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BEL OSTEOXONDROZU OLAN XƏSTƏLƏRDƏ RADİKULOPATİYANIN MEXANİZMİNİN AYDINLAŞDIRILMASINDA SONOQRAFİYANIN ROLU

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Məqalədə fəqərələrarası disk yırtığı və protruziyası zamanı bel radikulopatiyasının klinik təzahürləri ilə prosesin lokalizasiyası arasındakı əlaqənin öyrənilməsi məqsədilə aparılmış tədqiqat işi haqqında məlumat verilmişdir. Tədqiqata fəqərələrarası disk yırtığı olan 31 və protruziyası olan 57 xəstə cəlb edilmişdir. Tədqiqatın nəticələri göstərmişdir ki, bel və bel-oma mənşəli ağrı sindromunun kombinasiyası olan xəstələrdə yırtığın posterolateral lokalizasiyası və protruziyanın müvafiq olaraq paramedian ($p<0,01$) və median ($p<0,001$) lokalizasiyalı prosesə nisbətən daha çox, paramedian lokalizasiyası isə median ($p<0,001$) lokalizasiyasından daha artıq qeydə alınır. Bel-oma mənşəli ağrı simptomu yırtıq və protruziyanın paramedian lokalizasiyası olan xəstələrdə müvafiq olaraq posterolateral ($p<0,05$) və median ($p<0,01$) lokalizasiyalılardan xeyli tez-tez müşahidə edilmişdir.

Beləliklə, aparılan tədqiqatların nəticələri bel ağrısının, xüsusən də radikulopatiyanın səbəblərinin müəyyənləşdirilməsində ultrasəs müayinəsinin imkanlarını nümayiş etdirir.

Açar sözlər: ultrasəs müayinəsi, bel fəqərəarası disklərinin yırtığı, bel radikulopatiyası, maqnit rezonans görüntüləmə

Ключевые слова: ультрасонография, грыжа поясничных межпозвоночных дисков, поясничная радикулопатия, магнитно-резонансная томография

Keywords: ultrasonography, herniation of lumbar discs, lumbar radiculopathy, magnetic resonance imaging

THE ROLE OF SONOGRAPHY IN CLARIFYING THE MECHANISM OF RADICULOPATHY IN PATIENTS WITH LUMBAR OSTEOCHONDROSIS

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The article presents information on a research study conducted to investigate the relationship between the clinical manifestations of lumbar radiculopathy and the localization of the process in cases of intervertebral disc herniation and protrusion. The study included 31 patients with intervertebral disc herniation and 57 patients with protrusion. The results of the study revealed that among patients with a combination of lumbago and lumbosacral sciatica, posterolateral localization of herniation and protrusion

was recorded significantly more often than paramedian ($p < 0.01$) and median ($p < 0.001$) localization. Furthermore, paramedian localization was recorded more frequently than median ($p < 0.001$) localization. The clinical symptom of lumbosacral sciatica in patients with paramedian localization of herniation and protrusion was observed significantly more often than in those with posterolateral ($p < 0.05$) and median ($p < 0.01$) localization.

Thus, the results of the conducted studies demonstrate the potential of ultrasonography in determining the causes of lumbar pain, in particular radiculopathy.

Low back pain is an ordinary cause of individuals seeking medical care. Having a lower backache is a major health issue with a huge economic impact on communities. It not only increases the cost of healthcare, but it also increases disability and loss of productivity in the general population. In adults, the reported incidence of low back pain is 84%, with an estimated incidence of 18% in all age groups at any given time [1].

The most widely recognized reason for the pain is the degenerative state of intervertebral discs [2], which leads to disc-root interference, although numerous structural intersegmental spine changes may also have been responsible for causing patients' signs and symptoms. A degenerative disease of the spine is prevalent in the general population, and with aging, its incidence increases. Among those individuals, pain is the most frequently reported symptom; neurologic conditions are also associated with this pathology [3].

Men are more affected by disc degeneration than women. Annular disc tear, disc herniation, disc extrusion, narrowing of the spinal canal, narrowing of lateral recess, compression of neural foramen, facet arthropathy and ligamentum flavum thickening is common at the L4-L5 disc level. Spondylolisthesis and involvement of the L1-L2 discs are less common [4].

