Acute Two-Level Cervical Soft Disc Herniation with Radiculopathy: Case Report and Review of the Literature

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ABSTRACT

Acute two-level cervical soft disc herniation in a subject without underlying degenerative changes is rare. Only 3 cases could be found with a careful review of the literature. All such herniations are located in the midline, presenting with either quadriparesis or Brown-Sequard syndrome. However, laterally located two-level acute cervical sequestrated disc herniation with only radiculopathy seems to be extremely rare and not a single case could be found in our review.

Herein, we present a young male who developed severe upper limb radiculopathy not responsive to medication. MRI revealed two large cervical sequestrated discs located posterolaterally at the C5-C6 and C6-C7 levels. With consideration of the severity of pain not responsive to medications, two-level arthroplasty was advocated, but the patient refused despite pain intensity. Therefore, periradicular cervical block was done at 2 levels, which caused dramatic pain relief thereafter. Conservative treatment was continued with NSAIDs and analgesics. A week after the block, he restarted most of his previous activities. Three months later, follow-up MRI revealed complete resolution of the corresponding sequestrated discs.

To our knowledge, acute two-level cervical disc herniation with brachialgia is extremely rare with no similar case being found in the literature.

KEY WORDS: Acute cervical disc herniation, anterior cervical disc fusion cervical disc arthroplasty, foraminal block, natural history, outcome, spontaneous resolution, two-level cervical disc herniation

INTRODUCTION

Non-traumatic single-level acute cervical soft disc herniation is a common pathology (1,3,15,41,46). However, two-level acute soft disc herniation is an extremely rare scenario (18,60,63). In the review of the literature, only 3 cases of acute two-level cervical soft disc herniation could be found. The first example was reported by Finelli et al in 1992 and since then only two more cases have been published (18,60,63). In all these three cases, the sequestrated soft discs had migrated centrally, causing myelopathy. In a careful survey, we could not find a single case of two-level soft cervical disc herniation with radiculopathy. For example, in 648 patients with soft disc herniation reported by Murphy et al, not a single case of two-level soft cervical disc herniation could be found (46). Furthermore, all the 187 cases of Bucciero et al with soft cervical disc herniation were at one level (3). The same was seen in the series of Dubuisson et al where not a single case of double level could be encountered among 100 cases of soft cervical disc herniation (15). Apparently, double-level cervical soft disc herniation is quite different from two-level degenerative cervical disc disease with spondylotic radiculopathy, which is a common scenario.

Conservative treatment should be the first line of treatment in acute two-level cervical disc herniation with radiculopathy, but with minimal neural impairment as it is for single-level ones (4,8,1,11,15,17,19,27,58,59). However, in acute cases with radiculopathy not responsive

to conservative treatment, subjects with myelopathy, and patients with radiculopathy harboring marked neurological deficit, surgery is warranted. In these circumstances, two-level ACDF or two-level arthroplasty and posterolateral microdiscectomy will be the options (1,2,6,8,10,11,17,22,28,45,57,74).

The value of conservative treatment in soft cervical disc herniation with radiculopathy was supported in several studies and in particular by the first report of spontaneous regression of a herniated cervical disc which was published by Krieger and Maniker in 1992. A total of 46 more cases were published there after (7, 12,13,21,23,36,39,43,44,47,48,54,61,64,67). However, cervical radiculopathy is mostly unremitting and of such intensity that some patients cannot continue conservative treatment despite the possibility of spontaneous resorption. In this circumstance, periradicular block might result in pain amelioration by which the patients might start their normal daily activities permitting nature to solve their problem (4,5,9,16,3,52,65).

Recently, we treated a 27-year-old man with acute upper extremity radiculopathy due to two-level large sequestrated soft cervical disc herniations at C5-C6 and C6-C7 levels with minor neurological involvement. Since conservative treatment was ineffective after 5 weeks, surgery was proposed but was refused. Therefore, in order to help him to tolerate intractable pain, periradicular nerve block was done at both levels and this resulted in dramatic pain improvement. Five months after pain onset, we found that spontaneous resolution of both offending discs had taken place.

To the best of our knowledge, neither two-level acute cervical soft disc herniation with radiculopathy nor the simultaneous spontaneous resolution of these discs with time has been reported previously. This case might be another strong clue for the efficacy of a waiting strategy and conservative treatment as an alternative option in the management of acute sequestrated soft cervical disc herniations in the patients with mild neurological involvement.

