

Methicillin-Resistant *Staphylococcus aureus*-Induced Discitis Following Acupuncture: A Case Report

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Abstract: This report describes a case of lumbar disc infection potentially induced by acupuncture in a 43-year-old male with a history of back pain. After acupuncture treatment at another hospital, the patient experienced worsened pain. Physical examination revealed tenderness at the upper lumbar intervertebral space and paravertebral percussion pain. Laboratory tests showed no bacterial growth in both aerobic and anaerobic blood cultures after 5 days, but C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) were significantly elevated. CT and MRI scans revealed osteolysis of the L2/3 vertebral body and a paraspinal abscess in the left psoas muscle. The patient was treated with intravenous vancomycin (1 g every 12 hours for 4 weeks). After two weeks, CRP normalized, but ESR remained elevated. By week three, CRP increased to 61.19 mg/L, and severe anemia developed. Follow-up MRI indicated worsening of the lumbar infection. A transfusion was performed, and surgery was conducted in the fourth week. Intraoperative findings confirmed methicillin-resistant *Staphylococcus aureus* (MRSA) as the causative pathogen. Postoperatively, symptoms improved, and inflammatory markers normalized. This case highlights the need for standardized acupuncture practices and prompt surgical intervention in cases of infectious discitis unresponsive to conservative treatment.

Keywords: acupuncture, lumbar discitis, methicillin-resistant *Staphylococcus aureus*, surgical treatment

Introduction

Acupuncture, a traditional Chinese medical practice, works by stimulating specific acupoints to regulate the flow of “Qi” in the body, alleviating pain, improving function, and promoting overall health. It has been shown to effectively relieve chronic pain, such as headaches, back pain, and neuropathic pain, and to improve symptoms in patients with neurological disorders like Parkinson's disease. In the musculoskeletal field, acupuncture is used to treat conditions such as fibromyalgia and frozen shoulder. Additionally, acupuncture is widely applied to alleviate dysmenorrhea and enhance the treatment outcomes of infertility.¹ Owing to its unique efficacy and non-pharmacological nature, acupuncture has become a popular alternative or adjunctive treatment for numerous patients worldwide. Despite its relative safety, acupuncture carries certain risks and complications, such as local or systemic infections.² Local infections may include conditions such as skin abscesses, cellulitis, and paraspinal abscesses. In rare instances, more serious complications like endocarditis, pericarditis, or osteomyelitis may occur. If pathogens enter the bloodstream, systemic infections such as bacteremia or sepsis may develop.

Discitis is an infection of the intervertebral disc space. However, the vertebral endplates are frequently involved leading to infection of the vertebral body as well as the disc, or spondylodiscitis.³ The incidence of discitis is 0.4–2.4 cases per 100,000 people,⁴ typically occurring in immunocompromised individuals or following invasive procedures.⁵ The most common pathogens include *Staphylococcus aureus* (*S. aureus*), Gram-negative bacilli, and Streptococci/Enterococci. With the widespread use of antibiotics, MRSA discitis has been increasingly reported, accounting for

approximately 6.8–30% of pyogenic spinal discitis cases.⁴ However, an extensive literature review reveals no documented cases of MRSA discitis resulting from acupuncture. This report presents a case of MRSA discitis in a Chinese patient following acupuncture, highlighting the importance of standardized acupuncture practices. Notably, this is the first documented case where posterior lumbar interbody fusion with pedicle screw fixation was used to treat acupuncture-induced infectious discitis.^{6–8}

Case Report

Patient History

A 43-year-old male presented with lower back pain that began over a month ago without any apparent cause. He underwent multiple acupuncture treatments at an external clinic during this period. The qualifications of the acupuncturist, the length of the needles used, and the specific acupuncture points targeted remain unknown. Post-acupuncture, the patient experienced a brief alleviation of his back pain, but the symptoms recurred and intensified a few days later. Subsequently, he visited our outpatient clinic. The patient's medical history is as stated above, and he denies any history of smoking, alcohol consumption, or intravenous drug use. An MRI scan revealed L2/3 vertebral destruction and the formation of a paraspinal abscess, suggesting an infectious process (Figure 1A and B). The patient was admitted to our department with a preliminary diagnosis of L2/3 discitis.

