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Delayed esophageal perforation following anterior cervical fusion and retropharyngeal steroid use: A report of two cases

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Abstract

BACKGROUND CONTEXT: Prevertebral soft tissue swelling (PSTS) following anterior cervical spine surgery may result in postoperative catastrophic airway complications and persistent dysphagia. Systemic or local corticosteroids have been used to decrease complications related to PSTS. To date, studies using retropharyngeal steroid (RS) have not reported complications with local steroids such as infection, pseudarthorosis and other systemic adverse effects.

PURPOSE: To report delayed esophageal perforation who underwent anterior cervical spine surgery and RS use.

STUDY DESIGN/SETTING: A case report with a review of literature

METHODS: We presented two cases of delayed esophageal perforation without obvious cause in two patients who underwent anterior cervical spine surgery and RS use.

RESULTS: A 45-year-old female underwent C5-C6 anterior cervical discectomy and fusion (ACDF) for radiculopathy. Just before closing the wound, one ampule of triamcinolone acetate was placed in the retropharyngeal space. Two months post-operatively she presented to the emergency department with clinical symptoms of esophageal perforation. Radiographic studies demonstrated a retropharyngeal abscess. A 0.5 X 1.0cm sized esophageal defect was identified during the emergency surgery. Complete healing of the esophageal defect was achieved by revision repair with reinforcement using local muscle flap.

A 65-year-old-man with a history of ankylosing spondylitis presented with severe dysphagia one year following C7 pedicle subtraction osteotomy, C2-T4 posterior instrumentation and C6-C7 ACDF with a plate for a chin-on-chest deformity. Prior to closure, 1 cc of depomedrol had been placed into the wound. Eleven months postoperatively, he complained of new onset dysphagia. The endoscopic examination demonstrated an esophageal tear with visualization of the anterior cervical plate through the tear. Successful healing was possible with primary repair.

CONCLUSIONS: Retropharyngeal steroids have been shown to decrease prevertebral soft tissue swelling and dysphagia following anterior cervical spine surgery. We believe that it would be prudent to consider avoiding the use RS in patients with a history of chronic corticosteroid use and/or soft tissue vulnerability or only to use them with caution. Any history of dysphagia that occurs weeks, months or even years later should be investigated for the possibility of esophageal perforation.

Key words: Delayed esophageal perforation, anterior cervical fusion, retropharyngeal steroid, prevertebral soft tissue swelling, dysphagia, corticosteroid

Introduction

Prevertebral soft tissue swelling (PSTS) following anterior cervical spine surgery is inevitable due to retraction of the pharynx and esophagus during the surgical approach. PSTS can be severe following multilevel cervical fusion, cervical spine trauma and longer operative times [1-3]. It may result in odynophagia, postoperative catastrophic airway complications including asphyxia and respiratory arrest, and may contribute to persistent dysphagia following anterior cervical spine surgery [3, 4].

Systemic or local corticosteroids have been used to decrease complications related to PSTS [2, 5, 6]. The effects of retropharyngeal steroids (RS) on significantly reducing PSTS following anterior cervical spine surgery has been reported [5]. Another study demonstrated improved resolution of dysphagia with RS use after anterior cervical spine surgery [7]. To date, studies using RS have not reported complications with local steroids such as infection, pseudarthorosis and other systemic adverse effects.

We report two cases of delayed esophageal perforation without obvious cause in two patients who underwent anterior cervical spine surgery and RS use.

Case reports

Case 1

A 45-year-old female underwent C5-C6 anterior cervical discectomy and fusion (ACDF) for radiculopathy caused by right sided foraminal disc herniation. She had a history of multiple arthralgias including both hand small joints with morning stiffness. She also had thin skin with easy bruising however there was no documentation of prior steroid use.

Via a left sided Smith-Robinson approach, a C5-C6 instrumented ACDF was performed using autogenous tricortical strut graft harvested from the left anterior iliac crest. No other fusion material such as bone morphogenetic protein or demineralized bone matrix (DBM) was applied. Just before closing the wound, one ampule of triamcinolone acetate (40mg) soaked with morcelized Gelfoam sponge was placed in the retropharyngeal space. The operative time was 75 minutes.

Post-operatively she had resolution of her radicular symptoms and radiographs (immediate and 6 weeks post-operative) demonstrated well- positioned instrumentation and autograft (figure 1).

