Spontaneous Regression of the Sequestrated Cervical Discs: A Prospective Study of 26 Cases and Review of the Literature

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ABSTRACT
The spontaneous regression of a sequestrated cervical disc with root pain is regarded as a rare entity. The literature about this issue is limited to isolated case reports or small series of 2 to 6 cases. The authors have conducted a prospective study of 26 patients with acute upper extremity monoradiculopathy that was confirmed to be caused by a sequestrated cervical disc that migrated and lodged in the vicinity of one foramen. This phenomenon of regression occurred in all 26 subjects with clinical improvement. The marked resorption of the fragmented disc was observed simultaneously during a control MRI done within three to four months after the initial MRI for all of the subjects. Therefore, the simple conclusion was reached that we should not underestimate the possibility of regression in the evaluation and management of patients with an extruded- migrated cervical disc. In this study, the clinical picture and predictive imaging features will be described as guidelines for postponing surgery and waiting for resorption in subjects with acute cervical disc herniation. Furthermore, we will clarify the corresponding morphological changes as well as possible biomechanical and biological mechanisms of this phenomenon over time.

KEY WORDS: Cervical disc, Conservative management, Extruded disc

INTRODUCTION
The first report of spontaneous regression of an herniated lumbar disc was reported in myelography by Key in 1945 and then the issue was ignored until Teplick's report in 1983 on the same phenomenon in a patient with a lumbar disc extrusion that was demonstrated and documented in serial CT scans (14,26). Since then many reports on the spontaneous resorption of a lumbar disc have been published so far, as this became a well established entity (4,5).

The first report of spontaneous regression of a herniated cervical disc was published by Krieger and Maniker in 1992, but since then similar reports of spontaneous regression of herniated cervical disc are few (6,15,18,19,2428,29). Pan in 2009 reviewed the literature and found 13 cases reported in the past and added another own case (23). After reviewing, from 2009 to 2013, we encountered two more cases (22,25). In all of these reported cases, the process of resorption was documented retrospectively after the patient refused an operation and to date no prospective MRI study has documented this issue (6,15,19,21-25,28,29).

Herein, we will present the results of a prospective study of 26 patients with this condition where their extruded cervical disc regressed within three to four months of conservative treatment. Those patients with radicular pain and some sensory changes or abnormal reflex of the corresponding root but without an apparent motor deficit were selected for this mode of treatment. The clinical improvement preceded the phenomenon of disc regression documented in serial MRI studies. This study will determine the clinical application of this strategy and the ultimate outcome of the patients for whom this mode
METHOD

The current report presents 26 patients with spontaneous resorption of sequestrated cervical intervertebral disc herniation.

The ages ranged from 21 to 57 years with the mean of 37.3 years. Fifteen patients were male and the remaining 11 were female.

The inclusion criterion was acute monoradiculopathy considered to be due to an extruded disc located at or near a foramen according to a cervical MRI.

Exclusion criteria were bilateral radiculopathy, long tract signs and urinary disturbances. On imaging, the presence of large osteophytes in the background of the disc, a narrow canal, OPLL and bilateral or central herniated disc. In 16 cases the disc was at C5-C6 and in the remaining 10 at the C6-C7 level. In 15 cases the extruded disc was on the right side and in 11 on the left side. Cervical discs at higher levels were not observed.

The clinical picture of all of the patients was monoradiculopathy. Initially, radiculopathy was of so severe that it interrupted the patients’ normal activities with gradual decrease of pain intensity over time. Strength was slightly decreased in the triceps muscle of 6 patients and in the biceps in 8 patients showing diminished corresponding reflexes.

On admission to our clinic, a referral center, 12 of these patients were recommended surgery by one or two surgeons according to the patients’ cervical spine MRI. Nine more were actually scheduled for surgery by a surgeon. An interesting point is that the patients’ pain had decreased dramatically after they made an appointment at our clinic. These patients had usually tried a course of NSAIDs, corticosteroid and neck immobilization. The remaining five patients presented directly to the office of the senior surgeon for evaluation of their radiculopathy. A waiting strategy and conservative management were proposed for this group according to the MRI features of their sequestrated and migrated disc at one foramen.

All 26 patients were informed about the possibility of resorption. They all willingly agreed with and accepted the strategy of our study and all signed an informed consent.

