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Original article

THE ROLE OF MOVEMENT AND NON-MOVEMENT IN LUMBAR DISC HERNIA DEVELOPMENT AND AUTO-MANAGEMENT

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Abstract*

Aim. Lumbar disc herniation is a complex pathological condition with a higher prevalence among people of all ages. Lower-back pain, its main symptom, describes a heterogeneous and dynamic state, with a disorderly pattern, periods of relative absence interspersed with flares, which substantially affects the style and quality of patients' life.

Various studies in asymptomatic subjects have demonstrated the role of the sustained loading of the spine in generating pain by affecting non-contractile and periarticular structures of it and especially the intervertebral discs, which have a very limited capacity for repair or remodeling.

Disuse syndrome, first described in 1984 by Bortz involves effects of sedentary life on physical and human psyche, being responsible for altering health as well. It is caused by physical inactivity installed in various conditions, including lumbar disc herniation and is considered by experts the key variable in perpetuating chronic pain.

Conclusion. To combat the grief and the effects of loading case history of the spine biomechanics, an important role is played by patients' education in disease self-management, overcoming the fear of movement, the implementation of activity, and the increase of life quality.

Moreover, conclusive studies demonstrate the effectiveness of specific physical exercises to improve / prevent pain in subacute and chronic stages of herniated lumbar disc. They play a central role in maintaining the optimal state of the largest avascular structure in the human body, i.e. intervertebral disc.

Keywords: lumbar disk hernia, sustained loading of the spine, disuse syndrome, patient activism implementation

Introduction

Lumbar disc herniation is a complex pathological condition with a very high incidence on the population of all ages. Pain, its main symptom, is chronic, with a messy pattern, with periods of relative absence, interspersed with episodes of acute exacerbation and relapse (Croft et al., 1997).

Lower-back pain is a symptom that describes a heterogeneous and dynamic state. Patient experience, from this point of view, varies depending on the duration, intensity, severity and degree of functional impotence. Most lumbar disc herniations manifest themselves through small / medium pain intensity and low grade of disability, and the severe ones affect only the minority. Some subjects lull (without pain). However, given the high prevalence rate, lumbar disc herniation causes a high percentage of incapacity for work, having a significant impact on individuals and society.

The pain substantially affects the style and quality of life of patients, with long-term repercussions, resulting in lumbar disc herniation with major implications in terms of complex medical, social, psychological and costs, thus becoming a global socio-economic problem. It requires an appropriate treatment attitude, individualized to each case, in order to maximize results.

Physical therapy is a non-surgical treatment option for spine conditions that have impaired or immobilized movement and flexibility, and involves guidance from a physical therapist who teaches patients how to use their own muscles to improve flexibility, range of motion, muscular strength and endurance. Physical therapy can include the use of modalities like hot packs, TENS units and ultrasound (described as passive physical therapy), incorporate different stretching, strengthening and aerobic conditioning exercises (active physical therapy), or utilize the practitioner's hands to put pressure on and manipulate the joints and muscles (manual physical therapy).

The time factor and the loads

There is much research on the factors causing and / or triggering this condition. Various studies in asymptomatic subjects demonstrated the role of the sustained loading of the spine in generating pain. Not only the relaxed sitting position with the trunk or, in case of cervical spine,

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hyperextension, causes pain, but also how to maintain these positions for a long time. By reducing muscle activity (due to fatigue) occurred during these supported postures, the mechanical stress acts especially on non-contractile and periarticular structures, such as ligaments, joint capsule and intervertebral disc. The effect of maintained or repeated loading on the collagenous tissue during the time has an important role in the pathogenesis of musculoskeletal disorders (Sbenghe, 1981).

The pain installing insidiously, following this kind of situation, it is more frequent than its brutal outbreak. Experimental findings provide arguments that explain this phenomenon by damages created due to fatigue, occurring at low loads by cumulative stress (Dolan, 1998; Adams, Dolan, 1995; Wilder, Pope, Frymoyer, 1988). This increases the importance of case history load in the biomechanical of spine and in the etiology of herniated lumbar disc. For example, the sustained load generates stress concentration in the posterior fibers of the fibrous annulus, which can be a cause of pain in vivo (McNallz et al., 1996). The largest avascular structure in the human body, intervertebral disc, is particularly prone to fatigue, with a very limited capacity for repair or remodeling (Adams et al., 1995). Uncomfortable loads in flexion along with the previous translation and the time factor can be a cause of distortion or damage of any spinal collagenous structures. Weakening and cracking fibrous annulus blades, ligament or joint capsule are possible with charging supported (Adams, Freeman, Morrison, Dolan, p.68, 2000; Twomey, Taylor, 1988).

