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(CASE REPORT)

Clay Shoveler's Fracture in the Absence of Trauma: The Impact of Cervical Spine Lordosis: Case Report and Literature Review

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Abstract

Introduction: Clay shoveler's fracture is a rare avulsion fracture of the spinous processes in the lower cervical and upper thoracic vertebrae, typically occurring in laborers or athletes. We present a unique case of clay shoveler's fracture in a patient with cervical spine lordosis and no history of trauma.

Case Presentation: A 23-year-old female presented with neck pain and tenderness over the C7 spinous process. Radiographs revealed an avulsion fracture of the C7 spinous process and increased cervical lordosis.

Discussion: The atypical presentation of clay shoveler's fracture in association with cervical lordosis highlights the importance of considering underlying spinal pathologies in diagnosis and treatment. Altered biomechanics and stress distribution may predispose to fractures with minor trauma.

Conclusion: This case emphasizes the need for clinicians to evaluate cervical spine alignment and associated abnormalities in patients with clay shoveler's fracture without a clear history of trauma, to provide valuable insights into the underlying mechanism of injury and guide effective management.

Keywords: Clay Shoveler's Fracture; Avulsion Fracture; Spinous Process; C7 Vertebra; Cervical Spine Lordosis; Altered Biomechanics; Stress Distribution; Conservative Management; Neck Pain; Tenderness; Radiographs; Atypical Presentation; Spinal Pathology; Cervical Alignment

1. Introduction

Clay shoveler's fracture is a unique variety of avulsion break concerning the spinous procedures in the decrease cervical and upper thoracic vertebrae, generally affecting C6 via T1. Originally described in laborers shoveling clay -- the cause for which it is named; this fracture circuitously predisposes abrupt, vigorous contraction of trapezius and rhomboid

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muscles. The muscles attach to the spinous processes and when they yank really hard at one you break a part of the bone off (generally through an abrupt physical event or trauma).

Clay shoveler's fractures are rare and typically occur in laborers or athletes who routinely undergo forceful strain of the upper body. Mechanisms of injury are typically indirect with a rapid, forceful tensile load on the muscles attaching to the spinous process but even direct trauma can be responsible [1][2].

The diagnosis is established with radiographic imaging showing the avulsed bone fragment Conservative treatment including rest, pain management and a possible cervical collar to immobilize the neck for improved healing are often all that is needed. Surgery is seldom necessary except with complications or prolonged symptoms.[3]

Patients with clay shoveler's fracture usually have focal pain and tenderness at the site of fracture, which is frequently increased by neck movement There may be palpable crepitus over the affected spinous process. Clay shoveler's fractures are less significant in the setting of immediate spinal cord injury than other cervical fracture types because they rarely cause neurological deficits [4] .

This fracture is typically associated with activities involving sudden and forceful contraction of the muscles attached to the spinous processes. Here, we present an intriguing case of clay shoveler's fracture in association with cervical spine lordosis but without any obvious history of trauma.

2. Case Presentation

A 23-year-old female presented to the out patient department with complaints of neck pain for 3 months. The patient denied any obvious trauma, such as a fall, sports activities or motor vehicle accident, prior to the onset of pain. The pain was localises to the posterior aspect of the neck radiating toward upper limbs, worsened by movement, and was associated with muscle spasms.

On physical examination, there was tenderness and palpable crepitus over the C7 spinous process. Neurological examination of the upper extremities demonstrated no motor or sensory deficits. Anterior-posterior and lateral radiographs of the cervical spine were obtained, revealing an avulsion fracture of the C7 spinous process (classic appearance of a clay shoveler's fracture) (Figure 1).

