

Surgical Management of Cervical Spondyloarthropathy in Hemodialysis Patients

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Abstract: Dialysis-related spondyloarthropathy is a rare cause of spinal deformity and cervical myelopathy. Optimal management of cervical spine spondyloarthropathy often requires circumferential reconstructive surgery, because affected patients typically have both the anterior column and the facet joints compromised. The occasional presence of non-contiguous or "skip lesions" adds an additional level of complexity to surgical management, because decompression and fusion in an isolated segment of neural compression can worsen spine deformity by applying increased stress to adjacent cervical spine segments. We report two cases of hemodialysis patients who presented with cervical myelopathy and initially had anterior cervical discectomy or corpectomy. Because symptoms recurred due to hardware failure, both patients required posterior spine fusion as well. In retrospect, because of the hardware failure, both of these patients might have benefited from a circumferential (combined anterior and posterior) cervical spine reconstruction as their initial treatment.

Keywords: Hemodialysis, spondyloarthropathy, surgical management.

INTRODUCTION

Since first described by Kuntz in 1984, dialysis-related spondyloarthropathy has been recognized as a rare cause of cervical myelopathy and deformity [1]. Deposition of β_2 microglobulin amyloid, which is seen in nearly all hemodialysis patients at post-mortem [2], seems to be a key factor in the development of hemodialysis-related complications, because amyloid deposition in cartilage surfaces, tendons, and ligaments leads to destruction of joints and surrounding bone. Frequently encountered clinical manifestations of amyloid deposition in dialysis patients include carpal tunnel syndrome and generalized chronic arthropathy. In the spine, thickening of the posterior longitudinal ligament may cause spinal cord compression and destructive spondyloarthropathy (DSA), especially in the cervical spine [3-5], but renal osteodystrophy is also a possible cause of DSA.

Evaluation of cervical spine radiographs in hemodialysis patients demonstrates that DSA is common, but frequently asymptomatic, presumably due to the absence of deformity or neural compression [6]. Length of dialysis treatment appears to be a predictive factor for development of the disease [6]. Destruction of adjacent endplates can make differentiation from discitis and vertebral osteomyelitis difficult on imaging grounds alone [7].

We present two hemodialysis patients with cervical myelopathy due to DSA. Both patients initially had anterior column surgery (discectomy or corpectomy, instrumentation and fusion) but later required revision combined with posterior instrumentation due to hardware failure and myelopathy recurrence.

PATIENT 1

A 68-year-old man with a 7-year history of hemodialysis presented with a six-month history of progressively worsening neck pain, hand numbness and gait disturbance. Neurologic examination was unremarkable, except for bilateral decrease in pinprick sensation affecting the hands in a non-dermatomal distribution, and bilateral positive Hoffman's reflexes. Laboratory evaluation, including complete blood count and serum electrolytes was unremarkable, except for high blood urea and serum creatinine, consistent with renal failure. Lateral cervical spine flexion-extension radiographs showed cervical spondyloarthropathy with vertebral body degeneration, C3-C4 and C4-C5 instability and spurs (Figs. 1, 2), whereas cervical spine MRI demonstrated spinal cord impingement at the C3-C4 level (Fig. 3).

Based on these findings, the patient had anterior cervical discectomy and fusion at C3-C4 and C4-C5 using PEEK allograft, and anterior fixation with dynamic plate and screws from C3 to C5 (Fig. 4). Postoperatively, the patient experienced marked improvement: hand numbness and neck pain completely resolved while gait disturbance improved

