

THE ROLE OF MULTIMODAL APPROACH IN REHABILITATION OF VOLLEYBALL PLAYERS SUFFERING FROM ACUTE LUMBAR PAIN SYNDROME

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Abstract: *Objective: Acute lumbar pain syndrome (ALPS) is characterized by pain, spasms, frequent symptoms of lumbar radiculopathy as well as relapses. The Aim of the paper was to compare therapy effectiveness of combination of authorized techniques: McKenzie's mechanical diagnosis and therapy, Kinesio Taping (KT), Thera-Band Academy (TB) with the usual procedures in treatment of ALPS. Methods: The examination included 60 volleyball players diagnosed with ALPS. First group numbered 30 volleyball players included in rehabilitation program which included application of physical modalities (TENS, low-level laser therapy, magnetotherapy) with MDT, KT and TB. Control group numbered 30 volleyball players treated only with physical modalities. Patients were examined upon admission and at the end of hospitalization. Results: Upon admission, value of visual analogue scale of pain (VAS) was $\bar{x}VAS=8,07$ in the first group, and $\bar{x}VAS=8,13$ in the second; The Oswestry disability index (ODI) averaged $\bar{x}ODI=44,4\%$ for the first group and $\bar{x}ODI=45,2\%$ for the second group. At the end of rehabilitation program, analgesic effect was achieved for the first group with average of $\bar{x}VAS=0,53$, while the average value of VAS for the second group was $\bar{x}VAS=3,8$ ($p<0,001$); the average value of ODI for the first group $\bar{x}ODI=14,4\%$ was statistically significantly lesser compared to the second group $\bar{x}ODI=25,87\%$ ($p<0,001$). Conclusion: In therapy of ALPS the best results are achieved by applying multimodal program of MDT, KT, TB in combination with physical agents.*

Key words Low back pain; parameters of the disease activity; prevention; rehabilitation, outcome

INTRODUCTION

Lumbar pain syndrome (LPS) is defined as pain in the back from the level of the lowest rib down to the gluteal fold, with or without radiation into the legs. An episode of LPS is called acute if it has arisen for the first time in a patient's life, or after a pain-free interval of at least six months, and lasts no longer than six weeks. Recurrence of acute lumbar pain syndrome are common and involve the recurrence of symptoms after a period of apparent improvement or recovery (Casser, Seddigh & Rauschmann, 2016).

LPS is pragmatically classified as either nonspecific or specific (Deyo & Weinstein 2001; Casser, Seddigh & Rauschmann, 2016). Overall, some 80–90% of cases of low back pain are nonspecific, i.e., have no clear patho-anatomical correlate (Koes, Van Tulder & Thomas, 2006).

Many researchers report the incidence of acute lumbar pain syndrome in volleyball players to be around 45%. The volleyball-specific movements that induced pain were diverse (e.g., spike, serve, and pass) with no common factor. The factors associated with low back pain were an ankle injury within the previous year and years of volleyball experience (Mizoguchi, Akasaka, Otsudo & Hall, 2019).

It is important to understand that although many patients may recover spontaneously from acute weakness and back pain, adequate evaluation may be essential to guide treatment and improve outcomes. Most people who experience back pain may experience recurrence of these symptoms. That's why it's important for patients to seek medical help to determine the cause of their symptoms and to consider appropriate treatments that can reduce the risk of recurrence or long-term complications (Hoy, Brooks, Blyth & Buchbinder, 2010; Hebert, Kopenhaver & Walker, 2011).

The McKenzie method, developed by Robin A. McKenzie, is an approach to rehabilitation based on a multidimensional approach. This method classifies patients into one of three subgroups based on their symptoms and clinical examination findings. After classification, patients receive individually adapted exercises aimed at reducing pain and improving the functionality of the spine. The McKenzie method is often combined with other standard treatments in order to achieve a better therapeutic result (TENS, laser therapy and pulsed magnetic field therapy). The combination of the McKenzie method with these

therapies enables a holistic approach to the treatment of problems with the lower back, adapted to the individual needs of the patient and rehabilitation goals (Hawrylak, Demidaś, Chromik & Hawrylak, 2021; Ratajczak, et al., 2011; Clare, Adams & Maher, 2004).