Upon admission, the patient's vital signs were as follows: temperature, 37.2°C; heart rate, 74 beats per minute; respiratory rate, 18 breaths per minute; blood pressure, 128/71 mmHg. Physical examination revealed tenderness at the intervertebral space and positive paraspinal percussion tenderness in the upper lumbar region. The range of motion of the lumbar spine was significantly restricted in all directions, and the straight leg raise test was positive. Neurological examination and muscle strength in the limbs were unremarkable. Imaging studies, including X-ray (Figure 1C and D) and three-dimensional CT scans (Figure 1E–G) of the lumbar spine, indicated L2/3 vertebral endplate destruction and signs of infection. Laboratory tests showed elevated C-reactive protein (CRP) at 36.24 mg/L and an erythrocyte sedimentation rate (ESR) of 130 mm/h. Blood culture and T-cell tests for tuberculosis infection were unremarkable.

The patient was started on a 4-week course of intravenous vancomycin and linezolid immediately after admission. By the end of the first week of treatment, the patient's CRP had decreased from 36.24 mg/L to 6.13 mg/L (normal range: 0–10 mg/L), but the ESR remained at 130 mm/h, and hemoglobin levels had slightly decreased from 104 mg/L to 97 mg/L. During the first few days of the second week, CRP continued to decrease to 2.45 mg/L; however, there was no significant change in ESR. Three days later, the patient developed a fever with a maximum temperature of 38.9°C. Repeat blood cultures remained negative, CRP increased to 18.16 mg/L, and hemoglobin levels gradually dropped to 85 g/L. A follow-up three-dimensional CT scan of the lumbar spine revealed progression in the destruction of the L2/3 vertebral endplates and intervertebral disc (Figure 2A–C). MRI confirmed these findings (Figure 2D and E). In the third week, CRP spiked to 61.19 mg/L, ESR remained at 130 mm/h, and hemoglobin levels continued to decrease to 80 g/L. Given the patient's persistent back pain, unresponsive inflammation markers, and progressive findings on MRI, surgical intervention was deemed necessary. However, the patient's hemoglobin had dropped sharply to 68 g/L, prompting a preoperative blood transfusion to maintain hemoglobin above 90 g/L and preparation for intraoperative blood transfusion. Three days later, the patient was taken to the operating room.

The surgical procedure included posterior debridement, posterior spinal canal decompression, pedicle screw fixation, and interbody fusion. Additionally, a portion of the iliac bone was harvested for vertebral grafting. Intraoperatively, tissue samples from the lesion were collected for pathological examination and bacterial culture to identify the causative pathogen.

Postoperative Management

The excised intervertebral disc appeared as “white debris”, markedly different from the nucleus of a healthy lumbar disc. Pathological examination revealed necrotic tissue and inflammatory granulation tissue with a substantial infiltration of acute and chronic inflammatory cells and areas of calcification (Figure 3A). Cultures were positive for MRSA (Figure 3B), with a vancomycin minimum inhibitory concentration (MIC) of 4.71 mg/L, suggesting intermediate