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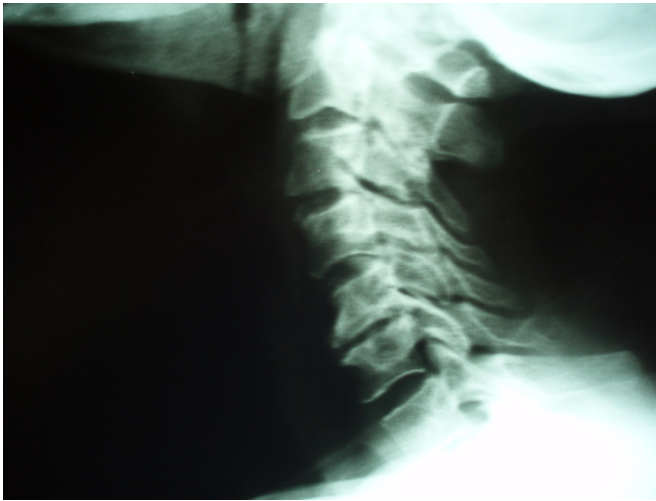


Fig. (1). Lateral cervical spine extension X-Ray showing spondyloarthropathy with vertebral body degeneration, C3-C4 and C4-C5 instability and spurs.

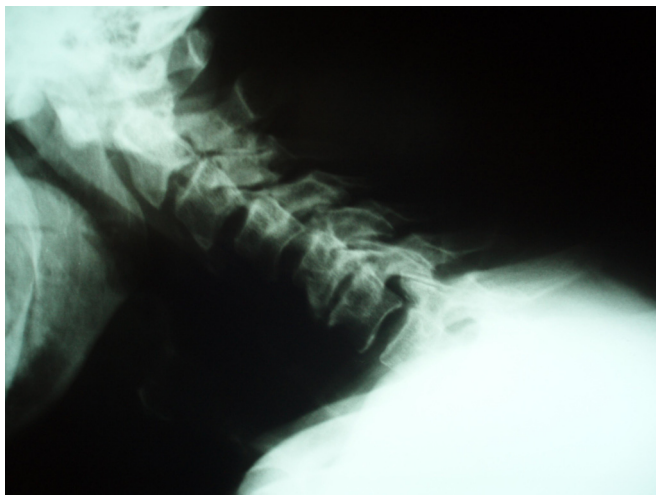


Fig. (2). Lateral cervical spine flexion X-Ray showing spondyloarthropathy with vertebral body degeneration, C3-C4 and C4-C5 instability and spurs.

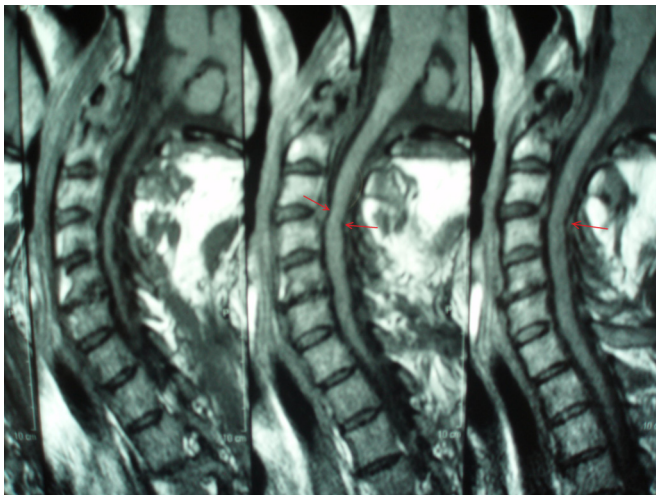


Fig. (3). Cervical spine MRI demonstrating spinal cord impingement at the C3-C4 level. Red arrows show the point of cord impingement.

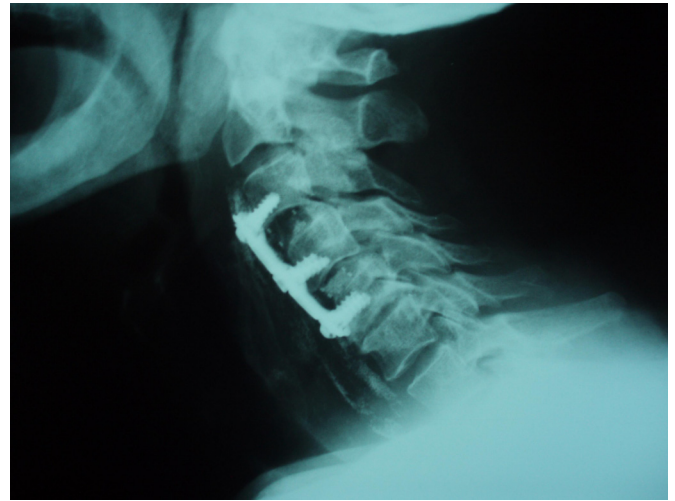


Fig. (4). Lateral cervical spine X-Ray showing anterior cervical discectomy and fusion at C3-C4, C4-C5 using PEEK allograft, and anterior fixation with dynamic plate and screws from C3 to C5.

