MOVEMENT ACTIVITY AND SPORT FOR PATIENTS AFTER CERVICAL DISCECTOMY

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Abstract: *Vertebral syndromes are frequent diseases among today's population. The success of conservative treatment of discogenic disease of the cervical spine is high, but not all states can handle it a conservative way. As a result, surgical solutions are often indicated. In clinical practice we often meet patients who have undergone implantation of an artificial cervical intervertebral disc or an interbody cage for spinal fusion. These are often people of productive age who can be fully involved in personal and professional life after the surgery. Regular sports activity helps these patients maintain good health, as well as physical and mental fitness. Patients who have undergone intervertebral disc surgery in the cervical spine should be educated about what kinds of sports and physical activity they should avoid, or at least what principles should be followed when engaging in physical activity. If a chosen physical activity is inappropriate, or if it is not performed in the right way, there is a possibility of damage to the locomotor system, and even injury.*

This article summarizes and recommends types of physical and sports activities that these patients can perform, emphasizing correct procedures.

Key words: *Movement activity. Sport. Intervertebral disc surgery. Cervical spine.*

Introduction

Spondylous syndrome is a disease with very high annual prevalence. According to the literature, there is 15-45% evidence of this indispositionevidence of probability . It is estimated that 1% of the population has temporary symptoms and 1% has permanent symptoms of spondylous disease (Dvorák et al., 2008). During a lifetime, 26-71% of the adult population may experience episodes of pain or stiffness in the area of the cervical spine. Neck pain is more common in women (77.8%) than in men (Graham et al., 2008).

Although the percentage of conservative treatment in cases of discogenic disease in the cervical spine is high, not all conditions can be positively influenced by this therapy (Nechvatal et al., 2014).

In these cases, surgery may be indicated. Some authors (Pataky et al., 2010) indicate that about 25% of patients with degenerative disease of the cervical spine meet the criteria indicating surgical treatment. Currently, various types of artificial intervertebral disc replacement are used in the cervical spine segment.

These are implants and spacers (Carbon, PEEK, Cespace, and the like) that preserve the anatomy and provide conditions for solid fusion (through the obliteration of adjacent vertebrae) (Chong et al., 2015).

If spondyloarthropathic changes in the relevant segment are not extended, semidynamic and dynamic replacement of intervertebral discs is indicated; which, unlike merger, partially replaces the physical abilities of the disc and eliminates development of compensatory hypermobility in segments adjacent to the operated plates. Luo et al. (2015), indicates in their study that patients

with fusion are at greater risk of early degenerative changes in adjacent disc levels. Other authors (Daniels et al., 2012, Matsumoto et al., 2010, Xia et al., 2013, Zhang et al., 2015) also state that, although anterior cervical discectomy and fusion is successfully performed during the treatment of symptomatic radiculopathy or myelopathy, merger occurs to the adjacent segments of the harmful effects; in other words, there is increased movement and a higher incidence of the progression of disc degeneration. It is assumed that restriction of movement in one segment results in hypermobility in adjacent segments, which then increases affective strength in adjacent segments. This speeds up the degeneration of the intervertebral disc. The effects of these adverse factors can be enhanced in certain specific physical activities, such as sport activity involving the incorrect position of the head and neck, as well as cervical spine movement into side positions.

CERTAIN PHYSICAL ACTIVITIES AND SPORTS

The development of society is associated with many serious changes and problems that are reflected in the level and quality of carrying out physical activities, which do not have sufficient status in the value criteria of today's society (Uherová, 2012). The consequences of an unhealthy lifestyle linked with a lack of exercise tend to motivate people to do different types of physical activities (Šingliarová, 2013). The aim of physical education and sport is to maintain and strengthen one's health, and to increase physical activity and performance. But engaging in the incorrect kinds of sports, those which are unreasonably excessive, and especially those which physically influence the affected musculoskeletal system can be associated with a high risk of further damage or even injury (Máček et al., 2011). The initial enthusiasm often turns into disappointment, which again can lead to hypokinesia.

