

CASE REPORT

Back pain—case report and a proposed three-step mind map to approach back pain in the emergency department

Ayesha Almemari^{1*} , Amani Mohamed Abdelwahab Elkhalfa² ,
Mohamed Ibrahim Elsakati² , Sarah Mohammed Bin Hariz² 

ABSTRACT

Background: Emergency medicine is instrumental in addressing undifferentiated patient concerns, particularly those related to non-traumatic back pain. While a significant portion of these presentations are benign, it is essential to maintain a systematic approach to identifying individuals with serious underlying conditions.

Case Presentation: A 47-year-old man presented with 6 months of escalating upper back pain. He had been slated for a magnetic resonance imaging (MRI) scan through an outpatient neurosurgery clinic, but this was delayed. A thoracic spine computed tomography scan in the emergency department revealed notable abnormalities at the thoracic vertebra 9 vertebral level. A subsequent MRI detected a major bone lesion with tumor intrusion into the spinal canal. Diagnosis revealed metastatic thyroid papillary carcinoma, leading to surgical interventions and subsequent treatments.

Conclusion: Given the frequency with which back pain concerns are addressed across medical specialties, it is vital to recognize potential red flags and adhere to a structured assessment approach. Timely imaging, guided by the patient's presentation and physical examinations, reduces the risk of missing serious pathologies.

Keywords: Case report, back pain, red flags, MRI, CT scan, structured approach.

Introduction

Emergency medicine has emerged as a specialty over the past 60 years. Its role in society continues to expand, central to assessing undifferentiated concerns, identifying potential life or limb-threatening conditions, initiating complex diagnostic workups, and coordinating patient care until admission or post-discharge follow-up [1].

Non-traumatic back pain frequently presents in the emergency department (ED), accounting for 2% to 3% of chief concerns. While most non-traumatic back pain is self-limiting, approximately 5% arises from pathologies requiring timely identification and management [2]. A structured approach to assessment, diagnosis, and awareness of red flags helps emergency physicians identify patients at risk for serious conditions and initiate timely imaging [3].

Upper back pain is one of these red flags, prompting imaging to discern the underlying cause. Pain originating from the local thoracic spine represents <2% of back pain in the ED. Furthermore, thoracic dysfunction is less prevalent than either cervical or lumbar dysfunction. Causes of upper back pain can

range from spine-related issues to non-spine pathologies such as vascular emergencies (e.g., aortic dissection), cardiac emergencies (e.g., acute myocardial infarction), pulmonary emergencies (e.g., pneumothorax), and many other non-spine-related conditions [4].

Patients with back pain might consult various specialties, including family medicine, emergency medicine, orthopedics, or neurosurgery. No studies have yet compared these specialties' efficiency, cost-effectiveness, or efficacy in diagnosing and managing back pain [5]. It is essential to have a structured approach to back pain assessment in the ED to ensure that serious pathologies

Correspondence to: Ayesha Almemari

*Consultant, Emergency Medicine and Critical Care, Shaikh Shakhbout Medical City, Abu Dhabi, UAE.

Email: amemari@ssmc.ae

Full list of author information is available at the end of the article.

