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Retropharyngeal approach in cervical disc hernias

Servikal disk hernilerinde retrofarengeal yaklaşım

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Abstract

Aim: High-level disc hernias are rare pathologies encountered in clinical practice. Treatment is more difficult than other cervical disc hernias. In this study, we aimed to convey our clinical experience in C2-3 and C3-4 disc herniations, also presenting the complications we encountered during surgical treatment.

Methods: In this retrospective cohort study, we reviewed the clinical and radiological records of 42 patients we operated between 2010-2019. Magnetic resonance imaging, computed tomography and direct radiographs were utilized as imaging modalities. Anterior retropharyngeal approach was the preferred surgical method. The modified Japanese Orthopedic Association (mJOA) score and Nurick Scale were used in clinical follow-up and physical examination of these patients.

Results: Among all patients, the most common symptom was severe pain radiating from the neck to the occipital region. The mean age was 54.14 years. The average mJOA scores were 15.1 in the preoperative period and 17 in the postoperative sixth month. We observed that 83.3% of our patients had an mJOA recovery rate of fifty percent and above. All but seven patients' complaints improved well after treatment. There was a negative correlation between symptom duration and recovery rate (P=0.003, Correlation Coefficient r=-0.449). The rate of recovery was lower in patients with a longer duration of symptoms. Three of our patients developed difficulty in swallowing after the operation and recovered within four weeks with diet and exercise.

Conclusion: We determined that retropharyngeal approach is a safe option for disc hernias at the upper cervical level. However, long operation time and excessive retraction during surgery may lead to complications such as difficulty in swallowing due to the stretching of the neural structures.

Keywords: Cervical disc hernia, Anterior retropharyngeal approach, Dysphagia

Öz

Amaç: Bilindiği gibi yüksek düzey disk hernileri klinik pratikte karşılaştığımız nadir patolojilerdir. Tedavisi diğer boyun fıtıklarına göre daha zordur. Bu çalışmada üst düzey servikal disk hernilerindeki (C2-3 ve C3-4) klinik deneyimlerimizi aktarmak istedik. Ayrıca, cerrahi yaklaşımda karşılaştığımız komplikasyonları da anlattık.

Yöntemler: Çalışmamızda geçmiş yıllarda (2010-2019) ameliyat ettiğimiz kırk iki hastanın klinik ve radyolojik kayıtlarını geriye dönük olarak gözden geçirdik. Hastaların görüntüleme testlerinde manyetik rezonans görüntüleme, bilgisayarlı tomografi ve direkt radyografilerden yararlanıldı. Cerrahi yöntem olarak anterior retrofarengeal yaklaşım kullanıldı. Hastaların değerlendirmelerinde klinik takip ve fizik muayenede modifiye Japon Ortopedi Derneği (mJOA) skoru ve Nurick Skalası kullanıldı.

Bulgular: Hastalarda en sık görülen semptom, boyundan oksipital bölgeye yayılan şiddetli ağrıdır. Hastaların ortalama yaşı 54,14 idi. Hastalarımızın ortalama mJOA skoru preoperatif dönemde 15,1, postoperatif altıncı ayda 17 olarak ölçüldü. Hastalarımızın %83,3'ünde mJOA iyileşme oranının yüzde elli ve üzerinde olduğu, %16,7'sinin ise yüzde 50'nin altında olduğu görüldü. Yedi hasta dışında hastaların şikayetleri tedaviden sonra düzeldi. Semptom süresi ile iyileşme oranı arasında negatif korelasyon vardı (P=0.003, Korelasyon Katsayısı r=-0.449). Semptom süresi daha uzun olan hastalarda iyileşme oranının daha düşük olduğu görüldü. Ameliyattan sonra üç hastamız yutma güçlüğü geliştirdi. Hastamız diyet ve egzersizle dört hafta içinde iyileşti.

Sonuçlar: Çalışmamız sonucunda retrofaringeal yaklaşımın üst servikal seviyedeki disk hernileri için güvenli bir seçenek olduğunu bulduk. Ancak ameliyat sırasında uzun ameliyat süresinden ve aşırı geri çekilmeden kaçınmazsak, sinir yapılarının gerilmesinden dolayı yutma güçlüğü gibi komplikasyonlarla karşılaşabiliriz.

