

Extrusion of a Screw Into the Gastrointestinal Tract After Anterior Cervical Spine Plating

Kostas N. Fountas, MD, PhD,* Eftychia Z. Kapsalaki, MD, PhD,† Theofilos Machinis, MD,* and Joe Sam Robinson, MD, FACS*

Abstract: In this case report of a screw extrusion into the gastrointestinal tract of a patient 16 months after anterior cervical discectomy and fusion (ACDF), the authors describe a rare but potentially lethal complication and review the literature on this topic. A 70-year-old white man with a surgical history of ACDF at C3–4 underwent an ACDF at C5–6 with autologous bone graft and a dynamic plate using locking, expanding screws. Sixteen months after the operation the patient presented with severe dysphagia. Radiographic findings indicating pulling out of the implanted plate and screws prompted a surgical removal of the instrumentation. One of the screws was not found during the operation and was visualized after surgery by abdominal radiography in the right lower abdominal quadrant. A subsequent Gastrografin swallowing test revealed an esophageal tear. The screw was removed endoscopically and the patient received antibiotics and had no oral intake for 4 days. He was discharged without symptoms on a soft mechanical diet; at 24 weeks, follow-up revealed no changes or symptoms. Screw extrusion into the gastrointestinal tract following ACDF is a rare but potentially lethal complication. The use of locking, expanding screws does not extinguish the risk of this complication, particularly in cases of suboptimal initial placement of the anterior instrumentation. Close follow-up is of paramount importance in detecting any pull-out of the implanted plate. Any signs of postoperative dysphagia or throat soreness should prompt immediate evaluation of the patient and, if indicated, surgical removal of the failed instrumentation.

Key Words: anterior fusion, cervical discectomy, complication, extrusion, instrumentation failure

(*J Spinal Disord Tech* 2006;19:199–203)

Anterior cervical discectomy and fusion (ACDF) is one of the most commonly performed spinal procedures in the United States.¹ More than 100,000 procedures are performed annually, with an excellent outcome in most of them.^{1–8} The complications associated with this proce-

dures are rare but can be troublesome.^{9,10} These have been adequately described in the literature.^{9–14} Among them, one of the most serious is the extrusion of the implanted instrumentation, with various consequences each time. We present a case of extrusion of an implanted screw for anterior cervical plate insertion during an ACDF procedure, and we review the literature on the incidence of this complication and its management.

CASE REPORT

This 70-year-old Caucasian man presented to our outpatient clinic with complaints of right shoulder and arm pain (8/10) as well as numbness and a tingling sensation of his right index finger. He stated that his symptoms started approximately 8 months ago and had been progressively worsening. His past medical history was positive for hypercholesterolemia, arthritis, benign prostatic hypertrophy, and diverticulitis. His past surgical history revealed a previous ACDF at C3–4 performed 3 years ago for disc degenerative disease at our institution. The neurologic examination revealed normal muscle strength (5/5) in both upper extremities and no reproducible sensory deficits. His upper extremity deep tendon reflexes were 2+ and symmetrical. The rest of his neurologic and physical examination was unremarkable. His preoperative imaging workup included plain radiographs, MRI, myelography, and a post-myelogram CT scan of the cervical spine. These studies revealed degenerative disc disease at C5–6 with concomitant neuro-foraminal stenosis on the right side at C5–6.

The patient underwent an ACDF with autologous bone graft using a standard Smith-Robinson approach. A dynamic semiconstrained, rotational anterior cervical plate was used. Intraoperative radiographs showed adequate position of the autologous bone graft and suboptimal position of the implanted screws (Figs. 1–3). At that point, it was decided that the position of the implanted cervical plate was adequate. The patient's postoperative course was uneventful, and he was discharged within 24 hours to his home with instructions.

He was followed in our outpatient clinic on a frequent basis, including visits at 2, 4, 8, and 12 weeks after surgery and then at 6 and 12 months after surgery. Cervical spine radiographs obtained at 4 and 12 weeks and 6 months after surgery again showed a suboptimal position of the implanted screw but no evidence of motion at C5–6. The patient returned to our outpatient clinic approximately 16 months after surgery with complaints of severe dysphagia (more prominent in solid than liquid food). His shoulder and arm pain had significantly diminished (2/10) and he was not taking pain medications. AP and lateral cervical spine radiographs showed some pulling out of the implanted plate and especially of the superior right screw (Fig. 4). These radiographic findings were discussed with the

Received for publication February 4, 2005; accepted March 17, 2005.

From the *Department of Neurosurgery, and †Department of Neuro-radiology, The Medical Center of Central Georgia, Mercer University, School of Medicine, Macon, Georgia.