The conservative treatment was started or continued with NSAIDs, low-dose Tizanidin, Pergabolin 50 mg twice daily with one or two long acting ACTH intramuscular injections. Neck immobilization with a soft collar for the first two weeks was advised. Neck traction was suggested and tried for the initial period of intensifying pain. Periodic follow-ups for the 15 patients were performed every three to four weeks for the subjects with accessibility to our clinic. The remaining 11 were questioned during telephone calls. All of 26 patients either improved or remained stable but none had worsened by the first three-week follow-up. In the subsequent weeks, all 26 subjects claimed marked improvement.

MRI control was suggested within three to four months after the appearance of pain. The changes over time in herniated disc sizes were evaluated using this imaging technique. An MRI taken earlier showed the liquefaction of the disc in non-contrast MRI and mild enhancement in the periphery of the sequestrated fragment in GD-injected images.

All of these extruded sequestrated discs migrated toward one foramen exhibited spontaneous regression. The time between initial presentation and complete spontaneous regression of the disc varied from 3 to 4 months according to the MRIs.

The patients were followed for a month to four years after the completion of our conservative management. Their regressed pain had not recurred by the time of these follow-ups. A few patients however had occasional neck pain.

The patients’ data including age, gender, the disc levels and the side of affliction are shown in Table 1. The process of resorption as reflected in the MRI images of 10 out of the 26 cases is illustrated in Figures 1 to 10.

DISCUSSION

The spontaneous disappearance of a cervical disc extrusion is a well-documented event. The first example of the spontaneous regression of a herniated cervical disc was reported by Krieger and Maniker in 1992 (16). Since then 14 cases have been reported (5,6,15,18-25,28,29).

A review of these reports indicates that the regressions were demonstrated in the control MRIs of the patients.
who had refused surgery. Therefore, it appears that the current case series is the largest one so far and the first prospective study in the literature.

Moreover, the postulated mechanism underlying this process needs to be thoroughly reviewed. Awareness about the possible phenomenon of spontaneous resorption can help to verify the natural history of cervical disc herniation and this may provide future novel therapies for cervical disc herniation (15,17).

Review of all of the proposed mechanisms that play a role in the process of gradual dehydration and shrinkage of free disc material as well as the accompanying enzymatic degradation is necessary for a better understanding of the issue (1-3,7-13,15,17,27). When a free disc fragment is trapped in the epidural space at neural foramina, histologically it is surrounded by granulation tissue characterized by inflammatory mononuclear cells and T-lymphocyte infiltration concomitant with the onset of newly formed vessels (2,3,7-9). This highly vascularized network and the inflammatory response are much more prominent in transligamentous extruded discs rather than in subligamentous extruded discs (7-9,15). Nonetheless, the interaction of reactive inflammatory macrophages and neovascularization around the disc leads to the generation and the secretion of inflammatory cytokine mainly interleukins. On the other hand, a degenerated disc spontaneously produces a high level of matrix metalloproteinases (MMPs) (7,8,12,27). The cytokines

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Figure 1: A,B) (Case 1) = Right C5-C6 in a 21-year-old female. C,D) Sagittal T2- weighted images of case 1

Figure 2: (Case 5) = Right C6-C7 in a 53-year-old male.
released around the disc fragment lead to the production of
tumor necrosis factor-a (TNF-a) resulting in upregulation
of the expression of MMP1, MMP-3 and MMP (1-3, 7-13). The latter enzymes are very potent proteoglycanase that
can degrade the matrix of disc tissues (7,8,12,27). With
this action, the proteoglycan chains of the chondrocytes
in the disc material undergo autolysis with the loss of
their hydrophilic capacity. This will ultimately result in
the desiccation of the disc fragment (13,27).

Figure 3: (Case 6) = Right C5-C6 in a 36-year-old male.

Figure 4: (Case 8) = Right C6-C7 in a 38-year-old female.
The fragmented disc material exposed in the epidural space may therefore be resorbed more quickly than an extruded subligamentous disc material (6,15,16-18,21-23,28,29). Exposure of the disc material to a rich vascular environment is the probable reason for faster regression. An interesting point is the process for the preferential regression of larger herniated disc fragments. This phenomenon may be partly due to the fact that larger fragments have higher water content and, therefore, may be more susceptible to regression through both dehydration/shrinkage and inflammation-mediated resorption.

Figure 5: (Case 10) = Right C6-C7 in a 35-year-old female.

Figure 6: (Case 11) = Right C6-C7 in a 35-year-old male.

