

# A three-stage concept of spine pathology treatment – a different perspective

Kamil Koszela 

Department of Neuroorthopedics and Neurology Clinic and Polyclinic, National Institute of Geriatric, Rheumatology and Rehabilitation, Warsaw, Poland

## Abstract

Spinal pathologies develop in patients of all ages and may have various underlying factors. These factors include, among others, myofascial pain syndromes, disc herniation and spinal degeneration. Treatment alone, both causal and symptomatic, is not always sufficient in certain situations. The aim of this paper is to discuss the question of comprehensive treatment of spine pathologies focusing on a three-stage treatment concept. An important aspect is to determine the risk factors and their reduction, or at least modification, i.e. the first stage of the discussed treatment concept. Then, medical treatment aimed at a specific pathology, including both conservative and surgical methods, allows the cause of the pathology to be removed, i.e. the second stage of the discussed concept. And finally, timely and specialized, broadly understood rehabilitation allowing to maintain the effect of medical therapy. The implemented rehabilitation can be considered as the third stage of the discussed treatment concept.

**Key words:** treatment, spine, back pain, risk factors.

## Introduction

Often, during the therapeutic process of musculoskeletal system pathologies, including the spine, various medical procedures are performed to eliminate the cause.

Targeted treatment to remove the cause of the disease or dysfunction should be the main goal of management. The success of such treatment is possible if it is directed at the pathology that is the cause of the symptoms, especially in the case of acquired spine pathologies such as discopathy or spondylosis [1]. The main groups of spine pathologies are presented in Table I.

Sometimes only symptomatic treatment is used. In most cases, conservative treatment is applied, but in some cases surgical treatment is implemented. However, attention is not always paid to the risk factors of the development of a given disease. Isolated treatment of musculoskeletal disorders may be insufficient. Taking into account the fact that spine diseases are nowadays becoming civilization diseases, they require a comprehensive approach, starting with the risk fac-

tors causing frequent spine pain, malfunctioning, depression, social withdrawal or work absence [2]. Their reduction, or at least modification, makes it possible to maintain effective medical treatment based on both conservative and surgical approaches. Then, the implementation of physiotherapy, in the broad sense, aimed at a specific pathology allows the good treatment effect to be maintained, paying particular attention to an individual approach to each patient [3]. The proposed three-stage treatment concept is presented below. The regime discussed in this paper takes into account three stages: The first is reduction/modification of the risk factor(s) for musculoskeletal system disorders, including the spine. The second stage involves the inclusion of medical therapy in the broad sense. Then the third stage is based on the implementation of targeted rehabilitation, especially kinesiotherapy, importantly, introduced when appropriate, depending on the type of pathology and the medical therapy used. It should be emphasized that in the process of treating spine disorders (SD), apart from doctors

---

### Address for correspondence:

Kamil Koszela, Department of Neuroorthopedics and Neurology Clinic and Polyclinic, National Institute of Geriatric, Rheumatology and Rehabilitation, 1 Spartańska St., 02-637 Warsaw, Poland, e-mail: [kamil.aikido@interia.pl](mailto:kamil.aikido@interia.pl)

**Submitted:** 30.12.2023; **Accepted:** 09.02.2024

and physiotherapists, nurses, psychologists, social workers and other specialists also play an important role.

The aim of this paper is to discuss the question of comprehensive treatment of acquired noninflammatory SD focusing on a three-stage treatment concept.

### Stage 1

#### Assessment of risk factors

Lack of regular physical activity, sports and a sedentary lifestyle are very important risk factors for spine pathologies, including frequently diagnosed discopathy. Already in the early years of life, atrophy of blood vessels in the intervertebral discs occurs and the region is nourished by the diffusion of surrounding tissues. The more physically active the child is, the better is the process of nourishing the intervertebral discs. If children do not exercise or play sports, they spend many hours at school and then using the computer. In consequence, these factors provide a basis for the development of discosis – i.e. the formation of degenerative lesions within the intervertebral discs. Subsequently, degenerative changes in the spine may occur due to discopathy [4]. We can influence many risk factors, known as modifiable factors. These include, among others: physical activity, sedentary and overloading lifestyle, smoking, a non-ergonomic workstation where we spend many hours during the day or throughout our lives. Fixing the monitor at an incorrect height, or incorrect use of a mobile phone at flexion, causes overload of the cervical spine [5, 6]. The overload level vs. flexion angle is presented in Table II.