Patients who have had intervertebral disc surgery in the cervical spine can begin to excercise after the radiological symptoms of bone fusion in the operated segment appear. It is important that the patient engages in a suitable type of sport or physical activity, but its correct performance is equally important. One of the most important factors involved in the development of degenerative disease of the cervical spine is the mechanical factor. Its negative effects will occur especially when the head is moved forcefully (i.e., pushed forward or backwards) and when it is exposed to physical shocks. Pushing the head forward will cause the articulated tabs of intervertebral (facet) joints to recuperate horizontal position, which results in the bearing of more head weight and therefore rapid degenerative changes. At the same time, it strains the nuchal muscles. Because the upper fixators of the shoulder blades have their distance on the cervical vertebrae, the constant carrying of heavy loads also transfers its weight onto the cervical spine (Rychlíková, 2009).

Among the popular sports that recreational athletes often engage in are cycling, swimming, running, and hiking. However, mountain bike riding is not suitable for people suffering from cervical spine problems, head is leaning backwards for a length of time during the ride, and that strains the neck muscles (Figure 1).

Figure 1. *Head pushed backwards whilst cycling (archival photo of the author)*

For this reason, it is more appropriate to exercise on a stationary bicycle, but only when maintaining the upper body and head in the correct position.

Similarly inappropriate is the breaststroke swimming style, which strains the cervical spine.

Many recreational swimmers prefer this method because it is easy, and the head is not under the water because it remains in reclined position (Gúth et al., 2011). This unsuitable position of the head sustains continuous isometric contraction of the neck muscles and back of the neck. It is therefore necessary to learn an appropriate method of swimming, in which head is in line with the body apart from the inspiratory phase.

In the swimming style known as "crawl", the head is underwater except when the swimmer breathes, when the head has to rotate to the side. However, less experienced swimmers take a breath every other stroke instead of every third stroke, so the neck always rotates to the same side, which causes uneven pressure to that area. Moreover, extreme rotation of the cervical spine is not advisable for patients who have undergone merger of the cervical vertebrae, as it may encourage hypermobility in adjacent motion segments.

Due to the drawbacks mentioned, the swimming style known as "backstroke" is classed as the most suitable. Supine body position and head positioned in the middle with minimal rotational movements excludes straining of the nuchal muscle and cervical spine. The disadvantage however, is the absence of visual control of the space in the direction of swimming.

Running and walking are the most natural physical activity for humans. These activities do not require much equipment and can be done at any time of the year. In regards to cervical spine problems, it is necessary to follow certain principles. Joints and the spine are exposed to shocks during running and walking. A healthy musculoskeletal system can absorb these shocks by means of different mechanisms. Examples of this are the suspension that arises when controlling how the foot is put down fully during the action of the dorsiflexors, and the visceroelastic properties of intervertebral discs. The function of absorption is missing as a result of the merger of cervical vertebrae discs. It is therefore important to use shoes with flexible soles and avoid exercising on hard surfaces (e.g., tarmac, concrete).

While hiking, we should also avoid shocks especially in rocky alpine environments. Shocks arise when stepping down; this can be eased, for instance, by using trekking poles, preferably those with a spring-loaded mechanism. It is also important to correctly choose a backpack with lumbar support and thick straps, which allow the weight to be transferred to the hip bones, taking pressure off the shoulders and neck muscles. However, it is not advisable if the backpack is too heavy, so that when balancing the body's centre weight it must move in a ventral direction, which will automatically force the head forward and the atlanto-occipital joint will be in reclined position (Figure 2) while the patient is looking forward.

Figure 2. *Head pushed forward during hiking (archival photo of author)*

Recently, Nordic walking has become popular; it is easy and it does not require high physical strength. It is suitable for elderly people, cardiac patients, and people with certain diseases of the locomotor system. Walking sticks are used, thereby significantly increasing the activity of the shoulder girdle muscles, especially the *musculus latissimus dorsi* (Kračmar et al., 2011). One of the functions of this muscle is the depression of the shoulder blades, thus inhibiting its activity in terms of reciprocal innervation of the antagonistic muscle group – i.e., the upper fixators. In this way, the cervical spine is not under pressure and at the same time it decreases the tendency of hypertonus and myogelosis in the nuchal muscles. With the right posture

and movements of the upper limbs, with an emphasis on the extension of the shoulder joints, Nordic walking is ideal as physical activity for patients after surgery of the cervical spine.

Various popular physical activities are used in physiotherapy and beyond. Some of these activities are well-known physiotherapy techniques with solid physiologically-provided actions of the mechanism. There are many, but we will mention only a few: the Stabilization and Mobilization (SM) system, Pilates exercises and Tai-chi.

