

Siedlecki Zygmunt, Kuriga Kinga, Bereźnicka Weronika, Śniegocki Maciej. Analysis of patient with cervical discopathy treated surgically on the own material of neurosurgical department. Journal of Education, Health and Sport. 2020;10(6):11-19. eISSN 2391-8306. DOI <http://dx.doi.org/10.12775/JEHS.2020.10.06.001>
<https://apcz.umk.pl/czasopisma/index.php/JEHS/article/view/JEHS.2020.10.06.001>
<https://zenodo.org/record/3872674>

The journal has had 5 points in Ministry of Science and Higher Education parametric evaluation. § 8. 2) and § 12. 1. 2) 22.02.2019.

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The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 10.05.2020. Revised: 15.05.2020. Accepted: 31.05.2020.

Analysis of patient with cervical discopathy treated surgically on the own material of neurosurgical department

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Running headline: cervical discopathy surgical treatment

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Abstract

Cervical discopathy is an important medical problem widespread in society. Symptoms are often upper limbs radicular pain, local pain in the cervical spine, and vetrebasilar cerebrovascular insufficiency. In the case of ineffective conservative treatment and severe pressure on nerve structures, surgical treatment is indicated. Cervical discopathy is most common at the age of 30 - 60 with a predominance of women. The authors of this manuscript analyzed the medical data of patients operated on due to cervical discopathy on their own material. Cervical discopathy was found to be more common in women, which is consistent with world references. A relationship was found between cervical myelopathy and critical spinal canal stenosis and C4-C5 stenosis. Stenosis on C3-C4 has also been rare in female patients and more common in men. Obtained data on own material are generally consistent with reports from world literature and constitute its complement in reference to the region of the Kuyavian-Pomeranian Voivodeship.

Key words: cervical discopathy; spinal stenosis; surgical treatment

Introduction

Cervical discopathy constitutes about 30 - 40% of diseases of the intervertebral disc of the whole spine. Lumbar discopathy is more common than her. Cervical discopathy occurs in people between 30 and 60 years of age, and its most common occurrence is observed after the fourth decade of life [1,2]. It is much more common in women. It is estimated that women make up about 60% with cervical discopathy [3]. The intervertebral disc undergoing

degeneration and retrograde changes causes local cervical spine pain. If the disease progresses and the disc is herniated in the direction of the spinal canal and nerve root holes, there is radicular pain or flaccid paresis of the upper limbs due to peripheral neuron disorder [1-3]. Compression on the spinal cord can in cause to myelopathy and severe spinal symptoms such as spastic paresis of the lower extremities. This all leads to progressive disability. Compression on vertebral arteries inside spine leads to vetrebasilar (VB) cerebrovascular insufficiency [2]. In the case of progression of neurological symptoms and deterioration, confirmed compression on anatomical nerve structures, surgical treatment is indicated [3]. The most frequently used method of surgical treatment is anterior access consisting of anterior discectomy and fusion using cervical cage (ACDF - Anterior cervical discectomy and Fusion, ACIF - Anterior Cervical Interbody Fusion) [1,2]. Cervical discopathy surgery with anterior approach was first introduced in the world by Ralph B. Cloward in 1953 [3], while in Poland it was introduced by Jan Haftek [4]. During almost 60 years of anterior access cervical discopathy, this method underwent many modifications. It became minimal invasive, instead of using initially taken blocks taken from the iliac bone, cage made of artificial substitutes such as titanium, PEEK was used [5,6]. Dynamic implants called artificial discs are also used, which maintain the mobility of the operated segment. The operated patients spend only a few days in neurosurgical departments and, in general, return to full activity very quickly after the operation without having to wear a collar [5]. For advanced neurological symptoms, rehabilitation is necessary.

Materials and methods

The study included 100 patients treated for cervical discopathy in the years 2018-2019, the study group included 60 women aged 32-57 (Me = 51.32) and 40 men aged 35-78 (Me = 54.20). Patients were qualified for surgery due to neurological symptoms such as root symptoms in the upper limbs and signs of compression on the spinal cord. Patients presented various neurological symptoms such as root pain, flaccid paresis of the upper limbs and spastic paresis of the lower limbs. These symptoms often overlapped in the same patients presenting complex neurological syndromes. Flaccid paresis resulted from compression of the peripheral neuron, while spastic paresis resulted from compression of the spinal cord. Pressure on nerve structures was caused by disc hernias and degenerative osteophytes. The scope of the surgical treatment plan and the number of operated levels was within the

competence of the qualifying physician and was based on the assessment of the correlation between cervical spine imaging and neurological symptoms. Qualifications for the scope of surgery were based on common neurosurgical practice based on general standards. The distribution of sex and age of operated patients is presented in Table 1.

Table 1. Distribution of sex and age of the study group

	Age				
	N	Mean	SD	Min	Max
Female	60	51,32	8,02	32	75
Male	40	54,20	8,53	35	78
Sum	100	52,47	8,31	32	78

A retrospective analysis of medical documentation of operated patients was performed regarding the number of operated cervical spine levels, specific operated level: C3-C4, C4-C5, C5-C6, C6-C7 and presence at any, at least one level of critical spinal stenosis. As a critical spinal stenosis, the lack of cerebrospinal fluid reserve at the contracting level was found, which is evidence of significant pressure on the spinal cord. Critical spinal stenosis was assessed only on the basis of its presence at least on one level and the study group was divided into two subgroups: 1. Without critical spinal stenosis (fluid reserve maintained at all levels) 2. Critical stenosis at one or more levels (no reserve cerebrospinal fluid in MRI images). All patients operated on for anterior access by means of discectomy and fusion using cervical cage (ACDF - Anterior cervical discectomy and Fusion, ACIF - Anterior Cervical Interbody Fusion). It is a widely accepted method of treating cervical discopathy and stenosis worldwide. In each of the analyzed cases, cervical cages made of PEEK material were used in 2018-2019. 53 patients (53%) were operated on one level, 33 patients (33%) on two levels, 13 patients (13%) on three levels, and 1 patient (1%) on four levels. In the case of operations at 3 or more levels, in addition to cage PEEK, titanium plate were used in some patients, according to the indications and individual assessment and qualification of the operating doctor. An analysis of operated patients was performed depending on age and sex. Women and men were compared and the study group was divided into younger patients aged 55 or under, and older patients over 55 years of age.