CASE REPORT

A 27-year-old man developed severe upper extremity pain after falling asleep in the sitting position after working long hours on a laptop computer. At the beginning, the intensity of pain according to the Visual Analogue Scale (VAS) was 10, associated with mild neural involvement. At a regional hospital, with the possibility of cervical disc herniation, MRI was done which showed two large soft discs at the C5-C6 and C6-C7 levels in T2-weighted sagittal views (Figure 1). T2-weighted axial views revealed two hyperintense large cervical disc herniations at the vicinity of the foramina, one at the C5-C6 and the other at the C6-C7 level, both on the left side (Figure 2A, B). With a diagnosis of double-level acute soft disc herniation, conservative treatment with the prescription of one dose of intramuscular long-acting corticosteroids, NSAIDs, pergabolin, dulexitin and analgesics were started.

After 5 weeks had gone by and he was referred to our institute, the pain intensity had decreased to 7 according to VAS. Brachial pain was at the territory of the C6 and C7 roots with paresthesia of the thumb and index and middle fingers. Mild weakness of the biceps and triceps muscles was noted on neurological examination. Both biceps and triceps reflexes were diminished one plus compared with the contralateral side. Mild hypesthesia of thumb, index and middle fingers was also found.

Since conservative treatment was ineffective**,** two-level cervical disc arthroplasty (CDA) was recommended, which was refused by the patient. Therefore, periradicular nerve block for amelioration of pain was proposed which was accepted and performed at both levels. This resulted in dramatic pain relief, associated with a decrease in his VAS to 3. A week later, he started his previous daily activities. He

Figure 1: *Cervical MRI; T2-weighted sagittal view shows 2-level disc herniation at C5-C6 and C6-C7 levels with considerable cord compromise.*

left for his city, but remained in contact with us via phone every other week.

Five months after the appearance of pain, a follow-up MRI was obtained. At this time, complete disappearance of the offending discs was demonstrated, both in axial and sagittal views (Figure 3A-C). At 18-months follow-up, his neurological examination was quite normal and he has remained pain free.

DISCUSSION

In the cervical spine , an acute soft disc herniation usually penetrates the posterior longitudinal ligament between the middle third and lateral third and enters the epidural space as a sequestrated fragment migrating towards a foramen which eventually causes radiculopathy (71). Infrequently the sequestrated disc might move centrally and cause acute myelopathy. While acute single-level soft sequestrated cervical disc herniation is quite common, two-level acute cervical soft disc herniation without underlying apparent degenerative changes is very rare. Review of the literature shows that only 3 cases of acute double-level cervical disc herniation with detailed clinical information have been reported in the literature (18,6,63). Surprisingly, all three cases were located centrally resulting in myelopathy whereas not a single case of double-level laterally migrated sequestrated disc herniation with radiculopathy could be found in our survey. Therefore, the presented case is the first example of double-level laterally-located sequestrated cervical disc herniation with radiculopathy. In the majority of cases with single-level acute cervical soft disc herniation, no definite cause can be determined. For example, 90%, of 468 cases reported by Murphy et al felt severe radicular pain when they woke up in the morning without remembering any cause (46). However, in a few cases, unusual causes such as cough, seizure, abnormal posture of the neck in the MRI machine or during general anesthesia and finally forceful contractions during labor have been found responsible (20,29,32,35). In our case, sleeping in the sitting position

