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Spontaneous regression of cervical discs

Retrospective analysis of 14 cases

Okan Turk, MD[a,*], Can Yaldiz, MD[b]

Abstract

Cervical disc herniation is a condition which arises from compression of cervical spinal nerve root by the degenerated disc and vast majority of the patients are aged between 30 and 40 years. Spontaneous regression of cervical disc was first reported by Kriegerand Maniker in 1992. Our study is the second large series in literature. Besides, 4 patients are the first who were shown to have resorption in C 4-5.

The records of patients diagnosed with cervical disc herniation who applied to the Spine Polyclinic between 2014 and 2018 were reviewed retrospectively. The files of the patients who were recommended surgery with the diagnosis of cervical disc herniation were examined. Patients who did not accept surgery on their own initiative, but who attended our outpatient clinic for a check-up were included in the study.

Of a total of 14 patients, 28.57% (n=4) were male and 71.43% (n=10) were female. Mean age of the patients was 40.79 (range 25–60).

The results of the study indicate that likelihood of spontaneous regression is higher in para-central or foraminal disc compared to central disc hernias. Although there are a limited number of case reports in the literature, conservative treatment seems to be a good option in patients without neurological deficits, with foraminal disc hernias and not requiring emergency surgery.

Abbreviations: ADC = apparent diffusion coefficient, CDH = cervical disc herniation, CNR = contrast-to-noise ratio, DWI = diffusion-weighted imaging, EMG = electro neuro-myographies, GRAPPA = generalized autocalibrating partially parallel acquisitions technique, RS-EPI = readout-segmented eco-planar imaging, SNR = signal-to-noise ratio, SS-EPI = single-shot echo-planar imaging, T1-WI = T1-weighted, T2-WI = T2-weighted, VAS = visual analog scale.

Keywords: cervical discs, magnetic resonance imaging, spontaneous regression

1. Introduction

Neck pain gradually increases in recent years due to sedentary life style although less frequent than low back pain. Approximately, 70% of the individuals experience neck pain at least once during their life time.[1] Yearly prevalence varies between 10% and 20%.[2,3]

Cervical disc herniation (CDH) is a condition which arises from compression of cervical spinal nerve root by the degenerated disc and vast majority of the patients are aged between 30 and 40 years.[4] Treatment options include conservative and surgical treatment. Most patients benefit from conservative treatment however surgical treatment may be recommended in presence of refractory pain or motor loss of power.[5–7] Spontaneous regression of CDH was first described by Krieger and Maniker in 1992.[8] Limited data are available in the literature about spontaneous regression of cervical disc herniation.

The aim of the present study is to define the patients who had been recommended surgical treatment due to protruded or extruded CDH however who did not agree for the operation, who were detected to have spontaneous resorption on cervical spinal MRI obtained for follow-up and to determine the response to conservative treatment.

Our study is the second larger serial following that of Rahimizadeh et al.[9] Besides the cases 1, 3, 13, and 14 in Table 1 are the first C 4-5 CDH patients who were shown to have resorption.

Editor: Takayuki Masui.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (name of institute/committee) and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

For this type of study formal consent is not required. This article does not contain any studies with human participants performed by any of the authors.

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The authors have no funding and no conflicts of interest to disclose.

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Medicine (2019) 98:7(e14521)

Received: 23 July 2018 / Received in final form: 22 January 2019 / Accepted: 22 January 2019

http://dx.doi.org/10.1097/MD.0000000000014521

Table 1

Distribution of demographic characteristics of the patients.