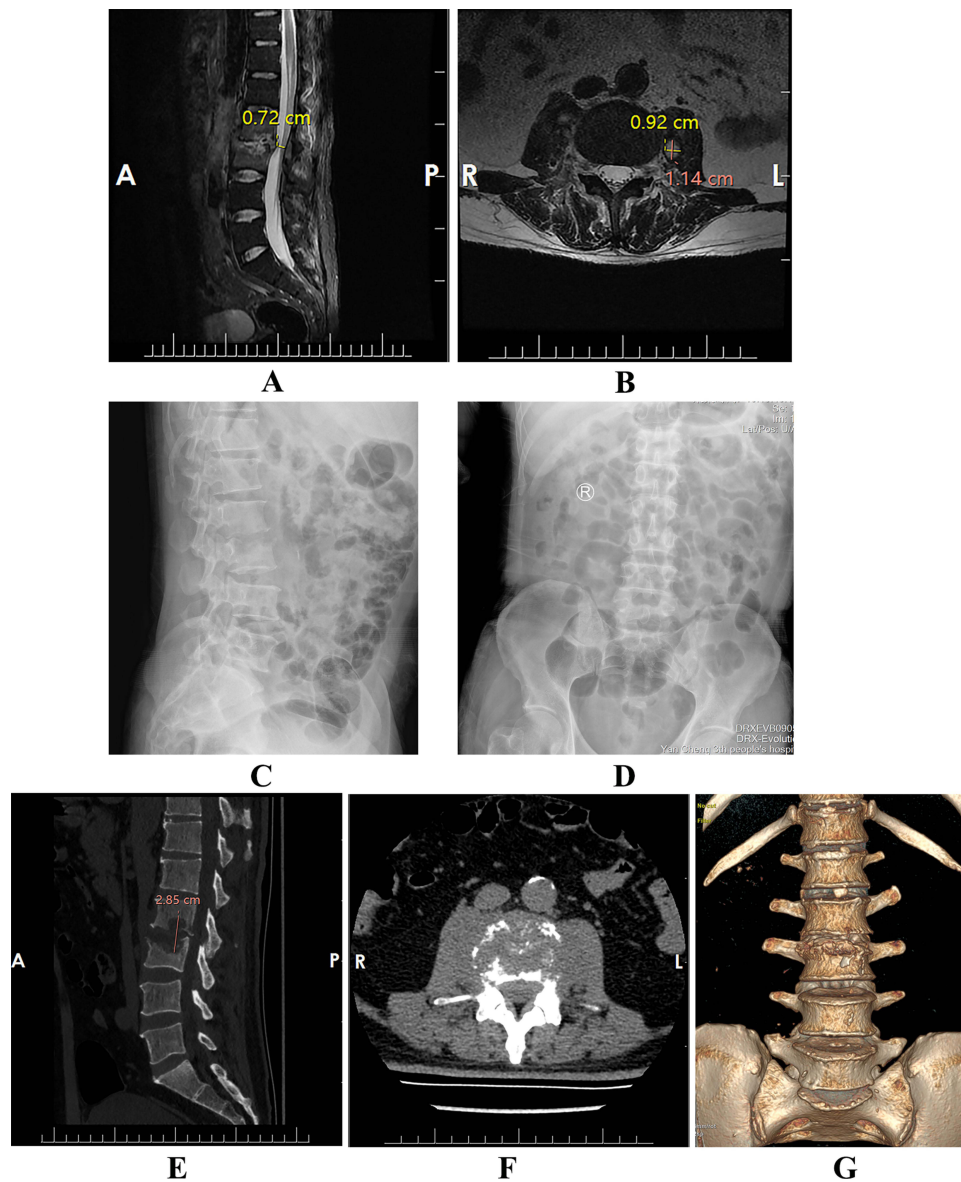


Figure 1 Imaging Examinations on Admission. **(A and B)** Sagittal and axial MRI scans of the lumbar spine show extensive vertebral and intervertebral disc destruction at the L2/3 level. The L2/3 disc space is narrowed to approximately 50% of its normal height, with corresponding spinal canal stenosis, the narrowest point measuring about 0.72 cm. Surrounding the vertebrae is soft tissue signal, predominantly long T1 and T2, with swelling of the psoas muscle and paraspinal soft tissues. The largest paraspinal abscess is located on the left side of the psoas muscle at the L3 level, with a maximum diameter of approximately 0.92 * 1.14 cm. **(C and D)** Anteroposterior and lateral DR images of the lumbar spine. **(E–G)** CT and 3D reconstruction images of the lumbar spine reveal significant vertebral bone destruction and signs of infection at the L2/3 level, with the maximum height of vertebral destruction measuring 2.85 cm.

susceptibility of the MRSA strain. The diagnosis of MRSA discitis was confirmed by both pathological examination and bacterial culture.

