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Preventable Adverse Outcomes in Spine Surgery: Insights from a Retrospective Case Series on Comprehensive Patient Evaluation

Omurga Cerrahisinde Önlenebilir Olumsuz Sonuçlar: Kapsamlı Hasta Değerlendirmesi Üzerine Bir Vaka Serisinden Eğitici Dersler

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ABSTRACT

Objectives: Safe spine surgery requires comprehensive evaluation. Inadequate assessment may lead to diagnostic errors, inappropriate interventions, and preventable adverse outcomes.

Methods: We retrospectively reviewed nine patients who were initially misdiagnosed or mismanaged for spinal complaints. Each underwent a detailed history, thorough physical examination, and appropriate imaging to establish an accurate diagnosis.

Results: Patients had diverse conditions, including vertebral fractures, spinal infections, peripheral nerve lesions, bone marrow edema, and anatomical variants. Examples included an osteoporotic femoral neck fracture misdiagnosed as lumbar degeneration, a thoracic vertebral fracture mistaken for soft tissue trauma, and a cervical spinal nerve mass identified only after unnecessary ulnar nerve decompression. Accurate evaluation enabled timely interventions such as vertebroplasty, posterior stabilization, microsurgical nerve excision, antibiotic therapy, and conservative management. No further complications occurred.

Conclusion: This series highlights the importance of broad differential diagnosis, vigilance for atypical presentations, and systematic clinical reasoning. Meticulous assessment, attention to unusual findings, and readiness to seek second opinions are essential to enhance patient safety. These cases provide valuable educational lessons for clinicians, emphasizing the prevention of diagnostic errors and unnecessary procedures.

Keywords: Clinical assessment; diagnostic errors; educational case series; patient safety; preventable complications; spine surgery.

ÖZET

Amaç: Omurga cerrahisinde kapsamlı öykü alma ve hasta değerlendirmesi kritik öneme sahiptir; yetersiz değerlendirme yanlış tanı, uygunsuz tedavi ve önlenebilir olumsuz sonuçlara yol açabilir. Kırıklar, enfeksiyonlar, sinir sıkışmaları ve nadir sendromlar gibi durumlar, özellikle dejeneratif disk hastalığı gibi yaygın şikayetleri olan hastalarda gözden kaçabilir. Bu çalışma, bu tür komplikasyonların önlenmesinde titiz değerlendirmenin eğitici değerini göstermektedir.

Yöntem: Spinal tanı ve tedaviler hakkında ikinci görüş almak isteyen dokuz yetişkin hasta (1 kadın, 8 erkek; ortalama yaş 49,8) retrospektif olarak analiz edildi. Her hastaya detaylı öykü, fizik ve nörolojik muayene ile gerektiğinde ek laboratuvar, görüntüleme (röntgen, MR) veya elektrofizyolojik incelemeler uygulandı. Tanısal bir tutarsızlık veya önlenebilir olumsuz bir sonuç tespit edilmesi durumunda vakalar çalışmaya dahil edildi.

Bulgular: Olguların tümünde tanısal tutarsızlıklar ortaya çıktı. Yanlış tanılar arasında kırıklar (n=2), kitle lezyonları (n=2), herpes zoster enfeksiyonları (n=2), kemik iliği ödemi, sakroiliit ve sakralizasyon yer alıyordu. Kapsamlı değerlendirme, doğru tanı ve uygun müdahalelerle daha fazla olumsuz sonucun önlenmesini sağladı. Her olgu, dikkatli değerlendirmenin gözden kaçan durumları nasıl tespit ettiğini ve zamanında, etkili tedaviye nasıl rehberlik ettiğini gösterdi.

Sonuç: Bu seri, önlenebilir komplikasyonların önlenmesi için hasta öyküsü, fizik muayene ve tanısal çalışmaların entegre edilmesinin büyük önemini vurgulamaktadır. Birçok omurga şikayeti diğer patolojileri taklit eder; bu nedenle klinisyenler geniş ayırıcı tanılar yapmalı, omurga dışı nedenleri göz önünde bulundurmalı ve anatomik varyantları tanımalıdır. Doğru tanıyı sağlamak, tedaviyi optimize etmek ve hasta güvenliğini artırmak için kapsamlı ve multidisipliner değerlendirme şarttır. Güvenli omurga cerrahisi, kapsamlı değerlendirme ve atipik durumlara karşı dikkatli olmaya dayanır. Taklit edici veya nadir görülen durumların farkında olmak, dikkatli klinik değerlendirme ve standart protokollere uyum, kaçınılabilir komplikasyonların önlenmesi ve güvenli, etkili hasta bakımı sağlanması için esastır.

