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## Degeneration of the lumbar intervertebral discs as a cause of root discomfort in the lumbar spine

Aneta Karlo<sup>1</sup>, Benjamin Szmelcer<sup>1</sup>, Marlena Kontowicz<sup>1</sup>, Patrycja Wszelaki<sup>1</sup>,  
Daria Zaborna<sup>1</sup>, Michał Wilczyński<sup>1</sup>, Natalia Krakowska<sup>1</sup>, Aleksander Florczak<sup>1</sup>,  
Aleksandra Modlińska<sup>1</sup>, Adrian Zwolinski<sup>1</sup>, Klaudia Kwiatkowska<sup>1</sup>, Paula Piątkowska<sup>1</sup>,  
Kornelia Kędziora-Kornatowska<sup>1</sup>

<sup>1</sup>Faculty of Health Sciences, Department and Clinic of Geriatrics, Nicolaus Copernicus University

### Abstract:

**Background:** The change in the lifestyle of modern man and the related lack of physical activity caused that pain in the spine has become a civilization problem, covering an increasing population regardless of latitude. Degenerative changes of the spine, also in the lumbar region, are the most frequently diagnosed cause of patients' dysfunction.

**Material and methods:** Analysis of available literature, articles in the Google Scholar and PubMed database using keywords: lumbar spine, degenerative changes, dysfunctions

**Results:** Currently, in addition to injuries and mechanical loads, the causes of lumbar spine dysfunction also include abnormal spinal nutritional composition and genetic factors, with the greatest emphasis on genes encoding type 1 collagen. During diagnostics, apart from X-ray imaging, computed tomography and resonance imaging methods should not forget about

properly conducted interviews and functional tests. Kinesitherapy assisted by physical treatment methods such as laser therapy or ultrasound should play a major role in rehabilitation. Kinesitherapy should be tailored to the individual patient, and exercises selected so that the patient can also do them at home.

**Conclusions:** In the prevention of degenerative changes of the lumbar spine, there should be a much greater emphasis on patient education related to risk factors or learning ergonomic work. Despite much work on this topic, there is still a need to improve public awareness and further research on prevention.

**Key words:** lumbar spine, degenerative changes, dysfunctions

## **Introduction**

A human on the path of developmental evolution relatively quickly adopted a two-legged body posture, which was associated with anatomical changes in the musculoskeletal system. It is believed that in such a fast pace of change, the human backbone was unable to trigger adaptive and compensatory mechanisms to the existing conditions. The vertebral column performs a supporting function, hence it is adapted to support the human muscle system. The spine is subjected to various loads every day. Every change of position, taking up everyday activities cause pressure in the organ of movement. Even a free standing position forces the spine to bear the weight of the body [1].

Along with the progress of civilization, humanity also changed the way of life. A sedentary lifestyle, inadequate physical activity, poor working conditions and stress adversely affect the motor system which central part is the spine. This leads to pathological dysfunctions within the skeletal system and rapidly occurring degenerative changes in the intervertebral discs. Accumulating overloads, unevenly distributed to the vertebrae, lead to the occurrence of painful pain in the lumbar spine which is most often of a root nature [1, 2].

Disease of the intervertebral discs is a major health problem occurring not only among the elderly. What is more, degeneration of the spine more often affects people of working age hindering the performance of professional activities and everyday life. Its progressive nature and annoying ailments requires comprehensive treatment that will reduce or get rid of pain symptoms, which will improve the quality of life of patients [1, 2, 3].

## **1. Anatomy**

The lumbar spine consists of 5 vertebrae. They are located between the thoracic segment and the sacrum. The core of the lumbar vertebra is massive and wide. Its upper and lower surface is flat and has a kidney shape. The arch is durable, narrowed at the base, but widening behind [4].

The lumbar vertebrae have several processes. They are [4]:

- Transverse processes - originating from the arch and shaft. They are primarily made of residual lumbar ribs. However, in a much smaller part of the appropriate transverse processes.
- Additional process - is the equivalent of the transverse process on other circles.
- Ponds processes - are arranged vertically. Top joint surfaces are facing backwards, and the lower joints are forward and sideways.
- Mastoid process - it is located on the upper joint processes, on their side.
- Spinous processes - connected to the arch from which they go backwards. Their ends are usually thickened.

