

Osteodiscitis Post- COVID-19 Infection: A Case Series

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Case report

Keywords: Osteodiscitis, COVID-19.

Posted Date: October 1st, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-936676/v1>

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Abstract

Background: Coronavirus disease (COVID-19) is an infectious disease. It affects almost all organs of the human body. Lumbar osteodiscitis is an infection of the vertebral body and disc. The association of COVID-19 with osteodiscitis has not been reported in the literature so far. The purpose of this study was to describe a series of four cases manifested as post-COVID-19 osteodiscitis.

Case presentation:

We performed a retrospective assessment of the clinical, radiological, and microbiological features of adult post-COVID-19 patients who underwent surgery for unstable lumbar osteodiscitis at our hospital. The mean age of patients was 45.8 ± 7.8 years. All the patients were treated according to their clinical conditions through a combined surgical approach as laminectomy, facetectomy, pedicular screw insertion, and fusion. The clear causes of infection were not recognized by routine methods, and COVID-19 was the only common factor in patients in the last 6 to 8 weeks.

Conclusions: This case series suggest that osteodiscitis could be one of the possible side effects after COVID-19 infection.

Background

The coronavirus disease 2019 (COVID-19) pandemic has affected nearly 230 million people worldwide with almost 4.7 million deaths reported to date [1]. Osteodiscitis is an infective process involving the discs and endplates of the vertebral column. It is a rare state with a rate of one patient per 50,000 population per year [2]. The numerous risk factors associated with osteodiscitis presented in the literature include diabetes mellitus, intravenous drug abuse, immunosuppression, malignancy, alcoholism, rheumatic disease, liver cirrhosis, renal failure, radiation, or osteopenic fracture, malnutrition, myelodysplasia, infective endocarditis, and urinary tract infections [3].

Studies showed that that COVID-19 infection affects almost all organs in the human body [4]. However, at the moment of this writing (September 1st, 2021), to the best of our knowledge, no studies were reported on the effect of COVID-19 on osteodiscitis. We aim to report a series of four cases manifested as post-COVID-19 osteodiscitis. We will discuss the clinical summary, imaging findings, microbiological features, and surgical procedures.

Case Reports

Case 1

A 58-year-old Persian female was admitted with acute paraparesis and urinary retention within hours. She had a history of occasional hemoptysis and severe back pain 6 and 5 weeks before admission, respectively. Her past medical history was getting Covid-19 8 weeks ago. Her body mass index (BMI) was

25.9. She was visited in the outpatient clinic and did not take any antiviral drugs and dexamethasone. Physical examination showed lower extremity weakness and her muscular strength was graded as 2 (on a scale of 0-5). She has no loss of sensory function and plantar reflex was down. Pre-operative CT scan and Magnetic resonance imaging (MRI) are shown in Fig. 1a & 1b & 1c. Image findings were compatible with spondylodiscitis. Laboratory tests showed the following results: white blood cell (WBC) count; 11,700/ μ L (neutrophil 68.4% and lymph 26.6%); C-reactive protein (CRP) 72 mg/L; erythrocyte sedimentation rate (ESR) 38 mm/h; and wright and coombs wright tests were negative. The patient underwent T6-T12 pedicle screw insertion. A laminectomy and facetectomy were performed at T8–T10 level, and evacuation of pus was done. A partial T8 and T9 corpectomy with expandable cage reconstruction was performed (Fig. 1d).

Histopathological examination did not confirm the diagnosis of an acid-fast bacillus (AFB). Cultures on sample discs were negative for any bacteria as tuberculosis (TB). Also, TB and Covid-19 PCR tests on the sample disc were negative.