Exercise therapy is a cornerstone in the prevention and management of ALPS, aimed at enhancing muscular endurance, strength, and flexibility of the back muscles and soft tissues (Tikhile, Patil & Jaiswal, 2024). Thera-Band® is the world's leading brand in the field of rehabilitation, sports and fitness. Thera Band began to be used for the first time in 1978 in the USA. All products from the Thera-Band program were created on a scientific basis and are constantly being improved. Thera-Band is the official rehabilitation program of all EU countries. All Thera-Band products are supported by highly qualified training within the Thera Band Academy. In the rehabilitation and prevention of LPS, the following can be used: exercise bands, gymnastic (Swiss) balls, balancers, tilting plates and therapeutic discs, the aqua product line, as well as many other products of Thera-Band Academy, which contribute to both spinal and in global stabilization (Mazraeia, Hosseinib, Dadgarc & Karimid, 2019). In the last decade, in the rehabilitation system, the so-called "core stability training", which can be translated as - basic stabilization training with a focus on strengthening the abdominal and back muscles. The goal of this type of training is to rehabilitate muscle imbalance and lumbar syndrome in the most adequate and fastest way possible (Meier, 1997). However, the classic system of rehabilitation of the lumbar spine requires a longer recovery period. Precisely for this reason, the goal of "Thera-Band Training" (which is mostly based on the type of training mentioned above) is aimed at developing optimal endurance and strength of the abdominal and lumbar musculature, which supports the spine in all its positions and movements (Tikhile, Patil & Jaiswal, 2024).

The Kinesio taping methods has become popular in the treatment of various musculoskeletal symptoms, including ALPS, shoulder injuries, and sports injuries. This technique uses special strips that are applied to the skin to achieve various therapeutic effects. Taping stimulates mechanoreceptors in the skin, which activates the pain control system through the "gate control" theory. In addition to reducing pain, taping can have other therapeutic effects, including increasing the range of motion in the joint, reducing fatigue and muscle spasms, reducing edema, and increasing exercise capacity. Studies have also shown that taping can improve blood flow and activate afferent nerve fibers in the soft tissues of the applied area. These mechanisms contribute to improved recovery and reduced symptoms in patients using this therapy. In short, taping is increasingly used as an effective option in the treatment and prevention of various problems of the musculoskeletal system, offering a wide range of therapeutic benefits without significant side effects (Jung K., Jung J., In & Cho, 2021).

The main characteristic of this work is the focus on treatment methods and principles of rehabilitation in ALPS. The key aim of physiotherapy is not only to relieve current symptoms, but also to achieve better results in the recovery of patients, reduce the duration of rehabilitation, as well as prevent future relapses and improve the quality of life of patients.

METHODS

The aim of the work was to compare the effectiveness of therapy using a combination of authorized techniques: McKenzie mechanical diagnosis and therapy (MDT), Kinesio Taping (KT), Thera-Band Academy (TB) with usual procedures in the treatment of ALPS, which are physical modalities that are most often used used to reduce pain and muscle spasm.

The research included 60 volleyball players diagnosed with ALPS, divided into two groups. The first group, consisting of 30 volleyball players, was included in a rehabilitation program that combined the application of physical modalities (TENS, low power laser therapy, magnetotherapy) together with the application of techniques such as MDT, KT and TB. The control group also included 30 volleyball players, who were treated only with physical modalities. Both groups were examined upon admission and at the end of hospitalization in order to compare the effectiveness of the therapy between the groups.

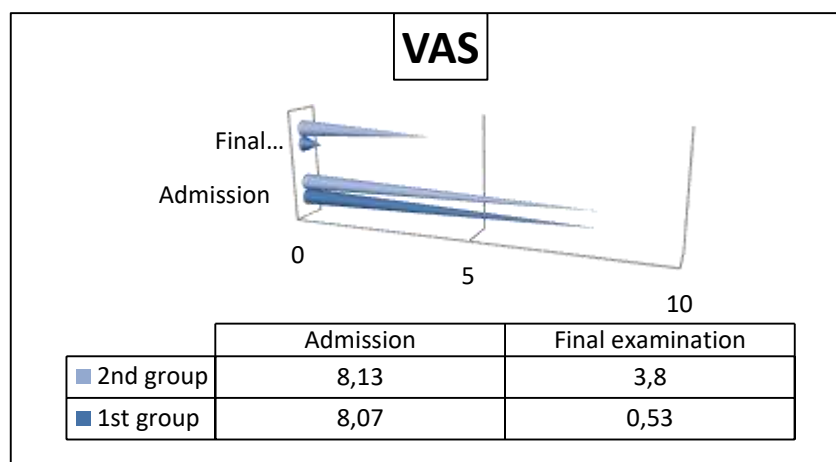
The Oswestry Questionnaire (ODI) was used to assess the disability caused by lower back pain at admission and at the final examination. Every patient in the first group received MDT. Exercises taught to patients included supine extension, supine extension with additional pressure from the patient, and

