

A Unique Failure of Anterior Cervical Discectomy and Fusion: How and why it Happened

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ABSTRACT

Anterior cervical implant failure can lead to catastrophic sequelae and requires prompt evaluation and management to reduce significant morbidity. This case report describes a 51 year old female who underwent a C2-3 and C3-4 Anterior Cervical Discectomy and Fusion (ACDF) with stand-alone, integrated plate-cage interbody devices for cervical spondylotic myelopathy (CSM). The index surgery was performed by a different surgeon at an outside institution. Unfortunately, no radiographic follow up was obtained by the primary surgeon during the initial postoperative period. Post-operatively she experienced persistent dysphagia and troubles swallowing. The patient was eventually seen by the Ear, Nose and Throat (ENT) service at our institution. 18 months after the index procedure, a nasolaryngoscopy revealed exposure of her ACDF implant through the posterior aspect of her pharynx. The ENT service obtained radiographs and immediately contacted our Spine Surgery service. Repeat anterior approach with implant removal was planned; however, during the interim, the patient suffered a coughing fit and complete expectoration of the C2-C3 implant with the locking screws in place had occurred. Patient experienced immediate relief of symptoms. Miraculously, the patient did not develop airway compromise, infection, or return of severe dysphagia symptoms. During continued follow up, no significant clinical sequelae of her anterior cervical soft tissue structures were identified. The patient chose to decline further surgical management of her cervical spine.

This case report highlights a unique and potentially catastrophic complication following ACDF. Several modifiable factors including implant design, C2-C3 ACDF cage placement, use of post-operative radiographs, and patient education regarding need for consistent follow up may have prevented this complication. Implant extrusion is a rare, but possible following ACDF. Presenting symptoms can be generalized and mild including pain, swelling, or worsening dysphagia. It is paramount to obtain orthogonal X-rays for routine follow-up of post-surgical ACDF patients, especially if dysphagia persists or worsens. Immediate surgical management is recommended if significant post-operative cage migration is encountered.

Keywords: ACDF; Dysphagia; Otolaryngology; Cage extrusion; Fusion

INTRODUCTION

Anterior cervical discectomy and fusion (ACDF) has become one of the gold standard surgical procedures in the treatment of cervical spondylotic myelopathy. Through decompression of neural elements, restoration of lordosis and bony fusion, patients can reliably experience significant improvement with regards to pain and neurologic symptoms [1-4]. Unfortunately,

this procedure is plagued by numerous risks such as esophageal perforation, durotomies, spinal cord or nerve root injury and dysphagia [5-7]. Implant loosening and extrusion is among these risks, particularly in the midterm post-operative setting. Here, we aim to review a case report, previously published in the Journal of Spine Surgery, regarding en bloc expectoration of a C2-C3 ACDF cage without significant sequela and discuss how and why this happened.

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LITERATURE REVIEW

How did this happen?

The patient is a 51-year-old female who presented to a community spine surgeon with progressive neck and back pain as well as myeloradiculopathy. Imaging showed evidence of degenerative disease in the cervical spine, consistent with central and foraminal stenosis at the C2-3 and C3-4 levels. Anterior surgical intervention was chosen, and the patient underwent C2-3 and C3-4 ACDF with stand-alone, integrated plate/cage interbody devices from Zavation (Zavation, Flowood, MS, USA) through an anterior Smith-Robinson approach. One month post-operatively, she began experiencing dysphagia and eventually presented to an Otolaryngologist. A modified barium swallow study (MBSS) showed evidence of a cricopharyngeal bar and thus she was placed on a dysphagia diet with swallow precautions. Follow-up was intermittent over the next 18 months until her symptoms acutely worsened, at which time a flexible nasolaryngoscopy revealed direct visualization of her spinal implants eroding into the posterior pharynx. Our orthopedic service was contacted regarding this finding and urgent imaging was arranged. X-rays showed complete dissociation of the C2-C3 implant from the vertebral bodies and disc space (Figure 1).