Case 2

A 39-year-old Persian male, presented with back pain that radiates through the buttocks and down into the back of the legs, with a history of occasional fever and chills in the past 2 months. He did not have urinary or fecal incontinence. There were no underlying disorders such as diabetes, and his BMI was 25. He was also treated for Covid-19 in the last 10 weeks. he was not treated with antiviral drugs and dexamethasone for Covid-19. Motor examination revealed (Medical Research Council (MRC) grading) 4/5 power in the proximal and distal muscle groups of both legs. He has no loss of sensory function. Laboratory tests revealed the following values: WBC count 11,800/ μ L (neutrophil 65% and lymph 23.7%); CRP 140 mg/L; ESR 55 mm/h; and wright and coombs wright tests were negative. The patient underwent radiological examinations (Fig. 1a & 1b), and spondylodiscitis was diagnosed. The deteriorating condition of our patient led to the decision to perform surgery. After pedicle screw insertion in L4 and L5 pedicles, laminectomy, facetectomy, and discectomy were performed. A partial corpectomy with mesh cage reconstruction and fusion with allograft and autograft was performed (Fig. 1c).

Specimens were processed for microscopy and culture. Also, a PCR test for tuberculosis DNA was done on tissue samples. The results were negative.

Case 3

A Persian male at age 47, was presented with low back pain in the past month. He was also treated for Covid-19 in the last 2 months as an outpatient. The patient did not have a specific disease. He did not take any special medicine, except painkillers for low back pain. Also, his BMI was 24.2. Motor examination presented MRC grading 5/5 power in upper and lower limbs. His sensory function was normal, with no sign of sphincter dysfunction. Spine CT and MRI imaging are shown in Fig. 1a & 1b & 1c. The patient laboratory tests showed the following findings: WBC count 12,800/ μ L (neutrophil 70.5% and lymph 13.3%); CRP 95 mg/L; ESR 82 mm/h; and wright, coombs wright, and 2 Mercaptoethanol

(2ME) tests were negative. Spondylodiscitis was diagnosed clinically and radiologically. During the posterior-only approach, the pedicle screw was inserted in L3 and L4 pedicles, and then laminectomy, facetectomy, discectomy, and fusion with allograft and autograft bone were done (Fig. 1d).

Histopathological examination confirmed the diagnosis of spondylodiscitis with no acid-fast bacillus (AFB). Cultures on sample discs were negative for any bacteria and tuberculosis (TB). Also, TB and Covid-19 PCR tests on the sample disc were negative.

Case 4

A 39-year-old man, 68 kg, 170 cm, was referred to our hospital with a 2-week history of persistent back pain, with no past medical history; and he did not take any special medicine. A physician had examined him previously and had prescribed pain killers for pain management. His Covid-19 was treated as per the local protocol, forty days ago. Five days before admission he developed progressive complaints of reduced bilateral lower limb strength, severe problems with urination and urinary retention, and paresthesia of the lower extremities. Motor examination revealed (MRC) grading 3/5 power in the proximal and distal muscle groups of both legs. Thoracolumbar MRI and CT imaging are presented in Fig. 4a & 4b & 4c. The patient laboratory tests revealed the following findings: WBC count 9,300/ μ L (neutrophil 68.4% and lymph 22.2%); CRP 34 mg/L; ESR 89 mm/h; and wright, coombs wright, and 2ME tests were negative. The diagnosis of T7/T8 spondylodiscitis and the epidural abscess was established clinically and radiologically. Intraoperatively, the decision was made to do T7/T8 laminectomy, facetectomy, and evacuation of pus. After that, pedicle screw insertion, discectomy, interbody and posterolateral fusion were done (Fig. 4d).

Cultures on sample discs were negative for any bacteria. Histopathological and PCR analyses were negative for TB and Covid-19.

The patient had immediate relief from his back pain. He was able to resume his daily activities 1 month after the surgery.

Discussion

To our knowledge, we reported the first cases of osteodiscitis due to post-COVID-19 infection. However, this diagnosis should be considered with caution because the final approval status is not definitively determined. It was also clear causes of infection were not identified by routine methods, and COVID-19 was the only common factor in patients in the last 6 to 8 weeks. COVID-19 infection affects almost all organs of the human body [4]. Musculoskeletal and joint complications after COVID-19 infection, have been reported in the literature [5], but there is no reported post-COVID-19 infection osteodiscitis.

Our team reported four cases of osteodiscitis, who developed this complication in a period of one to two months after their COVID-19 infection. In all cases, brucellosis was ruled out by negative results for agglutination tests (wright, comb's wright, and 2ME). Also, microbiologic studies on tissue biopsies (direct

smears and cultures) were reported negative. These patients were evaluated for tuberculosis osteomyelitis and they all reported as negative BK PCR in tissue samples. SARS-CoV-2 RT-PCR was also reported negative in all tissue samples.