standing extension. The patients performed one series of ten repetitions of the exercise in the priority direction of movement every four hours up to 4-5 times a day. Using a series of progressive functional exercises and a kinesitherapy program with an elastic band and ball, TB was performed. CT strips were placed on each patient after the initial clinical assessment, based on the clinical picture of each individual. Most often, "I" and "Y" forms were applied perpendicularly along both sides of the paravertebral musculature of the lumbar spine, while in some patients "I" forms were applied horizontally at the level of the spinal column segment corresponding to L4-L5 or L5-S1 part of the spinal column. After the ergonomic education, the patients were trained on proper posture, especially when sitting or performing some activities of daily life at home or activities at work of each individual.

RESULTS

Results of the Visual Analogue Scale research

Pain intensity, measured by the VAS pain scale, ranged from 0 to 10. On admission, the average value of the visual analog scale for the first group was $\bar{x}VAS=8.07$, while for the second, control group, the average value of the visual analog scale was $\bar{x}VAS= 8,13$. At the end of the rehabilitation program, the results showed a significant difference between the first and second research treatment. The average value of VAS (Visual Analog Scale) for the first group was $\bar{x}VAS = 0.53$, which indicates a relatively low pain sensation in patients who applied a combination of therapeutic techniques (MDT, KT, TB) with ergonomic education. On the other hand, the average VAS value for the second group was $\bar{x}VAS=3.8$, which means that the patients in the control group, who were treated only with physical modalities without additional therapeutic techniques, had a significantly higher pain sensation at the end of the treatment (graph 1). The value $p < 0.001$ indicates a statistically significant difference between these two groups in terms of the effect of therapy on pain reduction. This means that the combination of MDT, KT, TB with ergonomic education was more effective in reducing pain in patients diagnosed with ALPS compared to standard treatment that includes only physical modalities.

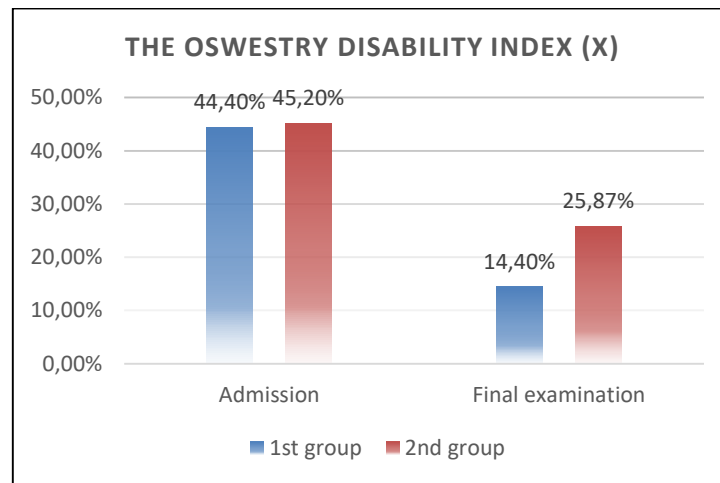


Graph 1 Pain intensity according to VAS

Oswestry disability index test results

In the research, the Oswestry index of incapacity was used as one of the questionnaires for assessing the incapacity that arose as a result of the presence of pain and as a measure for comparing the functional progress between the group that applied a combination of therapeutic techniques (MDT, KT, TB) with ergonomic education and control groups. which used only physical modalities. After receiving the patients and taking anamnesis, and performing a clinical examination, the patients filled out the form by circling a certain number in front of the sentence that describes their condition. On admission, the average Oswestry Disability Index (ODI) was $\bar{x}ODI=44.4\%$ for the first group and $\bar{x}ODI=45.2\%$ for the second group. At the end of the rehabilitation treatment, the average ODI value for the first group

$\bar{x}$ ODI=14.4% was statistically significantly lower compared to the second group $\bar{x}$ ODI=25.87% ($p<0.001$) (graph 2).