Postoperatively, the patient continued to receive intravenous vancomycin for an additional two weeks. By the end of the first postoperative week (week 5 of hospitalization), laboratory tests showed a reduction in ESR to 75 mm/h, CRP to 28.76 mg/L, and hemoglobin to 87 g/L. X-rays demonstrated successful debridement of the affected vertebrae and good vertebral stability (**Figure 3C and D**). The patient was discharged at the end of the second postoperative week (week 6 of hospitalization). Pre-discharge tests showed an ESR of 36 mm/h, CRP of 5.9 mg/L, and hemoglobin of 96 g/L.

The patient attended follow-up visits every two weeks post-discharge. Laboratory results from these visits indicated CRP levels consistently below 10 mg/L; ESR readings were 16 mm/h and 6 mm/h; and hemoglobin levels were 119 g/L and 130 g/L, respectively. Additionally, the patient's lower back pain and other symptoms were significantly alleviated.

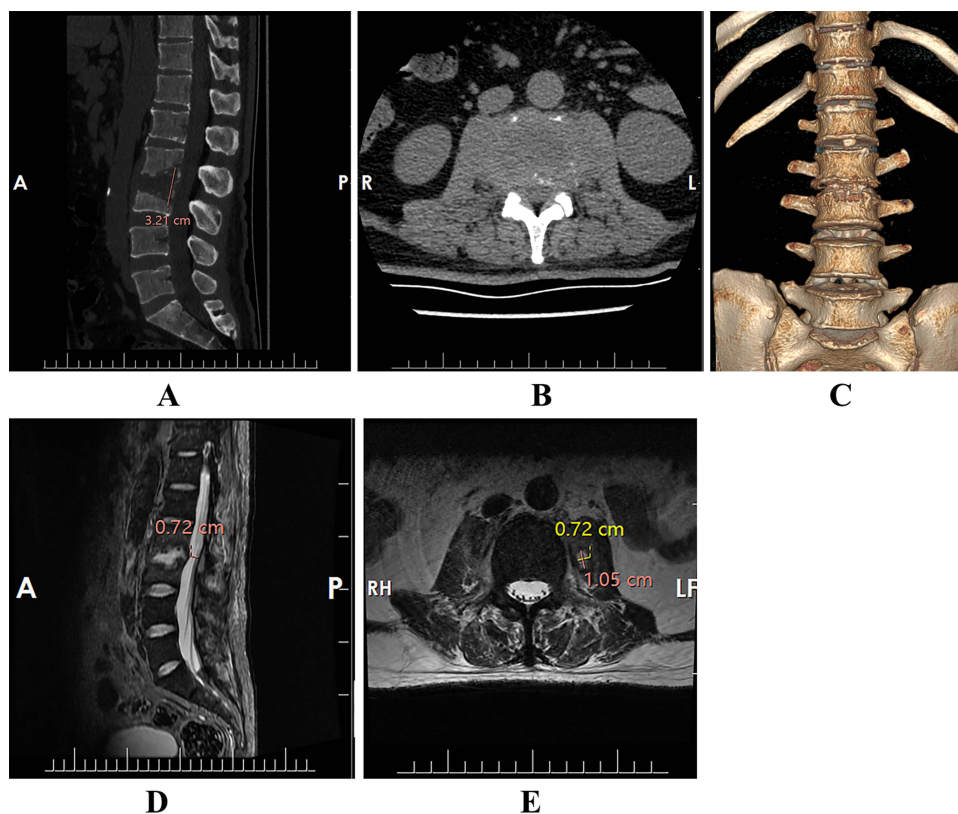


Figure 2 Preoperative follow-up CT and MRI. The scans show progressive destruction of the endplates at the L2/3 vertebrae. (A–C) Preoperative follow-up sagittal, axial CT scans, and 3D reconstruction of the lumbar spine reveal worsening vertebral bone destruction at the L2/3 level, with the maximum height of vertebral destruction measuring 3.21 cm. (D and E) Preoperative follow-up sagittal and axial lumbar spine MRI scans confirm the CT findings. The disc height is reduced by approximately 50%, with the narrowest point of the spinal canal measuring about 0.72 cm, and the largest paraspinous abscess has a maximum diameter of 0.72 * 1.05 cm.