No	Age	Gender	Complaint	Final neurologic examination	Level of CDH	MRI Type of herniation	EMG	Duration of reduction in severe pain, weeks	Duration between 2 MRIs, months	VAS at the time of diagnosis	VAS on control	Duration of physical therapy, weeks	Treatment for neuropatic pain
1	33	M	Pain in back of the neck, right arm	No motor deficit	c4-5	Central right foraminal	Normal	6	3	6	1	6	No
2	33	F	Pain in back of the neck, right arm	No motor deficit. Hypo-esthesia in right C6	c6-7	Diffuse discal, central dominancy	No	8	2	8	2	4	No
3	38	M	Pain in back of the neck, left shoulder	No motor deficit	c4-5	Right para-central foraminal	Normal	5	14	6	3	—	No
4	38	F	Pain in back of the neck, right arm	No motor deficit	c5-6	Right para-central	Normal	4	7	7	2	2	Yes—shorter than 6 months (Gabapentin)
5	28	M	Pain in back of the neck, left arm	No motor deficit. Hypo-esthesia in left C5-6	c5-6	Left para-median-foraminal	Normal	5	15	7	3	3	No
6	40	F	Pain in back of the neck, right arm	No motor deficit. Hypo-esthesia in right C6	c6-7	Right para-central-foraminal extruded	C6 chronic radiculopathy	6	6	6	3	6	Yes—shorter than 6 months (Gabapentin)
7	46	F	Pain in left arm	No motor deficit	c5-6	Diffuse	Normal	6	18	8	2	—	No
8	51	F	Pain in back of the neck, right arm	No motor deficit	c6-7	Central-left para-central	No	4	7	6	1	—	No
9	60	F	Pain in back of the neck, right arm	No motor deficit	c6-7	Right foraminal	No	4	11	5	1	4	Yes—shorter than 6 months (Pregabalin)
10	37	F	Pain in back of the neck, left arm	No motor deficit hypo-esthesia in left c6-7	c6-7	Right foraminal	No	7	2	8	6	6	Yes—shorter than 6 months (Gabapentin)
11	36	F	Pain in back of the neck, left arm	No motor deficit	c5-6	Central- left para-central extruded	Normal	4	20	8	4	—	No
12	55	F	Pain in back of the neck, right arm	Right forearm flexion 4-5/5	C5-6	Foraminal	C5 chronic adiculopathy	4	13	6	5	4–2	Yes—shorter than 12 months (Pregabalin)
13	51	F	Pain in back of the neck, left arm	No motor deficit	C4-5	Left foraminal	No	3	6	7	4	—	No
14	25	M	Left arm	No motor deficit	C4-5	Left foraminal	Normal	5	12	9	5	—	No

CDH = cervical disc herniation, EMG = electro neuro-myographies, VAS = visual analog scale