Anahtar kelimeler: Servikal disk hernisi, Anterior retrofarengeal yaklaşım, Yutma güçlüğü

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Introduction

A herniated disc in the cervical spine is usually located at C5-6 and C6-7 levels. However, the cervical herniated disc at the C2-3 segment is extremely rare [1], and usually occurs in elderly patients. Similarly, disc herniation at C3-4 level is an uncommon pathology and constitutes between 4-8% of all cervical disc hernias. The approach to the upper cervical region is highly challenging because of the mandible and the complex anatomy [2-4]. Several techniques have been described for approaching this region, such as anterolateral extradural, trans-corporeal, posterior extradural, transoral, anterior retropharyngeal and submandibular parapharyngeal approaches [5-9]. In this study, we shared our experience with 42 patients who were operated for cervical disc hernia at the C2-3 and C3-4 levels between June 2010-June 2019. Anterior retropharyngeal approach was our preferred technique. Our research in the literature showed that there are small case series about upper cervical disc hernias or a small section among larger cervical disc hernia series. Accordingly, our study includes the largest case series ever written on this subject.

Materials and methods

We operated forty-two patients who underwent surgical treatment due to C2-3 and C3-4 level disc herniation from June 2010 to June 2019 in our department. The patients' data were collected retrospectively from hospital records, including patients' demographic information, operative details, clinical outcomes, and radiological images (Table 1). All patients were evaluated with magnetic resonance imaging (MRI), cervical roentgenograms and computerized tomography (CT) (Figure 1). The modified Japanese Orthopedic Association (mJOA) score and Nurick Scale were used in the clinical follow-up and physical examination of the patients. The improvement rate of mJOA was calculated using the Hirabayashi method ((postoperative mJOA-preoperative mJOA)/(18-preoperative mJOA) x 100) [10]. The mJOA recovery rate of 50 percent or more was considered satisfactory. We used a sub-axial anterior retropharyngeal approach to remove the herniated disc from C2-3 and C3-4 disc space. Sample cases in our series are shown in Figure 1, 2 and Figure 3. A cervical collar was prescribed to the patients for use during the first four postoperative weeks. Exercise and diet program were applied to patients who had difficulty swallowing. Shaker exercise was taught to the patients and prescribed as a home program for four weeks every other day, 3 days a week and once a day. It was suggested that the amount of food intake at each meal be reduced. The clinical and radiographic outcomes were recorded and analyzed.

Surgical technique

All patients were operated under general anesthesia. The patient was placed in the supine position with hyperextension of the neck. A transverse incision was made from the anterior margin of the sternocleidomastoid muscle and extended until the anterior cervical midline of the C3 level. Then, the platysma and superficial fascia was incised horizontally. The facial artery and submandibular gland were retracted supero-laterally. The deep cervical fascia was divided, the pre-tracheal fascia was bluntly dissected, and carotid pulse was palpated. The prevertebral fascia was incised. A plane was created to reveal the cervical spine by cutting the prevertebral fascia between the medial border of the carotid sheath and the midline of the spinal column. After this stage, the vascular and neural structures at high cervical levels were dissected and retracted, and C2-3 and C3-4 disc spaces were reached. In two of our patients, the facial vein was ligated because it narrowed the surgical area. The disc contents and endplates were removed. The cervical Polyetheretherketone (PEEK) cage and auto graft were implanted.

Statistical analysis

Frequency and percentage, mean value, standard deviation, min-max are used for descriptive statistics. Shapiro-Wilk test was used to evaluate the normality of distribution of the quantitative variables, unpaired and paired T tests were utilized for comparison of normally distributed independent and dependent variables, respectively. Pearson Correlation Coefficient was used to show the relationship between variables. $P<0.05$ was considered statistically significant.

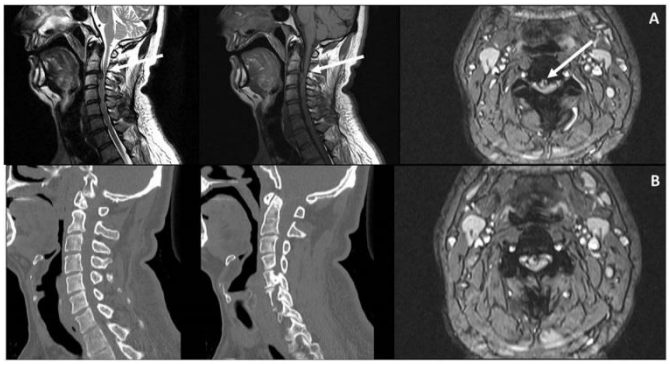

Figure 1: 38 /M He had severe pain in the right arm and suboccipital area for three months, no loss of motor function and a positive Hofmann reflex. A-In the preoperative period, C2-3 level discs are shown on the sagittal T1-T2 weighted MRI and axial-T2 MRI. B-Sagittal CT images and axial-T2 MRI show the C2-3 level disc.