In the lumbar region of the spine there is a bend called lordosis. It develops only after birth due to the various load and functioning of individual muscles [5].

Despite the fact that the lumbar spine is short compared to other parts of the spine, it shows a wide range of movements in the anterior joints. This is due to the appropriate size of

the intervertebral discs. Thanks to this, the mobility in the sagittal plane is increased. The lumbar spine and thoracic segment complement each other and are often treated as functional unity. Movement in the lumbar region is [5]:

Flexion:

18 - 40 years - 6 cm

41 - 60 years - 5 cm

61 - 85 years - 4 cm

Extension:

18 - 40 years - 8 cm

40 - 60 years - 6.5 cm

61 - 85 years - 4.5 cm

Side bending (thoraco-lumbar section):

18 - 40 years - 9 cm

41 - 60 years - 7.5 cm

61 - 85 years - 5 cm

Twist (thoraco-lumbar section):

18 - 40 years - 4.5 cm

41 - 60 years - 3 cm

61 - 85 years - 2 cm

Intervertebral discs play an important role in spinal movements. In the lumbar spine, their number is equal to 4. Lordosis lumbar is maintained by the fact that the discs are higher in the front part of the spine than in the posterior. Intervertebral discs are made of the nucleus pulposus (shock absorber during all kinds of shocks), the fibrous ring (connected to the vertebral body) and the boundary stems plates [6].

## **2. Etiology of degenerative intervertebral disc disease**

Degenerative disease of the intervertebral discs is a disorder that affects a growing number of people, it is therefore important to understand the etiology in order to prevent and educate society. For many years, the causes of degenerative changes in the intervertebral discs were considered to be injuries and mechanical strains, the current state of knowledge also indicates disorders in the nourishing pathways of the discs and genetic factors [7].

### **Mechanical loads and injuries**

For many years, it has been suggested that the main cause of degeneration of the intervertebral discs are mechanical strains and injuries, with clinical symptoms of backache. In order to induce experimental overloads and damages of the disk, research was carried out on an animal model that explicitly pointed to the direct relationship between overload and disk damage on the occurrence of degenerative changes in the intervertebral discs. Authenticity of the negative impact of mechanical loads is confirmed by studies analyzing the relationship of overweight to degeneration of the intervertebral discs, confirming the stated thesis. It is therefore concluded that BMI above 25 kg / m<sup>2</sup> is a predisposing factor for degenerative changes in the intervertebral discs [7,8,9,10].

### **Nutrients and oxygen**

Currently, one of the main reasons for the degeneration of the intervertebral discs is the lack or limited supply of nutrients and oxygen to the disk cells. The discs are devoid of their own vessels, so their activity and vitality is fully dependent on the diffusion of nutrients from the blood vessels located around the discs. Diseases such as Gaucher's disease, Caisson's

disease, atherosclerosis and sickle-cell anemia disrupt the supply of nutrients, resulting in degenerative changes in the intervertebral discs [7].

Studies have been carried out, the results of which have unequivocally confirmed the thesis concerning the degenerative changes of intervertebral discs associated with the decline in the supply of nutrients. Nutrients that reach the disk cells in a reduced amount have a noticeable effect on changing the size and density of cells. In the case of achieving a critical level of nutrition of the intervertebral disc, the death of the cells was noticed in the place of their smallest nutrition. Analysis of the results of the study showed that the earliest sign of degenerative changes in the intervertebral discs caused by a reduced level of nutrient supply is the reduction in the number of cells [11].

### **Genetic factors**

Research using tools in the field of genetics and proteomics has pointed to the influence of genetic factors on the onset and development of degenerative disc disease in the intervertebral discs. Currently, in order to understand the molecular etiology of degenerative diseases of the intervertebral discs, the most characteristic genes have been reviewed which have an undoubted influence on the formation of degenerative disc changes. In the assessment of genetic factors, attention was paid to collagen type I encoded by the genes COL1A1 and COL1A2. Studies were carried out that analyzed the relationship between COL1A1 gene polymorphisms and the occurrence of intervertebral disc degeneration - the study clearly indicated the degenerative changes in the intervertebral disc associated with the examined gene. In the assessment of the influence of genetic factors, attention was also paid to collagen IX encoded by the genes COL9A1, COL9A2, COL9A3 [12]