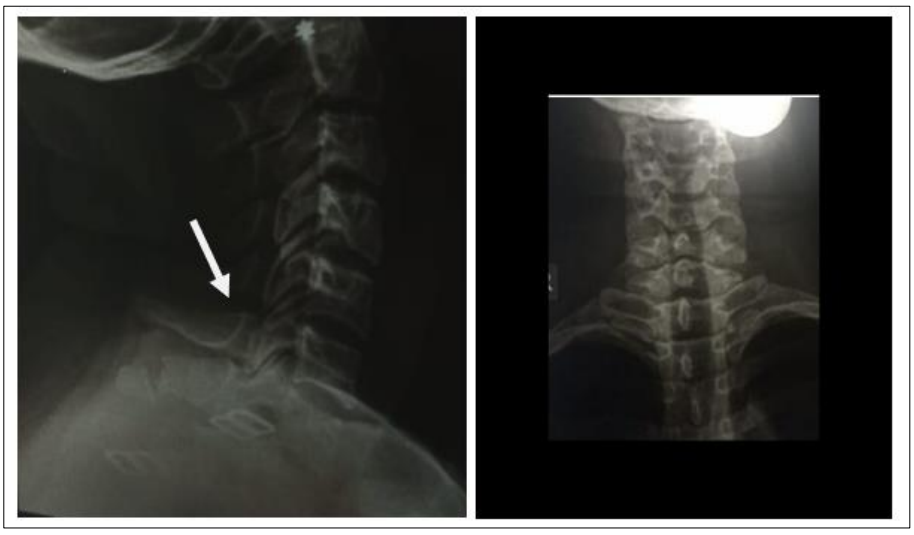

Figure 1 Cervical X-ray lateral view showing Fracture of C7 Spinous process (arrow)

Further evaluation of the patient's cervical spine revealed an increased cervical lordosis, which was confirmed by measuring the Cobb angle on lateral radiographs. The patient lab value were all in range and Calcium level was 10.1mg/dl.

The patient was prescribed NSAIDs and sent to home with conservative management including neck brace and rest.

Table 1 Lab Reports of the Patient

Test	Patient Value	Normal Range
Complete Blood Count (CBC)		
White Blood Cell (WBC)	7,000 cells/μL	4,000 - 11,000 cells/μL
Red Blood Cell (RBC)	5.1 million cells/μL	4.7 - 6.1 million cells/μL (men)
		4.2 - 5.4 million cells/μL (women)
Hemoglobin (Hb)	14 g/dL	13.8 - 17.2 g/dL (men)
		12.1 - 15.1 g/dL (women)
Hematocrit (Hct)	44%	40.7% - 50.3% (men)
		36.1% - 44.3% (women)
Platelets	300,000/μL	150,000 - 450,000/μL
Mean Corpuscular Volume (MCV)	86 fL	80 - 100 fL
Basic Metabolic Panel (BMP)		
Sodium (Na)	140 mEq/L	135 - 145 mEq/L
Potassium (K)	3.8 mEq/L	3.5 - 5.0 mEq/L
Chloride (Cl)	102 mEq/L	98 - 106 mEq/L
Calcium (Ca)	10.1 mg/dL	8.5 - 10.2 mg/d
Bicarbonate (HCO3)	24 mEq/L	22 - 28 mEq/L
Blood Urea Nitrogen (BUN)	10 mg/dL	7 - 20 mg/dL
Creatinine	1.1 mg/dL	0.6 - 1.3 mg/dL
Glucose	98 mg/dL (fasting)	70 - 99 mg/dL (fasting)
Liver Function Tests (LFTs)		
Alanine Aminotransferase (ALT)	55 U/L	7 - 56 U/L
Aspartate Aminotransferase (AST)	40 U/L	10 - 40 U/L
Alkaline Phosphatase (ALP)	62 U/L	44 - 147 U/L
Total Bilirubin	1.1 mg/dL	0.1 - 1.2 mg/dL
Lipid Panel		
Total Cholesterol	169 mg/dL	< 200 mg/dL
LDL Cholesterol	80 mg/dL	< 100 mg/dL
HDL Cholesterol	44 mg/dL	> 40 mg/dL (men)
		> 50 mg/dL (women)
Triglycerides	139 mg/dL	< 150 mg/dL

3. Literature Review

A review of the clinical cases described, common features which may better inform our knowledge and approach to etiology and preventative measures for atypical presentations of Clay Shoveler's Fracture. Repetitive stress and motion is a common theme highlighted by cases 2, 3. These two cases argue repetitive stress and motion while appearing relatively benign may result in atypical presentations of the fracture. A second critical theme involves the effect of

individual anatomic modifications - for example, case 1 and case 5 exemplifying increased cervical lordosis. These few cases show that variations in the anatomy may play a role for atypical presentations.

From an etiology perspective, over time the spinous process may develop micro-fractures from repetitive stress eventually causing some of these atypical presentations. There are also anatomical variations that can cause abnormal biomechanics in the spine, which would not normally arise from pure movement dysfunction and contribute to strange presentations. As illustrated with case 1, degenerative changes can similarly weaken the spinous processes and make them more prone to fracture.