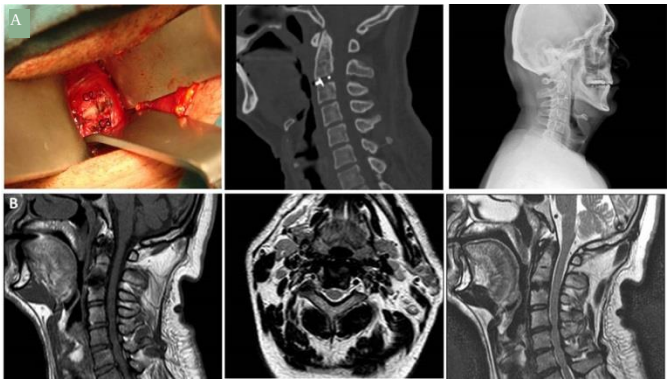

Figure 2: A- The intraoperative photograph of the C2-3 level is shown in the first box, followed by its postoperative images in sagittal CT and Lateral Cervical Spine Radiograph. B-In the postoperative period, C2-3 level disc was removed, which is demonstrated on the T1-sagittal, T2-axial and T2- Sagittal MRI images.

Figure 3: 51/M He complained of neck pain and had mild difficulty in buttoning and walking but could perform these without help. A- T2 sagittal and axial MRI sequence showing C3-4 disk herniation B- Sagittal and Axial CT scan of the spine revealed the C3-4 level C- Postoperative T2 sagittal MRI showing decompression D- Postoperative X-ray images revealed the peek cage

Results

In this study, 42 patients, 32 males and 10 females, were operated during a nine-year period. The mean age of all patients was 54.14 years. Suboccipital and neck pain was the most common symptom. Nine patients presented with signs of myelopathy, including gait difficulty and motor loss in the distal muscle groups of the upper extremities. In addition, their hand skills were severely reduced, and Hoffman's Sign was positive in physical examination. The mean duration of symptoms was 7.4 months. The patients were followed up for 23.1 months. Clinical symptoms and signs in the patients improved in the postoperative period except for seven patients. The mean preoperative Nurick score was 0.73. The average mJOA score of our patients was 15.1 in the preoperative period and 17 in the postoperative sixth month. Among all, 83.3% of our patients had a mJOA recovery rate of fifty percent and above. The mean mJOA recovery rate was 69.9%. There was a negative correlation between duration of symptoms and recovery rate (P=0.003, Correlation Coefficient=-0.449). The rate of recovery was lower in patients with a longer duration of symptoms (P=0.003). The mean duration of operation was 135.9 minutes, with 148 minutes for repair of hernias at C2-3, and 133.9 minutes for those at C3-4 (P=0.093). Mild dysphagia developed in three patients, who recovered in four weeks. The mean operative time of patients with postoperative swallowing difficulties was 184 minutes, while it was 132.2 minutes in patients without complications. This difference was statistically significant and there was a significant relationship between dysphagia and duration of surgery (P=0.004) (Table 2). Superficial wound infection developed in two patients, whose wounds healed within two weeks with antibiotic treatment and wound care.

Table 1: Demographic and clinical information of the patients

	Number of Patients	Minimum	Maximum	Mean	SD
Age	42	38	76	54.14	9.67
Follow-up Time (Month)	42	8	48	23.12	11.10
Preoperative Modified JOA Score	42	12	16	15.17	1.32
Postoperative Modified JOA Score	42	15	18	17.00	1.01
Preoperative Nurick Score	42	0	2	0.74	0.79
Recovery Rate of Modified (JOA	42	33.33	100	69.9	25.30
Duration of Symptoms (Month)	42	4	17	7.38	3.49
OperationTime(Minute)	42	110	190	135.98	18.90

Table 2: Statistical outcomes

Values		Number of Patients	Mean/SD	*P*-value
Modified JOA Score	Preoperative	42	15.17 (1.32)	0.001
	Postoperative	42	17.00 (1.01)	
Operation Time(minute)	Dysphagia	3	184.00 (7.21)	0.001**
	Other Patients	39	132.28 (13.66)	
Operation Time(minute)	C2-3 Level	6	148.00 (18.64)	0.093**
	C3-4 Level	36	133.97 (18.44)	
Duration of Symptoms (Month)	Complications	7	10.71 (3.59)	0.004**
	No complications	35	6.71 (3.11)	

* Paired t-Test, ** Unpaired t-test (Student t-Test)

Discussion

Cervical disc herniations are one of the stages of the spinal degeneration and often occur in the third and fourth decades. C5-6 and C6-7 levels are the most frequently affected segments. Anterior cervical discectomy and fusion is a method in which spinal cord and roots are relieved with decompressive surgery [1]. Fusion and sagittal balance are achieved using a cage [1,9]. Spine surgeons often prefer this method in cervical disc pathologies.