Unfortunately, nowadays, when the use of electronic devices is so common, it is practically impossible to eliminate these factors, but it is possible to modify them to some extent. For example, if a doctor recommends an accountant to quit the use of a computer, it is practically impossible. Therefore, this stage should be based on the adjustment of modifiable factors. Table III presents examples of modifications of risk factors for back pain syndromes.

The case is a bit more difficult for non-modifiable factors. We cannot significantly influence these factors, so any adjustments of modifiable factors may partially support this stage. The non-modifiable factors include mainly: age, patient’s predispositions (e.g. immune disorders – higher risk of infection, hematological disorders – higher risk of bleeding, hematoma) and genetic factors.

### Stage 2

#### Pharmacotherapy

Medical therapy in the broad sense is an almost fixed element of SD treatment. Very often, analgesics, anti-inflammatory drugs, myorelaxants and vitamin pharmacotherapy are used. However, it should be clearly stated that the use of analgesia alone, i.e. only symptomatic treatment, is insufficient. In consequence, it may have a negative impact on the patient by pain attenuation and delay diagnosis and targeted treatment implementation.

**Table I.** Groups of spine pathologies

Spine pathology
Congenital
Vertebral anomalies, e.g. Klippel-Feil syndrome, hemivertebrae
Abnormal spinal alignment
Scoliosis
Kyphosis
Lordosis
Congenital spondylolisthesis
Tethered spinal cord
Spina bifida
Meningocele and myelomeningocele
Acquired
Inflammatory
Infectious
Abscesses
Discitis
Non-infectious
Spondyloarthropathies
Non-inflammatory
Scheuermann’s disease
Overload pain syndrome
Discopathy
Spondylosis/spondyloarthrosis
Spondylolisthesis
Injuries
Secondary scoliosis
Tumors

**Table II.** Cervical spine load (in kg) vs. flexion angle between chin and sternum [7, 8]

Flexion angle between chin and sternum	0°	15°	30°	45°	60°
Cervical spine overload	4–5 kg	Approx. 12 kg	Approx. 18 kg	Approx. 22 kg	Approx. 27 kg

**Table III.** Examples of risk factors causing spine overload and their modifications

Risk factor	Spine overloads	Factor modification
Monitor fixed on the right/left side of the desk	Overloads, especially in the cervical spine	Place the monitor centrally or use a swivel chair to sit in front of the monitor
Monitor fixed at incorrect height	Overloads, especially in the cervical spine	Setting the monitor at the correct height – adjusting the ergonomic workstation
Sedentary work (long hours)	Entire spine overloads, especially the lumbosacral segment	Introducing frequent, short breaks, physical exercises, placing e.g. a printer at a certain distance from the workstation
Excessive cell phone use	Entire spine overload, especially the cervical segment	Minimizing the flexion angle between head and chest. Holding the phone, e.g. frontally
Carrying heavy loads	Entire spine overload	Weight distribution into smaller batches. Using e.g. a bag on wheels
Incorrect way of bending/lifting objects	Entire spine overloads, especially the lumbosacral segment	Ergonomic use of the musculoskeletal system, e.g. squatting and lifting objects from the knees
Breaststroke swimming	Overloads, especially in the cervical spine	Not giving up swimming, but modifying the swimming style, e.g. on your back, using a board
Incline cycling	Entire spine overload, especially the thoracolumbar segment	Continue cycling, position the handlebars higher, the seat lower – an upright body position
Yoga without warming-up	Overload of the spine, joints, tendon attachments	Implementing a warm-up that improves blood flow through soft tissues (muscles, tendons, ligaments)

According to the latest literature, rest and pharmacotherapy do not play a key role in the treatment of back pain syndromes. Physical activity and multidirectional treatment are recommended [9]. During exacerbations, it is difficult to talk about exercise therapy or kinesiotherapy in the broad sense. In such circumstances, the patient reports severe pain and limited spine mobility, which prevents them from working or performing basic everyday activities. Due to the fact that myofascial pain syndrome (MPS) is frequently diagnosed, one of the newer minimally invasive therapy alternatives that can interrupt this pathological process is the use of a microinjection technique, a peri-spinal therapy called local intradermal therapy, or more commonly, spinal mesotherapy. This method can be used with drugs to relieve pain and inflammation (e.g. ketoprofen), anesthetics (e.g. lignocaine, bupivacaine), myorelaxants (e.g. diazepam), and regenerative drugs (e.g. tropocollagen I) [10, 11]. Due to its safety and low risk of complications, this therapy is used more and more often as one of the treatment stages with the aim, among others, of interrupting the process of chronic disease exacerbation, reducing pain, improving mobility and creating conditions for the effective use of the third stage – rehabilitation.