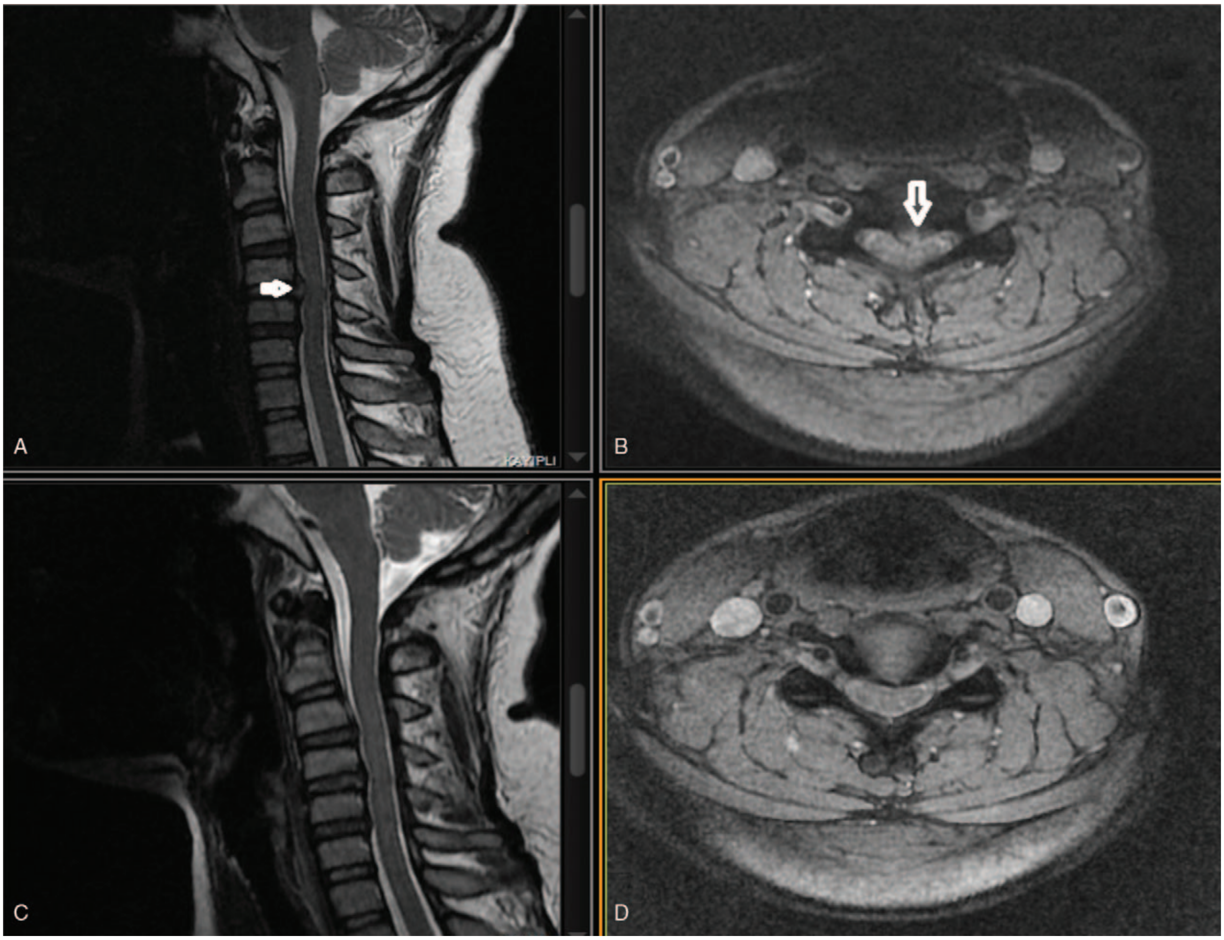

Figure 1. Of case 3, (A, B) Sequestered CDH on sagittal and axial spinal cervical MRI on admission (white arrow) . (C,D) Resorption image of the disc on control spinal cervical MRI. CDH = cervical disc herniation.

2. Material and method

Records of the patients who were admitted to Spine Outpatient Clinic between 2014 and 2018 and who were diagnosed with CDH were retrospectively screened. The patients who were admitted with neck pain and radicular pain were seen to have extruded or protruded CDH on magnetic resonance imaging (MRI) and to have been recommended surgery. The files of the patients who were recommended surgery with the diagnosis of cervical disc herniation were examined. Patients who did not accept surgery on their own initiative, but who attended our outpatient clinic for a check-up were included in the study. As a result of the evaluation, patients with spontaneous regression in the cervical spinal MRI were detected radiologically. When the files were examined, the patients whose anamnesis and neurological examination, radiological examinations and visual analog scale (VAS) scores were not complete, and who underwent invasive spinal pain interventional procedures between 2 outpatient and radiological examinations, and those who received physical therapy and rehabilitation were excluded from the study. Data about age, gender, complaints, cervical spinal MRI, level of CDH, whether they received physical therapy or therapy for neuropathic pain, visual analog scale scores, upper extremity electro neuromyographies (EMG) were obtained from patient files.

3. Results

Of a total of 14 patients, 28.57% (n = 4) were male and 71.43% (n = 10) were female. Mean age of the patients was 40.79 years (range 28–60). Mean duration between the time of MRI obtained on admission and the time of MRI obtained after follow-up was estimated as 9.71 months. Minimum time between 2 MRIs is 2 months (Table 1) (Figs. 1–3).

VAS scores on admission varied between 5 and 8, mean VAS score was 6.93. VAS score was 4–6 in 6 patients and 7–10 in 8 cases. On control, mean VAS score was 3 (range 1–6). VAS score was 1–3 in 9 cases and 4–6 in 5 cases.

Five patients were started therapy for neuropathic pain. Seven patients received therapy for neuropathic pain at any time of their treatment. Treatment of 3 patients (25%) still continues (minimum 6 months). Eight patients received physical therapy at any time and for any duration.

Mean duration of regression in complaints was found as 5.07 (4–8 weeks) in patients who had severe and disturbing complaints on admission. Permanent motor deficit developed in 1 patient. Patient no. 12 was operated as clinical complaints continued despite resorption in CDH and his/her pain recovered in postoperative period. Five patients had hypo-esthesia in dermatome consistent with the radiologic findings.