Discussion and Conclusion

Infectious discitis is relatively uncommon, but multiple studies have shown a rising incidence in recent years.⁹ The most common pathogen is *S. aureus*, with an increasing number of MRSA discitis cases, accounting for approximately 10–30% of all *S. aureus* isolates.¹⁰ Despite this, MRSA discitis caused by acupuncture has not been reported in the literature.

MRSA discitis is commonly observed in individuals with a history of invasive procedures, immunosuppression, or prolonged exposure to healthcare settings. With early diagnosis and timely, appropriate intervention, the prognosis can be significantly improved, similar to other MRSA infections.¹¹ However, despite the same underlying pathogen, MRSA infections in different anatomical sites exhibit substantial differences in risk factors, clinical approaches, and outcomes. For instance, MRSA pericarditis is frequently associated with cardiac surgery, cardiovascular diseases, hemodialysis, and systemic MRSA infections such as sepsis or MRSA pneumonia, posing life-threatening risks like cardiac tamponade.^{12,13} In contrast, MRSA discitis is typically linked to spinal interventions and is more prone to result in permanent neurological deficits.^{14,15} These differences underscore the necessity of developing personalized management strategies tailored to the specific characteristics of MRSA infections at different anatomical sites.

In this case, the patient had a previously unremarkable medical history, except for occasional low back pain, and reported no history of hypertension, diabetes, smoking, alcohol use, or intravenous drug use. Physical examination revealed no skin ulcers or abscesses. The only notable history was that the patient had undergone acupuncture treatment for lower back pain at a small clinic more than a month prior. Details regarding the acupuncturist's qualifications, the acupuncture points used, needle length, and sterilization practices were unknown. Given the patient's history, we believe the infection is closely related to the acupuncture treatment. This case demonstrates that even immunocompetent young individuals can develop severe infections following acupuncture. Despite the relative safety and reliability of acupuncture