Graph 2 ODI score

DISCUSSION

Research has shown that the application of KT tape and the MDT technique can significantly reduce pain and increase stability and mobility in patients with lumbar pain in all stages of the disease, even achieving centralization or complete abolition of pain. Also, the use of Thera-Band props for stabilization exercises and muscle strengthening has proven to be effective in the subacute and chronic phase of lumbar syndrome, as well as in the prevention of these problems. These therapeutic methods aim to improve patients' functionality and reduce symptoms related to lumbar pain.

Based on their research, Sheng et al came to the conclusion that the experimental group achieved significantly better results in terms of reducing pain in the lower back, after applying kinesio tex tapes, in contrast to the control group that did not use kinesio tex tapes in its therapeutic procedures. Also, the experimental group showed better results in terms of daily life activities (Sheng, Zhouying, Qiang, Wenhua, & Bo, 2019).

According to Kelle et al., who applied kinesio-tex tape to patients with non-specific low back pain for 12 days, it provided significant improvements in pain and reduced disability in these patients. The results of this study also agree with these claims (Kelle, Güzel & Sakallı, 2016).

MDT method is recognized as one of the most successful approaches to treating LPS. This is now the most commonly used clinically recommended treatment, especially among physical therapists. The leading premise of McKenzie's approach to the treatment of LPS is to promote exercises that lead to centralization of symptoms, while exercises that lead to peripheralization should be completely avoided (Namnaqani, Mashabi, Yaseen & Alshehri, 2019)

In the study conducted by Saxena et al. (2022), patients were divided into two groups: group A, where McKenzie exercises were performed in combination with theraband, and group B, where only McKenzie exercises were performed without using theraband tapes. Before starting the treatment itself and at the end of it, after 28 days, the patients filled out the Oswestry Questionnaire (ODI), assessed their pain with the Numerical Pain Assessment Scale (VAS) and had their muscle strength tested with a manual muscle test (MMT). The results at the end of the treatment were significant in both groups, with group A showing a statistically significant difference between the results before and after the treatment in these parameters, indicating a reduction in pain (VAS), an improvement in functional status (ODI) and an increase in muscle strength. (MMT). These results suggest that McKenzie exercises with theraband are effective in treating low back pain (LPS), reducing disability and improving muscle function (Saxena, Khan, & Naqvi, 2022). These statements are agreed by Hayden et al. (2021), who also came to the

conclusion that McKenzie exercises have a positive effect in reducing the intensity of pain and functional limitations (Hayden, et al., 2021).

A study conducted by Bose et al. (2017) provides useful insights into the effectiveness of the McKenzie method in the treatment of lumbar pain syndrome (LPS). The study involved 40 patients divided into two groups: group A, which practiced McKenzie exercises, and group B, which combined McKenzie exercises with exercises to strengthen the back extensor muscles. The results showed that both groups experienced a significant reduction in pain and improvement in functionality, which confirms the effectiveness of the McKenzie technique in reducing LBP symptoms. However, group B, which combined McKenzie exercises with exercises to strengthen the back extensor muscles, showed a slightly more significant improvement compared to group A. These findings suggest that the addition of exercises to strengthen the back extensor muscles can further enhance the effects of the McKenzie technique in the treatment of LBP. Nevertheless, the McKenzie method itself showed a positive effect on reducing pain and improving the functionality of patients with lumbar pain syndrome, which is key information for practitioners in choosing the optimal therapeutic approach for these patients (Bose & Gohill, 2018).

A prospective fifteen-day study was conducted by Ibrahimaj et al. in which a total of one hundred individuals of both sexes and ages over 23 were included. The McKenzie method was used for the treatment of patients, and assessments were made both before and after the procedure. Pain was measured using a numerical assessment scale, and mobility was measured using a modified Schober test. The results showed that during the subacute phase, the McKenzie approach significantly influenced the improvement of mobility and the reduction of lumbar pain (Ibrahimaj,, Deliu & Miftari, 2015).

The McKenzie method is one of the approaches that is used and has shown effectiveness in many studies. However, it is important that the therapy is individually adapted and that factors such as the cause of the pain, the level of functionality, the physical condition of the patient, as well as their goals and preferences are taken into account (Oliveira I., Pinto, Oliveira M., & Cêra, 2016).

CONCLUSION

Acute lumbar pain syndrome represents a challenge both in the diagnostic and therapeutic sense, requiring the engagement of a multidisciplinary team of experts in order to effectively solve the pathology at multiple levels. The key success factor in the prevention and treatment of this syndrome is the active involvement of volleyball players in the treatment process, adequate preparation and training process in volleyball, as well as consideration of the individual needs of each athlete, which enables the provision of the best possible level of prevention and rehabilitation.