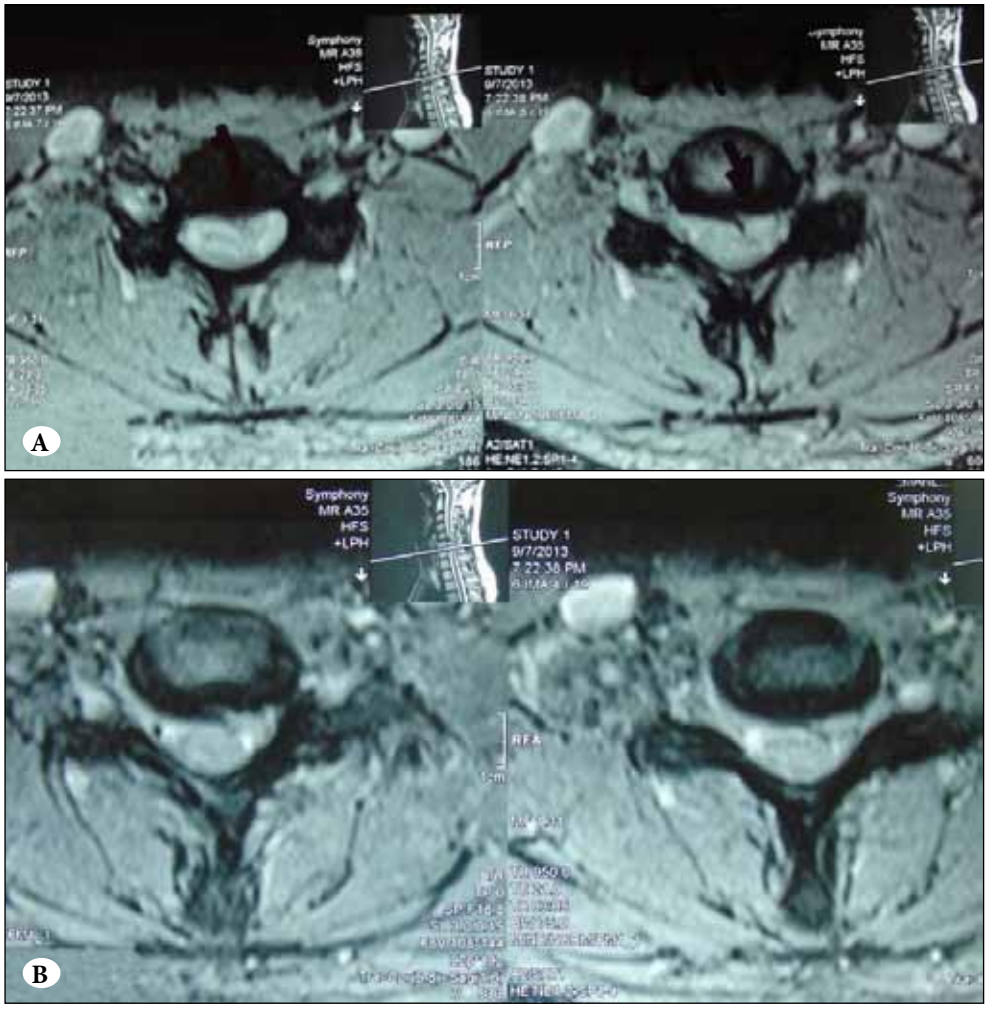

Figure 2: *Cervical MRI;* ***(A)*** *Axial T2-weighted MRI at C5-C6 level showing left sided high intensity mass compatible with acute sequestrated disc, near the left foramen.* ***(B)*** *T2-weighted at C6-C7 level demonstrate the disc near the corresponding foramen.*