Received: 24 April 2023 | **Accepted:** 22 August 2023

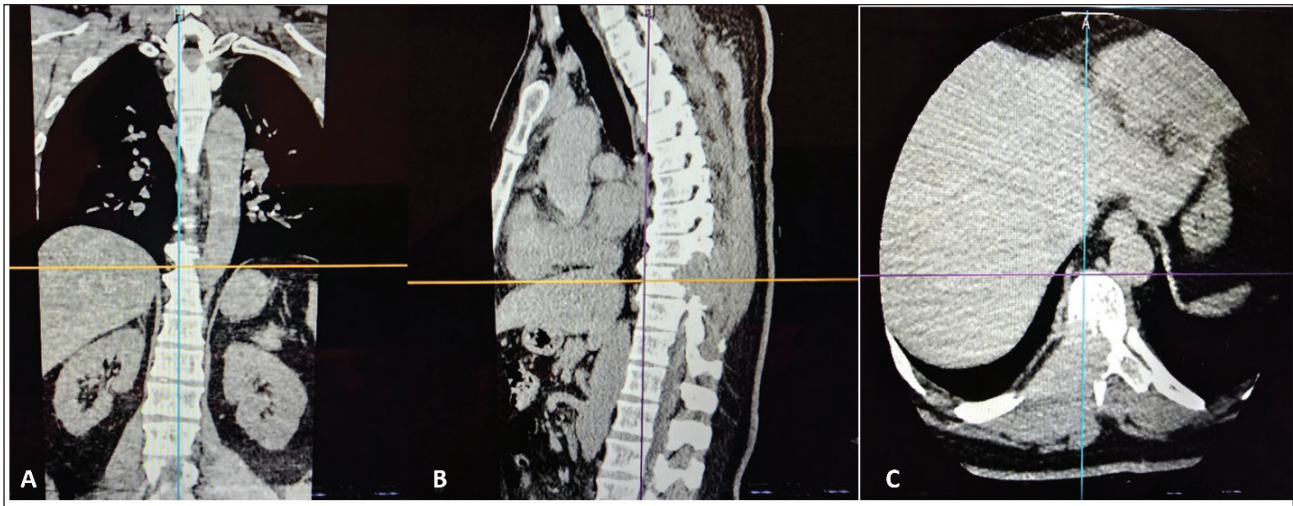


Figure 1. Patient spine CT showing right-sided intraspinal and extraspinal soft tissue mass lesions at the T9 vertebral level, eroding the posterior T9 vertebral body (a and b) and the right ninth rib posteriorly (c).

are not overlooked. We highlight the case of a patient with upper back pain assessed by neurosurgery, for whom a magnetic resonance imaging (MRI) scan was delayed for 3 months, almost resulting in overlooked cord compression.

Case Presentation

A 47-year-old man presented to our ED with a 6-month history of upper back pain that had intensified over the last 2 weeks. The outpatient neurosurgery clinic had previously assessed him and ordered an MRI; however, the appointment was delayed by 3 months. The patient described the pain as non-traumatic, continuous, and a combination of mild sharpness and achiness radiating toward the lower chest. The pain worsened with movement and sitting but improved with rest. In the weeks leading up to the ED visit, he experienced altered sensations and weakness in his right lower limb. He reported no bowel or bladder dysfunction, saddle numbness, abdominal pain, fever, chills, nausea, or vomiting. His medical history was unremarkable except for hypertension.

On initial assessment, his vital signs, including a temperature of 36.9°C, were within reference ranges. The patient was alert and oriented, and showed no spinal tenderness. Examination revealed typical spinal alignment, no step-offs, and numbness consistent with the lumbar vertebrae 3 and 4 distribution.

Blood tests conducted in the ED showed no abnormalities. Given his symptoms, a thoracic spine computed tomography (CT) scan was ordered to check for spinal issues. The CT revealed right-sided intraspinal and extraspinal soft tissue mass lesions at the Thoracic vertebra 9 (T9) vertebral level, eroding the posterior T9 vertebral body and the right ninth rib posteriorly (Figure 1).

Subsequently, an urgent thoracic spine MRI with intravenous (IV) contrast revealed a significant destructive bone lesion at the T9 vertebral body, with tumor extension into the spinal canal (Figure 2).

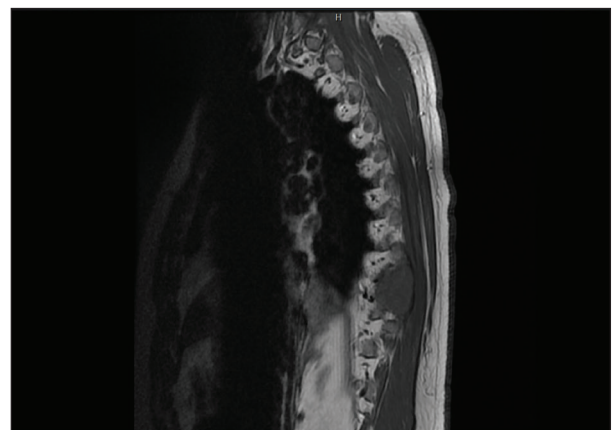


Figure 2. MRI with IV contrast showing a significant destructive bone lesion at the T9 vertebral body, with tumor extension into the spinal canal.

