplasms, of which about 60% are malignancy, mostly occurring in the manubrium sternum.

Case presentation: We reviewed a 77-year-old man with a solitary plasmacytoma of the sternal stalk presenting with pain in the anterior chest wall by examining a preoperative diagnosis of sternal manubrium malignant bone tumor. We performed extensive sternal manubrium tumor resection + bilateral partial costal cartilage resection + bilateral clavicular head resection + cervical lymph node dissection + thoracic reconstruction, and the postoperative recovery was perfect.

Conclusion: We report a rare case of solitary plasmacytoma of the manubrium sternum successfully treated by extensive radical surgery for the manubrium tumor. Although rare, the disease should be identified, examined, and treated early to avoid serious complications.

Background:

Solitary bone plasmacytoma (SBP) is a clonal proliferation of plasma cells similar to plasma cell myeloma, presenting localized bone growth. Plasma cell tumors account for about 1–2% of human malignancies, with an annual incidence of about 3.5/100,000. SBP is similar to MM in terms of cytology, immunophenotype, and genes. Among males and females, males account for about 65% of the incidence. The most common age of SBP is about 55 years old, and it predominantly occurs in the axial bone with a concentration of red marrow, with the most common occurrence in the spine, and sternal bone is very rare 2;3.

We describe a 77-year-old man who successfully treated a solitary plasmacytoma of the manubrium sternum with a broad-scale radical surgical procedure.

Case Presentation:

A 77-year-old male patient was admitted with "persistent chest wall pain for more than two months, anterior chest wall mass found for one month and progressive enlargement for ten days."

Physical examination: The sternal stalk showed a locally raised mass, stony and well-defined, with a size of 8.4cm× 10.6cm, mild to moderate tenderness in the center and surrounding of the pack, and no superficial skin veins on the surface of the mass (Fig. 1, a).**History:** A history of tuberculosis, no family history of hereditary cancer or other diseases.**Supplementary examination:** tumor markers, blood routine, erythrocytic sedimentation rate, alkaline phosphatase, hypersensitive C-reactive protein, urinary during qualitative tests were negative.**Color Doppler ultrasound (superficial lymph node examination)** bilateral neck region IV lymph node enlargement, the maximum diameter of 1.5cm. Chest plain scan and enhanced CT showed an 8.5cm-shaped round mass in the manubrium sternum, with expansive bone

destruction and marginal sclerosis (Fig. 1, b, c). Bone scan: Abnormal concentration of round nuclides in the sternal stalk was observed (Fig. 1, d).

During the operation, the tumor protruding on the surface of the sternal stalk, the size was about 7cm × 8cm, the periosteum was complete and soft, the cancer was not beyond the bilateral sternal edge, and the upper sternal edge, the bilateral clavicle head and the bilateral 1–3 ribs were not invaded (Fig. 2, a). In addition, the tissue inside the tumor was changed like fish, with a crisp texture and apparent oozing blood.

During the operation, the tumor was frozen : (mass of sternal stalk) malignant tumor, so the enlarged radical resection of sternal stalk tumor was performed. The cutting edge was 6cm from the edge of the tumor. No tumor invasion was observed in the aortic arch and superior vena cava. The manubrium sternum, part of the body of the sternum, part of the costal cartilage on both sides, and part of the thymus tissue below the tumor were removed entirely (Fig. 2, b). After the enlarged resection of cancer, the size of the chest wall defect was about 20cm × 20cm. The bilateral pleural cavity and mediastinal part of the defect could be seen under direct vision (Fig. 2, c). Two polyester patches were used to repair the defect.

The broken ends of both clavicles were bridged and fixed with curved reconstruction steel, and the functions of bilateral sternocleidomastoid muscles were rebuilt. The preformed rib plates were reconstructed for thoracic reconstruction (Fig. 2, d).

Postoperative pathological diagnosis was plasma cell tumor (sternal stalk tumor), and isolated bone plasma cell tumor was considered clinically. No tumor was found at the broken rib ends. Immunohistochemistry: Vimentin (+), CD38 (+), Kappa (+), CD138 (partially +), IgG (partially weak +), CD79α (locally +), Ki-67 (+, about 10%) (Fig. 3, a b). Supraclavicular lymph nodes and parathoracic lymph nodes were negative. The incision healed well after surgery, and he was discharged from the hospital smoothly (Fig. 3, c).

