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Hyoid Bone Fracture in a Patient as a Rare Cause of Persistent Postoperative Dysphagia Following Anterior Cervical Discectomy and Fusion

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Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Patient: Female, 76-year-old
Final Diagnosis: Hyoid fracture
Symptoms: Dysphagia
Clinical Procedure: —
Specialty: Orthopedics and Traumatology

Objective: Unusual clinical course

Background: Anterior cervical discectomy and fusion (ACDF) is widely used to treat cervical spondylosis, disc herniation, and degenerative disc disease that can cause neck pain, spinal stenosis, radiculopathy, and myelopathy. Dysphagia is a common complication following ACDF. In most cases this symptom is fleeting and resolves within weeks to months of surgery. However, severe and persistent cases of dysphagia do occur, and when they occur, they are rarely attributed to a hyoid fracture.

Case Report: We report the case of a 76-year-old woman who developed severe, persistent dysphagia and progressive odynophagia following a C3-5 ACDF. Despite initial treatment with oral steroids and a modified liquid diet, her symptoms worsened. By postoperative day 14 she could not swallow, had lost 4.5 kg in weight, and had a persistent cough. A computed tomography (CT) scan revealed a nondisplaced hyoid fracture. She required inpatient admission for IV hydration, steroids, and swallow therapy education. A percutaneous endoscopic gastrostomy (PEG) tube was recommended, but the patient declined. Her swallowing gradually improved with conservative management. By 10 weeks postoperatively, she demonstrated mild dysphagia on barium swallow, and at 5 months she had complete resolution of symptoms, with confirmed radiographic fusion.

Conclusions: Although dysphagia is common after ACDF, hyoid bone fracture is a rare but clinically important potential contributor to severe and persistent symptoms. A hyoid fracture should be considered in the differential diagnosis when dysphagia worsens or does not improve with standard therapy. CT imaging is essential to establish the diagnosis and guide management.

Keywords: Postoperative Complications • Hyoid Bone

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Introduction

Anterior cervical discectomy and fusion (ACDF) is a common surgical procedure used to treat cervical radiculopathy and myelopathy arising from disc degeneration. While ACDF surgeries are generally safe and effective, complications can arise. These include bleeding, infection, dysphonia, interscapular discomfort, odynophagia, and dysphagia [1]. Dysphagia most commonly occurs from manipulation of the soft-tissue structures anterior to the cervical spine. The combination of placing the neck in extension and retraction of the esophagus commonly leads to some degree of dysphagia postoperatively. Severe cases of persistent dysphagia are most often multifactorial. Hyoid fracture associated with ACDF is exceptionally rare and, to our knowledge, has only been documented once in the literature. This report presents a CT-confirmed postoperative case that adds to the limited literature on hyoid fracture following ACDF and increases awareness of hyoid fracture as a potential differential diagnosis when postoperative dysphagia is severe, progressive, or persists beyond the expected postoperative course.

The hyoid is a horseshoe-shaped bone in the anterior neck at the C3 vertebral level, positioned inferior to the mandible and superior to the thyroid cartilage [2]. It plays a critical role in tongue movement, mastication, swallowing, and prevention of regurgitation [3]. Hyoid fractures are uncommon and are typically associated with strangulation, assault, or athletic injuries. We present a rare CT-confirmed case of hyoid fracture following ACDF in a 76-year-old woman and discuss its relevance to postoperative dysphagia.

Case Report

Here, we present the case of a 76-year-old woman who developed a hyoid fracture after anterior cervical discectomy and fusion (ACDF) surgery. She presented with neck pain, left-sided trapezial pain, gait imbalance, and hand dexterity problems that had been ongoing for 8 months. She denied dysphagia prior to presentation and had no history of previous spine surgery. Her past medical history was relevant for hyperlipidemia, hypertension, osteoarthritis, and osteoporosis. On physical exam, Hoffmann and Spurling signs were negative, there was no hyperreflexia, and she demonstrated full (5/5) strength in both upper and lower extremities. She was neurologically intact at baseline. Flexion and extension radiographs revealed extensive anterior osteophyte formation at C3-4 and C6-7. Cervical magnetic resonance imaging (MRI) demonstrated severe cord compression at C3-4 and C4-5 without myelomalacia (Figure 1).