Two months post-operatively she presented to the emergency department with severe neck pain,

odynophagia, dysphagia and chills. She had a temperature of 38.5°C and erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) were substantially increased by 18 mm/hr (normal: < 20 mm/hr) and 8.93mg/dL (normal: 0.0~0.5mg/dL) respectively. Radiographs, cervical spine computed tomography (CT) and magnetic resonance imaging (MRI) demonstrated a 4.6 x 6.5 x 1.8cm retropharyngeal abscess (figure 2). Emergent surgery was performed to drain the abscess and remove the instrumentation. A 0.5 X 1.0cm sized esophageal defect was identified at the C6 level and was primarily repaired with the assistance of a thoracic surgeon. Her intra-operative cultures were positive for Streptococcus viridans. Two weeks post-operatively a persistent esophageal defect was detected on esophagography. Revision repair and reinforcement with local sternohyoid muscle flap resulted in healing of the defect. She was placed on tube feeds for 3 weeks and successfully transitional to oral intake 1 month post-operative. Her clinical course has been uneventful at 4 years and 8 months post-operatively.

Case 2

A 65-year-old-man presented with severe dysphagia one year following C7 pedicle subtraction osteotomy (PSO), C2-T4 posterior instrumentation and C6-C7 ACDF with a plate and allograft with DBM. The patient had ankylosing spondylitis and had been treated for a C7 compression fracture and chin-on-chest deformity. He underwent a posterior pedicle subtraction osteotomy followed by anterior fusion and plating. The length of the anterior surgery was 35 minutes and prior to closure, 1 cc of 40mg/cc depomedrol had been placed into the wound. Post-operatively the patient had significant improvement in his alignment and was satisfied. He had no complaints of dysphagia post-operatively until 11 months later, when he complained of new onset dysphagia. He was referred to an ENT specialist who performed an endoscopic exam. The endoscopy demonstrated an esophageal tear with visualization of the anterior cervical plate through the tear. He was afebrile but had an ESR of 26 (0-15.0 normal), CRP of 7.2 and WBC of 11.0. The rest of his labs were normal.

He was taken to the operating room at one year post-operatively from the initial surgery and underwent removal of the anterior plate. The plate was well fixed and non-displaced intraoperatively. ENT and thoracic surgery then performed primary repair of the esophageal tear, which was found to be a 1.5 cm longitudinal tear. The thoracic surgery service performed intra-operative endoscopic evaluation of the repair and was satisfied with it. They placed a percutaneous endoscopic gastrostomy tube to allow his esophagus to rest and heal. Cultures grew out rare candida tropicalis and “moderate mixed upper respiratory tract organisms.” The candida was treated with Fluconazone and Unasyn was added to cover skin and oral flora per infectious disease recommendations. He had an uneventful

hospital stay and was discharged home on post-operative day 10. He is now 2 years and 5 months post-op and doing well without any recurrence of his symptoms.

Discussion

Esophageal perforation following anterior cervical spine surgery is a rare complication with a prevalence of 0.02% to 1.49% [8-15]. However, if not diagnosed and managed promptly, mortality is high due to retropharyngeal abscesses, mediastinitis and sepsis. Causes of esophageal perforation can include 1) intraoperative direct injury by sharp instruments or forceful retraction, 2) delayed perforation of the posterior pharyngoesophageal wall by osteophytes or due to suboptimal placement or displacement of instruments or grafts [10, 11, 15]. During the early postoperative period, the iatrogenic injury usually produces clinical symptoms of esophageal perforation, such as severe dysphagia, odynophagia, cough, hoarseness, severe neck pain, subcutaneous emphysema and signs of local/systemic infection. However, delayed perforation has been described several weeks to years after anterior cervical spine surgery [16-22]. This entity is generally related to chronic compression, erosion and pressure necrosis. There have been case reports of delayed esophageal perforation with well-positioned anterior instrumentation [16, 19, 20]. In such cases, the etiology of the delayed esophageal perforation is unknown.

The common findings of our two cases of delayed esophageal perforation are the use of RS and uneventful recovery of preoperative symptoms. The operative time was not long (75 minutes and 35 minutes, respectively), and there was no identified intraoperative injury. These are the first cases of esophageal perforation in the authors' clinical practices, with a combined total of over three thousand-one hundred cases and since the anterior cervical instrumentations were optimally positioned, we propose that the delayed esophageal perforations may be related to the use of RS .

