Unusual Complications of Anterior Cervical Discectomy and Fusion: Report of Two Cases

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Abstract

Background: Anterior cervical discectomy and fusion (ACDF) is the most common surgical procedure of cervical spine, and its number has drastically increased in recent years due to advancement in technology and technique. Most of the time, it is safe and effective. However, unusual complications sometimes can cause devastating outcomes. The main aim of this report is to make surgeons aware of such complications and to prevent unexpected outcomes. Here we present two cases of unusual complications of ACDF.

Case Reports : The first case was a 60-year-old female who was planned for ACDF at the level of C3-4-5-6. While dissecting the soft tissues and longus colli (LC) muscle on the right side of the anterior surface of the vertebral body, the vertebral artery (VA) was injured. Immediate endovascular intervention saved the patient's life.

The second case was a 50-year-old female with morbid obesity and was planned for ACDF at C6-7. Because of a short and thick neck, retraction was difficult. Postoperatively she developed visual symptoms due to right Horner's syndrome.

Conclusion: Complications do happen after surgery, however, every effort should be made to prevent them, especially those which can endanger the life of the patient. Careful preoperative evaluation of patient and radio-imaging often gives hints most of the time.

Keywords: ACDF, complications, VA injury, Horner's syndrome

Introduction

Anterior cervical discectomy and fusion (ACDF) is a common spinal surgery and the most common cervical spine surgery. It is regarded as a safe and effective surgical procedure. Therefore, its number has increased more than three times in the last two decades.[1, 2] Moreover, advanced technology has made it more popular among surgeons and patients recently. Despite this fact, complications have been encountered repeatedly. However, the complication rate has dropped significantly over the last one and half decades, from 19.3% of total ACDF cases in 2007,[3] to 7% in 2023,[1].

Most of the complications are not significant. However, some unusual complications can be significantly harmful. Mere use of technology might not be enough to prevent and mitigate complications. Surgeon's experience, awareness, and vigilance are the key to preventing such complications.[4]

Here we present two unusual complications of so-called safe surgery, ACDF.

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Case Reports

Case 1: A 60-year-old female presented with the history of spinal cord injury with left leg weakness and balance issues. Her magnetic resonance imaging (MRI) cervical spine showed cord contusion and compression aggravated by disc herniation at C3-4-5-6 (Figure 1). Therefore, ACDF at C3-4-5-6 was planned. After anterior surface of the vertebral body was exposed, further lateral dissection of the longus colli (LC) muscle was done with monopolar cautery. While dissecting the LC on the right side, sudden blood gushing out was noticed. Pressure was applied locally with the help of gel foam and cotton patties. Further attempt was made to explore the local area but was not possible due to heavy bleeding. Vertebral artery (VA) injury was suspected (Figure 1, B), and thus the endovascular team was called for help. Angiography revealed the right VA injury which was then occluded after confirming contralateral VA flow

(Figure 1, C). She was taken back to the operating room and ACDF was accomplished. The patient went back home without any new neurological deficits.

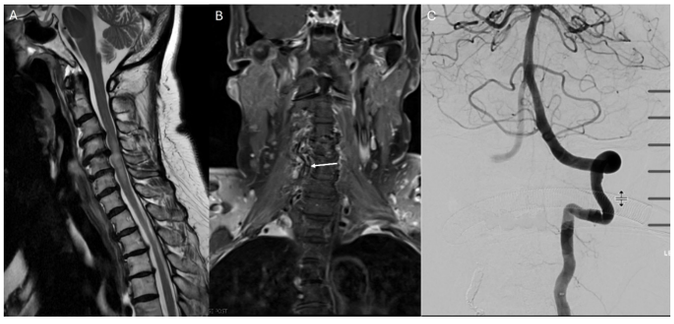

Figure 1: Case 1, A) preoperative MRI of cervical spine, T2 sagittal image showing cord compression and edema at C3-4-5-6, B) preoperative MRI T1 coronal image showing part of VA on the right side of C5 body, C) Angiogram of posterior circulation of brain, AP view showing Lt VA and distal flow, occluded right VA

Case 2: A 50-year-old female presented with cervical radicular pain due to disc herniation at C6-7 (Figure 2, A). She had morbid obesity with BMI more than 50 and her neck was short and thick. During surgery, retraction of soft tissues was extremely difficult. Finally, ACDF procedure was accomplished without any other significant complications. When she woke up after surgery she complained of right eye abnormal feeling. On examination there was mild ptosis and miosis on the right compared to the left (Figure 2, B). Anisocoria was worse in the dark. She was further evaluated and managed by a neuro-ophthalmologist who confirmed Horner's syndrome (HS).