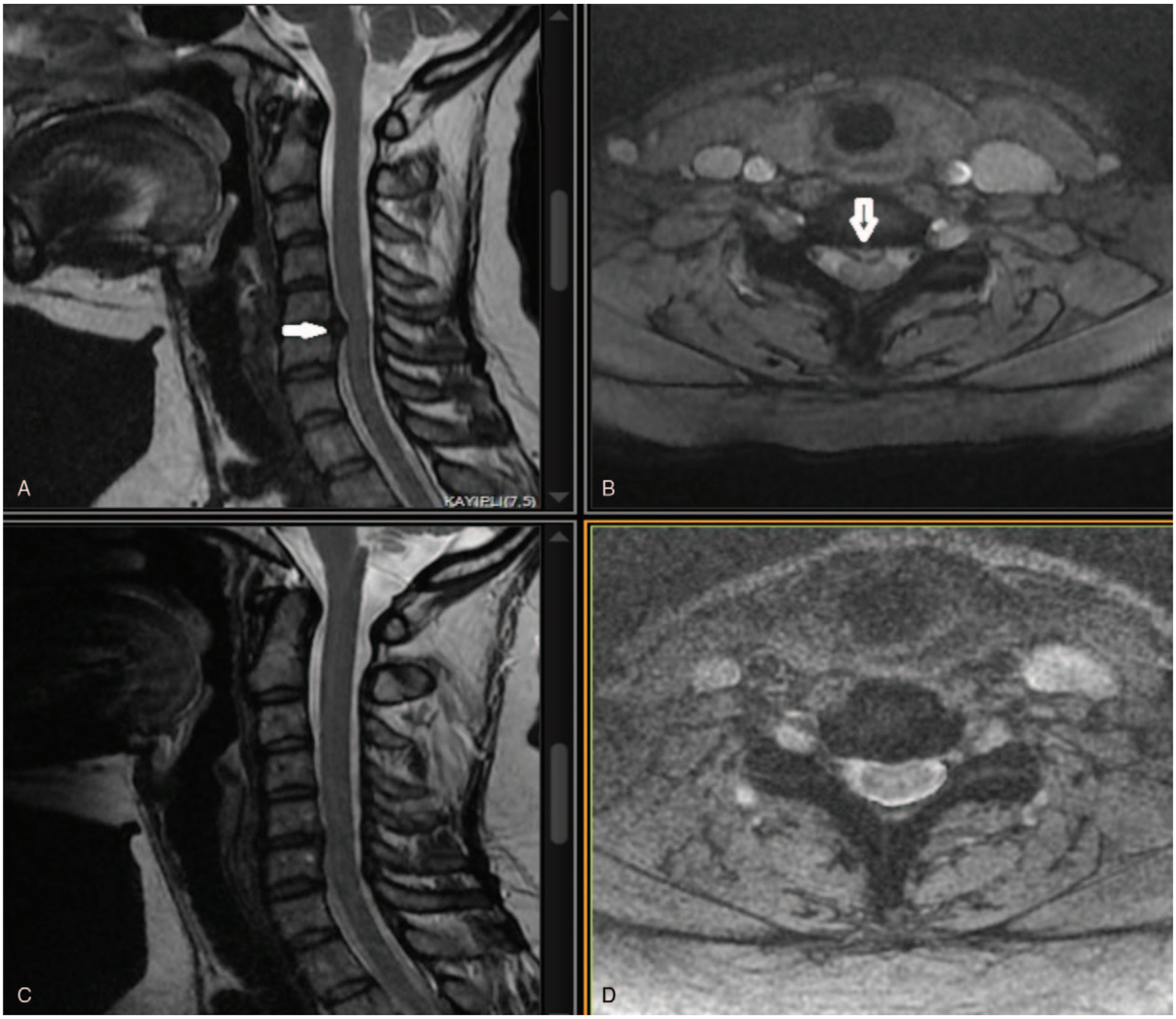

Figure 2. Of case 7, (A, B) Sequestered CDH on sagittal and axial spinal cervical MRI on admission (white arrow). (C, D) Resorption image of the disc on control spinal cervical MRI. CDH=cervical disc herniation.