Different causes and mechanisms have been proposed for these complications. In addition, Direct or indirect spread of bacterial as concomitant infections may affect the spinal column. Soh et al. [6], reported a case of spinal cord injury from an epidural abscess is a serious complication of COVID-19 Infection. They concluded that the spinal epidural abscess could be a result of lymphopenia and nearby lung abscess [6].

None of our patients showed lymphopenia or lung injuries as pneumonia or significant ground glass opacities during their COVID-19 infection period. Also, microbiologic studies as direct smear and cultures of tissue biopsies were negative for any bacterial cause.

Acute limb ischemia as a result of hypercoagulability state was also reported by Shires et al. [7], increased thromboembolic complications in COVID-19 patients reported among COVID-19 patients even those received anticoagulants. They suggested that a hypercoagulability state may cause ischemic conditions in the musculoskeletal system, especially in bones and cartilages. However, this may lead to subsequent complications like osteodiscitis.

The role of angiotensin-converting enzyme 2 (ACE2) for a direct invasion of SARS-CoV-2 has been studied in the literature. The ACE2 could be expressed in a small fraction of cartilage progenitors and regulatory fibrochondrocytes in the meniscus. So this may explain why osteodiscitis could be assumed as a complication of COVID-19 infection even in non-severe cases [5].

Osteonecrosis and bone mineral density reduction are assumed as consequences of critical COVID-19 disease[8]. None of our patients developed critical illness and all of them received supportive care. In addition, bone mineral density reduction may not be the cause of osteodiscitis in our patients. Although, this entity needs to be more investigated in future studies.

It could be proposed that other causes of bone demineralization, like systemic inflammation or vitamin D deficiency might prone patients to develop bone and joint complications even in absence of severe disease or treatments effects on the skeletal system like corticosteroids [9].

Genetic susceptibilities and gender differences could be supposed as risk factors in developing specific COVID-19 infection's complications of bone and joints especially osteodiscitis. A few reports indicate that male patients, especially older patients are more susceptible to develop complications of COVID-19 infections. More studies should be done on hormonal factors and other risk factors that affect bone metabolism. In addition, more studies on smoking and alcohol consumption are required [8]. In our case series, 3 of 4 patients were male, we didn't study their status about alcohol consumption or smoking condition.

At last, Corticosteroid therapy in COVID-19 is known as a risk factor for osteonecrosis[10]. Zhang et al. [11], reported that the complications of steroids on bones and cartilages after COVID-19 infection. They concluded that steroids administration for treatment of SARS-CoV-2 infection could develop adverse effects on bones and cause steroid-induced avascular necrosis of the femur. Although none of our patients received corticosteroids for treatment. This may raise the possibility that other risk factors than corticosteroid therapy could be involved in musculoskeletal complications of COVID-19 infection, even in mild cases.

Conclusion

This study demonstrates that post-COVID-19 infection could be one of the probable causes of osteodiscitis. However, further studies with larger samples are warranted to better understand the role of COVID-19 in osteodiscitis.

Abbreviations

CT: Computed tomography

MRI: Magnetic resonance imaging

COVID-19: coronavirus disease 2019

WBC: white blood cell

CRP : C-reactive protein

ESR: erythrocyte sedimentation rate

ACE2: angiotensin-converting enzyme 2

Declarations

Availability of data and materials

Not applicable.

Ethics declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Availability of data and materials

All the data supporting our findings are contained within the manuscript.

Competing interests

The authors declare that they have no competing interests.

Funding

None declared.

Authors Contributions

MR, AHZ, SF, PA, and SS managed the patient and wrote the manuscript. MR and SF performed the operation and NN reported assessment of infectious complications and took part in writing the manuscript. PA and TY contributed to the search, draft, and analysis of data. AHZ, TA, NN and PA supervised the whole project. The author(s) read and approved the final manuscript.