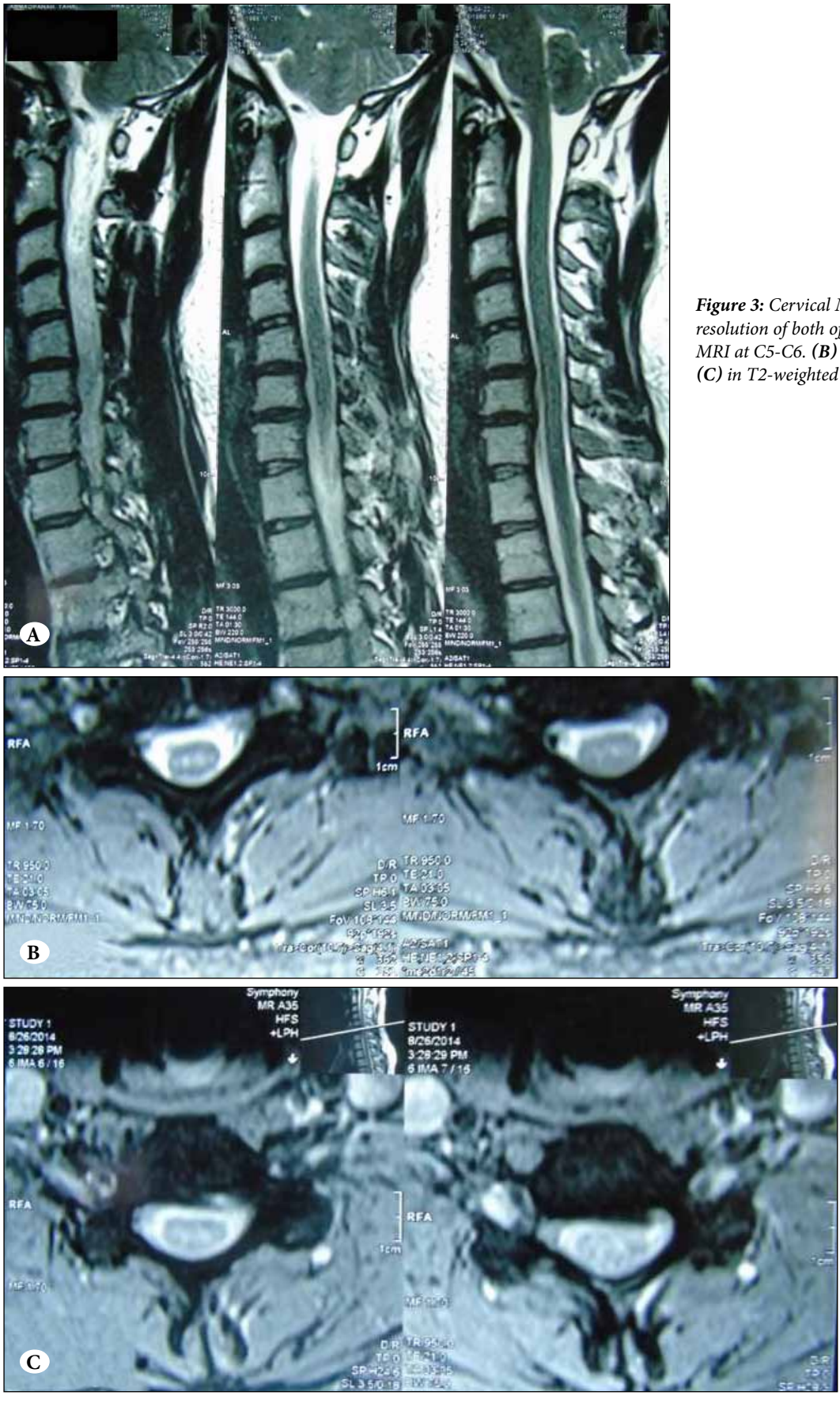

Figure 3: *Cervical MRI after 6 months: shows complete resolution of both offending disc in* ***(A)*** *Axial T2- weighted MRI at C5-C6.* ***(B)*** *Axial T2-weighted MRI at C6-C7 and* ***(C)*** *in T2-weighted sagittal view.*

was the etiology where probably constant flexion of the neck with rotation of the head to the left in the absence of muscle support had been the cause. The characteristic features of the two-root compression in two-level discopathy should be radiculopathy, more severe than single-level ones as was observed in our case being explained with simultaneous compression of two different roots.

A soft cervical disc herniation is best observed in T2-weighted images as an extradural hyperintense mass. The height of the affected intervertebral discs in such cases remains almost normal as it was observed in our case.

The first line of treatment for one-level laterally-located acute cervical disc herniation with marked neurological deficit and the centrally located ones with myelopathy is surgical intervention. For those with negligible neural involvement, conservative treatment for about 4 to 6 weeks is recommended.

However, many controversies exist regarding the timing of referral to a neurosurgeon and timing for surgical intervention. Nowadays, in many centers, the 4 to 6 weeks of conservative treatment and the timing for elective surgical intervention is not based on a scientific basis, but on the preference of the surgeon and acceptance of the patient.

With consideration of the intractable pain and MRI findings, and despite absence of an obvious neural deficit, cervical disc extrusions may be considered a definitive indication of surgery as the first line of treatment by some surgeons. This decision stems from a fear of the potential risk of developing permanent neurological deficits both by the patient and the surgeon. Furthermore, some patients might prefer surgery for their fast return to their activities despite promising effects of conservative treatment described by his physician. The rationale of this decision is continuation of the radicular pain where its intensity remains the cardinal factor.