Studies were carried out in mice, where overexpression of the mutated Col9a1 and inactivation of Col9a1 were observed to contribute to the degeneration of the intervertebral discs, which is why the effect of the COL9A1 gene mutation on the degeneration of the intervertebral discs in humans is finally discussed. Currently, attention is also paid to IL-1 and its relationship to the formation of degenerative changes in the intervertebral discs. IL-1 belongs to cytokines produced in response to exposures to a given antigen. Excessive activity of the described cytokine affects the destruction of tissue, therefore its biological hyperactivity is associated with inflammation.

Studies have shown that degenerated intervertebral discs produce increased amounts of IL-1 compared to discs with the correct structure. The development of molecular biology, including genetic testing, is an excellent diagnostic tool that will allow early diagnosis and personalized treatment [12,13].

### **3. Diagnostic methods**

Spine pain is one of the most common reasons for patients reporting to primary care physicians. Pain can be acute or chronic and its causes are very diverse and associated with dysfunctions within the structures of the spine, spinal canal and in the tissues located in the area of the spine. Pain can be caused by pathological changes within vertebrae, intervertebral joints or sacroiliac joints, ligaments and intervertebral discs. Determining the correct diagnosis of degenerative changes in the intervertebral disc causing root discomfort in the lumbar spine should be based on: patient interview, physical examination and imaging examinations [14,15].

**The interview** should include questions about the nature and severity of pain and the location of pain, characteristic moments of pain intensity and the time and manner of treatment of pain.

**Physical examination** is based on static and dynamic tests. The first stage is the assessment of standing and sitting posture. Then, the range of motion, sensory disorders and muscle strength are studied. There are also tests of reflexes and stretching symptoms in patients

reporting neurological symptoms. The additional part refers to the McKenzie method and constitutes a test with repeated movements. It involves making from a few to a dozen or so moves in each direction. The characteristic change in pain under the influence of testing allows for the initial diagnosis of the clinical syndrome. Evaluation of reaction to the test with repeated movements is based on the knowledge of the phenomenon of centralization and peripheralisation of pain symptoms. Centralization means the movement of radiating pain from distal to proximal parts as a result of specific movements and the adoption of specific positions. This phenomenon is likely to cause damage to the intervertebral disc. The occurrence of the phenomenon of centralization allows us to assume that the tested patient will have effective kinesitherapeutic treatment. Studies conducted by Laslett showed a 94% congruence in damage assessment of the intervertebral discs based on movement tests and discography results. In the case of protrusion of the intervertebral disc as a result of degenerative changes in the test there are unilateral asymmetrical symptoms below the knee level: often there is a deformation of the posture in the frontal plane. According to McKenzie, if the symptoms of sciatic neuralgia persists for over 12 weeks, they are caused by significant intervertebral disc protrusion with rupture fibrous ring [15, 16, 17].

**Diagnostic imaging** is based on X-ray, computed tomography and magnetic resonance. **X-ray** photography belongs to the most available and cheap methods of imaging diagnostics. The basic tests are the images in the antero-posterior and lateral projection. In the process of degeneration of the intervertebral discs in radiographs, degenerative changes are visualized in the form of lowering disc heights, calcifications in the disc and a vacuum symptom resulting from accumulation of gas within the disc. It should be remembered that on the basis of radiographs it is impossible to show the presence of intervertebral disc hernia or nerve root compression [14,18,19].

**Computer tomography (CT)** allows the assessment of the structure of bone structures and the surrounding soft tissues and blood vessels. Modern CT machines have the ability to assess the structure and pathology of vertebrae, intervertebral discs in virtually every plane and soft tissues lying around the vertebral column and inside the spinal canal. In the use of CT, the disadvantage is, as in the case of X-ray images, the use of X-rays, limiting its use. CT scan has a lower tissue resolution than MR, which in practice results in CT scanning in patients with contraindications to MR [18, 19].