Anahtar sözcükler: Eğitim vaka serileri; hasta güvenliği; klinik değerlendirme; omurga cerrahisi; önlenebilir komplikasyonlar; tanı hataları.

Thorough history-taking and comprehensive patient evaluation are essential in spine surgery, as inadequate assessment can lead to misdiagnosis, inappropriate treatment, and preventable adverse outcomes. Critical conditions such as tumours, infections, cauda equina syndrome, or vertebral fractures may be overlooked, particularly in patients presenting with common complaints like degenerative disc disease or spinal stenosis.[1]

Accurate diagnosis requires systematic review of patient history, physical and neurological examination, and standard investigations including laboratory tests (complete blood count, electrolytes, liver and kidney function, C-reactive protein, erythrocyte sedimentation rate), imaging studies (X-ray, CT, MRI), and, when indicated, electrophysiological tests (electromyography, somatosensory evoked potentials). Correlating clinical and laboratory findings is critical for safe and effective spine surgery.

Despite advances in medical technology, neglecting standard clinical practices can result in serious complications and poor outcomes. Clinicians must maintain a broad differential diagnosis and recognize non-spinal presentations to avoid preventable adverse events.[2] This case series illustrates the educational value of meticulous history-taking and patient evaluation in preventing such complications.

Methods

This retrospective case series includes nine adult patients (1 female, 8 male; mean age 49.8 years, range 29–76) who sought second opinions regarding their spinal diagnoses and previously recommended treatments. Each patient underwent meticulous evaluation, including detailed history-taking, physical and neurological examinations, and additional laboratory or imaging studies as indicated. Diagnostic imaging included X-rays (cases 1 and 9) and MRI (cases 2, 5, 6, 7, 8). Electrophysiological testing (electromyography) was performed in one patient (case 6), and specific laboratory tests (e.g., PCR for herpes zoster, inflammatory markers for sacroiliitis) were conducted as clinically indicated.

Patients were included if a diagnostic discrepancy or preventable adverse outcome was identified. As the cases were recognized retrospectively based on clinical observation rather than a predefined sampling strategy, no formal inclusion or exclusion criteria were applied. Institutional Review Board (IRB) or Independent Ethics Committee (IEC) approval was not required according to journal policy for retrospective case series without patient identifiers.

Results

Evaluation revealed diagnostic discrepancies in all nine cases (Table 1). Underdiagnosed or mismanaged conditions included two bone fractures (femoral neck and T10–11), two mass lesions (C7–8 spinal nerve and common peroneal nerve), and two herpes zoster infections (limb and back). Additional findings included one case each of bone marrow edema syndrome, sacroiliitis, and sacralization (Bertolotti's syndrome).

Following thorough reassessment, each patient received a corrected diagnosis and an appropriate treatment plan, preventing further adverse outcomes. These cases highlight how careful evaluation can identify overlooked conditions, guide timely interventions, and serve as educational examples to improve clinical decision-making and enhance patient safety in spine care.

Table 1. Summary of nine patients who were initially misdiagnosed with spinal disorders. Comprehensive reassessment revealed alternative diagnoses, and appropriate management prevented further harm

Case	Age / Sex	Initial Diagnosis	Correct Diagnosis After Re-evaluation	Management	Outcome
1	76 / M	Spinal stenosis, roto scoliosis	Femoral neck fracture	Total hip arthroplasty	Pain relief, full ambulation
2	68 / M	Back pain, soft tissue trauma	T10-11 level with the extension fracture	Posterior stabilization surgery	Pain relief, full ambulation
3	64 / F	Progressing left leg pain, “Black disc” at the L4-5 level	Shingles	Medical treatment	Pain relief
4	43 / M	Low back pain	Shingles	Medical treatment	Pain relief
5	34 / M	Ulnar nerve entrapment	A mass lesion originating from the left 7th cervical spinal nerve	Surgery recommended	Preferred another hospital
6	29 / M	Lomber discopathy	Peroneal nerve entrapment, intra-neural cyst	Peroneal nerve decompression and cyst excision	Pain reduction, regained mobility
7	50 / M	Radiculopathy	Bone marrow edema syndrome	Referred to the Department of Orthopedics	Out of follow-up
8	30/ M	Extruded lumbar disc herniation	Sacroiliitis and sacralization	Referred to the rheumatology clinic	Out of follow-up
9	55 / M	Spinal stenosis	Sacralization type 3A and osteoarthritis in his right sacroiliac joint	Preferred medical treatment in another center	Out of follow-up