Figure 1: Lateral X-ray showing complete anterior displacement of the C2-C3 integrated plate/cage device through the prevertebral soft tissues into the posterior pharynx.

While trying to arrange clinical evaluation, the patient orally expectorated her integrated C2-C3 cage and screw device en bloc following a coughing bout (Figures 2a and 2b).

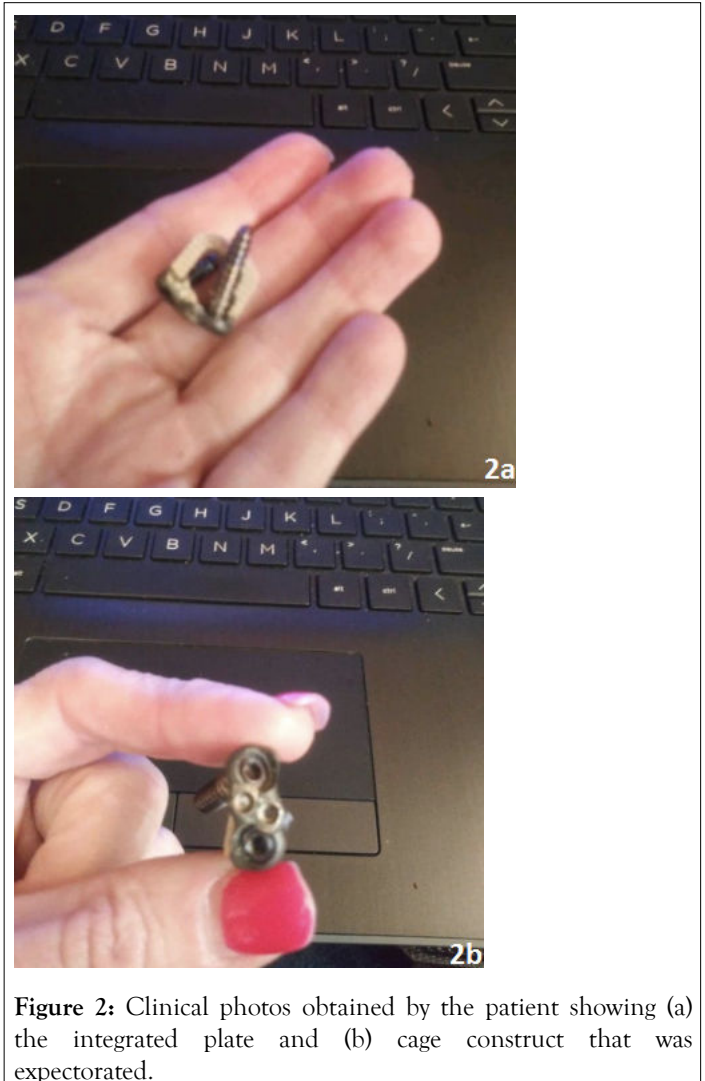


Figure 2: Clinical photos obtained by the patient showing (a) the integrated plate and (b) cage construct that was expectorated.

The patient reported immediate relief of her symptoms. Imaging showed complete removal of the entire C2-C3 device, including integrated cage and fixed angled screws, with retained C3-C4 implant. There was no evidence of loosening or failure at C3-4. CT scan revealed a pseudarthrosis at the C2-C3 level with minimal bony fusion across the site. She has been followed closely by both the otolaryngology and orthopedic spine services. She temporarily had a percutaneous endoscopic gastrostomy tube placed and was restricted to nothing by mouth, while her posterior pharynx perforation healed uneventfully. As of the most recent clinical visit, the patient reports mild residual axial neck pain with no neurologic symptoms. Ultimately, she elected to not proceed with revision surgical intervention.

DISCUSSION

Why did this happen?

This case highlights a unique and rare mode of failure following anterior cervical discectomy and fusion, particularly given the maintenance of fixed angle screw position within the device upon extrusion, and overall lack of catastrophic symptoms following hardware erosion through soft tissue. Various authors have reported on extrusion of single screws or partial implants with a wide range of outcomes such as no symptoms to death

[8-14]. However, to our knowledge this is the first en bloc expectoration of an ACDF implant with intact integrated locking screws reported in the literature.