**Magnetic resonance (MR)** allows good visualization of soft tissues, border plaques, degenerative changes, hemangiomas and other focal lesions. The imaging of the intervertebral discs is very detailed and allows the evaluation of herniated herniation of the fibrous ring and pressure on the intra-canal structures. In the course of degeneration of the intervertebral discs, the changes described as "black disc disease", lowering the height of the intervertebral disc and symmetrical bulging of the intervertebral disc in the lumbar region are observed. Interruption of the fibrous ring as a result of degenerative changes is manifested as a high intensity zone. These are linear or spherical high signal zones in the T2 images dependent on the back of the fiber ring. It is caused by the fluid's fluidity within the rupture of the fibrous ring and neovascularization at the edge of the rupture [19].

In order to confirm the occurrence of changes visible in imaging diagnostics, thoroughly collected intelligence and physical examination continue to play an important role [14, 15].

#### **4. Symptoms of degenerative changes**

The whole society struggles with pain in the lumbar region of the spine to varying degrees (so-called cross pains). Very often, the pain is so severe that it makes it impossible to perform movements, which may lead to temporary or permanent elimination from professional and social life. In the course of one of the best ways to prevent the development of degenerative changes is early and proper pro-health education. [20]

Every day, the human backbone is exposed to continuous mechanical overloads, damaging the intervertebral discs, which over time become flattened and lose their amortization function. Degenerative changes occur, which most often affect the discs and intervertebral joints. These changes may initially not show any clinical symptoms, only later, the progressive character of the changes leads to onerous ailments. In the course of the disease, one can distinguish the period of stabilization with symptoms occurring only during movement and the period of exacerbations, with the severity of symptoms. [21]

When the height of the intervertebral disc decreases as a result of degenerative changes, the positioning of adjacent intervertebral joints is changed. As a consequence, there are limitations of the physiological range of motion in the joints of the spine, with the secondary disappearance of the surrounding muscles. In addition, due to incorrect placement of joint processes, degenerative joint surface may also occur. [22,23]

In the course of degenerative changes of the lumbar spine, the so-called morning stiffness, lasting up to 30 minutes. It is also possible to notice the widening and distortion of bone contours resulting from a change in the position of the joint axis, the formation of osteophytes (bone exudates) and exudate in the joints. The symptoms of degenerative changes also include palpation of the joint, crackling during movements, damage to the intervertebral discs, radiological changes and narrowing of the intervertebral holes, which may lead to pressure on the nerve roots. [20,22]

Pain in the spine may be diffuse or scattered, located in a different location: in the whole lumbosacral region, in the area of sacroiliac joints or on one side of the spine. Very often, the nature of pain is difficult to determine, which makes diagnosis difficult. Pain as a result of degenerative changes do not subside after changing position and straightening the spine, usually appear after physical activity begins, and then they decrease. [23]

In the course of degenerative changes in the joints of the lumbar spine, nerve root irritation and consequent root pain may occur. It is a pain radiating along the nerve to the lower limb (groin, buttock or knee). Depending on the degree of pressure on the nerve, pain can take on a different character - from the transmitted pain along the dermatome through complete lack of sensation. This pain increases during spine movements, and disappears after taking a position that reduces pressure on the nerve. [22,24]

## 5. Differentiation of degenerative changes

Degeneration of the intervertebral discs in the lumbar spine is the main cause of pain in this area, however lumbar spine pain may be of different origin [25]. Mechanical changes within the intervertebral discs must be differentiated with other diseases. This aspect comes within the sphere of differential diagnosis [26]. Different disease entities that can cause lower back pain in the lumbar region, and do not result from degenerative changes, will be presented.

**Bone cancer or cancer with metastases to the skeletal system.** Disorders of the spinal column structure are often accompanied by neoplastic changes. A symptom in the X-ray image may be the lack of a circle's outline, and more precisely its base of the arch. A computed tomography or magnetic resonance imaging (MRI) reveals metastases in the spine, which with their pressure may cause pain and narrow the lumen of intervertebral apertures. This phenomenon is referred to as spinal canal stenosis [26].

**Degenerative changes of the sacroiliac joints (SIJ).** The pain resulting from degenerative changes in the sacroiliac joints is referred to as pseudo-radicular pain, because it can pretend radicular pain [27,28]. It is possible to differentiate degenerative changes of the lumbar region from changes in the sacroiliac joints by using clinical tests which determine the condition of the sacroiliac joints. These include among others the posterior superior iliac spine (PSIS) test, hip bone compression test or Mennell's sign [28].