Case Presentations

A. Fractures

Case 1: A 76-year-old man presented with severe right hip and leg pain that had been disabling him for one week. His chronic, mild back pain had worsened, and he was unable to perform daily activities. Initially, spinal decompression was recommended for rotoscoliosis based solely on MRI findings, without a thorough clinical examination. On evaluation, right leg movement, especially hip rotation, was restricted and painful. Pelvic X-ray revealed an osteoporotic femoral neck fracture, which was treated with total hip arthroplasty (Fig. 1). Postoperatively, his pain resolved immediately. Osteoporosis treatment was initiated to improve bone quality and minimize risk of future complications.

Figure 1. MRI showing degenerative rotoscoliosis of the lumbosacral spine (left), osteoporotic neck fracture of the right femur (middle), and postoperative plain radiograph after total hip arthroplasty (right).

Lesson: This case highlights the importance of correlating imaging with clinical examination. Sole reliance on MRI without physical assessment led to a delayed diagnosis, demonstrating how preventable adverse outcomes can occur even with advanced imaging.

Case 2: A 68-year-old man with a history of ankylosing spondylitis sustained back trauma after a bicycle accident. He was initially evaluated in the emergency department with a spinal CT and discharged with NSAIDs, without discussion of imaging findings. Four days later, he sought further evaluation due to persistent pain. Lumbar MRI was performed but did not include the T10–11 level, missing an extension fracture identified on the initial CT. Neurological examination was normal, and no immediate intervention was performed. The patient subsequently underwent posterior stabilization surgery and recovered without complications (Fig. 2).

Lesson: This case underscores the critical need for careful review of all imaging studies and attention to the full clinical context. Overlooking fractures due to incomplete imaging or misinterpretation can lead to preventable complications, including severe neurological injury.

Figure 2. Whole-spine CT revealing an extension injury at the T10–11 level, with disc material extending posteriorly into the T10 posterior elements (left); normal lumbar MRI findings below the T12 level (middle); and posterior stabilization from T8 to L1 (right).

B. Infection

Case 3: A 64-year-old woman presented with mild low back pain and progressive left leg burning sensations. MRI suggested a disc protrusion at L4–5. Conservative treatment with rest, NSAIDs, and muscle relaxants was initially recommended. Persistent pain prompted further examination, revealing herpes zoster lesions on the anterior lower leg, confirmed by dermatology consultation (Fig. 3). Appropriate antiviral treatment led to complete symptom relief.

Lesson: Careful inspection of the affected area is essential. Overlooking skin findings can lead to misdiagnosis and delayed treatment of preventable conditions.

Figure 3. MRI showing a degenerated "black disc" and disc protrusion at the L4–5 level (left). The same patient also presented with shingles on the left leg (right).

The figure demonstrates how herpes zoster can mimic radicular pain caused by lumbar disc disease.

Case 4: A 43-year-old man presented with diffuse back pain and burning sensations. Initial evaluation included limited physical assessment over clothing. Worsening pain prompted further examination, revealing widespread herpes zoster lesions on the lower back (Fig. 4). Dermatological treatment led to full recovery without complications.

Lesson: Comprehensive physical examination, including inspection of the skin, is critical for timely diagnosis and avoidance of preventable complications.

C. Mass Lesion

Case 5: A 34-year-old man with persistent left arm pain and numbness had undergone prior ulnar nerve decompression without improvement. Examination revealed a cervical nerve mass (C7) on MRI (Fig. 5). The patient opted for treatment at another center.

Figure 4. Shingles located on the lower back of the patient (white arrows).

Legend: Herpes zoster lesions are shown in the lumbosacral dermatomal distribution (white arrows).

Figure 5. Surgical scar from left elbow ulnar nerve decompression and MRI of C7–8 foraminal mass.

Lesson: Preoperative imaging and thorough evaluation are essential before surgical intervention to avoid unnecessary procedures and delays in correct diagnosis.

Case 6: A 29-year-old man presented with progressive foot weakness and lateral knee pain. Initial misdiagnosis suggested lumbar microdiscectomy. Examination and electrophysiology revealed peroneal nerve entrapment with intra-neural cystic mass. Surgical decompression resulted in rapid pain relief and recovery of muscle strength (Fig. 6).

Lesson: Accurate localization and diagnosis of peripheral nerve lesions prevent inappropriate spinal surgery and improve patient outcomes.