Pain in the lower back can manifest as lumbago, sciatica, inflammation of the epidural space. In most cases, the causes of back pain are several, it is difficult to determine the main one. In such cases, the intensity and nature of the pain, the zone of their distribution, is important. Often the degree of damage and intensity of pain do not match. During remission, most patients with herniated lumbar discs may not feel pain and can lift the weight. Hypothermia, uncomfortable forced body position, unbalanced heavy lifting can cause back pain [5, 6].

Radiculopathy is one of the variants of pain in the back and it is caused by mechanical

compression of the nerve root in the foramen. More often, radiculopathy develops as a result of degenerative disc disease, intervertebral joint, hypertrophy of the ligamentous apparatus, spondylolisthesis or a combination of these factors. The appearance of pain syndrome is explained by the increase in ectopic irritability of nerve fibers during their direct damage or the presence of the main factor near it [7].

Qualitative study of the diagnosis of radiculopathy requires comparison of clinical symptoms and the results of MRI or CT, which can directly visualize the affected discs, the central spinal canal, the canal of the spinal nerves, the intervertebral foramen, the ligamentous apparatus, the presence of an inflammatory process in the epidural space. Diagnosis of radiculopathy includes the collection of anamnesis, clinical examination, examination of reflexes, as well as X-rays, MRI studies [8]. In recent years, ultrasonography has been actively introduced into the diagnosis of musculoskeletal pathologies [9].

Objective. To evaluate the capabilities of ultrasonography in diagnosing the causes of lumbar radiculopathy in adults resulting from degenerative disease of the intervertebral discs.

Material and Methods. The study included 31 patients with lumbar disk hernia and 57 patients with disk protrusion at the age of 23-59 years. All patients underwent X-ray, MRI or CT and ultrasonography. Ultrasonography (USG) was conducted on a Philips HD 7 XE device using a convection transducer in the frequency range 2-5 MHz; MRI – General Electric, Signa HDI, 1.5T CT – Toshiba Aquillion 64, which allows you to simultaneously obtain 64 slices 0.5 mm thick, during a full revolution of 0.5 seconds.

Statistical analysis was carried out using the Student's t-test and the χ^2 test. If the p value < 0.05 , the difference between the compared groups was considered statistically significant.

Results. In 32 patients, herniation of lumbar discs was diagnosed, in 57 patients – protrusion. A hernia of lumbar discs was diagnosed in 32 patients, and a protrusion – in 57 patients. In 14

(43.8±8.8%) disks the hernia was median, in 13 (40.6±8.7%) – paramedian and in 5 (15.6±6.4%) – postlateral types. In 24 (42.1±6.5%) disks the protrusion was median, in 27 (47.5±6.6%) – paramedian and in 6 (10.5±4.1%) – postlateral types. At the level of L2-L3, hernia of the disk was not recorded. The median hernia in 2 (6.2±4.3%) cases was localized at level of L3-L4, in 5 (15.6±6.4%) – L4-L5 and in 7 (21.9±7.3%) – L5-S1; the paramedian hernia – in 7 (21.9±7.3%) cases was localized at the level of L4-L5 discs, in 6 (10.5±4.1%) cases at the level of L5-S1 discs; the postlateral – in 2 (6.3±4.3%) and in 3 (9.4±5.2%) cases, respectively.

Among the patients the median type of protrusion in 2 (3.5±2.4%) cases was localized at the level of L3-L4, in 11 (19.3±5.2%) – L4-L5, in 10 (17.5±5.0%) – L5-S1; the paramedian protrusion – in 3 (5.3±3.0%), in 10

(17.5±5.0%), in 12 (21.1±5.4%); the postlateral – in 3 (5.3±3.0%) and in 3 (5.3±3.0%) disks, respectively (Table 1).

In all patient were observed clinical symptoms of low back pain of different type. Back pain was divided into the following types: lumbago, lumbosacral sciatica, lumbago + lumbosacral sciatica (Table 2). Lumbago among patients with a median localization of hernia+protrusion was observed in 29 (76.3±8.5%) cases, with paramedian localisation – in 5 (12.5±5.2%) cases and posterolateral localisation – was not observed. In the group of patients with lumbosacral sciatica these parameters were: 7 (18.4±6.3%), 19 (47.5±7.9%) and 2 (18.2±11.6%), respectively. These parameters in the group of patients with Lumbago+lumbosacral sciatica were: 2 (5.3±3.6%), 16 (40.0±7.7%) and 9 (81.8±11.6%), respectively.