Patients should be reminded that the pain dramatically diminishes within a few weeks from its onset in the majority of the cases to such an extent that normal daily activities can be continued (62). Spurling & Segerberg prospectively reviewed the result of conservative treatment in 110 patients with cervical radiculopathy. Surprisingly, 88% of the cases showed pain and symptom improvement within the first 4 weeks to such an extent that normal daily activities could be continued (62).

However, if intractable pain continues, it can be controlled with a periradicular nerve block with a combination of corticosteroids and local anesthetics (4,5,16,30,52,65). In a study by Bush et al, radicular pain could be effectively controlled, by periradicular corticosteroid injections in 12 out of 13 cases with cervical brachialgia due to laterally located disc herniation (4s).

Cyteval et al had excellent or good long-term outcome with periradicular steroid infiltration in 10 out of 14 cases with cervical radiculopathy (9). Interestingly, no local complications occurred after the procedure and there was no rebound of pain at the 6-month follow-up. The CT-guided approach ensures the safety of vital structures and allows the precise injection of a steroid specifically targeted to the root (30,52,65). In fact, the effect of periradicular infiltration for root pains has been documented to be transitory with a rebound phenomenon at 3 and 6 months. Actually, these do not change the value of this type of interventional pain control, because in majority of the cases, the pain dramatically diminishes in the first 6 weeks of onset by nature (62). This means that the duration of pain amelioration provided by periradicular block is much more than the requirements of nature.

Several case series, one small randomized clinical trial and one prospective study have been in favor of conservative treatment (27,51,58). According to Saal et al and Mochida et al, cervical radiculopathy secondary to disc herniation gradually improves or disappears within 2 months after the onset of the symptoms with application of conservative measures in 40% of the cases (43, 58). Parallel to these reports that have discussed the good outcome of conservative treatment, the scenario of spontaneous resolution of the laterally located cervical soft disc fragments became more attractive and actually revolutionized the treatment of sequestrated discs with minimal neural impairment (7,12,21,37,39,43,44,54,61,64,67). For example, in one prospective study, all 26 cases with laterally located cervical soft disc herniation were spontaneously resolved within a few months after the onset (54). The phenomenon of resorption is based on a complex biochemical enzymatic process. The scenario starts with a layer of neovascularization around the outermost part of the disc fragment and is continued with macrophage attraction and phagocystosis (14, 38). This produces the appropriate interleukins that activate silent metalloproteinase enzymes which are already present in the free disc fragment (24,26,33,34,55,66,72). The final product of this process will be very potent proteoglycanase which with its action breaks the chains of the chondrocytes and the disc material undergoes autolysis (24,25,33). This enzymatic process clearly shows that all sequestrated disc fragments

will eventually disappear with time. However, how we can find whether the offending disc is sequestrated or contained remains a question. Hopefully, after 3 to 4 weeks from the onset, and with application of the contrasted MRI, one can easily differentiate between these two categories. Rim enhancement around the herniated disc seen in contrast-enhanced MRI representing the neovascularized zone with macrophage infiltration and since neovascularization around the outer layer of the disc is exclusively seen in sequestrated ones, the question is answered (40,70). Therefore, rim enhancement is a major determinant of spontaneous resorption of the herniated disc and, with its demonstration, the responsible physician can assure the patient that spontaneous resolution will happen with a high possibility (40,70).

However, if we assume that the current case had apparent neurological deficit or had not responded to conservative means, we could approach the discs via the anterior or posterior corridor (1,2,10,17,28,57). In the anterior approach, the surgical options include two-level ACDF and two-level arthroplasty (2,8,10,11,17,19,22,28,45,74). However, two-level posterolateral microdiscectomy remains another acceptable option for two-level sequestrated soft disc herniation (1,28,57). For better understanding, comparison of these different techniques for bi-level cervical disc disease is necessary.