Acknowledgments

The authors thank the staff of the Neurosurgery Unit and the Neuroscience Research Center, Al-Zahara Hospital, Isfahan University of Medical Sciences, Isfahan, Iran.

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Figures

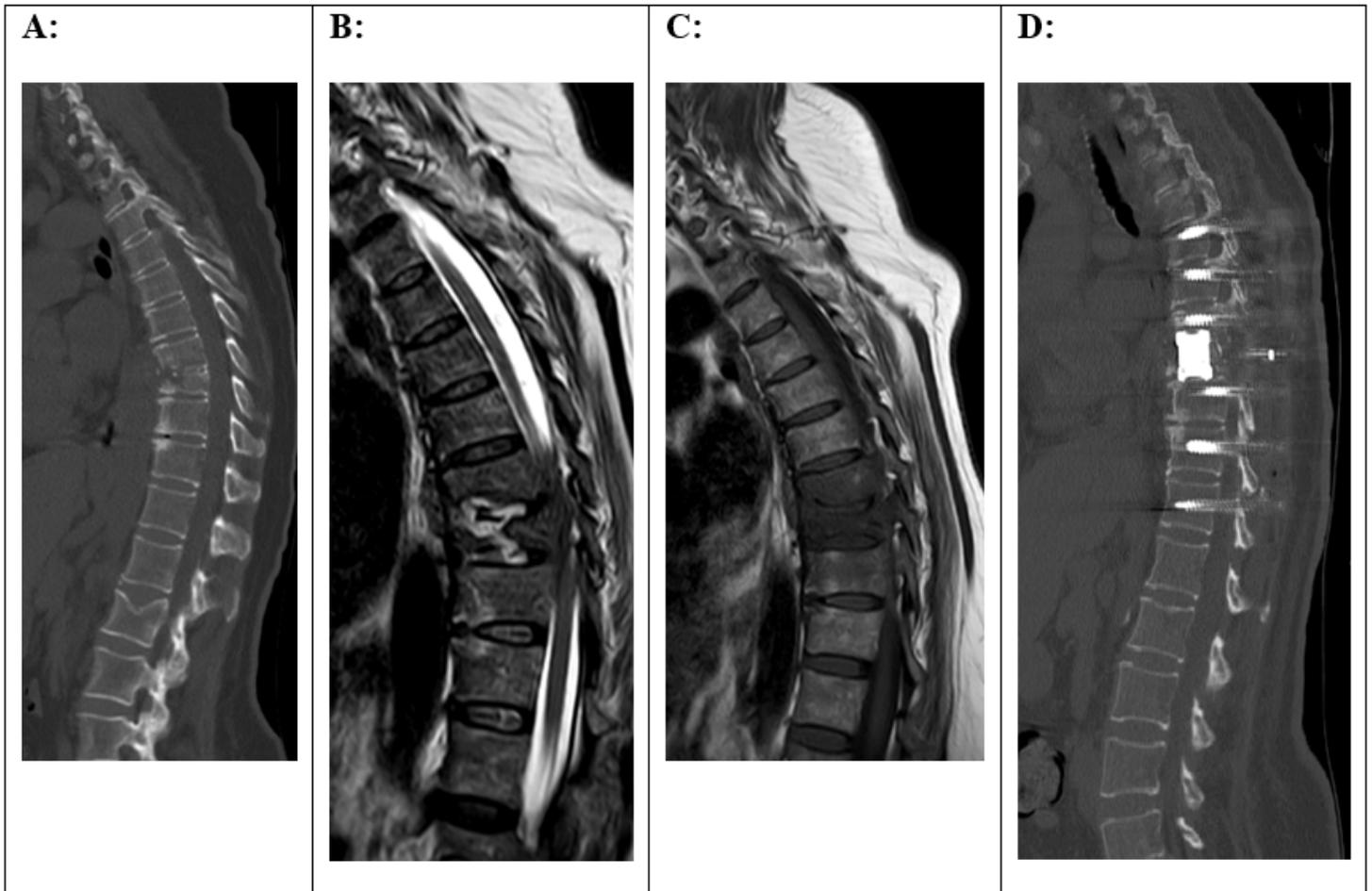


Figure 1

A preoperative sagittal CT scan of the spine. It revealed bony destruction of the lower endplate of T8 and the anterior body of T9. B MR imaging with sagittal T2 sequences through the thoracolumbar spine demonstrate hyperintense signal in T8/T9 and T9/T10 intervertebral disc and body of T9 with canal involvement. C Sagittal T1 sequences revealed a low signal intensity area at the T8/T9 intervertebral disc and adjacent vertebrae. D postoperative sagittal CT scan of the thoracolumbar spine.