Postoperative pathology showed no tumor involvement at the broken ends of the ribs, and no radiotherapy or chemotherapy was performed. Postoperative follow-up for half a year showed no depressions or protrusions in chest wall appearance, good recovery in respiratory and motor function, neck and shoulder activities, and no effect on daily life. In addition, DR chest reexamination showed an excellent rib plate and clavicle plate position, and no loosening was observed (Fig. 3, d).

Discuss:

The diagnosis of SBP is mainly based on pathological diagnosis, including tumor biopsy, puncture biopsy, tumor resection, etc. In this case, no preoperative pathological results were found, but preoperative chest CT showed bone destruction and local distension at the sternal stalk. Bone scan showed an abnormal increase in bone metabolism of the sternal branch accompanied by expansive bone destruction and primary bone tumor. Therefore, a preoperative malignant tumor of the sternal stalk was

considered. Once the sternal tumor is definitively diagnosed, in addition to the exclusion of distant metastasis or surgical contraindication, active surgical intervention should be taken regardless of whether the cancer is benign or malignant, and intraoperative margin should be guaranteed to be free of tumor tissue invasion⁴. The patient's chest (CT), bone scan, and other examinations showed only a single sternal stem bone destruction, negative BJP in urine, and pathological results confirmed that it was caused by a single plasma cell clone, thus meeting the diagnostic criteria of SBP⁵.

At present, the surgical resection range of chest wall malignant tumors should be at least 5 CMS above the tumor edge. If the tumor has invaded the lung tissue, the size and capacity of the lung tissue can be determined according to the intraoperative situation⁶. Most scholars believe that part of the sternum should be removed during the operation if the chest wall tumor is in the sternum. If necessary, the sternum and bilateral clavicle can be removed entirely to achieve the radical treatment of the tumor. In this case, we used enlarged radical resection of the sternal stalk tumor. The surgical resection scope was more than 6cm, and the supraclavicular lymph nodes and parathoracic lymph nodes were dissected during the operation. However, due to the dense adhesion between the pleura and the tumor tissue, part of the pleura was removed, and the tumor did not invade the lung tissue. During the operation, the anterior chest wall skin, muscle flap tissue, and intercostal muscle should be protected to prepare for the reconstruction of the chest wall and avoid the soft-tissue defect of the chest wall. At the same time, protective treatment and ligation of bilateral internal thoracic arteries and intercostal arteries should be performed intraoperatively to reduce intraoperative blood loss and improve surgical safety⁷.

After extensive radical resection of sternal manubrium tumor, the range of thoracic defect reached 20cm×20cm, so intraoperative thoracic reconstruction was performed⁸. At present, the materials for the rebuilding of thoracic defects can be divided into autologous tissue, allogeneic tissue, and artificial material. Autogenous tissue mainly includes rib, iliac crest, fibula, fascia lata, and musculocutaneous flap. The advantages of choosing autologous tissue for thoracic reconstruction are no rejection reaction and good compatibility. Disadvantages: enormous trauma, the limited amount of autologous tissue, unable to meet the repair of a wide range of thoracic defects, so we did not choose autologous tissue to reconstruct the thoracic cage. Artificial materials mainly include titanium mesh, titanium plate^{7;9}, etc. The 3D printed titanium mesh is used to rebuild the thoracic cage, which can accurately reconstruct the morphological structure of the thoracic cage and has good hardness. The postoperative thoracic deformity and abnormal breathing and movement are less. Therefore, it is an ideal repair material, but it isn't easy to obtain and expensive. During the operation, preformed rib plates (titanium plates), which were quickly available and affordable, were used to bridge and fix the ribs. Curve bone plates were used to bridge and improve the bilateral clavicles to reconstruct the thoracic cage. The function of the sternocleidomastoid muscle was retained during the operation.

Different opinions are held on whether adjuvant radiotherapy should be used after SBP surgery. Some scholars believe that SBP is highly sensitive to radiotherapy, and the local control rate after radiotherapy can reach 83%-96%¹⁰. At the same time, Ozsahin et al.¹¹ reported 94 patients who received surgical treatment for SBP and believed that combined postoperative radiotherapy had a positive effect. However,

adjuvant radiotherapy is not recommended for patients who can complete resection of the tumor and whose surgical margin is proved to be negative by pathology after surgical resection. The postoperative pathological report of this patient indicated no tumor involvement at the broken end of the rib, so postoperative radiotherapy was not performed.