D. Bone Marrow Edema Syndrome

Case 7: A 50-year-old man presented with worsening left hip and leg pain. MRI revealed bone marrow edema syndrome.[3] Laboratory tests were unremarkable. The patient was referred to orthopedics for further management (Fig. 7).

Lesson: Rare conditions with subtle imaging findings can be misdiagnosed; awareness and referral to appropriate specialists prevent delayed care.

E. Sacroiliitis and Sacralization

Case 8: A 30-year-old man with diffuse low back pain was initially advised lumbar microdiscectomy. Further evaluation revealed bilateral sacroiliitis (Fig. 8). Neurological examination was normal, but sacral joint provocation tests were positive. The patient was referred to rheumatology for targeted treatment.

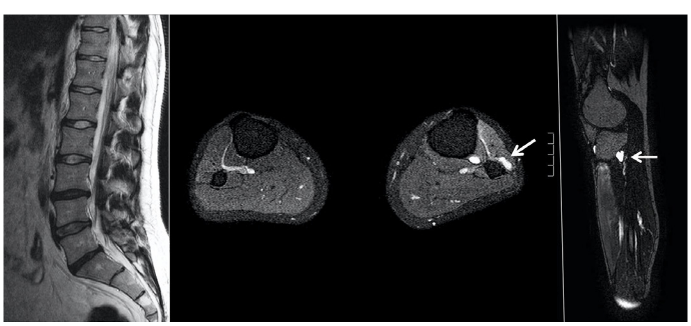

Figure 6. MRI showing a small disc protrusion and "black disc" at the L3–4 level (left), and axial (middle) and coronal (right) MRIs demonstrating a cystic structure (white arrow).

MRI showing a degenerated "black disc" with a small disc protrusion at the L3–4 level (left). Axial (middle) and coronal (right) MRI scans demonstrate a cystic structure (white arrow).

Legend: The cystic lesion was initially misinterpreted as a discogenic pathology.

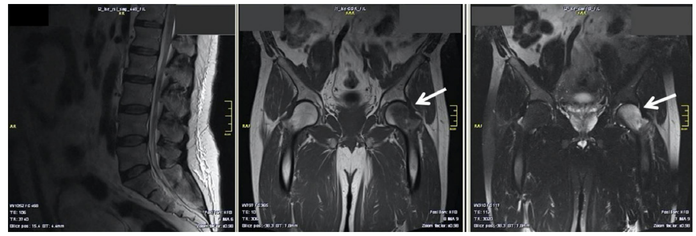

Figure 7. Lumbosacral MRI with normal findings (left), and T1-weighted (middle) and T2-weighted (right) MRIs showing bone edema in the head and neck of the left femur in the coronal plane (white arrow).

Lumbosacral MRI with normal findings (left). Coronal T1-weighted (middle) and T2-weighted (right) MRIs reveal bone marrow edema in the head and neck of the left femur (white arrow).

Legend: Extra-spinal pathologies may mimic lumbar radiculopathy and should be carefully evaluated.

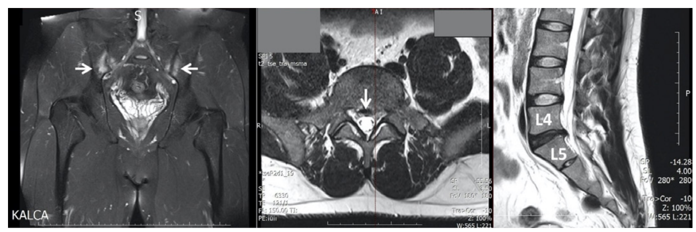

Figure 8. An MRI revealing edema in both sacroiliac joints (white arrows) (left), MRI showing disc protrusion in the axial plane (middle), and lateral section MRI at the L5–S1 level (right).

MRI showing bilateral sacroiliac joint edema (white arrows) (left), axial MRI demonstrating disc protrusion (middle), and sagittal MRI of the L5–S1 level (right).

Legend: Sacroiliitis was identified as the main pathology, initially overlooked due to the disc findings.

Lesson: Consider non-spinal causes in persistent low back pain to avoid unnecessary spine surgery.

Case 9: A 55-year-old man with low back and leg pain was found to have L3–4 segmental stenosis and sacralization (Bertolotti syndrome) (Fig. 9).[4,5] Proposed decompression surgery would not have addressed the underlying cause. He opted for conservative management.

Lesson: Recognition of anatomical variants and comprehensive assessment prevent inadequate surgical interventions.