Reprints: Dr K. N. Fountas, 840 Pine St., Ste. 880, Macon, GA 31201 (e-mail: knfountasmd@excite.com).

Copyright © 2006 by Lippincott Williams & Wilkins

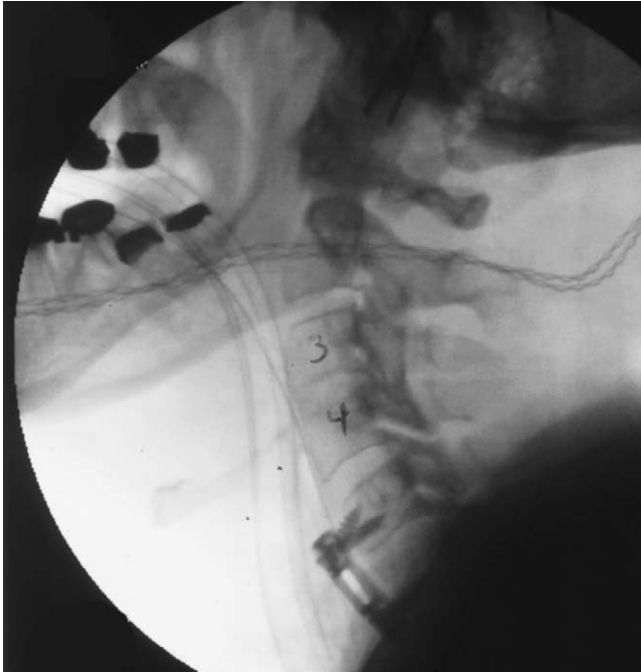


FIGURE 1. Intraoperative C-arm image shows an anterior cervical plate at C5–6. Alignment appears grossly anatomic and the bone graft position is adequate, although the position of the plate and the superior screws is suboptimal. A solid fusion is also noted at C3–4.



FIGURE 3. Early postoperative lateral cervical spine radiograph again shows the suboptimal position of the implanted plate.

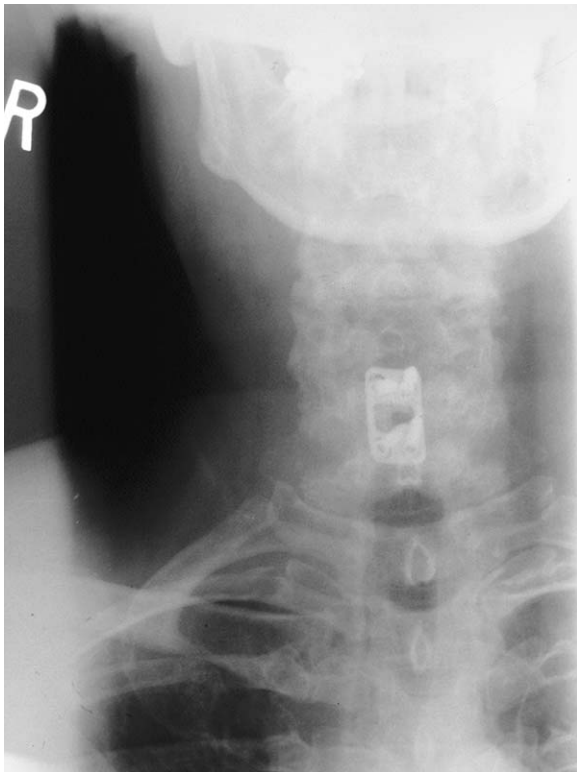


FIGURE 2. Early postoperative AP cervical spine radiograph shows the suboptimal position of the implanted plate at C5–6.

patient, and it was decided to remove the previously implanted plate.

This second procedure was delayed for 2 days after establishing the diagnosis of pulled-out instrumentation because of a co-existent upper respiratory infection. Under general endotracheal anesthesia, the old incision was reopened and the previously implanted anterior plate was identified and removed after removing three screws. The forth screw (right superior) could not be found during an exploration of the operative field. An intraoperative fluoroscopic image revealed no screw in the cervical area. The surgical wound was closed in layers in a standard fashion.

Chest and abdominal radiographs after surgery revealed a screw in the right lower abdominal quadrant (Fig. 5). A Gastrografin swallowing test revealed a dye leakage on the right side of the high cervical area, indicating an esophageal tear secondary to penetration of the esophageal wall by the loose screw and subsequent migration of this screw into the gastrointestinal tract (Fig. 6). The patient was given antibiotics and had no oral intake for 4 days, and the screw was endoscopically removed with no difficulties (Fig. 7). He was discharged on day 5 on a soft mechanical diet and was followed on an outpatient basis for 24 weeks. His postoperative course was uneventful.

