Case Report

Expectoration of anterior cervical discectomy and fusion cage: a case report

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Abstract: Anterior cervical implant failure can lead to catastrophic sequalae 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). Initial procedure was performed at an outside institution. Unfortunately, no radiographic follow up was obtained by the primary surgeon during the initial post-operative 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. Eighteen 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 C2–3 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 potentially catastrophic complication following ACDF. Several modifiable factors including implant design, C2–3 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 potentially serious complication 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 in recommended if significant post-operative cage migration is encountered.

Keywords: Anterior cervical discectomy and fusion (ACDF); dysphagia; implant failure; cage; cage extrusion; fusion; case report

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Introduction

Cervical spondylotic myelopathy (CSM) is a degenerative condition of the cervical spine that is often progressive and debilitating in the aging population (1,2). Non-operative management is generally limited to mild cases. However, with more severe or progressive symptoms, surgical management is necessary (3). First introduced in 1955, anterior cervical discectomy and fusion (ACDF) provided an early intervention with promising results for the management of this pathology (4-6). The goal of this procedure is to decompress the neural elements,

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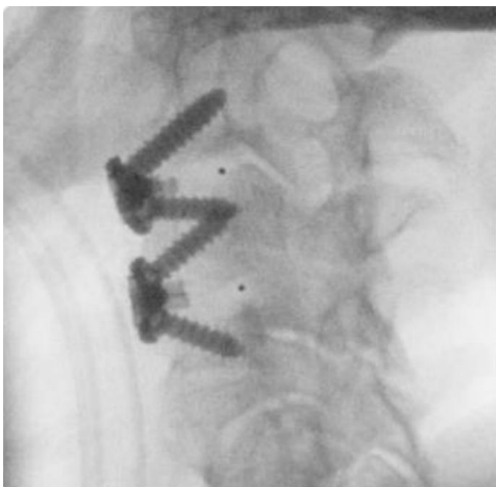

Figure 1 Intra-operative lateral view showing well-positioned implants.

restore lordosis, and obtain a bony fusion. This procedure has continued to improve over the years and serves as a very reliable treatment method with regard to pain relief, improvement in neurologic symptoms, and patient satisfaction in both short and long-term follow-up (7-9).

Despite its well documented success, this procedure comes with the risk of complications. Esophageal perforation, vertebral artery injury, dural tears, spinal cord injury, recurrent laryngeal nerve injury and dysphagia are known complications related to the approach (10-12). Other issues that may be identified in the post-operative period include pseudarthrosis, adjacent segment disease, implant subsidence or extrusion (10-12). These complications can cause significant patient morbidity and often require revision surgery for adequate management.

Here, we report the case of a patient who underwent a C2–3, C3–4 ACDF at an outside institution with an exceptionally rare complication involving interbody cage extrusion. Eventually, the patients integrated cage/plate device with fixed angle screws in place eroded through her pharynx and was auto-expectorated without catastrophic symptoms. We present the following case in accordance with the CARE reporting checklist (available at http://dx.doi.org/10.21037/jss-20-655).

Case presentation

The patient is a 51-year-old female with a history of scoliosis and prior posterior spinal fusion with Harrington Rods from T2–L3 in 1982. Other notable past medical history includes situs inversus, post-traumatic stress disorder, chronic obstructive pulmonary disease (COPD), and depression. She presented to a community spine surgeon with a several-year history of progressive neck pain, back pain, and worsening symptoms of myeloradiculopathy.

On examination, she was noted to have full motor strength and objective sensation in bilateral upper and lower extremities. She demonstrated hyperreflexia diffusely in bilateral upper extremities and exhibited balance impairment on gait evaluation. She otherwise exhibited no other upper or lower motor neuron signs. Imaging had been obtained. Computed tomography (CT) scan showed evidence of fusion from T2–L3. There was also evidence of severe disc degeneration in the cervical spine, most notably at the C2–3 and C3–4 levels with disc height loss and osteophyte formation. Magnetic resonance imaging (MRI) showed evidence of central and bilateral foraminal stenosis of the cervical spine, most notably at the C2–3 and C3–4 levels. Given the significance of her symptoms and imaging, as well as physical exam findings consistent with myelopathy, surgical intervention was chosen and the patient was scheduled to undergo C2–3 and C3–4 ACDF with stand-alone, integrated plate/cage interbody devices.