significantly. However, 14 months later he returned to the Outpatient Clinic with recurrence of neck pain and gait disturbance over a 2-month period. Although repeat cervical spine MRI scan did not reveal any abnormal findings, lateral cervical spine flexion-extension radiographs revealed hardware failure with cervical spine instability (Figs. 5, 6). Based on these findings, the patient underwent supplemental posterior cranio-cervical stabilization and fusion with occipital and lateral mass screws, rods and allograft (Fig. 7). Postoperatively, the patient experienced immediate symptom improvement, and was discharged home on postoperative day 4. Two years later, the fusion remains stable; the patient is doing well, and denies any symptom recurrence.

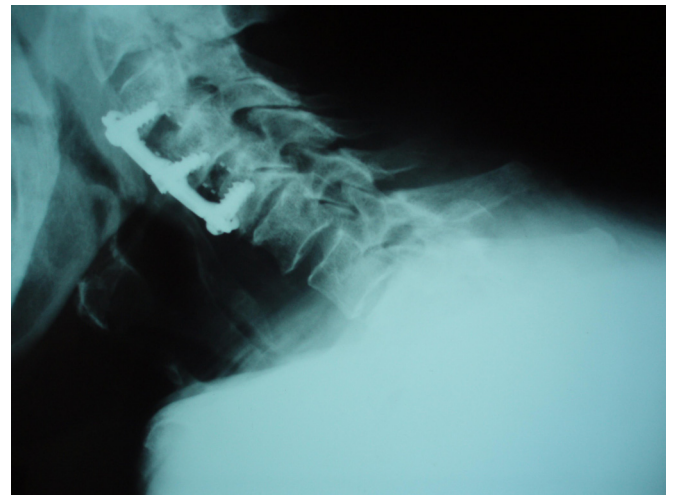


Fig. (5). Lateral cervical spine flexion X-Ray, which, in conjunction with extension X-Ray (Fig. 6) reveals hardware failure with cervical spine instability.

PATIENT 2

A 77-year-old patient, who had been on hemodialysis for 4 years, came to the Emergency Room for evaluation of bilateral proximal upper extremity weakness, progressively worsening over a 4-day period. The patient also reported worsening neck pain radiating to both arms (C4 and C5

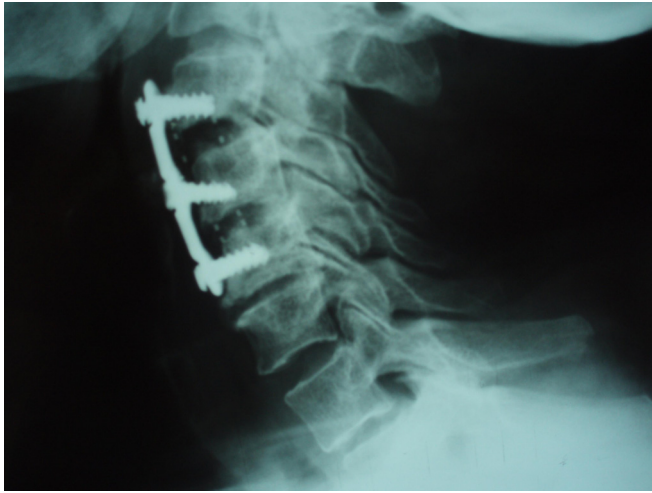


Fig. (6). Lateral cervical spine extension X-Ray, which, in conjunction with flexion X-Ray (Fig. 5) reveals hardware failure with cervical spine instability.