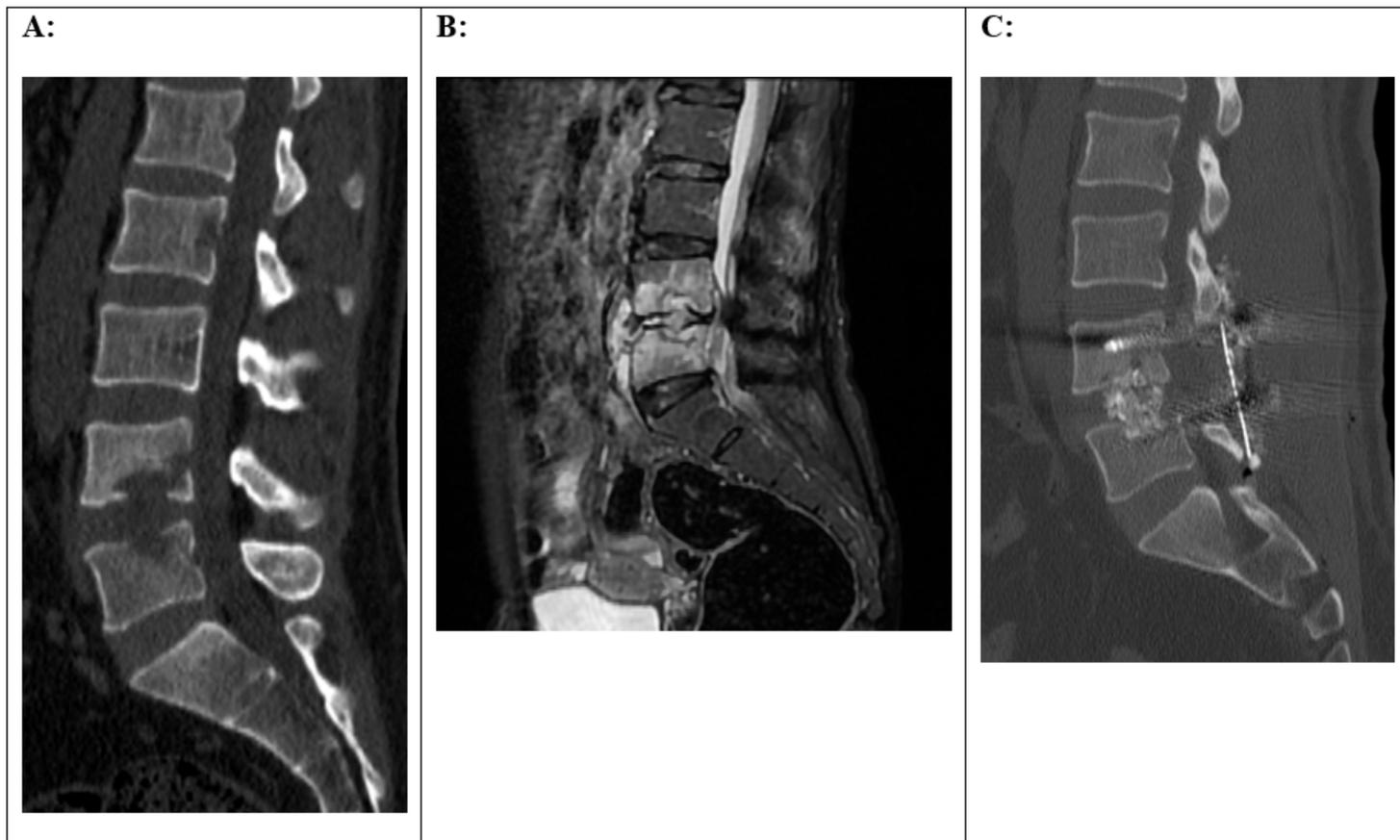


Figure 2

A preoperative sagittal CT scan of the spine. It showed L4/L5 endplate destruction. B MR imaging showed hyperintensity in T2 sequences at the L4/L5 intervertebral disc and vertebral bodies. C postoperative sagittal CT scan of the lumbar spine.