She was subsequently seen pre-operatively by cardiology due her history of situs inversus and COPD. Following review of echocardiogram and electrocardiogram, she was cleared for surgery. The procedure was performed through an anterior Smith-Robinson approach localized over the C3 vertebral body. Per the treating surgeon's operative report, the correct levels were identified, and complete discectomies were performed at C2–3 and C3–4 followed by central decompression. Appropriately sized integrated plate/cage devices (Zavation, Flowood, MS, USA) were then placed. These devices had been pre-filled with allograft and autograft bone that had been harvested from the posterior vertebral bodies. Two screws, cranial and caudal, were predrilled and placed into each device. Fluoroscopy confirmed that the cages, plates and screws were in proper position (*Figure 1*) and the wound was irrigated and closed in layered fashion. Neuromonitoring was used during the case and there was noted to be no problems with regards to the signals produced. Postoperatively, the patient stayed overnight for pain control. She worked with occupational therapy on the first post-operative day and was discharged home.

The patient was noted to have tongue weakness and left sided deviation following the procedure; additionally, she

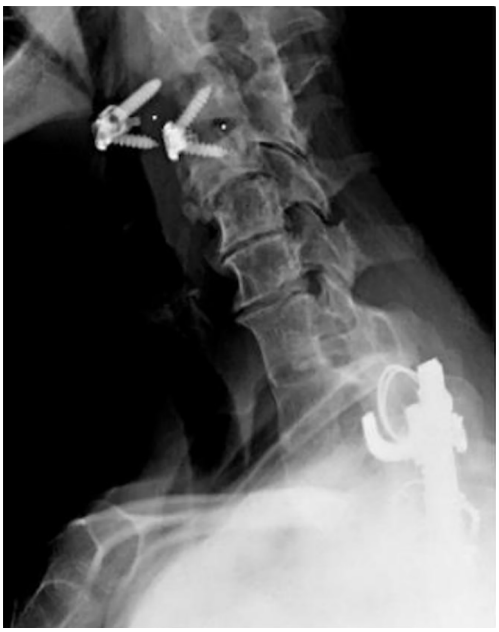

Figure 2 Lateral X-ray showing complete anterior displacement of the C2–3 integrated plate/cage device through the prevertebral soft tissues into the posterior pharynx.

developed worsening dysphagia approximately 1 month post-operatively. Symptoms persisted and she was referred to the ENT specialty for this issue at approximately 3 months. At this time, ENT determined that her tongue weakness and diminished range of motion as well the left sided deviation was related to a post-operative hypoglossal nerve palsy. For further evaluation of her dysphagia, she underwent a modified barium swallow study (MBSS), which showed evidence of residual ingested barium within the vallecula on the left side and a prominent cricopharyngeal impression, which could be suggestive of a cricopharyngeal bar that diminishes pharyngeal clearing. She was placed on a dysphagia diet with swallow precautions and instructed on oral and pharyngeal therapy exercises to work on improved strength and range of motion with scheduled follow-up with speech therapy.

Patient was lost to follow-up for approximately 6 months before returning to the ENT clinic. At that time, she reported baseline dysphagia without any choking or aspiration events. Laryngoscopy showed no lesions or swelling within the nasopharynx, hypopharynx or larynx. Given her persistent symptoms and concern for cricopharyngeal bar on prior MBSS, the ENT surgical team discussed proceeding with transnasal esophagoscopy (TNE) with dilation in conjunction to swallowing therapy. Over the next 18 months, it appeared her symptoms waxed and waned. For this reason, the patient elected not to proceed with the recommended surgical intervention.

Ultimately, her symptoms worsened around 2 years following her ACDF, and she presented to the emergency department. An urgent referral was placed to ENT. Given the COVID-19 pandemic restrictions, she was discharged from the emergency department and seen in the ENT outpatient office shortly thereafter. Flexible nasolaryngoscopy was performed which revealed direct visualization of her spinal implants that had eroded into the pharynx.