### Surgical treatment

In some patients, despite the implementation of conservative treatment, spinal surgical treatment should be considered, which is used primarily in the case of neurolog-

ical symptoms, such as paresis or sphincter disorders. Obviously it is targeted at its cause. Unfortunately, very often the surgical treatment is delayed for various reasons. Then, the pathological lesion progresses, the patient gets older, and new diseases develop with age. All this may have a significant impact on the final effect of surgical treatment.

Unfortunately, some patients still report pain despite spinal surgery. In such cases failed back surgery syndrome is diagnosed [12]. Failed back surgery syndrome is a generalized medical term that is often used to describe the condition where back pain persists or appears after spine surgery. Important risk factors include instability after surgery, tissue scarring after surgery, and the patient's predispositions [12, 13].

However, a very important aspect is a thorough assessment of whether the symptoms originate from the spine or whether they are caused by paraspinal pathologies, such as greater trochanteric pain syndrome, which require different treatment [14]. In consequence, it turns out that the patient, apart from SD, may also suffer from other disorders of organs of the musculoskeletal system, which, e.g., develop as a result of SD or constitute their complications.

### Stage 3

#### Rehabilitation

Spinal rehabilitation plays an essential role in treatment of musculoskeletal disorders. Eagerly used are

regeneration of pathologically changed tissues [15–17]. Many studies have reported the effectiveness and safety of various therapies. However, attention is not always paid to the time needed to implement a specific physiotherapeutic procedure for a specific spine pathology. Therefore, for this purpose, various studies are carried out to determine at what stage, after medical therapy, to implement the specialized rehabilitation: whether to use it simultaneously or immediately after the second stage – medical therapy – or sometimes after the discontinuation of medical therapy. This is important for the effective maintenance of previously administered medical therapy [18].

Soon after introducing conservative therapy (pharmacotherapy) as well as after surgical therapy the use of exercise therapy is recommended after a short time but under some conditions especially after surgical procedures.

However, starting exercise therapy too quickly in patients after spinal surgery may lead to health deterioration and expose the patient to complications requiring reoperations. This applies to both less and more invasive surgical techniques. After the endoscopic removal of an intervertebral disc herniation, i.e. a minimally invasive surgical technique that should cause little tissue trauma, the healing period of the annulus fibrosus is consistent with the biological process of soft tissue healing, i.e. a standard period of 6 weeks. Spinal rehabilitation introduced too soon may lead to the development of recurrent hernia [19].

The same applies to patients with spinal stenosis after extensive open spine surgery with spinal canal decompression and posterior lumbar interbody fusion, i.e. screw implantation. Typically, rehabilitation aimed at the spine is not implemented earlier than after 2–3 months due to the risk of implant loosening and exposing the patient to another surgical procedure [20, 21]. In some patients, the rehabilitation process can be started earlier; therefore the treatment in this matter should be

individualized. Table IV shows the implementation time of targeted rehabilitation for the operated basic pathology for selected spine surgery methods.

Therefore, each spinal pathology has its own different treatment regimen. Early postoperative physiotherapeutic treatment is justified, but it should first concern other issues, e.g. anticoagulation, breathing improvement, learning and controlling walking with the use of orthopedic equipment. Attention should also be paid to the patient's education, especially regarding spinal load reduction in everyday life.

## Discussion

The issues related to SD treatment constitute an enormous discipline. This is not only a health problem, but also a social one. In addition, other specialists play an important role. A psychologist or psychiatrist is often necessary in comprehensive management. Sometimes a social worker needs to be involved. Therefore, the treatment of spine pathology is multidirectional [24]. Many articles published in the world of medicine present the issue of risk factors for back pain syndrome separately. Medical and physiotherapeutic procedures are often discussed separately. However, papers promoting a disciplinary approach to the treatment of musculoskeletal system pathologies, including the spine, are increasingly published [25, 26].

Additionally, it is worth paying attention to a paper by the UEMS-PRM Section Professional Practice Committee, which describes the role of physical and rehabilitation medicine physicians in the management of spinal pain, focusing particularly on low back pain and neck pain [27].