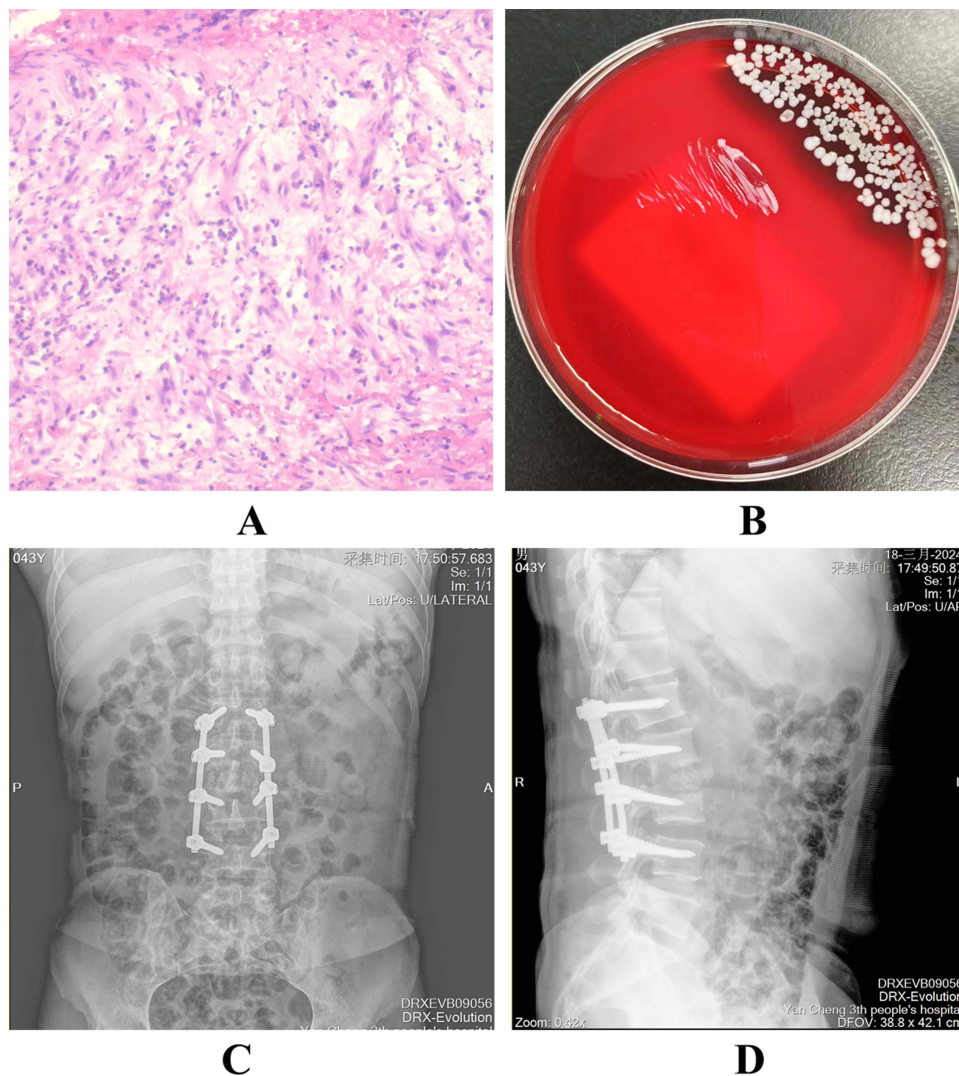


Figure 3 Histopathological examination, bacterial culture results, and postoperative plain radiographs. **(A)** Intraoperative histopathological examination reveals necrotic tissue, inflammatory granulation tissue, significant infiltration of acute and chronic inflammatory cells, and focal calcification. **(B)** Cultivation of Methicillin-Resistant *Staphylococcus aureus* (MRSA) on Blood Agar Plate, which illustrates the typical growth morphology and hemolytic activity of MRSA on blood agar. **(C and D)** Postoperative lumbar spine X-rays, showing successful vertebral debridement and good vertebral stability.

compared to other interventional treatments,¹⁶ it is crucial to seek treatment at licensed hospitals with certified and experienced acupuncturists, using disposable needles to avoid cross-infection and ensuring proper skin sterilization. For patients with diabetes, infective endocarditis, pulmonary tuberculosis, urinary tract infections, or compromised immune systems, acupuncture indications should be carefully evaluated to prevent serious complications.

The primary issue with severe spinal infections is not the treatment but the early diagnosis before the onset of significant neurological symptoms. Early bone erosive changes are not visible on plain X-rays; thus, contrast-enhanced MRI is the imaging modality of choice. Additionally, inflammatory markers such as ESR and CRP are crucial for the early evaluation of patients with back pain.¹⁷ Routine blood cultures should be performed in patients presenting with fever.^{13,18} For patients with existing infections, a thorough medical history and review of auxiliary examination results are essential to accurately identify the source and type of pathogen, preventing misdiagnosis and delayed treatment, which could exacerbate the infection and complicate subsequent management.^{17,18}