The orthopedic spine surgery team was immediately contacted at this time regarding this patient. Given restrictions due to COVID-19, a telehealth visit was arranged. Outpatient X-rays, CT, and MRI were obtained. Imaging was reviewed at this visit and X-rays showed that there had been osseous resorption around the C2 and C3 screws with complete anterior displacement of the implant through the prevertebral tissues into the posterior pharynx (*Figure 2*). On the CT, partial fusion was noted in the posterior half of the C2–3 intervertebral disc space (*Figure 3A,B*). The C3–4 implants were still in place with no evidence of migration despite some osseous resorption around the screws. Given the failure of her C2–3 implant, along with C2–3 fusion noted, repeat anterior exposure with hardware removal was discussed. The patient was given the option to be admitted to the hospital for monitoring prior to the surgery or to present for surgery the following day, which is what she elected to do.

That evening while working at her computer, the patient stated that she "coughed up" her implant in its entirety (*Figure 4A,B*). She endorsed immediate relief and significant improvement in her symptoms. She denied any new onset pain or shortness of breath. Patient immediately contacted the on-call orthopedic team and radiographic imaging was ordered. Cervical spine X-rays did not reveal any retained portions of the C2–3 device or screws; additionally, no interval change to the C3–4 implant was appreciated. The C2–3 disc height measured approximately 2.3 mm. There was 4° of cervical kyphosis measured on the upright cervical films (*Figure 5*). At the time, patient was still noted to be asymptomatic with no chest pain, shortness of breath or infectious symptoms. She also reported improvement of her neck pain as well.

Over the ensuing 6 months, the patient was followed via telehealth visits due to restrictions of the COVID-19

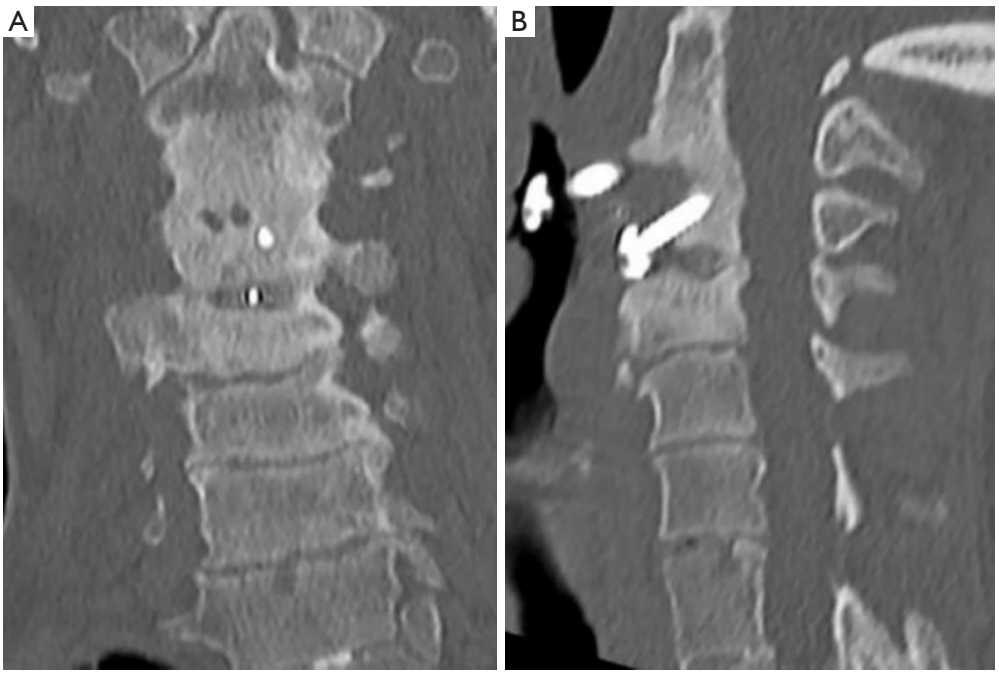

Figure 3 Coronal and sagittal CT scan images showing displaced implant with partial osseous fusion of the posterior aspect of the intervertebral disc space.