The results obtained from this research support the use of a sophisticated rehabilitation regimen in the treatment of lumbar pain syndrome, clearly showing how effective the combination of applied therapies is in providing a functional analgesic effect to patients with this syndrome. This process includes a combination of therapeutic techniques such as McKenzie (MDT), Kinesio Taping (KT), Thera-Band (TB), along with ergonomic education and the application of physical modalities such as TENS, low power laser therapy and magnetotherapy.

In conclusion, timely recognition and adequate management of lumbar pain syndrome are key to optimizing treatment outcomes and preventing possible complications in volleyball players..

REFERENCES

1. Casser, H. R., Seddigh, S., & Rauschmann, M. (2016). Acute lumbar back pain: investigation, differential diagnosis, and treatment. *Deutsches Ärzteblatt International*, 113(13), 223.
2. Deyo, R. A., Weinstein J. N. (2001) Low back pain. *N Engl J Med*, 344:363–70.
3. Koes, B. W., Van Tulder, M., & Thomas, S. (2006). Diagnosis and treatment of low back pain. *Bmj*, 332(7555), 1430-1434.
4. Mizoguchi, Y., Akasaka, K., Otsudo, T., & Hall, T. (2019). Factors associated with low back pain in elite high school volleyball players. *Journal of physical therapy science*, 31(8), 675-681.

5. Bose, G. N., & Gohill, D. (2018). Effect of Mckenzie Therapy and Lumbar Strengthening Program in Lumbar Spine Derangement Syndrome 1. *European Journal of Pharmaceutical and Medical Research*, 5(3), 160-164.
6. Tikhile, P., Patil, D. S., & Jaiswal, P. R. (2024). An Integrated Approach to Chronic Low Back Pain: Evaluating the Impact of Consecutive Loop TheraBand Training Combined With Proprioceptive Neuromuscular Facilitation and Conventional Physiotherapy. *Cureus*, 16(4).
7. Mazraeia, P. E., Hosseinib, S. G., Dadgarc, H., & Karimid, M. T. (2019). The Effect of 6-Week Core Stabilization Training with Thera-band on Static Balance, Pain, Functional Disability, and Energy Expenditure in Females with Mechanical Chronic Low Back Pain. *Journal of Clinical Physiotherapy Research*, 4(1), 9-14.
8. Briggs, A. M., Woolf, A. D., Dreinhöfer, K., Homb, N., Hoy, D. G., Kopansky-Giles, D., Åkesson, K., & March, L. (2018). Reducing the global burden of musculoskeletal conditions. *Bulletin of the World Health Organization*, 96(5), 366-368. <https://doi.org/10.2471/BLT.17.204891>
9. Clare, H. A., Adams, R., & Maher, C. G. (2004). A systematic review of efficacy of McKenzie therapy for spinal pain. *Australian journal of Physiotherapy*, 50(4), 209-216.
10. Hawrylak, A., Demidaś, A., Chromik, K., & Hawrylak, A. (2021). The effectiveness of the McKenzie method in treating lumbar discopathy. *Human Movement*, 22(4), 98-104.)
11. Hayden, J. A., Ellis, J., Ogilvie, R., Stewart, S. A., Bagg, M. K., Stanojevic, S., ... & Saragiotto, B. T. (2021). Some types of exercise are more effective than others in people with chronic low back pain: a network meta-analysis. *Journal of physiotherapy*, 67(4), 252-262.
12. Hebert, J. J., Koppenhaver, S. L., & Walker, B. F. (2011). Subgrouping patients with low back pain: a treatment-based approach to classification. *Sports health*, 3(6), 534-542. <https://doi.org/10.1177/1941738111415044>
13. Hoy, D., Brooks, P., Blyth, F., & Buchbinder, R. (2010). The Epidemiology of low back pain. *Best practice & research. Clinical rheumatology*, 24(6), 769-781.
14. Ibrahimaj, A., Deliu, S., & Miftari, S. (2015). EFFECTIVENESS OF THE MCKENZIE METHOD IN THE TREATMENT OF LOW BACK PAIN IN SUBACUTE AND CHRONIC STAGE. *Research in Physical Education, Sport & Health*, 4(1).
15. Jung, K. S., Jung, J. H., In, T. S., & Cho, H. Y. (2021, July). Influences of kinesio taping with therapeutic exercise in patients with low back pain. In *Healthcare* (Vol. 9, No. 8, p. 927). MDPI.)
16. Kelle, B., Güzel, R., & Sakallı, H. (2016). The effect of Kinesio taping application for acute non-specific low back pain: a randomized controlled clinical trial. *Clinical rehabilitation*, 30(10), 997-1003.
17. Namnaqani, F. I., Mashabi, A. S., Yaseen, K. M., & Alshehri, M. A. (2019). The effectiveness of McKenzie method compared to manual therapy for treating chronic low back pain: a systematic review. *Journal of musculoskeletal & neuronal interactions*, 19(4), 492.
18. Oliveira, I. O. D., Pinto, L. L. S., Oliveira, M. A. D., & Cêra, M. (2016). McKenzie method for low back pain. *Revista Dor*, 17, 303-306.
19. Ratajczak, B., Ryfa, R., Boerner, E., Kuciel-Lewandowska, J., Hawrylak, A., & Demidaś, A. (2011). Ocena Wpływu Laseroterapii i Magnetoterapii w Połączeniu z Kinezyterapią u Pacjentów z Chorobą Zwyródnienia Niewą Odcinka Lędźwiowo-Krzyżowego Kręgosłupa/Assessment the Influence of the Lasertherapy and Magnetotherapy in Connection With Kinesiotherapy Used by Patients with the Degenerative Low Back Disease Abstract. *Postępy Rehabilitacji*, 25(2),
20. Saxena, A., Khan, A. R., & Naqvi, Z. A. (2022). Comparison of effect of McKenzie exercises with or without TheraBand in patient with sub acute non-specific low back pain. *International Journal of Health Sciences and Research*, 12, 30-41.
21. Sheng, Y., Zhouying, D. U. A. N., Qiang, Q. U., Wenhua, C. H. E. N., & Bo, Y. U. (2019). Kinesio taping in treatment of chronic non-specific low back pain: a systematic review and meta-analysis. *Journal of Rehabilitation Medicine (Stiftelsen Rehabiliteringsinformation)*, 51(10)