Conclusion:

We report a rare case of solitary plasma cells in the manubrium sternum. The diagnosis of isolated plasma cells in the sternal stalk was mainly based on histopathological examination, and multiple myeloma should be excluded. Although rare, the disease should be identified, tested, and treated early to avoid serious complications.

Abbreviations

SBP: Solitary bone plasmacytoma; CT: Computed tomography;

MM: Multiple myeloma;

Declarations

Acknowledgments

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Availability of data and materials

The data supporting the conclusions of this article are included within the article.

Authors' contributions

All authors participated in the design of the case report and coordination and helped to draft the manuscript. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Consent for publication

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

Ethics approval and consent to participate

Not required.

Disclosures

The authors have no funding, financial relationships, or conflicts of interest to disclose.

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Figures

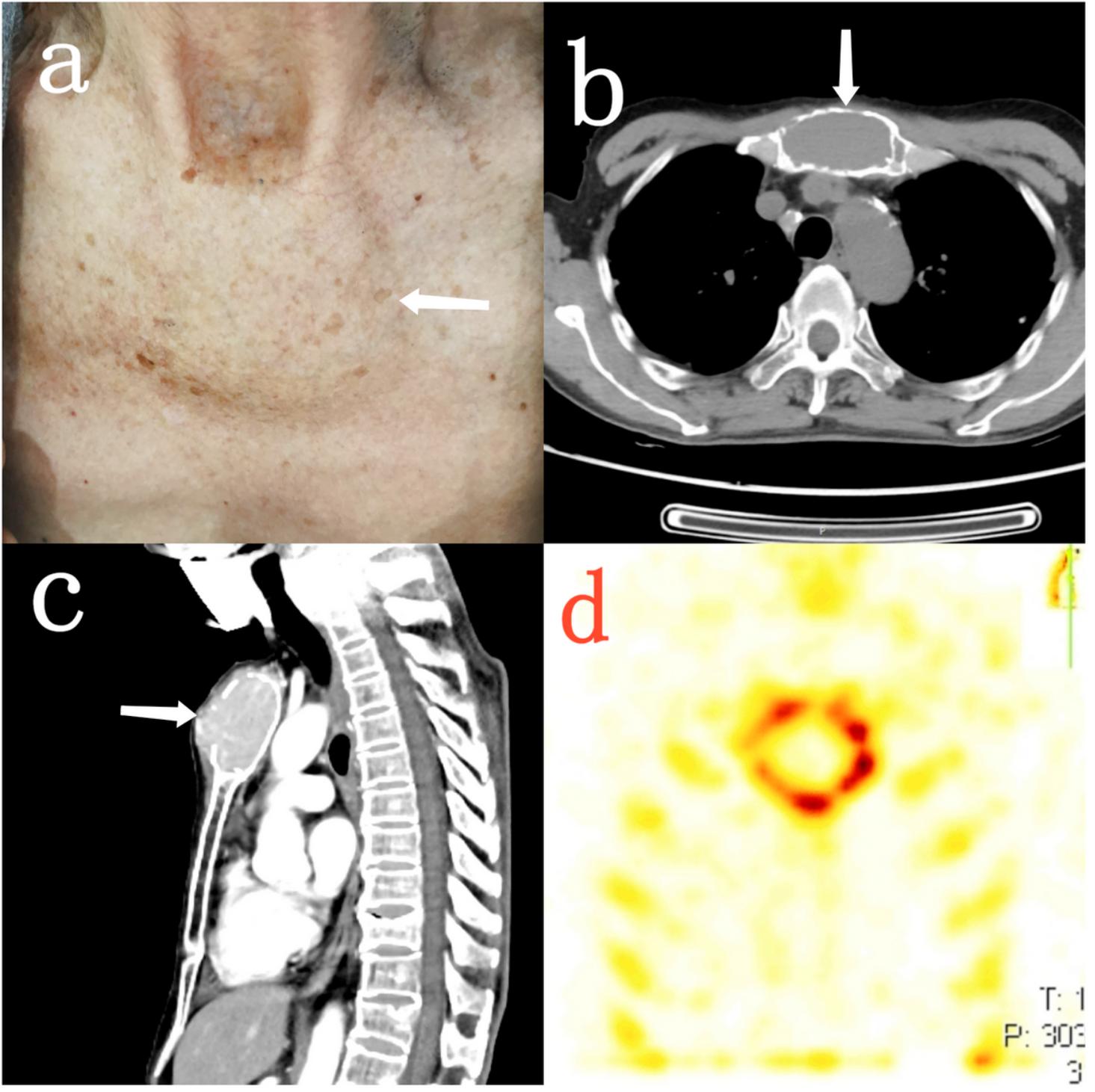


Figure 1

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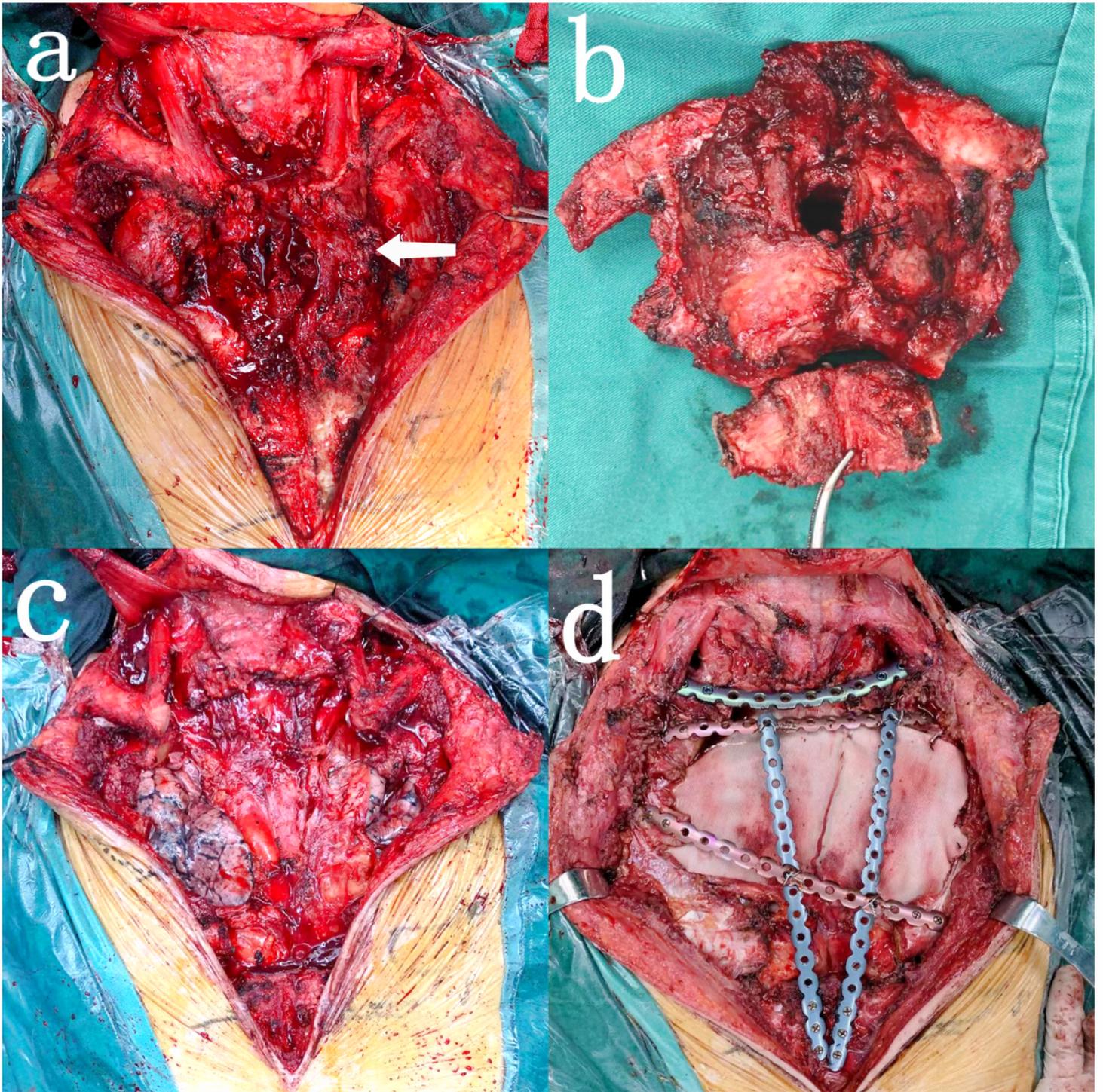