The patient initially underwent 8 weeks of physical therapy without improvement. Given her worsening myeloradiculopathy,

a 2-level ACDF was performed at C3-5 via a right-sided approach. An intraoperative lateral cervical radiograph was taken to make an incision centered over the C4 vertebral body. The modified Smith-Robinson technique was performed. Retraction of soft tissues was performed by a physician assistant using the Shadow-Line cervical system. The anterior osteophytes between the vertebral bodies of C3-5 were resected and later used as local bone graft. After completing the decompressions, the cartilaginous endplates were decorticated with a high-speed burr, and a polyetheretherketone (PEEK) cage filled with 0.35 mg of recombinant human bone morphogenetic protein-2 (rhBMP-2), local bone, and demineralized bone matrix was placed into each level. An anterior cervical plate (Atlantis Medtronic Sofamor Danek) was then secured with variable angled screws that were locked into the plate. A collagen sponge soaked with 40 mg of Depo-Medrol was then placed anterior to the cage and a deep drain was inserted.

On postoperative day (POD) 1 she reported dysphagia with swallowing hydrocodone pills but tolerated liquid medications of elixir hydrocodone and oral Robaxin. She was neurologically intact and discharged home later that day after radiographs were taken. Over the course of 4 days, she reported progressively worsening dysphagia and odynophagia. A Medrol dose pack was prescribed on POD 5. By POD 14, she reported inability to swallow solids or liquids. She also noted a persistent cough and a 4.5 kg weight loss.

The patient was seen in the office the same day with a well-healed surgical wound and she was neurologically intact. Same-day radiographs revealed well-placed hardware and minimal prevertebral soft-tissue swelling. She was administered IV fluids and steroids. A CT neck soft-tissue scan was performed to rule out esophageal injury. The CT scan revealed a nondisplaced acute fracture of the right hyoid bone with mild adjacent soft-tissue edema (Figure 2). The patient was admitted to the hospital for electrolyte replenishment, IV steroids, and possible PEG tube placement. Education on dysphagia was given and strategies to improve caloric intake were discussed with the patient. A barium swallow study confirmed poor swallowing and a PEG tube was recommended. However, the patient refused PEG tube placement and after a 1-week inpatient hospital stay felt that her swallowing had improved enough to return home.

A barium swallow study done 10 weeks postoperatively showed significant improvement with only mild pharyngeal dysphagia with no laryngeal penetration or aspiration. No further swallow therapy was recommended. At her 5-month POD visit she had normal swallowing and resolution of preoperative neck and trapezial pain, with radiographs showing complete fusion (Figure 2).