Duration between 2 MRIs varied between 2 and 20 months. Mean duration between 2 MRIs on which CDH was detected to disappear was mean 9.71 months.

EMG was obtained in 9 cases and found normal except 2.

4. Discussion

Spontaneous regression of CDH was first reported by Krieger and Maniker in 1992.[8] Limited data are available in the literature about spontaneous regression of CDH. Rahimizadeh et al. have reported 26 cases, Gürkanlar et al[10] 6 cases, Vinas et al[11] 4 cases, Mochida et al[12] 3 cases, a total of 9 cases with spontaneous regression was reported in literature until today.[8–16] Our study is the second large serial in the literature.

When previous case reports and serials were analyzed, C5-C6 and C6-C7 were seen to be the locations where resorption is observed most. Spontaneous regression of C3-C4 and C4-C5 has not been reported yet.[9] While our serial is consistent with literature, cases 1, 3, 13, and 14 in Table 1 had CDH at level C4–5 and this is the first in literature.

Reports of spontaneous resorption have been dominantly reported in males (9). Female dominancy was seen in our study, on the contrary to literature.

Three hypotheses have been proposed for spontaneous regression of inter-vertebral disc herniations. First is the retraction of the protruded disc. Second is gradual dehydration and shrinkage of the disc. The third hypothesis is enzymatic degradation of disc tissue due to inflammatory reaction and neo-vascularization and phagocytosis.[3,17–19] This is the most striking mechanism. The extruded disc material is suggested to be perceived as a "foreign body" in epidural vascular field of the spine and lead to an inflammatory reaction by auto-immune system.[3,20] Various histo-pathologic studies of surgical samples and test animal researches support this theory.[21,22] However, it is possible that all 3 mechanisms play a role in regression and disappear of the herniated disc tissue.

MRI is also useful in evaluating the generative disk because it is highly sensitive to the water content in the disc tissue. T2-weighted (T2-WI) and T1-weighted (T1-WI) MRI are the most common techniques for examining the health of intervertebral discs.[23–26] MRI is also used in disk rating systems. However,