Therefore, the aim of this paper is to address the issue of comprehensive treatment of spine pathologies, focusing on a three-stage treatment concept, especially taking into account the aspect of risk factors. Their reduction is often impossible for various reasons. A doctor's

**Table IV.** Optimal time to start rehabilitation after the most common spine operations [19–23]

Spine pathology (indications for surgery)	Method	Time of targeted physiotherapy for the operated pathology
Lumbar disc herniation	Endoscopic	6 weeks
	Microdiscectomy	6–12 weeks
	Classic herniectomy	6–12 weeks
Lumbar disc herniation with instability	Posterior lumbar decompression and fusion (PLDF)	2–3 months
Lumbar stenosis	Posterior lumbar decompression and fusion (PLDF)	2–3 months
Spondylosis/spondyloarthrosis	Posterior lumbar interbody fusion (PLIF)	2–3 months
Lumbar spondylolisthesis	Posterior lumbar interbody fusion (PLIF)	2–3 months
Cervical disc herniation	Anterior cervical decompression and fusion (ACDF)	6–12 weeks

recommendation of changing job is not always possible to implement due to various factors, including economics or the patient's education. Very often, our patients work many hours in front of a computer in a sitting position. The probability that they will give up their profession is faint. Therefore, it is worth considering the modification of risk factors discussed above. Multidirectional treatment provides a chance for effective therapy.

Timely implemented targeted rehabilitation maintains its effectiveness. Based on the available literature, it is difficult to find papers taking into account the so-called three-step concept for treatment of spine pathologies. Moreover, the term "three-step concept" has not been used in medical nomenclature until now. This paper also aims to take a different look at the treatment of musculoskeletal pathologies, involving not only medical staff – doctors, physiotherapists or psychologists – but especially the patients themselves, who will make certain modifications in their everyday activities, including professional work.

## Conclusions

Based on theoretical considerations, implementing a three-stage approach in the treatment of non-inflammatory SD, especially arising as a result of spine overload or degenerative processes of the spine (e.g. osteoarthritis), can significantly improve the effectiveness of the therapies used. Rehabilitation should be viewed as continuing the management of the healing process.

*The author declares no conflict of interest.*

## References

- Huie JR, Vashisht R, Galivanche A, et al. Toward a causal model of chronic back pain: Challenges and opportunities. *Front Comput Neurosci* 2023; 16: 1017412, DOI: 10.3389/fncom.2022.1017412.
- Koszela K, Krukowska S, Woldańska-Okońska M. Back pain as a lifestyle disease. *Pediatr Med Rodz* 2017; 13: 344–351, DOI: 10.15557/PiMR.2017.0036.
- Manigold T, Gantschnig BE, Streitberger K. [Multiprofessional treatment approach in chronic back pain]. *Z Rheumatol* 2023; 82: 31–37, DOI: 10.1007/s00393-022-01258-6 [Article in German].
- González Martínez E, García-Cosamalón J, Cosamalón-Gan I, et al. [Biology and mechanobiology of the intervertebral disc]. *Neurocirugia (Astur)* 2017; 28: 135–140, DOI: 10.1016/j.neucir.2016.12.002 [Article in Spanish].
- Malińska M, Bugajska J, Bartuzi P. Occupational and non-occupational risk factors for neck and lower back pain among computer workers: a cross-sectional study. *Int J Occup Saf Ergon* 2021; 27: 1108–1115, DOI: 10.1080/10803548.2021.1899650.
- Ye S, Jing Q, Wei C, Lu J. Risk factors of non-specific neck pain and low back pain in computer-using office workers in China: a cross-sectional study. *BMJ Open* 2017; 7: e014914, DOI: 10.1136/bmjopen-2016-014914.
- David D, Giannini C, Chiarelli F, Mohn A. Text Neck Syndrome in Children and Adolescents. *Int J Environ Res Public Health* 2021; 18: 1565, DOI: 10.3390/ijerph18041565.
- Fares J, Fares MY, Fares Y. Musculoskeletal neck pain in children and adolescents: Risk factors and complications. *Surg Neurol Int* 2017; 8: 72, DOI: 10.4103/sni.sni\_445\_16.
- Shipton EA. Physical Therapy Approaches in the Treatment of Low Back Pain. *Pain Ther* 2018; 7: 127–137, DOI: 10.1007/s40122-018-0105-x.
- Koszela K. Zastosowanie mezoterapii w zespole bólowym kręgosłupa. In: Koszela K. (ed.). *Choroba zwyrodnieniowa kręgosłupa w praktyce lekarza POZ. Nowe spojrzenie. PZWL, Warsaw 2022; 40–54.*
- Mammucari M, Maggiori E, Russo D, et al. Mesotherapy: From Historical Notes to Scientific Evidence and Future Prospects. *Scientific World Journal* 2020; 2020: 3542848, DOI: 10.1155/2020/3542848.
- Xu W, Ran B, Zhao J, et al. Risk factors for failed back surgery syndrome following open posterior lumbar surgery for degenerative lumbar disease. *BMC Musculoskelet Disord* 2022; 23: 1141, DOI: 10.1186/s12891-022-06066-2.
- Koszela K, Krukowska S, Woldańska-Okońska M. Wpływ rehabilitacji na poziom napięcia dolegliwości bólowych u chorych z zespołem bólowym kręgosłupa po nieskutecznym zabiegu operacyjnym. *Pol Merkur Lekarski* 2017; 42: 252–255 [Article in Polish].
- Torres A, Fernández-Fairen M, Sueiro-Fernández J. Greater trochanteric pain syndrome and gluteus medius and minimus tendinosis: nonsurgical treatment. *Pain Manag* 2018; 8: 45–55, DOI: 10.2217/pmt-2017-0033.
- Koszela K, Krukowska S, Woldańska-Okońska M. [The assessment of the impact of rehabilitation on the pain intensity level in patients with herniated nucleus pulposus of the intervertebral disc]. *Pol Merkur Lekarski* 2017; 42: 201–204 [Article in Polish].
- Krukowska J, Woldańska-Okońska M, Jankowska K, et al. [Analgesic efficacy of magnetotherapy in patients with low back pain syndromes]. *Wiad Lek* 2010; 63: 265–275 [Article in Polish].
- Zdrodowska B, Leszczyńska-Filus M, Leszczyński R, Błaszczuk J. [Comparison of the effect of laser and magnetic therapy for pain level and the range of motion of the spine of people with osteoarthritis lower back]. *Pol Merkur Lekarski* 2015; 38: 26–31 [Article in Polish].
- Stupiński M, Popieluch M. Rola terapii ruchem w chorobie zwyrodnieniowej stawów. In: Koszela K (ed.). *Choroba zwyrodnieniowa stawów w praktyce lekarza POZ. Nowe spojrzenie. PZWL Wydawnictwo Lekarskie, Warsaw 2023; 111–126, DOI: 10.53271/wglspoz.2022.4.007.*
- Ono K, Ohmori K, Yoneyama R, et al. Risk Factors and Surgical Management of Recurrent Herniation after Full-Endoscopic Lumbar Discectomy Using Interlaminar Approach. *J Clin Med* 2022; 11: 748, DOI: 10.3390/jcm11030748.
- Barbosa TP, Raposo AR, Cunha PD, et al. Rehabilitation after cervical and lumbar spine surgery. *EFORT Open Rev* 2023; 8: 626–638, DOI: 10.1530/EOR-23-0015.
- Oestergaard LG, Nielsen CV, Bünger CE, et al. The effect of early initiation of rehabilitation after lumbar spinal fusion: a ran-