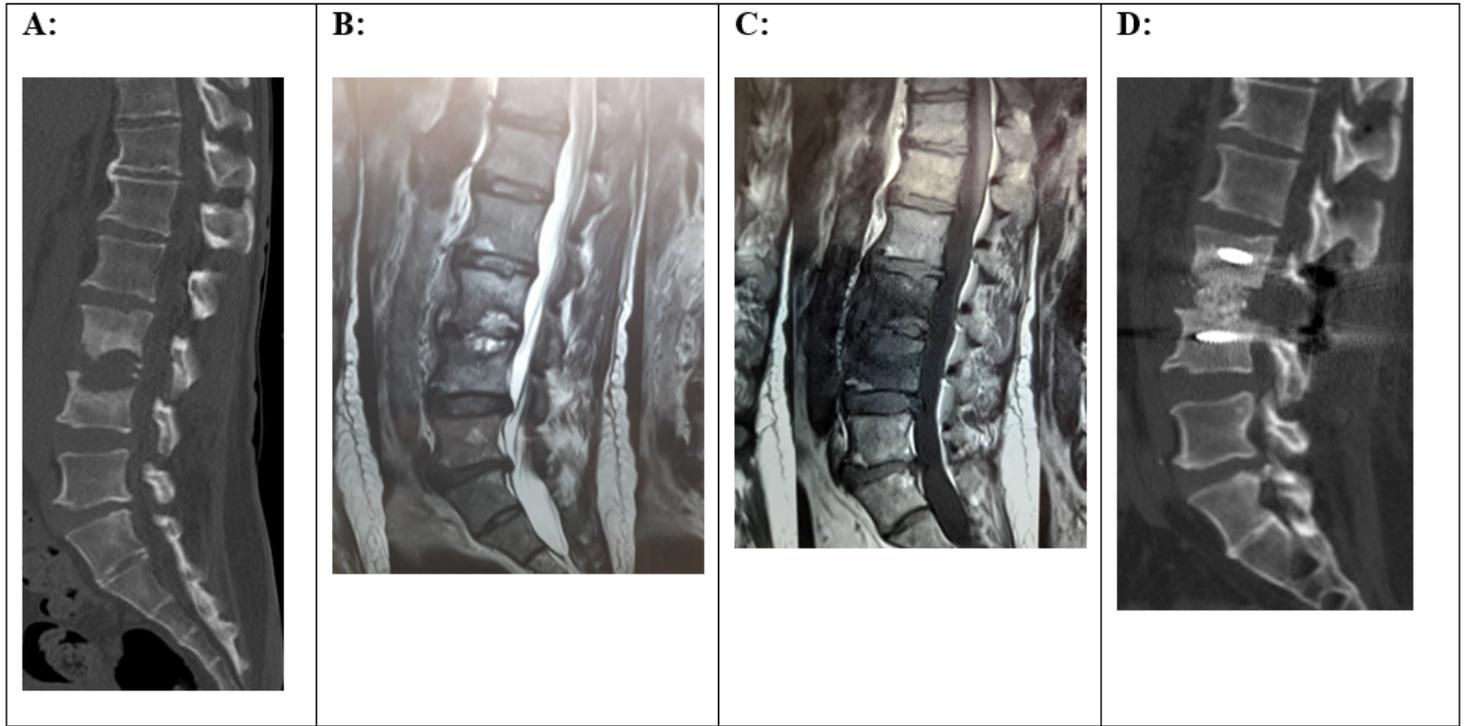


Figure 3

A preoperative sagittal CT scan showed L3/L4 endplate destruction. B & C MR imaging revealed hyperintensity in T2 sequences and hypointensity in T1 sequences at the L3/L4 intervertebral disc and vertebral bodies. D postoperative sagittal CT scan of the lumbar spine.