The SM system is a set of exercises that involves elastic rope. The basic principles of the SM system includes coil stabilization (stabilization of the spine by muscular spiral chains), which creates an upward traction force (Smíšek et al., 2009). This relieves the intervertebral discs and joints and straightens the spine. Furthermore, it attenuates the paravertebral muscles, through active stretching using reciprocal inhibition of muscle recovery of the body axis, and builds extended movement patterns of the shoulder and pelvic girdle. These principles with their synergistic action induce muscle balance, build complex stabilizing musculature, and support upright posture. This creates favourable conditions for the correct position of the cervical spine and head, and this then helps to activate the *latissimus dorsi* spiral (Labunová et al., 2014). The SM system is also a suitable method for those with implanted intervertebral discs in the cervical spine. However, guidance from a trained physiotherapist or other competent worker is essential.

The Pilates method is an exercise program focusing on a deep stabilizing system, removing muscle imbalance, improving body posture, focusing on movement coordination, and maintaining physical fitness. It consists of 32 basic exercises that can be adjusted accordingly to an individual's needs. With regular exercise, the cervical spine will get into correct position with respect to the thoracic spine and the sagittal plane (Cruz-Ferreira et al., 2013). It is beneficial for the nuchal muscles, and it does not strain, thus it eliminates the malfunction either in the muscle itself or in the motion segment actively linked to the group of muscles in the neck.

Tai-chi is a set of 108 exercises which are taken and adapted from the traditional Chinese martial art. It aims at slow, controlled, continuous movements which are coordinated with breathing, leading to so-called meditation in motion. This exercise has beneficial effects on the human body such as physical and mental well-being. It restores and hardens mental and physical balance and fitness. It improves muscle strength and may be an effective treatment for fibromyalgia (Zhang, 2014). There are studies published in the literature that demonstrate the positive impact of primary Tai-chi for pain in the cervical spine (Plastaras et al., 2011). Tai-chi, however also benefits patients if they have neck pain related to poor posture, with the head pushed forward, and to stress (Plastaras et al., 2011).

CONCLUSION

Sports and physical activity should be a natural part of a healthy lifestyle in our society. A healthy person may be limited by the lack of free time or their own convenience. People with health problems may have additional limitations related to their disability. Nevertheless, regular exercise helps to maintain good health and physical and mental well-being. An incorrect choice of physical activity or sports activity, or its incorrect performance, may result in damage to the tissue of the locomotor system or even deterioration of the condition. Therefore, even for people with implanted artificial cervical intervertebral discs, it is important to understand which sports activities are appropriate, and how they must be carried out safely and appropriately.

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TJELESNE AKTIVNOSTI I SPORT NAKON CERVIKALNE DISKEKTOMIJE

Sažetak: *Vertebralni i vertebrogeni sindromi česta su oboljenja. Uspješnost konzervativnog liječenja diskogenih oboljenja vratne kralježnice je visoka. Međutim, ne postoji uvijek mogućnost njihovog tretmana na konzervativni način, već je često puta indicirano kirurško liječenje. U kliničkoj praksi sve češće susrećemo pacijente kojima je ugrađena proteza cervikalnog intervertebralnog diska. To su često puta ljudi u produktivnom dobu, koji se poslije operacije u potpunosti ponovo uključuju u osobni i profesionalni život. Redovito bavljenje sportom pomaže tim osobama u očuvanju dobrog zdravstvenog stanja, kao i fizičke i psihičke kondicije. Pacijente podvrgnute operaciji intervertebralnog diska u području vratne kralježnice potrebno je podučiti o tome koje sportove i tjelesne aktivnosti trebaju izbjegavati, odnosno koja načela moraju poštivati tijekom bavljenja tim aktivnostima. Ako se izabere neprikladna tjelesna aktivnost, odnosno ako se ona ne izvodi na pravilan način, može doći do ozljede odnosno oštećenja lokomotornog sustava.*

Ovim radom želimo široku stručnu javnost izvjestiti o preporučenim tjelesnim i sportskim aktivnostima kojima se pacijenti poslije operacije intervertrebralnog diska mogu baviti, s naglaskom na njihovo ispravno izvođenje.

Ključne riječi: *sport, operacija intervertebralnog diska, vratna kralježnica*