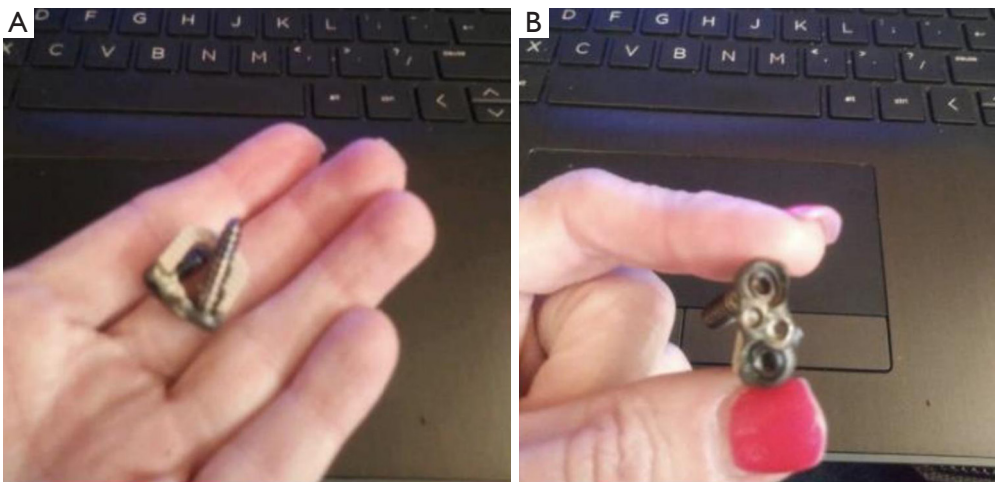

Figure 4 Clinical photos obtained by the patient showing the integrated plate and cage construct that was expectorated.

pandemic as well as in person clinic appointments. Following extrusion of her cage, she was restricted to nothing by mouth via the ENT service and had a percutaneous endoscopic gastrostomy (PEG) tube placed while her pharyngeal perforation healed. Her perforation went on to heal uneventfully as evaluated by nasolaryngoscopy and her PEG tube was removed. She continues to have some difficulty with swallowing solid foods; however, she can tolerate liquids and soft foods. As of 6 months post-extrusion she was still being managed conservatively for these symptoms.

The patient developed no neurologic symptoms following the extrusion of the cage, and, interestingly, she reported some improvement in her neck pain. However, as

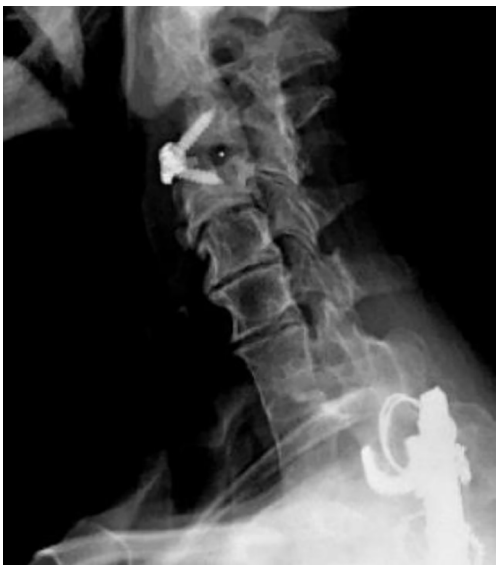

Figure 5 Lateral X-ray after patient orally expectorated their implant showing no evidence of retained hardware. Note the C3–4 implant appears unchanged and well fixed.

of 6 months post-extrusion, residual neck pain was her only remaining complaint. This was localized to her axial cervical spine and does not radiate. On exam, she exhibited no weakness and denied any numbness or paresthesia. Imaging studies, most notably the CT scan revealing pseudoarthrosis at the C2–3 level, were discussed at length with the patient as a source of her continued neck pain. Discussions about surgical management and revision fusion were had; however, as of 6 months post-extrusion, patient had elected to proceed with non-operative management. She was educated on strict return precautions as well as red flag symptoms. Patient is currently maintaining following up for continued observation. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient.

Discussion

The case presented above is unique given the integrated plate-cage device extrusion, maintenance of fixed angle screw position within the device upon extrusion, and overall lack of catastrophic symptoms following hardware erosion through soft tissue. ACDF cage extrusion is a very rare complication with incidence estimated to be less than 1% (13). During the authors' extensive literature review, similar but not identical cases have been reported.