Fig. (7). Lateral cervical spine X-Ray showing posterior cranio-cervical stabilization and fusion with occipital and lateral mass screws, rods and allograft.

distribution) for 2 months. Neurologic examination demonstrated bilateral deltoid and biceps muscle weakness, but no other abnormal findings. Laboratory evaluation showed elevated urea and serum creatinine levels, consistent with end-stage renal disease. Plain cervical spine films and computed tomography revealed partial destruction of the C3 and extensive destruction of the C4 and C5 vertebral bodies (Figs. 8, 9). MRI scan demonstrated mild compression of the anterior subarachnoid space and impingement of the C5-C6 roots, but no spinal cord abnormalities.

Based on these findings and because upper extremity weakness was progressing, the patient had anterior C4 and C5 corpectomy and fusion using iliac crest autograft and anterior stabilization with dynamic plate and screws from C3 to C6 (Fig. 10). In the immediate postoperative period, he noted significant improvement of neck pain but radiculopathy symptoms did not improve. Then, on postoperative day 2, the patient experienced acute, severe neck pain recurrence while ambulating. Repeat cervical spine CT scan showed hardware failure at C3 with anterior shift of the autograft (Fig. 11).

The patient then underwent repeat cervical spine surgery, which consisted of anterior fusion revision with replacement of the displaced screws and autograft, combined with supplementary posterior fixation and fusion using lateral mass screws from C3 to C7, rods and allograft (Fig. 12). Postoperatively, the patient experienced complete resolution of neck and arm pain and moderate improvement of upper extremities weakness. He was discharged home on postoperative day 7, and remains pain-free after 14 months.



Fig. (8). Cervical spine lateral X-Ray showing partial destruction of the C3 and extensive destruction of the C4 and C5 vertebral bodies.



Fig. (9). Computed Tomography of the cervical spine, showing partial destruction of the C3 and extensive destruction of the C4 and C5 vertebral bodies.

DISCUSSION

The optimal management of cervical spine DSA remains controversial. Albumi *et al.* believe that cervical spine DSA often requires circumferential reconstructive surgery, because affected patients typically have both the anterior columns and the facet joints compromised [4]. In contrast, Yuzawa *et al.* suggest that anterior long-span surgery may be too invasive in hemodialysis patients, whereas posterior decompression and fusion may be a reasonable, effective strategy for severe hemodialysis-associated cervical spondyloarthropathy with neurologic deficits [8]. On the other hand, Nair *et al.* reported two cases managed with

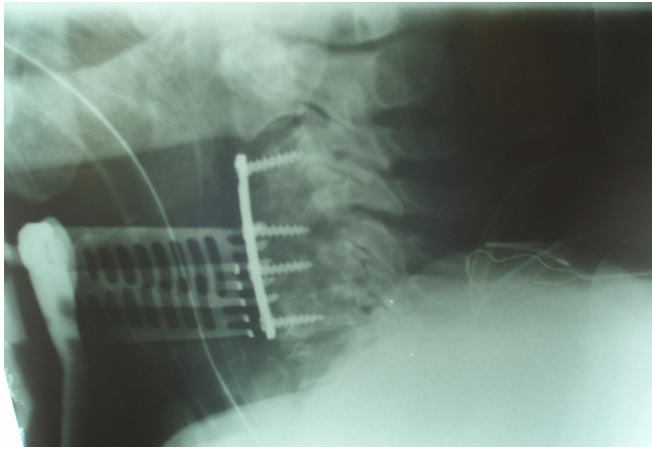


Fig. (10). Lateral cervical spine X-Ray showing anterior corpectomies and fusion using autograft and dynamic plate and screws from C3 to C6.