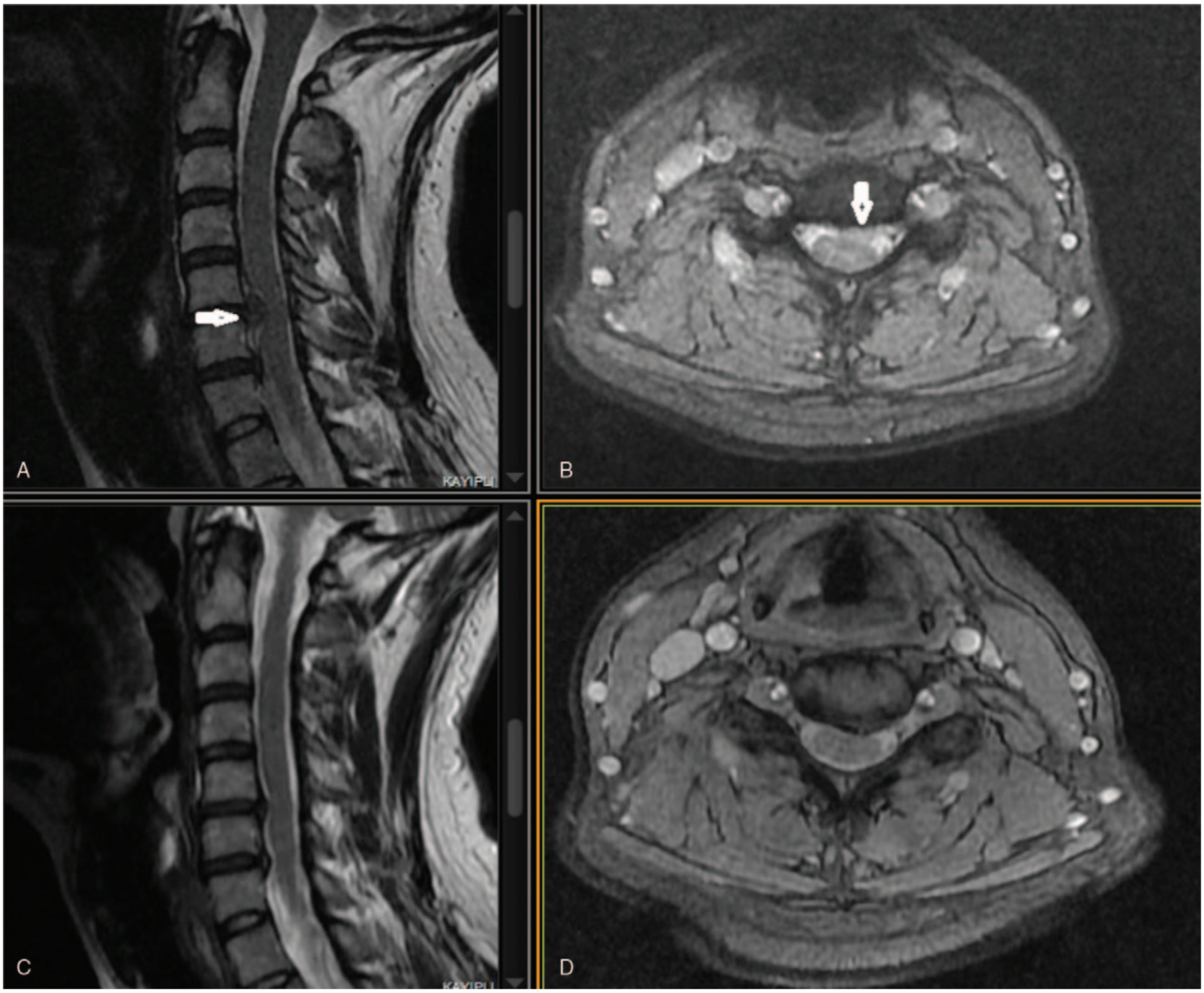

Figure 3. Of case 11, (A,B) Sequestered CDH on sagittal and axial spinal cervical MRI on admission (white arrow). (C,D) Resorption image of the disc on control spinal cervical MRI. CDH = cervical disc herniation.

traditional MRI techniques are insufficient to detect biochemical changes in the disc. For this reason, it restricts the applications for early diagnosis of the generative disc. In order to understand biochemical changes in different tissue types, many quantitative functional MRI techniques, such as T2 mapping, T2 star and diffusion-weighted imaging (DWI), have been developed. Among these techniques, DWI has been indicated to reveal pathophysiological status in intervertebral discs. In particular, DWI may provide valuable information on the biochemical content of the disc by detecting random movements of water molecules in the intracellular or extracellular fluid. Based on the DWI data, the apparent diffusion coefficient (ADC) can be calculated to determine the degree of water use in the disc. However, there is a significant technical limitation in the diagnosis of degenerative DWI application.[23–26] Specifically, single-shot echo-planar imaging (SS-EPI) is the routine sequence for clinical DWI tests, but SS-EPI has many disadvantages, including artefacts, which appear as image blur. Readout-segmented eco-planar imaging (RS-EPI) has been suggested as a better alternative to SS-EPI due to reduced distortion. In addition, RS-EPI has proven to be better at qualitative image quality, such as signal-to-noise ratio (SNR), lesion contrast and contrast-to-noise ratio.[27] RS-EPI sequence with 2-dimensional navigator correction, RESOLVE (REadout Segmentation Of Long Variable Echo-trains) is the latest RS-EPI technique. Sensitivity can reduce distortions caused by respiration, motion and vibrations and increase spatial resolution for higher quality images. In addition, generalized autocalibrating partially parallel acquisitions technique (GRAPPA) which can also be applied to reduce scan time in MRI examination.[23–26] Diffusion-weighted imaging (DWI) is an imaging technique that provides basic information about the tumor composition, such as cellularity and / or perfusion. Several reports showed a significant correlation between DWI and cell count in different malignancies. Furthermore, DWI is helpful in differentiating malignant and benign lesions. According to the literature, malignant tumors have a significantly lower ADC than benign lesions.[23–27] In addition, as high spatial resolution enabled gradient echo MR imaging of the reconstructed three-dimensional (3D) Fourier transformation constructive interference in steady state (CISS) intervention spinal cord, spinal disc relationship can be used in terms. It determines small structures surrounded by 3-D CISS MR imaging, high contrast enhancement and high-resolution CSF. This provides the convenience of use for MRI cisternography.[28]