There could be three possible mechanisms of the delayed esophageal perforations in this report: 1) Delayed manifestation of undetected intraoperative injury to the esophageal wall. 2) Esophageal wall defect originating from microscopic injury by the retraction blades and wound healing inhibition from the effect of RS. 3) Underlying soft tissue susceptibility with multiple etiologies including chronic systemic corticosteroid use, augmented by the RS. There have been several reports of asymptomatic, spontaneous expulsion of anterior cervical instruments via the alimentary tract [18, 21, 22]. These cases are thought to have been due to esophageal tears with gradual healing over several years. In addition, an asymptomatic period of greater than 2 month would be extremely rare in the case of intraoperative esophageal injury.

Inhibition of wound healing is one of the well-known adverse effects of systemic corticosteroid use [23-26]. The inhibitory process can affect nearly every step of wound healing: inflammatory reaction, proliferation of fibroblasts, collagen synthesis and wound maturation [25]. Decrease of wound tensile strength and increase of wound complications such as dehiscence and infection have been reported following chronic use of systemic corticosteroid or high dosage (15-40mg/kg/day) use during the perioperative periods [26]. To our knowledge there has been no evidence of healing problems with short-term use of systemic steroid such as RS. The outcomes of local epidural steroid administration following lumbar decompression surgery have been reported to decrease postoperative pain, hospitalization stay and postoperative scarring [27, 28]. No studies to our knowledge have reported any complications of delayed neural structure defect or wound healing problems following local epidural steroid use after lumbar decompression.

One of the cases in this report may have underlying soft tissue vulnerability caused by chronic corticosteroid for her medical conditions; rheumatoid–like multiple arthrosis. The second patient with and ankylosing spondylitis had not been on chronic steroids, however. In addition, the use of RS may have negatively affected the tissue healing process. Finally, we could postulate that microscopic intraoperative injury on the esophageal surface, which heals well and usually does not cause clinical problems, may have been deepened by peristalsis and friction and eventually developed into the delayed defect. Although the etiology of the delayed esophageal defect in our two cases is still unclear, we recommend having a high index of suspicion for delayed esophageal perforation as a possible complication of RS use. As a direct result of our complications, we no longer routinely use retropharyngeal corticosteroids, a practice that we had previously advocated at meetings and in a publication. We wrote this report to publicize our concern about a possible relationship, despite the fact that we do not have conclusive evidence, because if there indeed is a causal effect, widespread retropharyngeal steroid usage could result in catastrophic complications.

Conclusions

Retropharyngeal steroids have been shown to decrease prevertebral soft tissue swelling and dysphagia following anterior cervical spine surgery. However, the authors have experienced unexplained presentations of delayed esophageal defects following RS in anterior cervical spine surgery. At recent meetings, investigators have presented their plans to perform studies using intra-wound steroids in anterior cervical cases to prevent dysphagia. We would like to caution surgeons involved in such studies to be aware that late complications may occur and that esophageal perforations can present months after the index operation. Although we have no proof that our cases

were related to the steroid use, we believe that it would be prudent to consider avoiding the use RS in patients with a history of chronic corticosteroid use and/or soft tissue vulnerability or only to use them with caution. Any history of dysphagia that occurs weeks, months or even years later should be investigated for the possibility of esophageal perforation.

Legends

Figure 1. The cervical spine lateral radiographs of the 45 year-old female who underwent C5-C6 anterior cervical discectomy and fusion. (A)Pre-operative, (B) immediate post-operative and (C) 6 weeks post-operative. There were no prominent osteophytes or instrumentation displacement.

Figure 2. Cervical spine Neck anteroposterior (A) and lateral radiograph (B), T2 weighted sagittal MR image (C) and sagittal CT image (D) at the 2 months post-operative surgery demonstrating a huge retropharyngeal abscess with air-fluid level (arrows) .

Figure 3. The lateral cervical radiographs of the 65 year-old female who underwent C7 pedicle subtraction osteotomy, C2-T4 posterior instrumentation and C6-C7 ACDF with a plate. Post-operative anteroposterior (A) and lateral (B), and intraoperative lateral radiographs (C).

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