**Rheumatic diseases.** Low back pain may also result from diseases of rheumatoid origin. These include ankylosing spondylitis, rheumatoid arthritis and psoriatic arthritis [29]. In the case of ankylosing spondylitis after X-rays, it is easy to see the difference to degenerative changes. The X-ray image shows ossifying ligaments are visible, which cause that the vertebral bodies obtain a shape similar to a square [26]. In turn, magnetic resonance imaging, indicates bone marrow edema, i.e. the early inflammatory symptoms characteristic of AS [26].

**Unknown reason.** After exclusion of degenerative changes in the lumbar spine, it may be impossible to find the cause of low back pain. Non-specific low back pain is referred to in the literature as a symptom whose origin is simply unknown [30].

In conclusion, when diagnosing the cause of lumbar spine pain, degenerative changes should be differentiated from other diseases. Often the cause of pain is difficult to determine and multifactorial, and sometimes the patient suffers from back pain for reasons not fully explained [30]. However, when there is an accurate diagnosis, patients should start rehabilitation as soon as possible, and it can include, for example, kinesitherapy (exercises), physical therapy or massage [31].

## 6. Physiotherapeutic treatment

Physiotherapeutic treatments used to treat low back pains are considered as adjunctive therapy and should always be only a part of a rehabilitation program based on kinesitherapy or manual therapy. The most frequently used treatments in this field are ultrasounds, TENS currents, interference currents and laser therapy [32].

TENS (transcutaneous electrical nerve stimulation) is a method based on electrical stimulation through the skin of peripheral nerves. These are impulse currents usually with a rectangular shape, but also sinusoidal and triangular with a frequency greater than 10 Hz, usually between 40 and 100 Hz. There is a low current intensity that causes a clear feeling of vibration or tingling [33]. It stimulates blood circulation in the place of surgery, causes faster healing and nourishing of tissues, eliminates swelling, inhibits inflammatory processes and, above all, acts as an analgesic and regulates muscle tone [34]. In chronic lumbar spine pain, TENS is used in which: pulse duration is 150-200  $\mu$ s, frequency 1-20 Hz, and intensity up to 100mA. After 20-30 minutes, the analgesic effect appears and persists for a long time after the end of the procedure [32].

Laser therapy plays a large role in the treatment of lumbar spine pain, however, so far only a few studies have been carried out to confirm its effect [35]. The analgesic effect of laser therapy is related to the mobilization of metabolic processes in the cellular mitochondria. According to various sources, mechanisms such as are possible:

- reduction of conductivity through polarization of sensory fibers, where hyperpolarization of membranes increases and the amplitude of functional potentials increases within 90-120 mV. It causes faster regeneration of nerve cells and neurolemma.
- changes in conduction in the cholinergic and serotonergic synapses causing vasoconstriction and improvement of microcirculation. This reduces the swelling.
- stimulation of beta-endorphins secretion in the central nervous system and nerve fibers. Endogenous opioids are 18-30 times more potent than morphine and are definitely less toxic than analgesics [33].

However, according to some sources, laser therapy should not be recommended in spine pains due to lack of evidence of its effectiveness [36]. However, there are works confirming the beneficial effects of laser biostimulation. According to Kujawy, clinical observations are positive and persuade to introduce laser therapy during comprehensive rehabilitation, especially in patients with chronic lumbar pain [37].

Ultrasounds (UD) use mechanical vibrations with frequencies above 20 kHz, which are the result of ultrasonic waves. It penetrates deep into the tissue (4-6 cm). In the case of spinal problems appearing at the L-S level, the procedure is performed paraspinally within the segment from L5 to S1 and around the posterior superior iliac spines. The gel is used as a coupling agent, applied on a handheld probe with an area of approximately 5 cm<sup>2</sup> and emits vibrations of 800 kHz or 1000 kHz. By making circular motions around the operated area, the desired phenomena to the tissues is delivered. The recommended dose is 1-1,5W / cm<sup>2</sup>, the duration of the treatment 5-15 min and 5-20 treatments in the series [1]. Ultrasounds are not indicated in acute conditions, because they may exacerbate the inflammatory reaction [38].