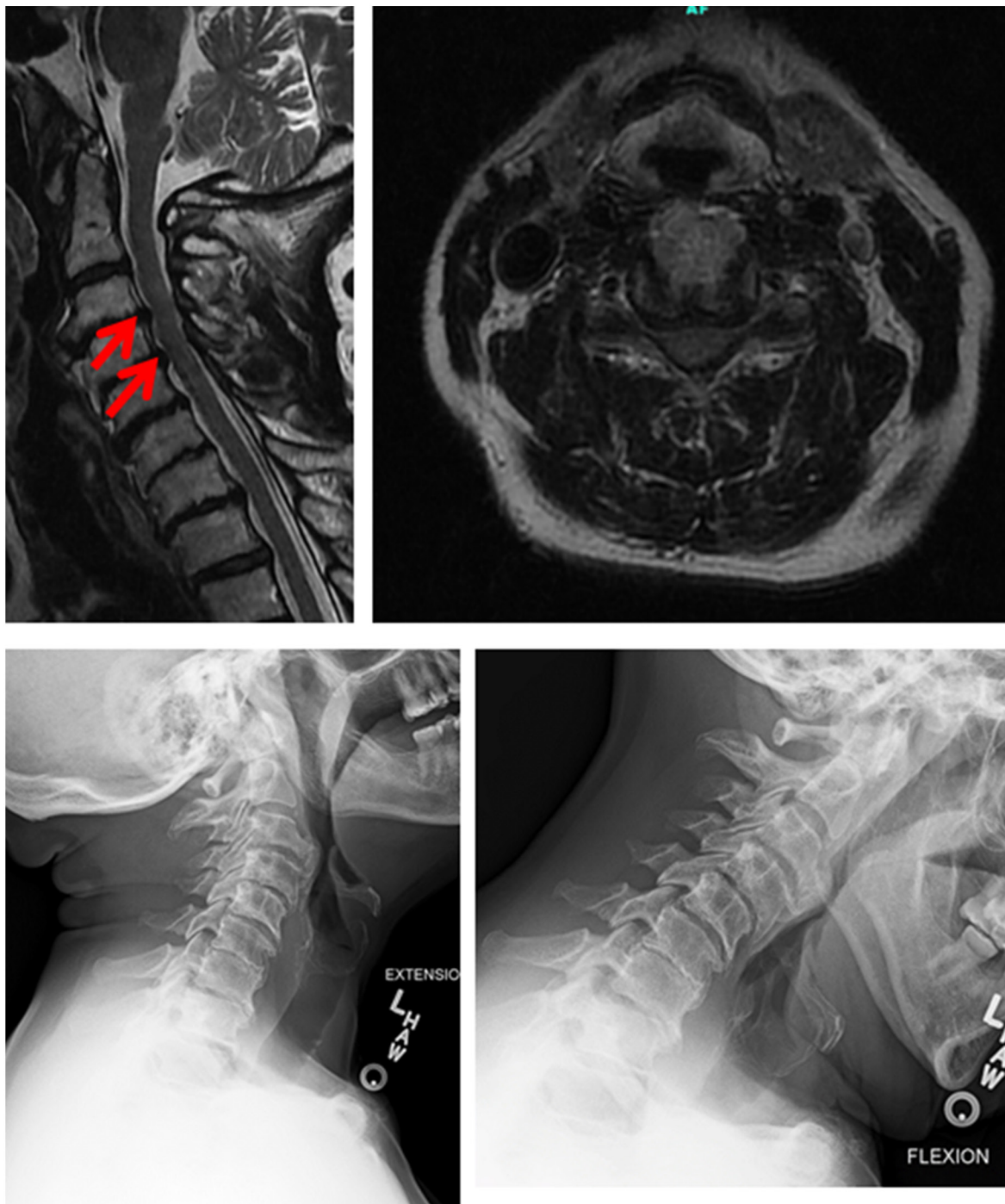


Figure 1. Cervical magnetic resonance imaging scan at C3-4 and cervical flexion extension radiographs (preoperative).