DISCUSSION

ACDF is the most commonly performed surgical procedure to treat radiculopathy and myelopathy from degenerative disc disease.^{1,15} Although the use of anterior



FIGURE 4. Late postoperative (16 months) cervical spine radiograph shows almost complete pull-out of the previously implanted plate and screws.



FIGURE 5. Abdominal X-ray of the kidneys, ureter, and bladder (KUB) obtained immediately before the second surgical intervention shows a radiopaque foreign body (cervical titanium screw) overlying the right ileum.

plating has remained controversial, it has become a common practice among spinal surgeons.^{16–19} Anterior cervical plating is not without complications; among them, extrusion of the failed instrumentation is one of the most uncommon but serious ones.^{20–24}

Few reports have been published regarding the extrusion of a previously implanted screw.^{20–23} Geyer and Foy reported a single case in which a previously implanted screw for securing an anterior cervical plate was orally extruded.²⁰ In their case, as in ours, the extruded screw was a locking, expanding one. Fujibayashi et al reported extrusion of four locking screws and following discharge of an implanted plate via the gastrointestinal tract.²³ In contrast, in the cases reported by Chataigner et al²¹ and Yee and Terry,²² the orally extruded screws were non-locking, conventional ones.

In all the reported cases the final outcome of these complicated cases, as well as in our case, was very good, with no further complications associated with the esophagus perforation. It is well known that such a complication, as in the case of spontaneous esophageal perforation (Boerhaave's syndrome), can have consequences such as mediastinitis and death. A possible mechanism of this surprisingly good outcome may be the fact that the esophageal perforation is the result of a

chronic, slow-evolving erosion, which gives the opportunity of selfhealing and sealing of the esophageal perforation.^{20,23} However, underreporting of such complicated cases, particularly when they are associated with death, cannot be excluded.

Thorough examination of all the reported cases, including our case, shows that the main predisposing factor in the development of screw or plate extrusion is the initial suboptimal position of these screws. In the cases reported by Yee and Terry and Chataigner et al, the screw extrusion occurred in multilevel fusion.^{21,22} In contrast, in our case as well as the one reported by Geyer and Foy,²⁰ the screw extrusion occurred after a single-level and a two-level fusion, respectively. Characteristically, in short fusion cases the superior screws were the ones extruded, while in long, multilevel fusions the lower screws were pulled out. Especially in our case, the existence of dense scar tissue, due to the previous fusion at the adjacent C3–4 level, could be another factor predisposing to esophageal erosion by the extruded screw. Hanci et al suggested that esophageal perforations were due to pressure sores caused by the metallic implant and its microtrauma effect as a mechanism of the observed esophageal perforation in three cases.²⁴ Similarly, Witwer and Resnick reported a case with esophageal perforation without associated failure of the implanted instrumentation.²⁵



FIGURE 6. Gastrografin swallowing study shows a contrast leak on the right side at C5–6 level as well as moderate amount of air in the soft tissues on the same side.

The importance of close follow-up cannot be overemphasized in cases of initial suboptimal implantation of the instrumentation. In regard to the diagnosis of this potentially lethal complication, the presence of any dysphagia or sore throat or radiographic evidence of loosening of the implanted screws more than 5 mm should alert the clinician and lead to an accurate and early diagnosis.²⁶ Occasionally one of the presenting symptoms is midthoracic pain radiating to the shoulders; this symptom is nonspecific, since in most of these patients shoulder pain may be the result of their cervical degenerative disease.

In terms of the management of this life-threatening complication, immediate surgical removal of the failed instrumentation is strongly indicated. Imaging of the esophagus with esophagography to rule out esophageal strictures, as well as a thorough radiologic and laboratory work-up to rule out mediastinitis, surgical emphysema, or pneumomediastinum, is also indicated. Finally, as in our case, if the extruded screw has not been spontaneously removed, it must be surgically removed to avoid any further gastrointestinal tract perforation. This risk was significantly high in our patient, who had a history of diverticulitis.

In conclusion, extrusion of failed instrumentation is an uncommon but potentially lethal complication of ACDF. Adequate positioning of all screws and avoidance of the false belief that locking, expanding screws cannot be extruded could minimize the incidence of this serious



FIGURE 7. Abdominal X-ray of the kidneys, ureter, and bladder (KUB) obtained after the endoscopic removal of the cervical screw.

complication. Frequent follow-up and maintenance of a high index of suspicion of any postoperative dysphagia or throat soreness can lead to early diagnosis and successful management of this situation. Surgical removal of the failed instrumentation and conservative healing of the esophageal perforation seem to be adequate for treating these patients.