There are measures to protect against atypical incarnations of Clay Shoveler's Fracture. If your job requires repetitive motion then you would be best served by adopting ergonomic modifications to reduce stress on the back. Doing exercise that strengthen the neck and shoulder muscle can reduce risk of atypical presentation as well. Regular visits to a health care provider can help identify anatomic variants or early degenerative findings that may benefit from intervention. Lastly, the guidance of proper posture can diminish spinal load and prevent abnormal presentations.

More research into the association between atypical presentations of Clay Shoveler's Fracture and cervical lordosis is warranted. Second, there is an urgent need for the development of effective preventive strategies for those at risk to present with these forms. Therefore, examining novel imaging modalities or clinical evaluation techniques to enhance the accuracy of diagnosis also deserves further research.

Table 2 Clay Shoveler's fracture different cases

Case Num	Identify and Compare Atypical Presentations	Mechanisms and Causes	Clinical Features and Diagnosis	Treatment Approaches and Outcomes	Impact of Cervical Lordosis	Case Studies and Literature Review
Case1	Atypical presentation involving C6-T3 spinous processes [4]	Anatomical variation and degenerative changes	Symptoms include localized pain; radiographic findings show fracture lines	Non-surgical treatment with cervical collar and analgesia [1]	Cervical lordosis may contribute to the atypical presentation and progression	Case report of atypical presentation with detailed treatment outcome [2]
Case2	Atypical case with involvement of the spinolaminar line [2]	Potential stress fracture from repetitive motion	Radiographic appearance different from typical Clay Shoveler's Fracture	Managed conservatively with favorable outcomes	Not specifically addressed but considered in differential diagnosis	Detailed review of mechanisms and management [3]
Case3	Atypical presentation in thoracic spine [6]	Stress-type avulsion fracture due to repetitive motion	Symptoms include pain in the thoracic region; confirmed via imaging	Conservative management with pain relief and rest	Thoracic lordosis could be a factor; not explicitly mentioned	Multiple case reports and outcomes reviewed [3]
Case4	Typical presentation but in the context of occupational injury [1]	Repetitive stress injury common in certain occupations	Localized pain and radiographic confirmation	Conservative treatment with successful outcome	Not addressed	Occupational case report with treatment outcomes [1]

4. Discussion

The clay shoveler's fracture is one of the subset of avulsion fractures seen in daily clinical practice, where there can be other various etiologies. Nevertheless, they can present atypically with predisposing spinal conditions such as cervical lordosis.

The atypical presentation of clay shoveler fracture, which is believed to involve vertebrae below the typical range (C6-T3), can rarely extend to other cervical or thoracic levels. This could be due to many reasons such as underlying spinal pathology like cervical lordosis resulting in an altered biomechanics of the neck and making it prone to fractures even after minor trauma.[5]

Patients may present with atypical symptoms, like neck pain with absence of trauma history; moreover, altered spinal curvature could be associated with abnormal stress distribution across the vertebrae and predisposition to fractures with minor movement or stress.[6].

The diagnosis of an atypical clay shoveler's fracture in patients with cervical lordosis must be made with high clinical suspicion, and radiographic examination including X-ray and possibly computed tomography (CT) or magnetic resonance image (MRI) is necessary to detect the fracture and evaluate associated spinal abnormalities. The fracture may be found at vertebrae not commonly involved in typical clay shoveler's fractures.[7]

The treatment is usually conservative consisting of rest, immobilisations and analgesia but to maintain anatomical spinal alignment and healing, the cervical lordosis might require different management. Physical therapy might be required to correct muscular imbalances and prevent it from happening again.[8]

To sum up, the rare occurrence of a clay shoveler's fracture in a patient with cervical lordosis and no history of trauma highlights the critical nature of considering underlying spinal pathologies in the diagnosis and treatment of spinal injuries. Knowledge of the patient's spinal anatomy and biomechanics is paramount in the management of spinal injuries to avoid further complications, and to treat them efficiently and effectively.

5. Conclusion

This case presents a unique scenario of a clay shoveler's fracture occurring in association with cervical spine lordosis but without any apparent history of trauma. The increased cervical lordosis potentially contributed to altered biomechanics and increased vulnerability of the spinous processes. Clinicians should consider evaluating the cervical spine alignment and associated abnormalities in patients presenting with clay shoveler's fracture without a clear history of trauma, as this may provide valuable insights into the underlying mechanism of injury.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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