Table 1. The type and level of lumbar discs hernia and protrusion

Level of lumbar disks	Hernia (n = 32 disks)			Protrusion (n =57 disks)		
	1	2	3	1	2	3
	Median	Paramedian	Postlateral	Median	Paramedian	Postlateral
L2-L3	-	-	-	1	2	-
L3-L4	2 (6.2± 4.3%)	-	-	2 (3.5±2.4%)	3 (5.3±3.0%)	-
L4-L5	5 (15.6±6.4%)	7 (21.9±7.3%)	2	11 (19.3±5.2%)	10 (17.5±5.0%)	3 (5.3±3.0%)
L5-S1	7 (21.9±7.3%)	6	3	10 (17.5±5.0%)	12 (21.1±5.4%)	3 (5.3±3.0%)
Total	14 43.8±8.8% P 2-3 <0.01	13 40.6±8.7% P 2-3 <0.05	5 15.6±6.4%	24 42.1±6.5% P 2-3<0.001	27 47.4±6.6% P 2-3<0.001	6 10.5±4.1%

Table 2. Comparison of clinical symptoms and preferential localization of hernia and protrusion of intervertebral discs among the examined patients

Clinical symptoms	Median Hernia+protrusion	Paramedian Hernia+protrusion	Postlateral Hernia+protrusion
	1	2	3
	n=38	n=40	n=11
Lumbago	29 (76.3±8.5%) p 1-3<0.001	5 (12.5±5.2%)	-
lumbosacral sciatica	7 (18.4±6.3%)	19 (47.5±7.9%) P 2-3<0.05 P 2-1<0.01	2 (18.2±11.6%)
Lumbago+ lumbosacral sciatica	2 (5.3±3.6%)	16 (40.0±7.7%) p 2-1<0.001	9 (81.8±11.6%) p 3-2<0.01 p 3-1<0.001

As can be seen from the table, among patients with a combination of lumbago + lumbosacral sciatica, posterolateral localization of hernia and protrusion was recorded significantly more often than paramedian ($p<0.01$) and median ($p<0.001$) localization, and paramedian localization was more often than median ($p<0.001$), respectively. The clinical symptom of lumbosacral sciatica in patients with paramedian localization of hernia and protrusion was observed significantly more often than posterolateral ($p<0.05$) and median ($p<0.01$) localiza-

tion, respectively,

When assessing the nature of degenerative changes (osteocondrosis) in the lumbar intervertebral discs, we considered the presence, size, and location of hyperechoic inclusions (calcifications) in the nucleus pulposus of the discs, the degree of thinning, and discontinuity of the fibrous ring image due to a crack or rupture. We also considered the location of protrusion or herniation within the spinal canal, which was important in explaining the mechanisms of low back pain and radiculopathy (**Fig. 1-4**).

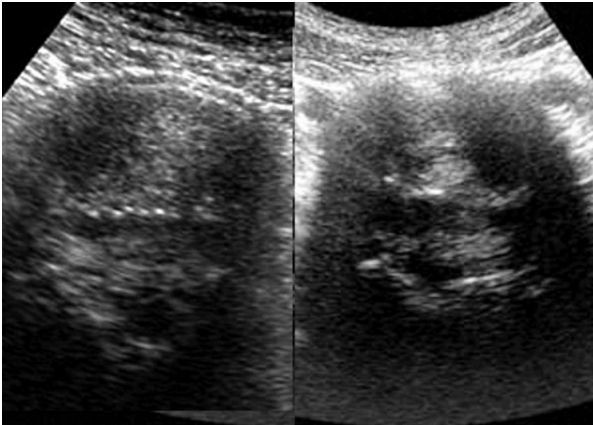


Fig. 1. The large circular hernia of L4-L5 and L5-S1 disks with severe spinal stenosis, epiduritis in a patient with lumbago, chronic sciatica.