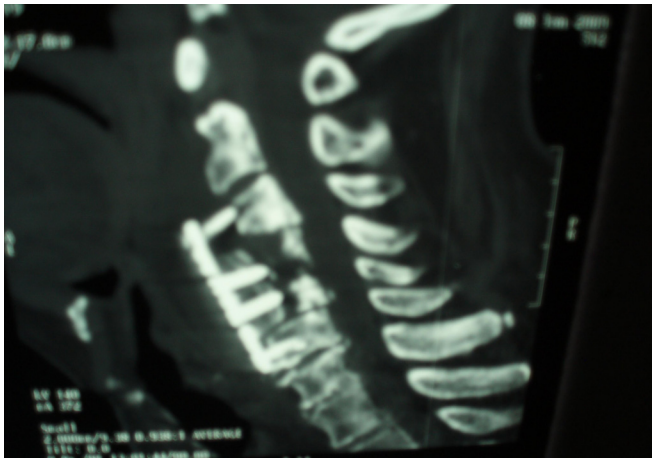


Fig. (11). Postoperative cervical spine CT showing hardware failure at C3 with anterior shift of the allograft.



Fig. (12). Lateral cervical spine X-Ray showing revision of the anterior fusion with replacement of displaced screws, and posterior fusion with screws, rods and allograft from C3 to C7.

anterior approach due to anterior compression, with one of the two requiring supplemental posterior fixation because of hardware failure and pseudarthrosis [9]. Of note, because of

poor bone quality and slow bone healing [3,10], the incidence of loss of fixation and mechanical failure is high even with circumferential stabilization, and some patients require extension of the spinal fusion [11]. Albumi *et al.* note that pedicles are a favorable site for fixation in DSA patients [4] because they demonstrate high pullout resistance in biomechanical studies and tend to maintain their integrity even when other spinal fixation points are diseased. Cervical pedicle screws, however, require precise placement, because injury to the spinal cord or vertebral artery may occur from an improper screw trajectory. Consequently, these concerns have led to limited acceptance of this technique.

The occasional presence of non-contiguous or “skip lesions” in these patients add complexity to surgical management; decompression and fusion at the level of neural compression can lead to deformity, by applying increased stress upon nearby spinal levels where there is bone loss from renal spondyloarthropathy.

In our cases, both patients had signs and symptoms of cervical myelopathy due to spondyloarthropathy and spinal cord compression. Because these lesions were located in front of the spinal cord, we chose to operate through the anterior approach, and proceeded with discectomy or corpectomy and fusion with peek or iliac crest autograft and fixation with dynamic plate. Despite initial improvement, however, both patients sustained hardware failure and symptom recurrence, requiring supplemental craniocervical stabilization or lateral mass screw fixation, respectively, with prompt symptom resolution.

The optimal surgical management of cervical spondyloarthropathy in dialysis-related patients is still unclear [8,9], and there are no published guidelines or recommendations. However, it seems that patients treated from the beginning with circumferential reconstructive surgery and 360-degree fusion have the best results, with low incidence of symptom recurrence, while avoiding the risks of a second operation [4]. In our two cases, we chose the anterior approach to surgical reconstruction, due to location of the compression, and also because we wanted to avoid a long circumferential operation. However, because of hardware failure and symptom recurrence, a second operation became necessary in both patients. In retrospect, both of these patients might have benefited from a circumferential (combined anterior and posterior) cervical spine reconstruction as their initial treatment. Based on our limited experience, and also on published relevant experience from other spine surgery centers, we now believe that combined circumferential stabilization and decompression may be the treatment of choice from the beginning in this high risk patient population.

CONCLUSION

Destructive cervical spondyloarthropathy, occasionally involving non-contiguous spinal segments, can cause spinal instability or neurologic deficits in hemodialysis patients. Surgical management is challenging in this patient population, because of diffuse osteoporosis and slow bony healing, leading to a high incidence of hardware failure. In our opinion, because of the high probability of hardware failure, combined anterior and posterior cervical fixation should be the initial procedure of choice in these patients,

thereby avoiding the risk and expense of a second operation in this high risk cohort. However, as not all experts agree on this, and there is clearly some controversy in the literature, more data, preferably from large, rigorous prospective studies are required before the controversy settles and guidelines or consensus statements can be formulated.

CONFLICT OF INTEREST STATEMENT

This work was supported solely by Department funds. All authors declare they have no conflict of interest to report.

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