ULOGA MULTIMODALNOG PRISTUPA U REHABILITACIJI ODOJKAŠA SA AKUTNIM LUMBALNIM BOLNIM SINDROMOM

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Sažetak: Cilj: Sindrom akutnog lumbalnog bola (ALPS) karakterišu bol, grčevi, česti simptomi lumbalne radikulopatije kao i recidivi. Cilj rada bio je da se uporedi efikasnost terapije kombinacijom ovlašćenih tehnika: McKenzie mehanička dijagnoza i terapija (MDT), Kinesio Taping (KT), Thera-Band Academy (TB) sa uobičajenim procedurama u lečenju

ALPS. Metode: Pregledom je obuhvaćeno 60 odbojkaša sa dijagnozom ALPS. Prva grupa je brojala 30 odbojkaša uključenih u program rehabilitacije koji je podrazumevao primenu fizikalnih modaliteta (TENS, terapija laserom niske snage, magnetoterapija) sa MDT, KT i TB. Kontrolna grupa je brojala 30 odbojkaša lečenih samo fizikalnim modalitetima. Oni su pregledani po prijemu i na kraju hospitalizacije. Rezultati: Prilikom prijema, vrednost vizuelne analogne skale bola (VAS) bila je $\bar{x}VAS=8,07$ u prvoj grupi, a $\bar{x}VAS=8,13$ u drugoj; Osvestri indeks nesposobnosti (ODI) je u proseku iznosio $\bar{x}ODI=44,4\%$ za prvu grupu i $\bar{x}ODI=45,2\%$ za drugu grupu. Na kraju rehabilitacionog programa postignut je analgetski efekat za prvu grupu sa prosekom $\bar{x}VAS=0,53$, dok je prosečna vrednost VAS za drugu grupu bila $\bar{x}VAS=3,8$ ($p<0,001$); prosečna vrednost ODI za prvu grupu $\bar{x}ODI=14,4\%$ bila je statistički značajno manja u odnosu na drugu grupu $\bar{x}ODI=25,87\%$ ($p<0,001$). Zaključak: U terapiji ALPS-a najbolji rezultati se postižu primenom multimodalnog programa MDT, KT, TB u kombinaciji sa fizičkim agensima.

Ključne reči: Bol u donjem delu leđa; parametri aktivnosti bolesti; prevencija; rehabilitacija, ishod