Fountas *et al.* reported of a patient having undergone prior C5–6 ACDF who 16 months post-operatively presented with severe dysphagia and imaging showing evidence of implant pull-out (14). He subsequently underwent hardware removal, however the fourth locking, expansion screw was not seen during surgery and was later found on abdominal imaging to be in his right lower quadrant. Another report is of a patient who 3 years following C5–6 ACDF presented with acute onset odynophagia and was found to have extrusion of one of the inferior locking screws into the hypopharynx (15). This was subsequently removed under anesthesia with forceps during a microlaryngoscopy procedure. In a case reported by Fujibayashi *et al.* it is suspected that an anterior cervical plate, along with the 4 locking screws associated with it, was passed unknowingly through the gastrointestinal (GI) tract after having extruded as there was no imaging evidence of the implants in place and the patient never underwent surgical removal (16).

Similarly, Geyer *et al.* reported on a patient having orally expectorated an expansion screw from an anterior cervical locking plate after it extruded (17). In addition to orally extruded screws, reports have been made regarding oral extrusion of synthetic graft as well as iliac crest graft (18,19). To date, our case is the first such report of complete oral extrusion of the cage, plate and screw in whole. All of the patients above experienced no significant reported complications from their implant displacement. However, Riew *et al.* reports on a patient that suffered catastrophic airway compromise following dislodgment of their anterior cervical plate resulting in death 3 days post-operatively (20).

To the best knowledge of the authors, this is the first *en bloc* expectoration of ACDF implant reported in the literature. Thus, the exact short- or long-term sequalae of this mode of failure is unknown. One would assume this patient would be at risk of either catastrophic airway compromise or development of florid infection with acute decompensation. Fortunately, neither of these arose in our patient.

Of the reports reviewed, the general consensus is that implant displacement is attributed to implant malpositioning and/or poor fixation. In a review of 8,887, Smith *et al.* identified 11 cases of implant extrusion and attribute them to involving long complex constructs spanning 3 or more levels and being located at the cervicothoracic junction,

which puts high stresses on the implants and causes biomechanical failure (13). In our case, our suspicion is that this implant failed in the acute post-operative period. This likely contributed to motion at the bone-implant interface, which led to instability, loosening of the screws and eventual extrusion. It is unknown as to whether or not the patient was immobilized in a cervical collar post-operatively. The anterior displacement of the implant contributed to her dysphagia through mass effect, in addition to the noted post-operative hypoglossal nerve palsy. Chronic pressure from the implants likely led to pressure necrosis and erosion of the implants into the pharynx as has been reported by other authors (21).

As discussed in the case report, the authors recommended a revision cervical fusion procedure to the patient. Goals of the procedure included successful fusion from C2–4, revision of interbody cages C2–4 for anterior column support, improved cervical lordosis, and posterior cervical fusion C2–4 to decrease her risk of pseudoarthrosis. The difficulty of the anterior portion of the procedure would be the revision nature of an anterior approach. Excessive scar formation would be expected especially in the setting of a potential pharyngeal fistula. However, with the assistance of an ENT surgeon, pharyngeal repair could be performed. Alternatively, an all-posterior cervical fusion would avoid dissection through the significantly scarred anterior cervical tissue while achieving high rate of fusion and limiting risk of further damage to anterior cervical soft tissue structures (22,23). After thorough discussion of this, patient expressed her desire to avoid surgery altogether and continue with conservative management.

This case report stresses the importance of radiographic monitoring. After her MBSS, she had no formal radiographic imaging of the cervical spine until there was gross exposure of her implant in the posterior pharynx. The authors desired to proceed with urgent removal of this hardware, however in the interim she self-expectorated the implants. The fact that she did not develop serious infection, such as mediastinitis or osteodiscitis leading to sepsis, is likely related to the fact that this was a chronic process developing over several years with erosion of the posterior pharynx and pseudocapsule formation.

Implant extrusion is a rare, but possible post-operative complication. It can present with pain, swelling and/or dysphagia. It is paramount to obtain orthogonal X-rays for routine follow-up of post-surgical ACDF patients, especially if dysphagia persists or acutely worsens. Identification of early loosening or extrusion of implants can prevent significant morbidity.

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Footnote

Reporting Checklist: The authors have completed the CARE reporting checklist. Available at http://dx.doi.org/10.21037/jss-20-655

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/jss-20-655). Dr. CJK reports grants and personal fees from Medicrea, personal fees from Medacta, personal fees from Biocomposites, personal fees from Allosource, personal fees from Medtronic, grants from Globus, personal fees from DePuy Synthes, outside the submitted work. The other authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient.

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