Interferential currents according to Nemeč's are medium frequency currents modulated in amplitude with low frequency [33]. The healing effect is attributed to the phenomenon of interference that arises when two flow rhythms overlap. When the signals overlap, their amplitudes add up. In the therapy of low back pain syndromes, two electrical circuits are used. The electrodes are placed in such a way that they form a square with a side of 15-20 cm, within the lumbar-sacral segment, and the painful level should be located where the currents intersect. In order for interference currents to reduce pain and have an analgesic effect, it is recommended to use a current of 80-100 Hz for 10-15 minutes [32].

## **7. Kinesitherapeutic treatment**

One of the fundamental problems of patients with discopathy is the limitation of the scope of torso and pelvic mobility. Providing an adequate amount of physiological effort allows the improvement of soft tissue condition, thus allowing proper nutrition of articular cartilage and optimal stretching of collagen fibers [39].

It is extremely important to provide individualized sets of exercises, this allows not only to maintain, but also to restore the physiological function of the spine. When preparing a set of exercises, the therapist must pay special attention to the proportional amount of flexibility, endurance and strength exercises, while the exercises should be performed within the limits of pain. When selecting a set of exercises, keep in mind the so-called "Muscular corset" (it ensures the optimization of intervertebral disc loads) and "passive spine stabilizers" (ligaments and handbags). Physiotherapist conducting kinesitherapeutic treatments pays particular attention to the proper mobility of individual segments: lumbar spine - pelvis - lower limb. When it is necessary to eliminate pelvic inclination forward and reduce the occurrence of lumbar spine overload, it is recommended to stretch the hip flexors, extensors of the loins and strengthen the weakened gluteal and abdominal muscles [29,40,41,42,43]

Studies have been conducted that have demonstrated the beneficial effects of exercise in the treatment of patients with lumbar discopathy. Thanks to active rehabilitation, an improvement in the mobility of the spine was observed, thus affecting the stabilization of the moving parts of the spine. In addition, physical exercises eliminate states of fatigue and micro-injuries within the spine building parts due to improved coordination and precision of movements, which is generally classified as improving the mechanisms controlling body posture. The conducted research has shown that the time of exercises is reflected in the quality of life of people with degeneration of intervertebral discs. Patients who declared exercise more than 2 hours per week in a history showed a lower level of pain, moreover, a better functional condition of the spine, high level motor fitness, lower motor disorders and increased professional activity were observed [39].

An extremely important element in the effective elimination of pain is kinesitherapy, physiotherapists pay particular attention to taking exercises, because the early application of kinesitherapy gives 90% effectiveness of therapy. Acute pain in the spine is an indication of rest, but not completely immobilized. Activities in the field of kinesitherapy can be taken in

the acute phase, but you should follow the advice of a physician and physiotherapist. In the case of treatment with movement, it is extremely important to have an individual approach to the patient and his current state of health, following these rules gives a good chance of effective therapy [44]

Systematics of kinesitherapy distinguishes the following methods of treatment by movement:

- isometric training: lower and upper limbs, abdominal muscles, back and buttocks,
- breathing exercises,
- autoimmobilization of the spine and lower limbs,
- stretching and elongation exercises,
- exercises allowing to develop the habit of taking the correct posture [44].

If an intervertebral disc hernia is diagnosed, a test aimed at defining the painless directions of the ill person is recommended.

In the first stage of treatment, effective kinesitherapy is aimed at finding movements in which hernia-repositioning is observed. Examples of exercises in the field of reposition are the centralization of pain through exercises initiating spinal hypertrophy, or spinal hypertrophy in a standing position.

In the second stage of treatment, the main goal is to maintain the effects of the first phase treatment, i.e. repositioning of the intervertebral disc. Therefore, it is recommended to perform daily exercises that reverse the hernia, then attention is paid to the restoration of the torso. Physiotherapists recommend systematic exercises to strengthen and give flexibility to the paraspinal muscles and tissues [39,44].

## **8. Prevention**

Spinal pain in modern medicine is a big problem and a challenge for her. 90% of spinal pain is related to its degeneration [45,46]. One of the causes of spinal pain is degeneration of intervertebral discs [47].