Figure 7: (Case 13) = Right C5-C6 in a 24-year-old female.
Figure 8: (Case 15) = Right C5-C6 in a 35-year old male.

Figure 9: (Case 20) = Left C5-C6 in a 48-year-old.
A literature review disclosed that both the young and the middle-age patients experienced spontaneous disappearance of an extruded disc. The same holds true in the current series. Reports of spontaneous resorption have been predominantly seen in males (6,15,16,18,21-25,28,29). The latter might be due to the higher susceptibility of males to cervical disc disease.

Cervical disc herniation is typically presented as a radiculopathy, myelopathy or a combination of both. Some subjects might remain asymptomatic. The clinical picture for the patients who should be selected for spontaneous resorption is predominantly radicular pain at the corresponding nerve root without motor deficit and paresthesia (6,15,16,18,21-25,28,29). However, if a motor deficit occurs during the follow up or the pain intensifies after initial regression, the patient might need an appropriate surgical intervention according to the surgeon’s preference and school of thought.

Apparently, moderate and severe myelopathy are absolutely contradiction for the waiting strategy. However, there are two reports of the successful regression of cervical discs in the patients with mild myelopathy (19,24).

Documenting the spontaneous regression of herniated cervical disc is only valuable when it is supported by detailed imaging findings. However, MRI is the radiological tool of choice for depicting the magnitude, exact location and the level of disc. Moreover, serial MRIs are the method of choice for documenting resorption. With the application of MRI, It has been shown that the tendency toward regression differs based on the anatomic position of extruded disc material. This means that the extruded discs at or near the foramina are more receptive to spontaneous resolution. Patients with a laterally sequested disc are preferred for this type of treatment. Protruded or central discs should not be included in this category yet, unless their resorption can be proved in further studies (19,24). Radiographic improvement might be evident from three to four months after the initial diagnosis, while symptomatic relief usually precede the imaging process and occurs between three and six weeks after the onset of the radicular pain. Notably, if a contrast MRI is obtained earlier, instead of resorption only the process of newly formed vessels or neovascularization which is an important part of the staged resolution can be demonstrated.

A review of the current cases and previously reported ones has shown that C5-C6 and C6-C7 are the most common site for an extruded disc that undergoes resolution (6,15,16,18,21-25,28,29). This reflects the greater frequency of cervical discs at these levels in the general population. However, spontaneous disappearance of discs at C3-C4 and C4,C5 levels have not been mentioned yet. We also could not find a case at higher levels on the subaxial cervical spine.

The indications for surgical discectomy are very straightforward and include radiculopathy with an apparent motor deficit as well as myelopathy. However, some surgeons try surgical intervention when a patient
is admitted with intractable radicular pain, even in the absence of neurological impairment. We believe that a proper conservative regimen can decrease pain and discomfort dramatically in the first few weeks of treatment, particularly if the intractable pain is documented to be caused as the result of a mechanical compression by a sequestered and laterally located disc fragment.

As part of continuation of conservative treatment, rest at home or stopping work might be necessary but only for the first two weeks of the discomfort (18). We found that wearing a soft collar and intermittent neck traction are of great assistance in this period. Hard collars such as a Philadelphia collar where the neck and head go in extension, might aggravate the radiculopathy because of the narrowing of the foramina.

Nonetheless, the outcome of this conservative treatment in selected group of the patients with radiculopathy caused by a transgressed extruded disc lodged at one foramen is expected to be very good (6,15,16,18,21-25,28,29).

Obviously, conservative management does not have the shortcomings of surgical treatment such as dysphagia, dysphonia, untoward esophageal injuries and in particular adjacent level disc disease is not seen in conservative treatment.

In conclusion, the details of the current study offer a strong clue about the validity of conservative management for certain types of cervical disc herniation. According to this study, spontaneous regression is very probable in a sequestered disc located at the vicinity of a foramen. However, this does not mean the subligamentous sequestrated disc fragments do not undergo resorption (4). Frequency of the regression of the cervical discs lets one to try conservative treatment first and to avoid rushing to surgical intervention if the patients have monoradiculopathy but are free of neurological deficit and with a MRI-documented sequestered disk fragment near to a foramen. Repeated MRI scans may provide evidence of morphological regression and the disappearance of such disc fragments. Finally, one can reassure the patient about the safety of this type of management and even of its superiority to surgical intervention.

REFERENCES


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