Discussion

Thorough history-taking and comprehensive patient evaluation remain paramount for accurate diagnosis and appropriate treatment in spine surgery. Despite advances in imaging and surgical techniques, identifying the primary cause of a patient's complaints can be challenging. This series of nine

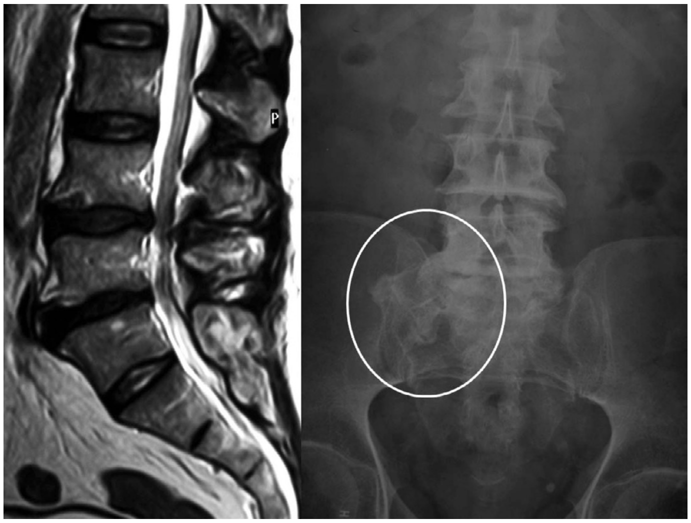

Figure 9. MRI showing lumbar spinal stenosis at the L3–4 and L4–5 levels (left), and anteroposterior radiograph revealing arthrosis and unilateral sacralization (right).

MRI revealing lumbar spinal stenosis at the L3–4 and L4–5 levels (left), and anteroposterior radiograph showing arthrosis with unilateral sacralization (right).

The coexistence of degenerative stenosis and transitional vertebra highlights the importance of correlating MRI with plain radiographs.

cases highlights misdiagnoses or mismanagement resulting from insufficient adherence to standard clinical protocols. Pathologies that should be considered in the differential diagnosis of spinal complaints include bone fractures, herpes zoster infection, peripheral nerve entrapment, bone marrow edema, sacroiliitis, and osteoarthritis. Clinicians must perform meticulous evaluation to mitigate preventable adverse outcomes.[2,6]

During initial evaluation, all available information—including patient history, physical examination, and imaging—should be carefully integrated to determine the cause of symptoms.[6] Comprehensive physical examinations are critical to rule out alternative pathologies and contributing factors, which may include structural, functional, environmental, or personal influences.[7]

Many conditions can mimic spinal pathology, such as intervertebral disc herniation. Surgical interventions are indicated primarily when radiographic findings correlate with history and physical examination.[1] For example, in hip pain, a thorough assessment of patient history, risk factors, and functional limitations is essential, and alternative diagnoses should be considered when symptoms persist despite standard interventions.[8] Lower extremity involvement in herpes zoster is rare but may mimic lumbar radiculopathy; careful inspection and history-taking facilitate accurate diagnosis.[9]

Even low-energy injuries can cause significant spinal fractures in patients with ankylosing spondylitis (AS), and fracture diagnosis is frequently delayed in this population.[10,11] Similarly, peripheral nerve entrapments and intraneural cysts can be misdiagnosed if electrodiagnostic studies and imaging are not adequately performed.[12–15] Bone marrow edema syndrome, sacroiliitis, and Bertolotti's syndrome are additional examples of conditions that may mimic common spinal pathologies, emphasizing the importance of broad differential diagnosis and attentive evaluation.[3–5,16–20]

This case series underscores that thorough history-taking, meticulous physical and neurological examination, and comprehensive evaluation are essential to prevent unnecessary or harmful interventions. Recognizing uncommon and mimicking conditions, integrating multidisciplinary approaches, and adhering to standard clinical protocols optimize patient outcomes and enhance safety in spine surgery.

Conclusion

Accurate diagnosis in spine surgery relies on comprehensive clinical assessment and vigilance for atypical presentations. Awareness of uncommon or mimicking pathologies, combined with multidisciplinary evaluation and adherence to standard protocols, is crucial to prevent avoidable complications. Clinicians should recognize the limitations of imaging and value the irreplaceable role of thorough history-taking and examination to ensure safe and effective spinal care.

Disclosures

Ethics Committee Approval: This study includes a retrospective analysis of nine cases. The article does not contain any personal or identifiable patient information. As this is a case series that does not contain identifiable patient data, institutional review board (IRB) or ethics committee approval was not deemed necessary.

Informed Consent: Informed consent was obtained from all patients undergoing surgical treatment prior to the procedure.

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