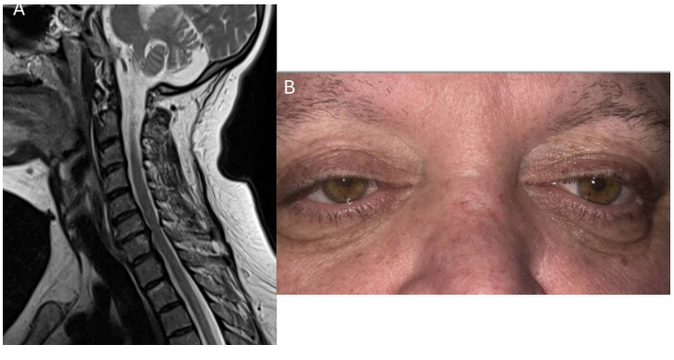

Figure 2: Case 2, A) MRI T2 sagittal image showing disc herniation and cord compression at C6-7, B)mild ptosis with miosis in right eye

Discussion

ACDF is getting increasingly popular in recent years due to its simplicity, high success, and low complication rates. Most of the complications are less serious and transient. Complications like VA injury, on the other hand, can be fatal or severely debilitating.

Complications occur due to either patient or surgeon factors. Old age, multiple level fusion, revision surgery, obesity etc. are patient factors.[1, 5] Surgeon's experience is another factor that has a significant impact on outcome.[4]

VA injury is one of the possible complications of ACDF, but extremely rare. Studies have shown that the incidence of VA injury in overall spinal surgery is 0.20% to 1.96%.[6,7] Even though VA injury during ACDF procedure is reported to be about 0.5%, bigger series did not find any out of thousands of cases.[1, 3]

A study reported that resection of uncinate process does not cause additional risk of VA injury.[8] However, in our case, longus colli (LC) was being dissected with monopolar to expose the uncinate process which was partially exposed when VA injury occurred. Figure 1, B shows the anomalous location of VA and thus its injury. Most of the VA injury during ACDF is due to anomalous VA anatomy which is found in about 20% of normal human beings as we can see in our case. Lateral dissection of LC with monopolar is the riskiest procedure and should be done with caution maintaining a reasonable distance from midline. Junction of vertebral body and transverse process can be a good landmark lateral to which lies VA. Dissection beyond that can be hazardous. A cadaveric case report showed prior ACDF C4-7 nearly missed VA by less than 2 mm.[9]

A careful and meticulous study of imaging to see VA anatomy before surgery is the key to preventing VA injury. If VA injury is encountered, the first step to do is compression to stop further bleeding. Primary repair can be attempted but is often difficult. Ligation of VA would be the next step if contralateral VA is intact.

In the situation or setup where endovascular treatment cannot be available immediately, VA injury can be fatal while doing ACDF.

HS is another unusual complication of ACDF which is observed postoperatively without any intraoperative notice. The overall occurrence rate is estimated to be 0.06%-1.1%.[3] However, previous studies have shown that its occurrence is decreasing with time with growing experience.[1, 3, 10, 11]

HS occurs due to injury to third order neuron of cervical sympathetic chain (CSC), which is a post ganglionic fiber that lies along the medial aspect of LC muscle. Sympathetic neurons innervating eye starts from hypothalamus and ends in the ciliary muscle and superior tarsal muscle of eye. The CSC lies about 1 cm from the medial border of longus colli at the level of C6 and about 2 cm more cranially. That means CSC converges medially in cranial to caudal direction and is most medial at C6.[12] Therefore, HS is mostly found at C5-6 after ACDF. In our case, CSC injury occurred at C6-7 and it was due to excessive retraction of soft tissues laterally.

Therefore, lateral dissection or sectioning of LC muscle with cautery or a sharp instrument or excessive retraction of LC should be avoided. Similarly, subperiosteal dissection of LC, reducing duration and extent of retraction, and intermittent release of retractors help to preserve CSC.

HS after ACDF mostly recovers partially or completely within one year's time. There is no specific treatment recommended for HS after ACDF.

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