The patient underwent successful excision of the dorsal thoracic mass, posterior spinal fixation, and complete tumor removal. Pathological examination identified the primary source of the tumor as the thyroid gland, diagnosed as metastatic thyroid papillary carcinoma. This diagnosis was confirmed via thyroid transcription factor-1 positive immunohistochemistry. The patient later underwent a total thyroidectomy, followed by radioactive iodine ablation and radiotherapy. He has since recovered well, with no neurological deficits, and currently receives treatment with denosumab injections and levothyroxine.

Discussion

Though there is no universally validated approach to back pain, it is crucial to assess patients with back pain in a structured way to prevent delayed or missed diagnoses [6]. Taking a thorough history to identify red flags associated with back pain is vital. Our patient presented with upper back (thoracic) pain, a recognized red flag. Other red flags include a duration of pain lasting longer than 6 weeks; age under 18 or over 50 years; constitutional symptoms such as fever, weight loss, or dyspnea; rapidly progressing

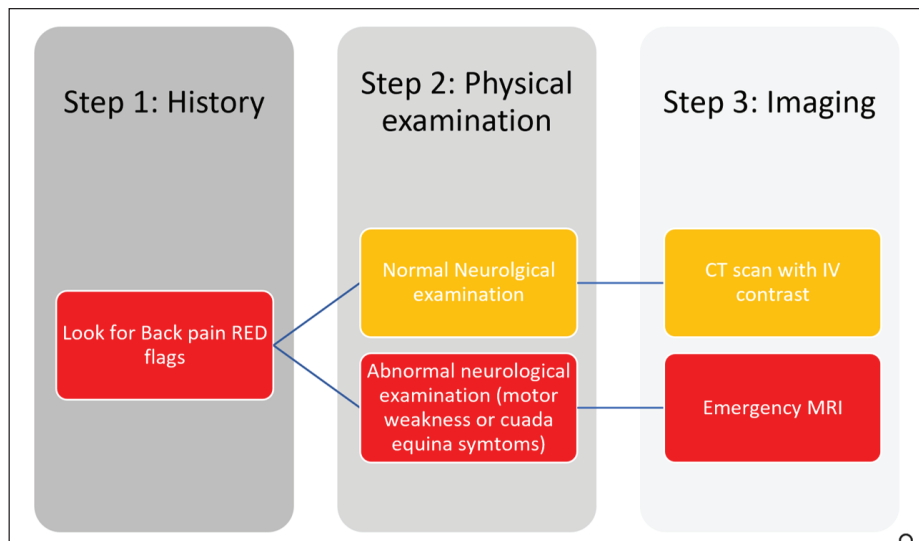


Figure 3. Three Steps mind map of approach to back pain in the ED.

neurological deficits; IV drug use; urinary or fecal incontinence; and a history of trauma or malignancy [6-8]. With or without cord compression and radiculopathy, back pain can be a primary presenting symptom of distant thyroid carcinoma metastases (TC). It accounts for approximately 20% of all TC cases and significantly contributes to thyroid disease-related mortality [9].

A comprehensive physical examination, which includes motor and sensory weakness assessment and gait analysis, is essential [8]. This structured assessment's objective is to determine whether the patient has non-specific low back pain (in which case no imaging would be necessary, as these cases are often self-resolving) or back pain associated with radiculopathy or spinal canal stenosis which requires emergent or semi-urgent imaging [6,10].

A straightforward approach involves identifying any red flags in the patient's history. If red flags are present, imaging becomes crucial to determine the pain's cause [6]. While spinal X-rays are both low-cost and widely available, they are primarily used to rule out fractures in trauma cases. If a fracture is detected, further imaging with a CT scan or MRI becomes necessary [10]. MRI remains the gold standard for diagnosing back pain caused by disc herniation, tumors, or soft tissue infections. However, MRIs are costly and often not immediately available, which could lead to waiting times unless there are signs of spinal emergencies such as cauda equina syndrome. For traumatic histories or when MRI is not accessible, a CT scan or CT myelogram can be crucial for identifying suspicious pathologies, as demonstrated in our patient [10].