The primary question regarding this case that remains unanswered is exactly how this failure occurred in such a drastic way. Initial use of anterior cervical plates revealed complications such as screw and plate loosening; however, with the advent of locking plates these rates of instrumentation failure have improved [15-18]. It has been reported that long fusion constructs, specifically those spanning 3 or more levels, put high stresses on the implants and causes biomechanical loosening and failure [19,20]. Additionally, a pseudarthrosis puts high stress on implants and can ultimately lead to loosening and failure [21]. Although this patient did not have a long fusion construct (3 or more levels), her CT scan showed evidence of minimal bony fusion along the posterior aspect of the C2-C3 disc space suggestive of pseudarthrosis. The instability at this level placed constant stress on this implant and likely played a very large role in the mode of failure she experienced.

Screw and interbody cage placement primarily influence implant stability and longevity. Screws placed entirely within the disc space or penetrating the disc space have been shown to lead to loosening and fracture, respectively [22]. Without post-operative imaging or imaging prior to implant failure, it is difficult to determine whether implant positioning played a role in the failure of this patient's implants. Given the upper cervical C2-C3 ACDF, great difficulty can be encountered intraoperatively to achieve an appropriate in-line trajectory for cage placement. Furthermore, the caudal angulation necessary for placement of the inferior C3 anterior vertebral screw can prove exceptionally difficult in the upper cervical spine, depending on the patient's body habitus and facial anatomy. A screw placed partially or completely within the disc space would undoubtedly have expedited implant loosening and development of instability in this case.

Graft choice plays a pivotal role in the outcomes following fusion surgery. We do not know what type of graft was used during the index surgery. In a meta-analysis, Shriver et al. showed higher pseudarthrosis rates among patients who received allograft instead of autograft [23]. Those receiving allograft had a pseudarthrosis rate of 4.8% whereas those receiving auto graft had a pseudarthrosis rate of 0.9%. Although it is unlikely that graft choice would have been the definitive reason for failure in this patient's case, it is just one of the many facets to consider in both pre-operative planning and during retrospective review of unexpected complications.

Cervical orthosis use following ACDF surgery is primarily a preference of the surgeon. There is inconclusive data showing that orthosis use does not improve outcomes and fusion rates following one- or two-level ACDF [24-26]. It is not known whether this patient was placed into a service collar post-operatively; however, we do not believe that this influenced her outcome based on the current body of evidence that exists. With regards to patient risks factors, we do not believe this played a role in this case. She was a healthy 51-year-old female who was a non-smoker and did not have any identified co-morbidities (osteoporosis, diabetes, immunosuppressive diseases).

A final learning point to stress from this case is the importance of radiographic monitoring. No formal radiographic imaging of the cervical spine was obtained on this patient until approximately 18 months post-operatively, when gross exposure of her implant in the posterior pharynx was noted upon nasolaryngoscopic evaluation. Despite repeated follow up visits to her spine surgeon with complaints of dysphagia, to the best of our knowledge, no X-rays were obtained. It is imperative to obtain serial post-operative x-rays on patients receiving an ACDF, especially if there are complaints of worsening dysphagia. Fortunately, this patient did not have catastrophic sequela or acute decompensation; however, this complication likely could have been identified sooner and addressed appropriately with surgical removal of the hardware to prevent a catastrophic event.

CONCLUSION

Implant extrusion is a unique and rare postoperative complication following ACDF. There are many suspected factors contributing to this mode of failure; however, we believe that this particular case was likely related in part to pseudarthrosis of the involved level and initial malpositioning of the implants. These factors likely lead to continued loosening and ultimately, extrusion. Every patient who undergoes ACDF needs routine post-operative imaging to evaluate the implants, alignment, and development of interbody fusion mass. This is especially true if they are presenting with concerning symptoms such as worsening dysphagia or shortness of breath. Identification of early loosening or extrusion of implants can prevent potentially catastrophic complications.

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