Documentation of spontaneous regression is important only when it is supported by detailed imaging findings. Identification of the lesions of the spine requires clinical suspicion and advanced radiological imaging evaluation. Bone and soft tissue lesions of the spine usually have characteristic imaging features that can help making in differential diagnosis. MRI imaging are the best methods to characterize bony spinal lesions and to identify neural compression and its relation to surrounding tissue.[23–25]MRI is the best preferred radiologic tool for displaying magnitude, exact location and level of the disc. In addition, serial MRIs is the preferred method for documentation of resorption. In the literature, resorption is more frequent in cervical discs close to cervical foramens and conservative options may be tried for the discs at this location. However, this option should not be preferred in central discs.[9] While radiologic recovery may arise 3 to 4 months after diagnosis, symptomatic relief usually develops before radiologic recovery and seen between 3 and 6 weeks.[9] Mean duration between MRIs at regression and disappearance is 9.71 months. Minimum duration was found as 2 months. Axial cervical spinal MRI CDHs included foraminal, para-central, central disc herniations (Table 1).

Disc resorption can be seen in MR images. However, clinical improvement does not always accompany to radiological improvement in these patients. There are adhesions due to inflammation during responsible resorption in here. In current MR imaging, we cannot see this clearly. We believe that more information can be obtained with imaging methods and progress in health technologies in the future.[28–32]

Clinical recovery is usually associated with radiologic regression. However, a direct association was not reported between clinical and radiologic recovery.[3] In our study, complaints of the patients reduced at mean 5.07 weeks. However, we could not see the same radiologic recovery on MRIs obtained in the early period. Besides, almost all of the patients had continuing or recurrent radicular pain despite radiologic recovery.

5. Conclusion

According to the results of the present study, likelihood of spontaneous regression is higher in para-central or foraminal discs compared to central disc hernias. Although limited number of case reports are available in literature, conservative treatment seems to be a good option in patients who have foraminal discs, who do not have neurologic deficit and who do not require urgent surgery.

Author contributions

Data curation: Okan Turk.
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Methodology: Can Yaldiz.
Resources: Okan Turk.
Software: Can Yaldiz.
Supervision: Can Yaldiz.
Validation: Okan Turk.
Visualization: Okan Turk.
Writing – original draft: Can Yaldiz.
Writing – review & editing: Can Yaldiz.