We suggest a simple three-step mind map for addressing back pain in the ED (Figure 3). The first step involves history-taking and identifying any red flags. Based on the physical examination (Step 2), the appropriate imaging (Step 3) is determined. If the physical examination is normal or shows no motor weakness, a CT scan with IV contrast can be initiated. However, an emergent MRI

becomes essential if there is a motor weakness or signs of cauda equina syndrome.

Conclusion

Back pain is a frequent concern and can be evaluated by primary care physicians, emergency physicians, neurosurgeons, or orthopedic surgeons. Recognizing red flags and considering a CT scan or MRI when red flags in a patient's history coincide with abnormal physical examination findings is essential.

List of Abbreviations

CT	Computed tomography
ED	Emergency department
IV	Intravenous
MRI	Magnetic resonance imaging
TC	Thyroid carcinoma
T9	Thoracic vertebra 9

Conflict of interests

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

None.

Consent to participate

Not applicable.

Consent for publication

Written informed consent was obtained from the patient.

Ethical approval

Our institution does not require ethical approval to publish an anonymous case report.

Author details

Ayesha Almemari¹, Amani Mohamed Abdelwahab Elkhalfi², Mohamed Ibrahim Elsakati², Sarah Mohammed Bin Hariz²
 1. Consultant, Emergency Medicine and Critical Care, Shaikh Shakhboub Medical City, Abu Dhabi, UAE

2. Specialist, Emergency Medicine, Shaikh Shakbout Medical City, Abu Dhabi, UAE

References

1. Morganti KG, Bauhoff S, Blanchard JC, Abir M, Iyer N, Smith A, et al. The evolving role of emergency departments in the United States. *Rand Health Q.* 2013;3(2):3.
2. Singleton J, Edlow JA. Acute nontraumatic back pain: risk stratification, emergency department management, and review of serious pathologies. *Emerg Med Clin North Am.* 2016;34(4):743–57. <https://doi.org/10.1016/j.emc.2016.06.015>
3. Downie A, Williams CM, Henschke N, Hancock MJ, Ostelo RW, de Vet HC, et al. Red flags to screen for malignancy and fracture in patients with low back pain: systematic review. *BMJ.* 2013;347:f7095. <https://doi.org/10.1136/bmj.f7095>
4. Casiano VE, Sarwan G, Dydyk AM, Varacallo M. Back pain. Treasure Island, FL: StatPearls Publishing; 2023 [cited 2023 Apr 22]. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK538173/>
5. Atlas SJ, Deyo RA. Evaluating and managing acute low back pain in the primary care setting. *J Gen Intern Med.* 2001;16(2):120–31. <https://doi.org/10.1111/j.1525-1497.2001.91141.x>
6. Edlow JA. Managing nontraumatic acute back pain. *Ann Emerg Med.* 2015;66(2):148–53. <https://doi.org/10.1016/j.annemergmed.2014.11.011>
7. Edwards MA, Hawkins M, Alao D. Missing red flags in back pain - tuberculosis of the spine: an important differential for back pain in non-endemic countries. *Case Rep.* 2013;2013:bcr2012008511. <https://doi.org/10.1136/bcr-2012-008511>
8. Acute low back pain: recognizing the ‘Red Flags’ in the workup. *Consultant360.* 2013 Jun 25 [cited 2023 Apr 22]. Available from: <https://www.consultant360.com/article/acute-low-back-pain-recognizing-%25E2%2580%259Cred-flags%25E2%2580%259D-workup>
9. Omranipour R, Hassanesfahani M, Nili F, Farahzadi A. Delayed solitary scapular metastasis from primary follicular thyroid carcinoma, a case report. *SN Compr Clin Med.* 2022;4(1):187. <https://doi.org/10.1007/s42399-022-01272-4>
10. Lateef H, Patel D. What is the role of imaging in acute low back pain? *Curr Rev Musculoskelet Med.* 2009;2(2):69–73. <https://doi.org/10.1007/s12178-008-9037-0>