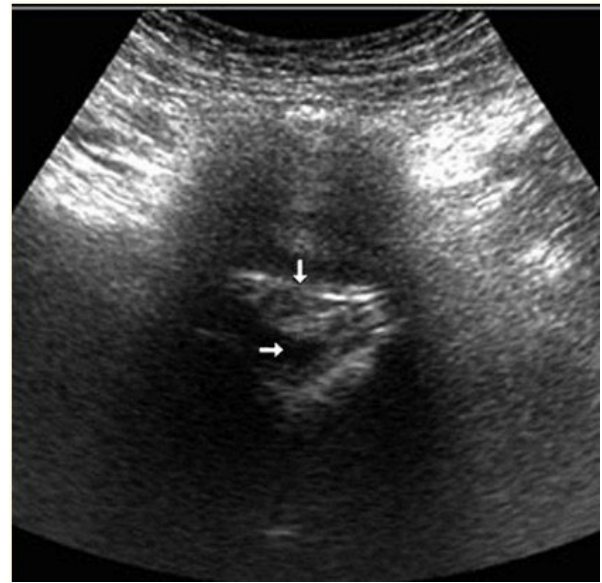


Fig. 2. Axial section. Moderately severe lumbar spinal stenosis (lower arrow) at L4-L5 due to a large median herniation (upper arrow).



Fig. 3. Axial view. Right sided paramedian disc herniation (top arrow) at the level of L4-L5 and severe hypertrophy of the yellow ligament (bottom arrow).



Fig. 4. Echogram of the intervertebral disc L5-S1 in a patient with lumbar pain and sciatica with spreading to the right leg. A large posterolateral hernia with stenosis of the radicular canal (arrow) is defined.

Discussion

The most common MRI degenerative finding is disc dehydration [10-12], followed by the disc bulge, hypertrophy of the ligamentum flavum, hypertrophy of facet joint, herniated disc, spinal canal narrowing, osteophytes. Sharma et al., (2018) indicated that the most common MRI findings among patients with persistent low back pain were disc signal change (83.3%), followed by disc bulge (77.8%), foraminal narrowing (76.9%) while the least of them was endplate change (15.7%) [13].

According Bark et al, (2019), it has been reported that the most common degenerative outcome is degenerative disc disease, followed by disc herniation, facet joint hypertrophy, spondylolisthesis, Schmorl nodules [14]. However, according Vagaska et al., 2019, the most well known finding of patients

with non-specific chronic low back pain was disc bulge (61.5%), followed by disc protrusion (40.4%) [15].

Recent studies demonstrate the superiority of ultrasonography over radiography in the diagnosis of lumbar osteochondrosis, as well as the method's capabilities being similar to those of magnetic resonance imaging [16]. According to our data, in 76.3% of cases, the median localization of hernias and protrusions is accompanied by the clinical symptom of lumbago, while posterolateral localization leads to the development of radiculopathy in 81.8% of cases.

Conclusions. Ultrasonography can, in most cases, determine the cause of low back pain. A posterolateral herniation or protrusion most often presents as radiculopathy, while a median herniation often presents as lumbago.

Conflict of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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РОЛЬ СОНОГРАФИИ В ВЫЯСНЕНИИ МЕХАНИЗМА РАДИКУЛОПАТИИ У БОЛЬНЫХ С ПОЯСНИЧНЫМ ОСТЕОХОНДРОЗОМ

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Резюме. В статье представлена информация о результатах исследования, проведенного с целью определить взаимосвязь клинических проявлений с локализацией грыж поясничных дисков и протрузией. К исследованию были привлечены 31 пациентов с грыжей поясничных межпозвоночных дисков и 57 больных с протрузией. Результаты исследований выявили, что среди пациентов с сочетанием lumbago+lumbosacral sciatica заднебоковая локализация грыжи и протрузии регистрировалась достоверно чаще, чем парамедианная ($p<0,01$) и медианная ($p<0,001$) локализация, а парамедианная локализация чаще, чем медианная ($p<0,001$), соответственно. Клинический симптом lumbosacral sciatica у пациентов с парамедианной локализацией грыжи и протрузии наблюдался достоверно чаще, чем заднебоковая ($p<0,05$) и медианная ($p<0,01$) локализация, соответственно.

Таким образом, результаты проведенных исследований демонстрируют возможности ультрасонографии в определении причин поясничных болей, в частности радикулопатии.

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