References

[1] Fejer R, Kyvik KO, Hartvigsen J. The prevalence of neck pain in the world population: a systematic critical review of the literature. Eur Spine J 2006;15:834–48.
[2] Jull G, Sterling M, Falla D, et al. Therapeutic exercise for cervical disorders: practice pointers. Whiplash, Headache, and Neck Pain: Research-Based Directions for Physical Therapies 1st edn. Churchill Livingstone Elsevier; 2008; 207–229.
[3] Komori H, Shinomiya K, Nakai O, et al. The natural history of herniated nucleus pulposus with radiculopathy. Spine 1996;15(21(2)):225–9.
[4] Dahnert W. Radiology Revievv Manual. 3rd edn. Baltimore: Williams & Wilkins Company; 1996. 146–147.
[5] Kim SG, Yang JC, Kim TW. Spontaneous regression of extruded lumbar disc herniation: three cases report. Korean J Spine 2013;10:78–81.
[6] Yang X, Zhang Q, Hao X, et al. Spontaneous regression of herniated lumbar discs: report of one illustrative case and review of the literature. Clin Neurol Neurosurg 2016;143:86–9.
[7] Ryu SJ, Kim IS. Spontaneous regression of a large lumbar disc extrusion. J Korean Neurosurg Soc 2010;48:285–7.
[8] Krieger AJ, Maniker AH. MRI-Documented regression of herniated cervical nucleus pulposus: a case report. Surg Neurol 1992;37:457–9.
[9] Rahimizadeh A, Hamidifard A, Rahimizadeh S. Spontaneous regression of the sequestrated cervical discs: a prospective study of 26 cases and review of the literature. World Spinal Column J 2013;4:32–41.
[10] Gurkanlar D, Yucel E, Er U, et al. Spontaneous regression of cervical disc herniations. Minim Invasive Neurosurg 2006;49:179–83.
[11] Vinas FC, Wilner H, Rengachary S. The spontaneous resorption of herniated cervical discs. J ClinNeurosci 2001;8:542–6.
[12] Mochida K, Komori H, Okawa A, et al. Regression of cervical disc herniation observed on magnetic resonance imaging. Spine 1998;23: 990–5.
[13] Orief T, Orz Y, Attia W, et al. Spontaneous resorption of sequestrated intervertebral disc herniation. World Neurosurg 2012;77:146–52.
[14] Pan H, Xiao LW, Hu QF. Spontaneous regression of herniated cervical disc fragments and its clinical significance. OrthopedicsSurgery 2010;2:77–9.
[15] Stavrinou LC, Stranjalis G, Maratheftis N, et al. Cervical disc, mimicking nerve sheath tumor, with rapid spontaneous recovery: a case report. Eur Spine J 2009;18:176–8.
[16] Han SR, Choi CY. Spontaneous regression of cervical disc herniation: a case report. Korean J Spine 2014;11:235–7.
[17] Guinto FC Jr, Hashim H, Stumer M. CT demonstration of disk regression after conservative therapy. AJNR Am J Neuroradiol 1984;5:632–3.
[18] Teplick JG, Haskin ME. Spontaneous regression of herniated nucleous pulposus. AJR Am J Roentgenol 1985;145:371–5.
[19] Slavin KV, Raja A, Thornton J, et al. Spontaneous regression of a large lumbar disc herniation: Report of an illustrative case. Surg Neurol 2001;56:333–6.
[20] Bozzao A, Gallucci M, Masciocchi C, et al. Lumbar disk herniation: MR imaging assessment of natural history in patients treated without surgery. Radiology 1992;185:135–41.
[21] Haro H, Shinomiya K, Komori H, et al. Up regulated expression of chemokines in herniated nucleus pulposus resorption. Spine 1996;21: 1647–52.
[22] Hirabayashi S, Kumano K, Tsuiki T, et al. A dorsally displaced free fragment of lumbar disc herniation and its interesting histologic findings. A case report. Spine 1990;15:1231–3.
[23] Chen P, Wu C, Huang M, et al. Apparent diffusion coefficient of diffusion-weighted imaging in evaluation of cervical intervertebral disc degeneration: an observational study with 3.0 T magnetic resonance imaging. Biomed Res Int 2018;18:6843053.
[24] Surov A, Nagata S, Razek AA, et al. Comparison of ADC values in different malignancies of the skeletal musculature: a multicentric analysis. Skeletal Radiol 2015;44:995–1000.
[25] Abdel Razek AA, Alvarez H, Bagg S, et al. Imaging spectrum of CNS vasculitis. Radiographics 2014;34:873–94.
[26] Abdel Razek AA, Gaballa G, Denewer A, et al. Diffusion weighted MR imaging of the breast. Acad Radiol 2010;17:382–6.
[27] Abdel Razek A, Samir S. Diagnostic performance of diffusion-weighted MR imaging in differentiation of diabetic osteoarthropathy and osteomyelitis in diabetic foot. Eur J Radiol 2017;89:221–5.
[28] Yamada H, Yamamoto A, Okada T, et al. Diffusion tensor imaging of the optic chiasm in patients with intra or parasellar tumor using readout-segmented echoplanar. Magn Reson Imaging 2016;34:654–61.
[29] Fushimi Y, Miki Y, Ueba T, et al. Liliequist membrane: three-dimensional constructive interference in steady state MR imaging. Radiology 2003;229:360–5.
[30] Zhang YT, Zheng YL, Lin WH, et al. Challenges and opportunities in cardiovascular health informatics. IEEE Trans Biomed Eng 2013;60: 633–42.
[31] Hea X, Zhang H, Landis M, et al. Unsupervised boundary delineation of spinal neural foramina using a multi-feature and adaptive spectral segmentation. Med Image Analysis 2017;36:22–40.
[32] Xu L, Huang X, Ma J, et al. Value of three-dimensional strain parameters for predicting left ventricular remodeling after ST-elevation myocardial infarction. Int J Cardiovasc Imaging 2017;33:663–73.