Figure 2

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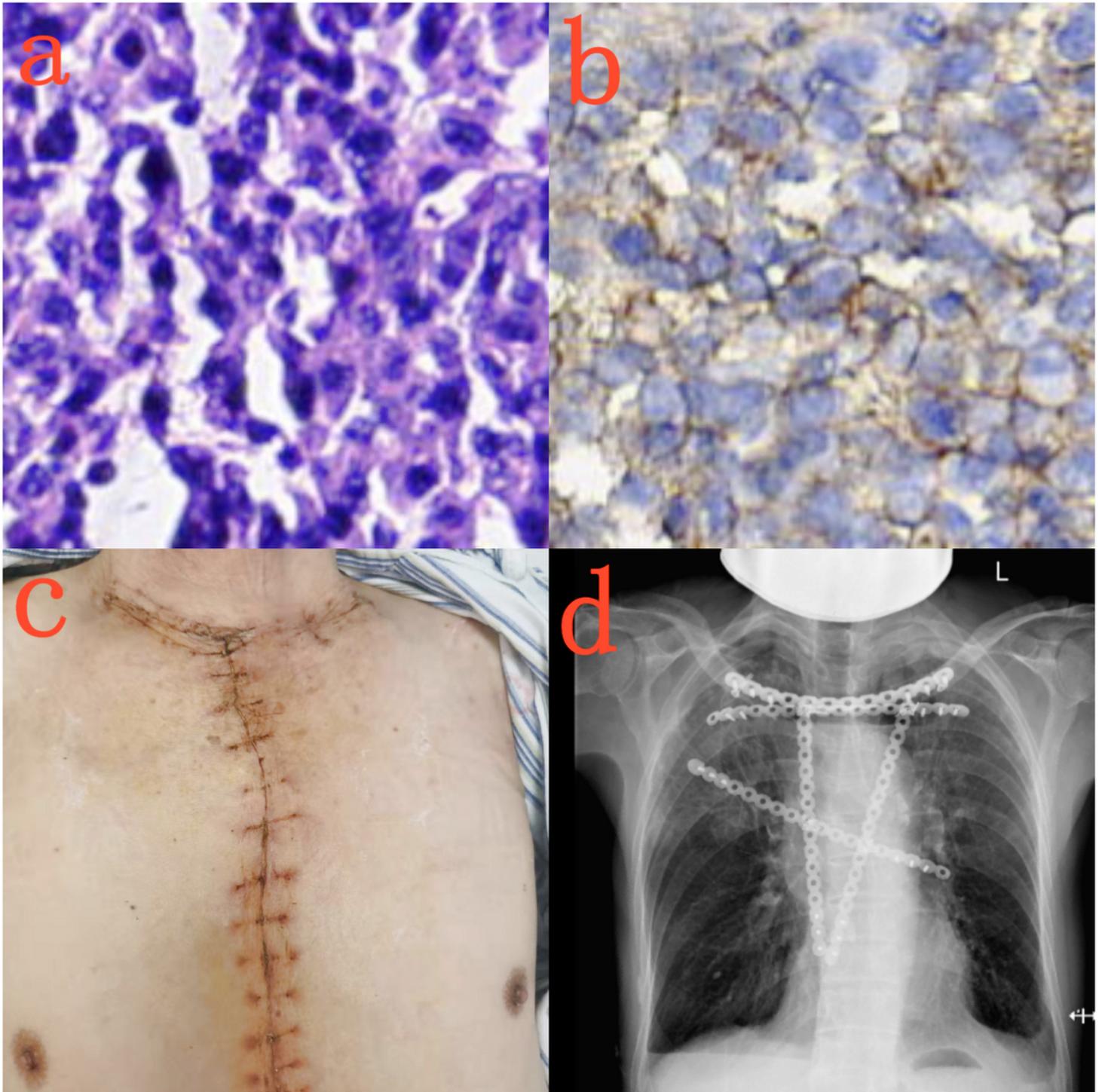


Figure 3

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