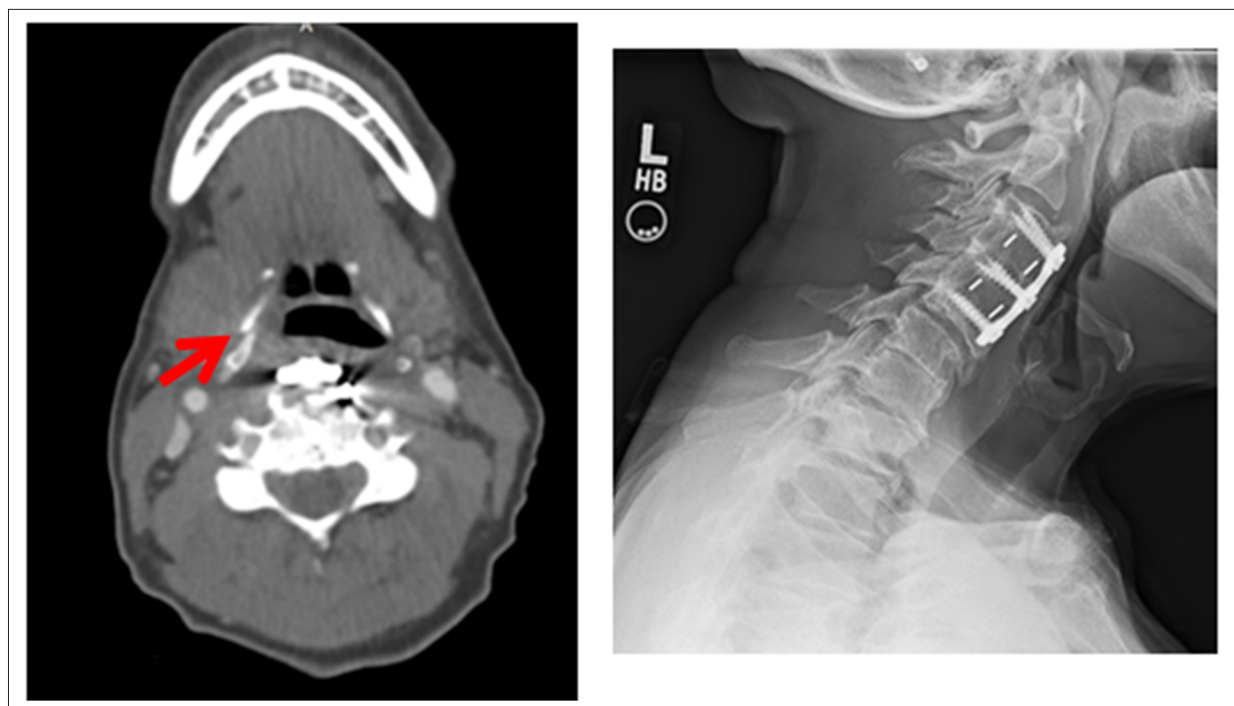


Figure 2. Cervical computed tomography scan (POD14) showing hyoid fracture (arrow) and postoperative cervical radiographs (5-months postoperative).

Discussion

Hyoid bone fractures are exceptionally rare, with a reported incidence of only 0.002% of all fractures [4]. They are most commonly associated with strangulation and are often a post-mortem finding [5]. Only 1 prior case of hyoid fracture following ACDF has been reported in the literature. The symptoms of hyoid fracture range from mild dysphagia to life-threatening airway compromise. Dysphagia, odynophagia, and anterior neck pain are the most common presenting features [4,5]. Because these symptoms overlap with the expected postoperative course after ACDF, the diagnosis may be delayed or overlooked. Radiographs are unreliable for detecting hyoid fractures, and CT imaging is the diagnostic modality of choice [6]. Kaufman et al reported 3 separate cases of missed hyoid fracture diagnosis followed by severe respiratory distress in these patients [7]. In our patient, worsening dysphagia, weight loss, and cough prompted further investigation and led to the identification of a nondisplaced hyoid fracture. No baseline pre-operative neck CT was available for direct comparison, which limits certainty regarding the accuracy of the hyoid finding. However, the presence of adjacent soft-tissue edema on postoperative CT, together with the acute postoperative onset and progressive clinical course, supports our interpretation that the fracture was acute, but an anatomical variant cannot be completely excluded in the absence of baseline imaging.

The mechanism in this case was likely multifactorial. Several factors may have contributed, including large anterior osteophytes, reduced soft-tissue mobility, surgical retraction, neck extension, and intubation. These factors are based on operative and clinical features observed and are plausible, but unproven, explanations for the injury.

Hyoid fractures are most often associated with trauma such as strangulation, hanging, sports injuries, or motor vehicle accidents [5]. Two perioperative cases have been reported in the literature. Ong et al described a hyoid fracture following repeated transesophageal echocardiography procedures during coronary artery bypass grafting, likely due to neck extension and probe manipulation [2]. Anthony et al reported a delayed hyoid fracture discovered 25 years after ACDF, associated with pharyngeal wall fibrosis and dysphagia [8]. Our case differs in that the fracture occurred acutely after the ACDF and may have contributed to the patient's unusually severe and persistent dysphagia, although other postoperative factors, including intubation, surgical exposure, and pre-existing cervical osteophytes, may have also contributed.

Most hyoid fractures can be managed conservatively with hydration, IV steroids, analgesics, and a soft diet [6,9]. In severe cases with airway compromise or open fractures, surgical repair may be necessary. Our patient improved with conservative measures alone, despite initially requiring inpatient support and PEG tube consideration.