- domized clinical study. *Spine (Phila Pa 1976)* 2012; 37: 1803–1809, DOI: 10.1097/BRS.0b013e31825a17ab.
22. Oosterhuis T, Costa LO, Maher CG, et al. Rehabilitation after lumbar disc surgery. *Cochrane Database Syst Rev* 2014; 2014: CD003007, DOI: 10.1002/14651858.CD003007.pub3.
  23. Kotłowski K, Baryła Urban P, Orzechowski D. Rehabilitacja pooperacyjna. In: Jarmużek P. (ed.). *Choroby kręgosłupa*. Medipage, Warsaw 2016; 627–642.
  24. Raciborski F, Gasik R, Kłak A. Disorders of the spine. A major health and social problem. *Rheumatology* 2016; 54: 196–200, DOI: 10.5114/reum.2016.62474.
  25. Oliveira CB, Franco MR, Maher CG, et al. The efficacy of a multimodal physical activity intervention with supervised exercises, health coaching and an activity monitor on physical activity levels of patients with chronic, nonspecific low back pain (Physical Activity for Back Pain (PAyBACK) trial): study protocol for a randomised controlled trial. *Trials* 2018; 19: 40, DOI: 10.1186/s13063-017-2436-z.
  26. Schega L, Kaps B, Broscheid KC, et al. Effects of a multimodal exercise intervention on physical and cognitive functions in patients with chronic low back pain (MultiMove): study protocol for a randomized controlled trial. *BMC Geriatr* 2021; 21: 151, DOI: 10.1186/s12877-021-02093-1.
  27. Valero R, Varela E, Küçükdeveci AA, et al.; UEMS-PRM Section Professional Practice Committee. Spinal pain management. The role of physical and rehabilitation medicine physicians. The European perspective based on the best evidence. A paper by the UEMS-PRM Section Professional Practice Committee. *Eur J Phys Rehabil Med* 2013; 49: 715–725.