Creep, hysteresis and set

If a constant force is applied to a collagenous structure for a longer period of time, the movement occurs as a consequence. This movement is very slow, discreet, imperceptible and is known as "creep," according to McKenzie (2004). It is the result of rearrangement / redistribution of collagen and proteoglycans, as well as of the resorption of water from the tissue. The short periods of biomechanical stress do not act enough to create the appearance of this phenomenon, unlike the case when the forces are backed up, causing elongated structures, as if maintaining the sitting position on an office chair for several hours, for example (sedentary occupations).

After the removal of the force, and if it does not act excessively, tissues start to recover. However, the recovery of the original shape occurs more slowly and with a capacity of less elongation than the initial one, respectively the possibility to deform. The degree to which restoration occurs after loading is known as the "hysteresis" (Twomey, 1982). Initially, the structures may not recover completely, remaining slightly elongated. This difference between the original and the actual length is known as the "set" (McKenzie, 2004), a phenomenon that often occurs after "creep". If the interval after the occurrence of the phenomenon of "creep" is long enough, it can achieve full recovery and the structure can return to the start. Depending on the tissue and force applied, they can be temporarily stretched, if the load is straining, or tablets, if it is of compressive type.

Either way, collagenous structures are usually not given enough time to return to their original shape before recharging. If the force causes the dysfunctional links between collagen fibers (overthrust, tangle), the set can persist indefinitely (McKenzie, 2004). Therefore, repetitive forces applied for long periods of time may cause alteration of the mechanical properties of collagen structures. Not only ligaments, joint capsule, or parts of the intervertebral disc can elongate and may lose some of the mechanical properties, but at the same time, the tissues become vulnerable to damage and thus likely to succumb due to fatigue.

After sustained stress / repetitive structures can succumb to much lower loads than those causing damage through a single application. While loading has no effect of damage on tissue, the same load, within normal limits, longer or repeatedly applied can lead to tissue tearing (McKenzie, 2004).

The "disuse" syndrome (Calotă, 2016)

Chronic pain of any kind predispose to the risk of developing a physical syndrome of "disuse" in which the muscle mass and decreases in terms of the mass and force if not optimally used. In principle, disuse syndrome involves sedentary effects on human physique and psyche. It was first described in 1984 by Bortz and since then it has been given more attention in relation to chronic pain, and other pathological conditions. It was generally concluded that it is responsible for altering the health of human beings and that is caused by lack of physical activity, installed in various diseases, including lumbar disc herniation in particular, and also caused by the actual style of life of the society, in general.

The effects of the disuse syndrome

The disuse of the optimal body components leads to multiple functional damages. This phenomenon is an extension of the old adaggio "use it or lose it".

There are several consequences of disuse. They occur in multiple systems tissues and systems of the body, but the most obvious are installed in muscle and bone tissue, cardiovascular system,

blood components, gastrointestinal tract, endocrine and nervous system, as follows:

In the muscular system, inactivity can quickly lead to muscle atrophy and inertia. The perimeter of an immobilized limb decreases noticeably after a period of immobilization;

Cardiovascular effects include a decrease in the oxygen concentration, the increase in systolic blood pressure, the decrease of plasma volume by 10-15 percent after some prolonged bed rest;

Physical inactivity causes changes in the proper functioning of the nervous system: the slowness of intellectual processes, memory and concentration problems, depression, anxiety.

In addition, there are many other physiological changes. "Failure" (disuse) was described as follows: inactivity has a pervasive role in the absence of wellbeing. Failure is physically, mentally and spiritually debilitating.

Many specialists believe that disuse syndrome is the key variable in the perpetuation of many chronic pain. It can appear in a variety of medical problems, increasing the likelihood of installing a chronic pain syndrome, or exacerbating it.

Unfortunately, the attitude and the usual treatment in the medical world sometimes lead to an even greater passivity of the patient with lumbar disc herniation, without paying attention to physical activity and exercise therapy of any kind.

The disuse syndrome may also cause emotional changes associated with the increased pain perception. Trying to become physically active can be overwhelming for people with chronic pain, therefore physical therapist supervision and guidance are needed.

Education

Numerous research suggests that patient education plays an important role in managing pain occured in the lumbar disc herniation (Indahl, Velund, Reikeraas, 1995; Burton, Wadell, Tillotson, Summerton, 1999; von Korff, Moore, 1998; Moore, von Korff, Cherkin, 2000; Roland, Dixon, 1989), but also in preventing or alleviating the phenomenon described above (creep - hysteresis - set). These studies used various methods to provide patients with adequate information on the conduct of normal activities, self-management of the disease and overcome fear of movement and to influence their attitudes, beliefs and behavior (Nedelcea and Dumitru, 1999) in disease management.