Dysphagia after ACDF is common and is reported in 1% to 79% of cases [1]. This wide range in reported dysphagia rates is largely attributed to variability in assessment methods [10,11]. Some researchers have suggested that postoperative dysphagia should be considered a surgical adverse effect, rather than a complication [10]. Although dysphagia after ACDF surgery is common, it is normally temporal, with specific risk factors reported and debated in the literature [1]. Dysphagia after ACDF surgery has been attributed to soft-tissue swelling and inflammation associated with tissue retraction, hardware placement, and, rarely, esophageal injuries [1,10]. It has been reported to be more common in patients with more vertebral levels fused, more proximal levels fused (above C4), longer surgeries, older patients, surgeries using rhBMP-2, and patients with preoperative dysphagia [1,10].

Our patient had a 2-level surgery with use of an anterior plate and rhBMP-2. Intraoperatively, the exposure was difficult as the soft tissues were taut and less mobile than expected. Immediate postoperative dysphagia was not unexpected. Contributing factors included a 2-hour operative time, fusion at proximal levels C3-5, and placement of an anterior cervical plate. However, the persistence and severity of the dysphagia were most concerning, which prompted the patient's return to the office for re-evaluation. Despite oral steroids, the patient was experiencing worsening dysphagia over a 10-day period. This case underscores the importance of maintaining a broad differential diagnosis when postoperative dysphagia symptoms appear to be disproportionate to the expected course.

Although rare, hyoid fracture may warrant consideration in patients with severe, progressive, or persistent symptoms, especially when initial evaluation does not identify a more common cause. The mechanism of the hyoid bone fracture in this case could not be determined and can only be surmised based on the patient's anatomy and operative circumstances. She had significant anterior osteophyte formation demonstrated in preoperative radiographs and the intraoperative exposure was described as difficult with taut and relatively immobile soft tissues. We hypothesized that these baseline findings may have increased the forces required for soft-tissue retraction. Additionally, neck extension required during surgical exposure of the upper cervical spine may have reduced hyoid mobility and potentially increased susceptibility to injury during intubation and/or surgical manipulation and retraction. These observations are not evidence-based and should be interpreted cautiously.

The senior author has since modified his operative technique for anterior cervical exposure by positioning the neck in a more neutral position rather than in extension and switching from use of the wide Shadow-Line retractor blades to narrow blades. This practice change was based solely on the

authors' hypothesis that the aforementioned changes would allow for greater intraoperative hyoid mobility and theoretically reduce mechanical stress on the hyoid and subsequent chances of hyoid fracture. Accordingly, these technical modifications are speculative and appropriate caution should be maintained when considering them. Further cases and investigative studies are needed to determine evidence-based preventive recommendations.

This report presents an additional CT-confirmed case and contributes to the limited literature on hyoid fracture following ACDF. The primary clinical contribution of this case report is to increase awareness of hyoid fracture as a potential differential diagnosis when postoperative dysphagia is severe, progressive, or persists beyond the expected course. The findings should be interpreted within the limitations of a single case report and do not establish a broader causal or preventive relationship between ACDF and hyoid fracture.

Conclusions

Persistent, progressive, or unusually severe postoperative dysphagia after ACDF surgery should prompt consideration of uncommon structural causes in addition to the more typical postoperative etiologies. This case involved a rare CT-confirmed hyoid fracture identified during evaluation of an atypical postoperative course and highlights hyoid fracture as a clinically important potential contributor to severe and persistent dysphagia after ACDF. Although a nondisplaced hyoid fracture may be an incidental finding, its acute appearance in close temporal association with the onset and progression of dysphagia makes it a plausible and clinically relevant contributor to the patient's symptoms. Given the multifactorial nature of postoperative dysphagia after ACDF, a definitive causal relationship cannot be established from a single case report. The primary clinical implication of this case is diagnostic vigilance when postoperative dysphagia is disproportionate to the expected recovery trajectory. CT imaging was instrumental in identifying the hyoid fracture in this patient and should be considered when postoperative dysphagia is unusually severe, progressive, or persistent.

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Patient Informed Consent

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

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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