C2-3 and C3-4 level disc herniations are usually seen in the elderly population. Etiology is still unclear. However, there are some opinions in the elderly population that upper cervical level disc hernia develops because of the increase in upper segments due to spondylosis, which develops over time at C5-6 and C6-7 levels. It is less common in the younger population [3]. In our series, the mean age was in harmony with the literature. The side approach to the cervical spine involves surgical difficulties due to vertebral artery and nerve roots [8]. Anterior approach to the cervical spine is commonly preferred by surgeons during cervical disc surgery, because of anatomic orientation [4,5,7]. Since high level hernia is exceedingly rare, there are a limited number of studies in the literature about this subject. Various techniques for approaching C2-3 and C3-4 discs are defined, including posterolateral intradural, anterolateral extradural, trans-corporeal, anterior retropharyngeal, and submandibular approaches [6,8,11]. We preferred the anterior retropharyngeal approach, which is almost identical to the submandibular approach. This method is mostly preferred in clinical trials, as reported in the literature [4, 5, 7]. In this approach, many surgeons emphasized that the head should be tilted at least 30 degrees to the opposite side [2, 4, 5], so that the mandible does not prevent performing the surgery comfortably [4,5]. Undeniably, all approaches have their own risks. Russo et al. stated that the C2-3 level disc was an obstacle in the standard anterior approach, as the internal branch of the superior laryngeal nerve enters the thyroid membrane just below the C3 vertebra. Superior laryngeal nerve damage leads to permanent change in phonation and increases the risk of aspiration [4]. In our study, there was no related complication. Nishizawa et al. performed C2-3 discectomy using posterolateral intradural approach in 3 elderly patients and did not encounter any complications in their follow-up. However, since C1-C3 laminectomy and suboccipital craniectomy are performed in this technique, it is likely that it may cause instability in the long term, especially in young patients. Again, there is a risk of developing cerebrospinal fluid fistula and meningitis because the dura mater is opened. There are no such risks in the anterior approach we use.

Anterior approaches are not without complications, as well. Finn et al. used an anterior retropharyngeal approach in their series, which included 11 cases. They stated that 4 patients developed dysphagia, of which three resolved, and one patient developed mild permanent dysphonia [9]. Structural pharyngoesophageal lesions, which are among the causes of oropharyngeal dysphagia, include oropharyngeal and esophageal carcinoma, benign tumors, esophageal web, Zenker's diverticulum, inflammatory diseases, postoperative changes, foreign bodies, thyroid enlargements, vertebral spur, cervical lymphadenopathy, and vascular anomalies. Anterior cervical spinal fusion surgery may temporarily impair pharyngeal swallowing function. It has been reported many times in the literature that anterior interventions in cervical spine surgery can temporarily impair swallowing function. Behavioral changes, postural changes, swallowing exercises and diet programs

constitute the basis of treatment in oropharyngeal swallowing difficulties [12,13]. In our series, three patients had difficulty swallowing and recovered within four weeks with exercise and diet.

The most common complications in the anterior retropharyngeal approach are dysphonia and difficulty swallowing [9,14]. To prevent these complications, it was recommended that the skin incision be performed at least 2 cm below the mandible and excessive retraction of trachea and esophagus during the operation be avoided [5,14,15]. Anderson et al. made a number of recommendations to prevent the development of postoperative dysphagia, some of which include keeping the operation time under one hundred seventy-five minutes, and the endotracheal tube pressure below 20 mm Hg, using small and smooth surface retractors, local steroid injection to the retropharyngeal area (triamcinolone 40 mg), and working with speech therapists and otolaryngologists in high risk cases [12]. According to our results, the longer the operation time, the higher the risk of developing dysphagia.

In their cadaveric study, Fard and his colleagues indicated that some anatomical structures blocking the surgical corridor can be divided, such as ascending pharyngeal artery and vein, lingual artery and vein, facial artery vein, retromandibular vein (temporo-maxillary vein, posterior facial vein) and digastric tendinous junction [16]. In our study, we had to ligate the facial vein in two patients with no complications.

Limitations

The surgical method we used in the study is unfortunately exceedingly difficult to apply in short-necked and obese patients. Therefore, these patients were not included in the study. Also, since disc hernias at the C2-3 and C3-4 levels are rare, they cannot be compared with other surgical methods. A larger number of patients and longer follow-up periods could improve the quality of the study, which may take many years, based on the low incidence of this disease.

Conclusion

Compared to other approaches, less complications occur in the anterior retropharyngeal approach. Since most complications are due to excessive retraction and long operation time, we suggest avoiding both, if possible. In addition, the benefit from surgery decreases as the duration of symptom increases. We think this result will help us better inform our patients about surgical treatment and its results. Likewise, it would be more appropriate to choose posterior approaches in patients with short necks.

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