REFERENCES

1. Jenis LG, An HS, Simpson JM. A prospective comparison of the standard and reverse Robinson cervical grafting techniques: radiographic and clinical analysis. *J Spinal Disord*. 2000;13:369–373.
2. Bohlman H, Emery S, Goodfellow D, et al. Robinson anterior cervical discectomy and arthrodesis for cervical radiculopathy. *J Bone Joint Surg [Am]*. 1993;75:1298–1307.
3. Gore D, Sepic S. Anterior cervical fusion for degenerated or protruded discs: a review of 146 patients. *Spine*. 1984;9:667–671.
4. Riley L, Robinson R, Johnson K, et al. The results of anterior interbody fusion of the cervical spine. *J Neurosurg*. 1969;30:127–133.
5. Robinson R, Walker A, Ferlic D, et al. The results of anterior interbody fusion of the cervical spine. *J Bone Joint Surg [Am]*. 1962;44:1569–1587.
6. White A, Southwick W, DePonte R, et al. Relief of pain by anterior cervical spine fusions for spondylosis: a report of 65 cases. *J Bone Joint Surg [Am]*. 1973;55:525–534.
7. Williams J, Allen M, Harkess J. Late results of cervical discectomy and interbody fusion: some factors influencing the results. *J Bone Joint Surg [Am]*. 1968;50:277–286.
8. Pokras R. Surgical and non-surgical procedures in short-stay hospital. *Vital Health Stat*. 1983;13:1–41.
9. Tew JM, Mayfield FH. Complications of surgery of the anterior cervical spine. *Clin Neurosurg*. 1976;23:424–434.

10. Lunsford LD, Bissonette DJ, Jannetta PJ, et al. Anterior surgery for cervical disc disease. *J Neurosurg*. 1980;53:1–11.
11. Parthiban JK, Singhanian BK, Ramani PS. A radiological evaluation of allografts (ethylene oxide sterilized cadaver bone) and autografts in anterior cervical fusion. *Neurol India*. 2002;50:17–22.
12. Salam MA, Cable HR. Acquired pharyngeal diverticulum following anterior cervical fusion operation. *Br J Clin Pract*. 1994;48:109–110.
13. Cloward RB. Complications of anterior cervical disc operations and their treatment. *Surgery*. 1971;69:175–182.
14. Martino V, Nina P, Franco A, et al. Cervical myelopathy caused by median disc herniation: analysis of the complications following anterior discectomy with and without fusion. *J Neurosurg Sci*. 1997;41:153–158.
15. Lopez-Oliva Munoz F, Garcia de las Heras B, Concejero Lopez V, et al. Comparison of three techniques of anterior fusion in single-level cervical disc herniation. *Eur Spine J*. 1998;7:512–516.
16. Grob D, Peyer JV, Dvorak J. The use of plate fixation in anterior surgery of the degenerative cervical spine: a comparative prospective clinical study. *Eur Spine J*. 2001;10:408–413.
17. Kaiser MG, Haid RW Jr, Subach BR, et al. Anterior cervical plating enhances arthrodesis after discectomy and fusion with cortical allograft. *Neurosurgery*. 2002;50:229–236.
18. Brown JA, Havel P, Ebraheim N, et al. Cervical stabilization by plate and bone fusion. *Spine*. 1988;13:236–240.
19. Samartzis D, Shen FH, Lyon C, et al. Does rigid instrumentation increase the fusion rate in one-level anterior cervical discectomy and fusion? *Spine J*. 2004;4:636–643.
20. Geyer TE, Foy MA. Oral extrusion of a screw after anterior cervical spine plating. *Spine*. 2001;26:1814–1816.
21. Chataigner H, Gangloff S, Onimus M. Elimination spontanée de vis d'ostéosynthèse cervicale antérieure par les voies naturelles. *Rev Chir Orthop*. 1997;83:78–82.
22. Yee GK, Terry AF. Esophageal penetration by an anterior cervical fixation device. *Spine*. 1993;18:522–527.
23. Fujibayashi S, Shikate J, Kamiya N, et al. Missing anterior cervical plate and screws: a case report. *Spine*. 2000;25:2258–2261.
24. Hanci M, Toprak M, Sarioglu AC, et al. Oesophageal perforation subsequent to anterior cervical spine screw/plate fixation. *Paraplegia*. 1995;33:606–609.
25. Witwer BP, Resnick DK. Delayed esophageal injury without instrumentation failure: complication of anterior cervical instrumentation. *J Spinal Disord Tech*. 2003;16:519–523.
26. Lowery GL, McDonough RF. The significance of hardware failure in anterior cervical plate fixation. *Spine*. 1998;23:181–187.