Statistical analysis

Statistical analysis was performed using the STATISTICA 10.0 program from StatSoft®. The correlation of the analyzed qualitative variables was performed using the chi2

test, considering the test probability value $p < 0.05$ as a statistically significant level. In the result tables, in addition to empirical numbers, percentages are also presented to emphasize the mutual relations of variables in individual categories.

Results

Based on statistical analysis, it was found that discopathy at the C3-C4 level was significantly more common in male patients ($p = 0.0050$), while there were no differences in the occurrence of discopathy at this level between younger and older patients. In the topic of other levels: C4-C5, C5-C5, C6-C7, no statistically significant differences were found depending on gender and age. The dependence of C3-C4 discopathy on a gender-specific basis is presented in Table 2.

Table 2. C3-C4 discopathy depending on gender

C3-C4	male	female	
0	27	54	
	67,50%	90,00%	0,0050*
1	13	6	
	32,50%	10,00%	
Sum	40	60	

By the use of statistical analysis it was also found that the presence of cervical myelopathy positively correlated with the presence of critical spinal canal stenosis. In patients without cervical myelopathy, statistically significantly less frequent was critical stenosis manifested by the lack of cerebrospinal fluid signal in MRI ($p=0.0009$). These results are shown in Table 3.

Table 3. Myelopathy depending on critical stenosis

	Myelopathy		p
	0	1	
Critical stenosis			
0	56	9	
	74,67%	37,50%	0,0009*
1	19	15	
	25,33%	62,50%	
Sum	75	24	

It was also found that the presence of cervical myelopathy positively correlated with the presence of stenosis at the C4-C5 level. Myelopathy was significantly less frequently diagnosed in patients without C4-C5 stenosis or disc herniation ($p=0.0406$). These results are shown in Table 4.

Table 4. Myelopathy depending on the C4-C5

	Myelopathy		p
	0	1	
C4-C5			
0	43	8	0,0406*
	57,33%	33,33%	
1	16	32	
	66,67%	42,67%	
Sum	75	24	

Discussion

Epidemiological data on patients treated surgically for cervical discopathy and the characteristics of these patients have been reported in the literature for many years. In 1981, J. Kramer pointed out that cervical dicopathy is more common in women, and in fact, by the sixth decade of life, women constitute about 60% of patients with this ailment [3]. This is completely consistent with the data from our manuscript, where the right women constituted 60% of the patients analyzed. It is noteworthy that in comparison to Kramer's reports, there is a time interval of about 40 years in ours, and the gender distribution of patients suffering from cervical dictation is the same. Also L. Tumialán et al. in 2019, describing cervical myelopathy and radiculopathy, they pointed to the frequent occurrence of cervical discopathy in society [7]. As in our manuscript, Tumialan drew attention to the relationship between the occurrence of myelopathy and critical spinal stenosis. In this topic, the results of Tumialan and ours are convergent and prove that the greater the pressure on the spinal cord, as evidenced by the lack of a signal from the spinal cord in MRI, the greater the risk of spinal dysfunction and disturbing neurological symptoms resulting from it. Adams et al. in 2020 he described the surgical treatment of cervical discopathy [8] showing a similar distribution to our manuscript of patients qualified for surgical treatment. Also Waheed et al. reviewed the medical records of patients operated on due to cervical discopathy and obtained similar results in the field of medical data of patients treated surgically [9]. The papers published in this discussion published at the turn of many years prove that the characteristics of patients treated surgically

for cervical discopathy are unchanged. Similar epidemiological data have been shown by Kramer et al. in 1981 [3], as well as Adams et al. [8] and Tumialan et al. [7] in 2020. All this data is generally convergent in this manuscript

Conclusions

Based on the study's own material, it can be concluded that surgically treated cervical discopathy occurs more frequently in women, which is in line with literature reports, while discopathy and stenosis at the C3-C4 level occur less frequently in women and more often in men. Cervical myelopathy is associated with critical spinal stenosis and spinal compression at the C4-C5 level.

Abbreviations

- ACDF - Anterior cervical discectomy and Fusion,
- ACIF - Anterior Cervical Interbody Fusion
- Me - median
- MRI – magnetic resonance image
- VB - vetrebasilar

Declarations

- Ethics approval and consent to participate: Was not required because the work concerned only retrospective analysis of medical documentation of patients without any participation or medical examination.
- Consent for publication: Written informed consent was not required.
- Availability of data and materials: All relevant data are within the paper.
- Competing Interests: The authors declare that they have no conflict of interest.
- Funding: The study was financed from own funds of the Neurosurgery of Collegium Medicum in Bydgoszcz. The authors received no specific funding for this work.
- Authors' contributions:

Protocol/project development: ZS

Data collection and management: ZS, KK, WB

Data analysis: ZS, WB, KK

Manuscript writing/editing: ZS

Verification of the manuscript in terms of substantive and formal: MS

All authors read and approved the final manuscript.

- Acknowledgements: the authors thank medical and nursing staff of neurosurgical department during the collection of medical data of patients being examined

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