Prevention of spinal pain is the basis of therapeutic activities, as it is of great importance in inhibiting the progression of the disease. It is conducted to educate patients to increase their awareness of the pathomechanism of spinal pain and the consequences of ignorance of pro-health procedures [48].

Prophylaxis in combating the formation of degeneration of intervertebral discs includes mainly taking care of one's own spine [49]. This includes a correct seating position and the selection of an appropriate seat. It is necessary to maintain a dynamic seat, consisting of uniform loading and unloading of intervertebral discs, and to avoid tanning. For this purpose, it is necessary to choose a seat in which the backrest should be approx. 50cm high above the adjustable seat, and the seat itself 40x40cm in size, with the function of slightly moving it forward or backwards. This seat should be provided with lumbar support and shoulder support to relieve strain on the intervertebral discs. It is important to sit on its entire surface so that the back of the thighs is not pressed down [47].

Another factor is also taking care of proper sitting and standing up, so as not to burden the spine. When moving from standing to sitting, it is important to lower the buttocks slowly until they come into contact with the surface of the chair, preventing the pelvis from turning backwards. When standing up, tilt the trunk forward so that the center of gravity moves above the feet, and then straighten all joints from hip to ankle joints [47].

A correct standing position is maintained when the pelvis is slightly twisted forward and the spine retains its physiological structure. During normal posture, overloading of the intervertebral discs can be reduced. Adequate stabilisation of the lumbar region can be maintained through strong abdominal muscles and back rectifiers. The most effective release

of the intervertebral disc is achieved by avoiding uncontrolled movements and excessive contraction.

When lifting light objects from the ground, keep your back straight or in an upright position so that you do not strain your spine. Heavy objects should be lifted by standing apart, bending the knee joint to an angle of 90 degrees, hip joints bent to a degree allowing the object to be lifted and the back straightened [47].

The factors influencing spine prophylaxis include ergonomics of work, proper body weight, active lifestyle, avoiding the sitting mode as much as possible. If a person is working in a sitting position, physical activities during or after work are recommended for him/her in order to improve his/her mood, condition, physical fitness and muscle strength [47,48].

## **Discussion**

Pain in the lumbar spine is an increasingly common disorder in both young people and the elderly. It can be caused by various ailments, such as: changes in the intervertebral disc, problems in the inter-gonarthral joints or sacroiliac joints. However, the most common cause of pain in the lumbar spine are changes caused by the degeneration of the intervertebral disc [50].

Most often, discopathy occurs in the lumbar spine. In one study [50] out of 99 patients with discopathy, up to 87.88%, the problem was located in the lumbar region.

As mentioned in our article, discopathy applies to people of all ages. In the study Wolanin et al. [51] compared the effects of physical activity in patients with discopathy before the age of 60 and after the age of 60. They observed that people over 60 had less physical activity and greater disability compared to younger patients.

Part of the comprehensive treatment of patients with intervertebral disc degeneration is physiotherapeutic treatment. Borzęcki et al. [52] checked which methods in the field of physiotherapy are most often used in patients with lumbar spine discopathy. In 33% of the subjects, they underwent physical therapy, 28% - kinesitherapy, massage - 26%, and 13% declared the use of other forms of therapy. In addition, as many as 74% of the respondents recognized that physiotherapy is helpful in the treatment of spine dysarthria. Boyraz et al. [53] compared the effectiveness of high energy laser therapy with ultrasound therapy and kinesitherapy. The VAS scale and the Ovestra questionnaire were used to assess the effectiveness. In all three groups, an improvement in results in the scales used was observed. In another study, Mikołajczyk et al. [54] assessed the influence of two other methods in the field of physiotherapy on pain in the lumbar region of the spine. The first group used methods in the field of therapeutic massage, kinesitherapy and physical therapy, while in the second group, KinesioTaping. In both groups, a decrease in pain symptoms and a decrease in the degree of disability on the Ovestra scale were observed.

In the treatment of spinal pain, spa treatment is also used. The positive effect of spa treatment in this group of patients was confirmed by Wójcik et al. [55]. In people undergoing this form of therapy, they observed reduction of pain, improvement of quality of life and reduction of painkillers. The literature on the subject shows that physiotherapy has many different therapeutic methods, which have been used in patients with lumbar spine problems to bring positive effects for the patient.

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