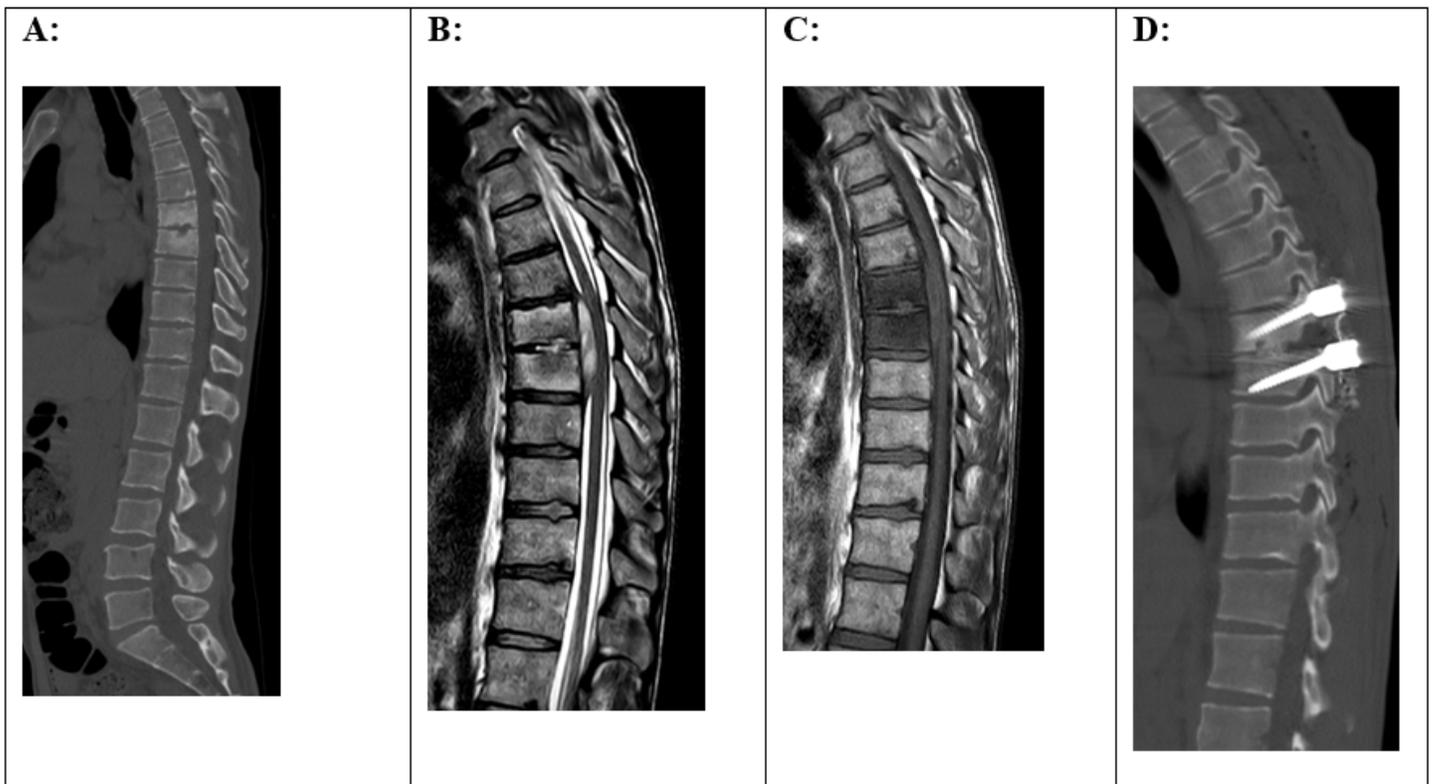


Figure 4

A preoperative sagittal CT scan showed T7/T8 endplate destruction and reduced disc height. B & C MR imaging revealed hyperintensity in T2 sequences and hypointensity in T1 sequences at the T7/T8 intervertebral disc and vertebral bodies. Also, it is associated with space-occupying lesions of the spinal canal. D postoperative sagittal CT scan of the lumbar spine.