The use of appropriate, sensitive antibiotics administered in adequate doses and for an extended duration remains a crucial method for controlling infections. Vancomycin is a potent bactericidal antibiotic commonly used for MRSA coverage, facilitating the rapid reduction of bacterial load in the early stages of infection. However, its penetration into

bone and intervertebral disc tissue is limited.¹⁹ In this case, the avascular nature of adult intervertebral disc tissue, along with abscess encapsulation and calcification at the lesion site, prevented the antibiotic from reaching therapeutic concentrations.²⁰ Intraoperative cultures identified a vancomycin MIC of 4.71 mg/L for MRSA, indicating intermediate resistance. In contrast, linezolid demonstrates better bone penetration and is effective against MRSA, making it particularly advantageous in cases where vancomycin's tissue penetration is restricted. It is generally advised to administer intravenous sensitive antibiotics for 2–4 weeks or until CRP levels significantly decrease, followed by oral antibiotics for 6–12 weeks.²¹ The combination therapy helps prevent bacterial resistance, ensures comprehensive infection coverage, and reduces the risk of treatment failure. Additionally, it may mitigate adverse effects associated with prolonged linezolid use, such as bone marrow suppression.^{22,23} These considerations support the empirical initiation of vancomycin combined with linezolid upon the patient's admission.

If the causative organism remains undetermined, broad-spectrum antibiotics with anti-staphylococcal coverage are recommended.²⁴ Cottle et al suggest using a combination of ciprofloxacin and clindamycin, as this provides coverage for both staphylococci and Gram-negative bacteria.⁴ Surgical intervention may be necessary for patients who do not respond to conservative treatment or exhibit progressive symptoms or worsening imaging findings. The objectives of surgery include debridement of infected tissue, ensuring adequate blood supply for tissue healing, and restoring spinal stability compromised by infection or surgical procedures.²⁵ Common surgical approaches include debridement, spinal fusion, and pedicle screw fixation.

Multiple factors contributed to the patient's persistent decline in hemoglobin levels. The potential causes include: (1) bone marrow suppression associated with linezolid therapy,²² (2) MRSA discitis, where inflammatory cytokines may inhibit erythropoiesis and disrupt iron metabolism, leading to decreased red blood cell production,²⁶ and (3) the impact of infection-related stress and prolonged illness on dietary intake and nutrient absorption, potentially resulting in deficiencies of iron, vitamin B12, or folate—key nutrients for erythropoiesis. Consequently, in patients with severe discitis, regular monitoring of hemoglobin levels during hospitalization is crucial to enable timely interventions, such as blood volume supplementation and anemia management, particularly in those undergoing surgical preparation.

In conclusion, special attention should be given to patients who experience worsening back pain after acupuncture treatment. Upon admission, a comprehensive clinical assessment is essential, including a detailed medical history review, physical examination, and auxiliary tests to reach a timely diagnosis. Empirical broad-spectrum antibiotics can be used for early intervention, with adjustments made to sensitive antibiotics based on bacterial culture results. Regular imaging and monitoring of CRP and ESR can reflect changes in the patient's condition. For patients with persistent or progressive disease, immediate surgical intervention may be necessary. Furthermore, standardization in acupuncture practices remains a work in progress, including certification of acupuncture clinics and practitioners; evaluating the benefits and risks of acupuncture treatment based on the patient's health status and developing personalized acupuncture plans; emphasizing strict hygiene standards, using sterilized or disposable needles, and maintaining a clean treatment environment; establishing standardized protocols for needle insertion depth, angle, and location, while closely monitoring and promptly addressing any discomfort during treatment; regularly providing continuing education for practitioners and integrating new evidence-based practices into clinical work.

Abbreviations

CRP, C-reactive protein; ESR, Erythrocyte sedimentation rate; MIC, Minimum inhibitory concentration; MRSA, Methicillin-resistant *Staphylococcus aureus*; S. aureus, *Staphylococcus aureus*.

Data Sharing Statement

If necessary, data can be obtained from e-mail: shifengchao1980@126.com

Ethical Approval and Consent to Participate

All procedures were performed in compliance with relevant laws and institutional guidelines and that the medical ethics committee of The Third People's Hospital of Yancheng City. The case details have been approved for release by the Third People's Hospital of Yancheng. The patient agreed to participate.

Consent for Publication

The patient agreed to publication and we obtained written consent from him.

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Disclosure

The authors report no conflicts of interest in this work.

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