There are many potential side effects of too much sitting, for example, including numerous problems related to the lower back. Patients can be adviced to avoid this health issue (that is commonly reffered to as sitting disease) by applying the following ideas (Stephanie Burke):

Standing up every 20 to 30 minutes. It engages both the lower back and leg muscles, which in turn spurs nourishing blood flow throughout the body. So this simple act can reduce the lumbar pain and muscle stiffness, while increasing the level of energy;

Incorporating stretching into the daily routine. Spending prolonged periods of time in the seated position tends to shorten the hamstring muscles, as well as the muscles and the soft tissues around the hips. Keeping the hands on the computer mouse and the keyboard, for example, can also stiffen up the shoulder joints. Even a few stretches throughout the day can go a long way towards loosening up the muscles and soft tissues;

Going for a walk. Walking provides many benefits, including spurring the release of endorphins.

Shortly, the patients must be educated to strive towards a healthier lifestyle, by committing to stand up and move a little more every day.

The physical exercise

There are conclusive studies on the effectiveness of specific physical exercises, particularly for low back pain of subacute and chronic stages of the disease (Faas, 1996; Haigh, Clarke, 1999; Maher, Latimer, 1999; Nordin, Campello, 1999). Maher and his colleagues conclude that patients in the acute phase should be advised to avoid bed rest and return progresively to their normal activity and chronic patients should be strongly encouraged to practise intensive exercise.

Bakhtiary et al reported results of a prospective randomized controlled trial investigating the effect of lumbar stabilizing exercise in patients with lumbar disc herniation. Of the 60 patients included in this crossover design study, 30 were assigned to each treatment group. Patients in Group A received four weeks of lumbar stabilizing exercise, followed by four weeks of no exercise. Patients in Group B received four weeks of no exercise, followed by four weeks of lumbar stabilizing exercise. The lumbar stabilizing exercise protocol included four stages of stabilizing exercises from easy to advanced. The authors concluded that a lumbar stabilizing exercise protocol may increase lumbar stability and improve activities of daily living performance in patients who have suffered with a herniated lumbar disc for more than two months.

Thackeray et al performed a prospective randomized controlled trial to investigate the therapeutic outcomes of physical therapy after selective nerve root blocks (SNRB) and of SNRBs alone in people with low back pain and sciatica due

to disc herniation. The authors concluded that the results of this pilot study failed to show that physical therapy interventions, intended to centralize symptoms after SNRBs, were more beneficial than SNRBs alone.

Specific exercises for leg pain and other symptoms from a lumbar herniated disc are prescribed according to which positions will cause the patient's symptoms to move from the leg (or foot) and into the low back.

Exercising is an effective way to strengthen and stabilize low back muscles and prevent further injury and pain. Strong muscles support body weight and bones—taking unnecessary pressure off spine.

But even if the pacient have strong muscles to support the back, they must lose weight to truly support the spine. Losing weight will reduce pain and promote the health of back.

Both in the case of a patient with lumbar disc herniation, recovering from a flare and to prevent the creep-set-hysteresis phenomenon, the effects of exercise could be summarized briefly as follows:

- maintain and correct posture;
- maintain and increase muscle endurance and strength;
- develop and maintain normal motor functions and recover the disturbed ones;
- prevent osteoporosis inactivity;
- increase capsule and ligament strength and elasticity;
- improves muscle properties:
- trophicity, elasticity, excitability and contractility by synchronizing the motor units etc .;
- helps the patient regain confidence in his/her own possibilities for recovery, causing his/her active participation in the execution of the physical therapy program.

Specifically, through therapeutic exercise, the following objectives are aimed to:

- Improving the postural balance;

- Correcting the track position of the center of gravity of the body;

- Maintaining / reforming the physiological lumbar lordosis;

- Toning the muscles of the belts (scapular and pelvic) and lower limbs simultaneously with toning the abdominal and paravertebral muscles;

- Finding means by which to achieve self-management of the disease (avoid prolonged bed rest versus activism, the hygiene of the spine by practising physical exercise regularly, alternating periodically the supported postures to prevent damages of collagen structures, influencing attitudes and beliefs about pain).

Faas (1996) says that in acute back pain, exercise therapy is ineffective, whereas in subacute back pain, exercises with a graded activity program, and in chronic back pain, intensive exercising, deserve attention.

Conclusions

Non-movement has destructive effects upon human body in general and upon intervertebral disks in particular.

Educating the patient with lumbar disc herniation on the management of this chronic, progressive disease may contribute greatly to his/her increased quality of life.

Systematic practice of physical exercises maintains a good hygiene of spine and its non-contractile structures, preventing their deterioration.

It is desired to implement to patient the activism versus maintaining fixed positions for a long time, prolonged rest and fear of moving, through / using the recovery team (the physician – the physical therapist).

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