For a cervical soft disc herniation, ACDF can provide neurological decompression and stability. The effectiveness of ACDF in single-level herniated disc with consideration of pain amelioration and patient's satisfaction has been demonstrated to be between 8% and 95% (2,3,15,19,22,45). However, in two-level pathology, two-level ACDF is a larger surgical intervention compared with one-level ACDF with less effectiveness and with greater risk of preoperative complications (2,19,56). The overall complication rate in ACDF varies from 4.3% to 19.6% for one- to three-level cervical soft disc herniations. A recent retrospective cohort study of over 90,000 patients undergoing ACDF found that patients having two or more levels of fusion had higher rates of complications and readmissions. The major long-term complication of ACDF is adjacent segment hyper mobility and accelerated degeneration. This complication has been estimated to affect 25% of patients with one-level ACDF within 10 years of the initial surgery. Eventually, two-level fusion can lead to a substantially greater increase in intradiscal pressure in the adjacent levels than one-level fusion (42,49). However, there is an interesting point that two-level ACDF has the benefit of restoring sagittal alignment and this is associated with a lower rate of adjacent level problems (31).

In order to reduce the risk of adjacent level, cervical disc arthroplasty (CDA) has been developed with the rationale of preservation of segmental motion and reduction of the incidence of adjacent segment disease. Several studies have compared two-level cervical disc arthroplasty (CDA) and two-level ACDF and the results of two-level CDA have been promising in particular in the prevention of adjacent segment degeneration (8,10,11,17). A meta-analysis of these six studies has shown that these two methods are almost equivalent in the short-term and intermediate-term, but in some aspects the results of arthroplasty are superior to ACDF at 4 years with significantly better clinical outcomes than the ACDF group at two contiguous levels cervical disc disease (74). Because of the large number of positive clinical series of patients undergoing cervical arthroplasty, a false impression can be given that the surgery is a complication-free procedure. In fact, with improvement of the learning curve and technology, the rate of complications has decreased significantly (53). However, we strongly believe that complications exist even at the hands of the most expert surgeons. The underreporting of two-level cervical disc arthroplasty-related complications can cause a hazardous situation with significant medicolegal ramifications. It should be noted that approach-related perioperative and early post-operative complications of two different anterior procedures such as dysphagia, dural tear epidural hematoma, retropharyngeal hematoma, esophagus perforation, Horner's syndrome and local infection are eventually similar. The perioperative complication rate in two-level CDA is about 12.4 (53). However, short and long term complications related to the applied hardware such as mal-positioning of prosthesis, migration of prosthesis, early mechanical failure as well as subsidence of the prosthesis or its wearing and heterotopic ossification should be borne in mind. Some studies indicate that CDA is associated with fewer reoperations than anterior cervical discectomy and fusion, although this should be interpreted with caution. However, complications of revision surgeries are more frequent in CDA, with longer hospital stay, higher cost and more perioperative infection and dysphagia compared to ACDF. Another important shortcoming of CDA is heterotopic ossification which has been shown to be more frequent in two-level CDA than single-level ones (69). Eventually, in the patients with soft disc herniation, heterotopic ossification is less prevalent than single-level degenerative disc disease (69). To these, the possibility of

severe postoperative segmental kyphosis and hypermobility syndrome should be added as the shortcomings of CDA that lead to unfavorable results

The last option for two-level cervical soft disc herniation might be two-level posterior microdiscectomy. This technique has shown good results in single-level soft disc herniation, in terms of safety and feasibility. Survey of the published series of posterior microdiscectomy showed that this procedure has a positive outcome from 75% to 100% of the cases with single-level cervical disc herniation (1,6,28, 57). Apparently, the rate of success diminishes in two-level posterior microdiscectomy.

Nonetheless, in our young patient with intact facet joints, two-level arthroplasty could have been the best option if conservative treatment had failed. However, selection of the mode of surgical intervention does not rely only on these studies but depends on the surgeon's school of thought and his experience that optimize patients' final outcomes.

In summary, to the best of our knowledge, the current case is the first example of acute two-level cervical soft disc herniation with radiculopathy. Furthermore, this case is the first example of two level acute cervical disc herniation that has undergone spontaneous resorption.

Furthermore, although two-level arthroplasty may be the choice for surgical management of a patient with two-level acute cervical spondylotic disc disease, with consideration of short and long-term complications inherent in these surgeries, the management of soft disc herniation should be revisited. In fact, the phenomenon of spontaneous resolution might provide insight for choosing conservative treatment in patients with radiculopathy due to acute cervical sequestrated disc herniation.

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Manuscript submitted September 24, 2016.

Accepted February 09, 2017.

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