

Research article

Successful rehabilitation program after AIS/Frankel C paraplegia through a recently operated lumbar disc hernia

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ABSTRACT: Intervertebral disc herniation is the pathological process by which fragments of the nucleus pulposus tear the fibers of the annulus fibrosus and come into contact with the root of the spinal nerve (1). The most significant functional damage generated by the lumbar disc herniation is paraplegia and can be ameliorated by an early and staged specific rehabilitation program.

Materials and Methods: This paper presents the case of a 56-year-old patient who was admitted to the Neurosurgery Clinic (NCH) III of SCUBA for low back pain and motor deficit, AIS Frankel C paraplegia. The left lower limb was more affected than the right one. It occurred following a thoraco-lumbar medullary compression and a paramedian lumbar disc herniation L3. The patient was treated surgically. Subsequently, the patient was transferred to the Neuro-Muscular Recovery Clinic of SCUBA for the specific rehabilitation treatment, with indication for mobilization. He was dynamically evaluated using the following scales: quality of life assessment (QOL), modified Ashworth scale, Functional Assessment Classification, FAC, Activities of daily living (ADL), Spinal Cord Independence Measure (SCIM), evaluation of muscle strength on Medical Research Council, MRC, scale, evaluation of American Spinal Injury Association Impairment Scale (AIS).

Results: The patient benefited from a complex program of neuro-muscular rehabilitation, having a favorable evolution with an improving score of the evaluating scales and finally gaining his gait balance, including ascending and descending stairs (instrumentally assisted for left plantar dorsiflexion movement with orthosis walking). At discharge the patient's neurological deficit was reclassified as AIS D paraplegia, with the neurogenic bladder and bowel having been remitted.

Discussions: The disc herniation at L3 level generated a cauda equina syndrome, which initially generated a paraplegia. When the inflammation remitted it became clear that the left L4 root was affected, with a complete deficit of plantar dorsiflexion. In conclusion it was not a case of spinal cord syndrome (as the spinal cord ends at L2 level) or conus medullaris syndrome.

Conclusions: The interdisciplinary therapeutic approach together with a specific, customized rehabilitation program for a patient with AIS C paraplegia after a surgically treated disc hernia is successfully improving the neuromuscular deficit and upgrading the patient's quality of life.

Keywords: *rehabilitation, disc hernia, low back pain, paraplegia*

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1. INTRODUCTION

Low back pain is a prevalent symptom, as approximately 80 % of the population sustains an episode once in their lifetime. (1) Within the many differentials of low back pain, the most common cause is the intervertebral degeneration which leads to lumbar disc herniation and degenerative disc disease. (2) One of the most correlated risk factor to herniated disc and particularly lumbar disc hernia is abnormal activities and weightlifting associated with spine twist. (3) It is shown that repetitive bending, lifting and twisting movements of the back increases the pressure on the disc, thus injuring it. (4) Repetitive wrong

movements or activities and incorrect back posture in the early life can lead to regression of the disc nucleus, thus reducing the pressure. (3) Also working in fields where physical load is a daily activity correlates with developing Lumbar Disc Herniation (LDH). (4) Some theories suggest that the higher incidence of LDH in male patients is a direct correlation with the harder labor that these perform in day-to-day activity and workplace. (5) Spinal disc herniation is the pathological process in which a disk fragment comes from the nucleus pulposus, tears the fibers of annulus fibrosus and affects the adjacent nerve root at different grades: irritation, phase III stage I – pain; compression, phase III stage II – pain and paresthesia; interruption, phase III stage III – paralysis or paresis. (6, 7) A spinal disc herniation phase III/stage III can cause a lower limb motor deficit as paralysis or paresis. If the prolapse is massive and paramedian, the compression of the roots is bilateral and can result in a bilateral lower limb motor deficit. (7)

MATERIAL AND METHODS.

Having the patient's consent and the approval of the Ethics Committee of "Bagdasar-Arseni" Clinical Emergency Hospital, N.O. 24386/28.06.2021, this article presents a case of a 56-year-old patient admitted in our clinic (13.05.2021) for the following complaints: motor deficit AIS C paraplegia (neurological level L2); the left lower limb was more affected than the right one. The cause was a high effort which determined a paramedian lumbar disc herniation L3 and set a thoraco-lumbar cord compression, accompanied by severe low back pain, locomotor and self-care dysfunction.

The patient is known with: operated right ankle fracture (osteosynthesis with metal material), intestinal occlusion (1995) and craniofacial trauma (1998). In 10.05.2021 the patient was admitted to the Neurosurgery Clinic and operated for left median and paramedian disc herniation at L3 level and for a fragment of the disc that migrated inferiorly. It was a L3-L4 approach with ablation of L3-L4 disc fragment.

Clinical examination:

The patient is conscious, cooperative, oriented temporo-spatially with nonspecific facial expression and postoperative lumbar scar in the process of healing with sutures present. *Cardiovascular system:* normal heart sounds, without pathological murmurs, HR = 64b / min, BP = 130/70 mmHg. *Respiratory system:* present bilateral vesicular murmur, without signs of respiratory failure, SpO₂ = 96% spontaneous. *Digestive system:* supple abdomen, painless at superficial and deep palpation, liver and spleen within normal limits. *Urogenital tract:* nonpalpable kidneys, neurogenic bladder, carrier of Foley fixed urinary catheter.

Local examination:

Examination of cranial nerves: normal.

Muscle tone: upper limb – normal; lower limb – diminished.

Sensitivity: -subjective paresthesia in the lower limbs distally.

Reflexes: - normal for upper limbs; absent knee reflex for the lower limbs, bilateral; plantar reflex: present in flexion for the right lower limb.

Functional: the patient has indication for mobilization.

Examination of spine (7)

Static vertebral syndrome: diminishing of the lumbar curvature, dextro-scoliotic attitude.

Dynamic vertebral syndrome: cervical - mobility within all range of movements (flexion, extension, inflexion right and left); lumbar: limited extension, inflexion left >> right.

Muscle and Ligaments Syndrome: left paravertebral thoraco-lumbar muscular contraction >> right.

Dural syndrome: lower limbs Lassegue positive, bilateral.

Root syndrome: absent rotula reflex, bilateral; paraplegia motor deficit (bilateral L4 and left L5 root lesion); diminished tonus in lower limbs.

Psycho-emotional syndrome: affirmative.

The patient was dynamically evaluated using the following scales: Quality of life assessment (QOL), score QOL:96/112; Modified Ashworth scale; Functional Assessment Classification, FAC, score:2/5; Activities of daily living (ADL), score=3 points; Spinal cord independence measure (SCIM); Evaluation of muscle strength on Medical Research Council, MRC scale; Evaluation of American Spinal Injury Association Impairment Scale AIS: American Spinal Injury Association, ASIA motor exam: Upper limbs: 50/50 points; Lower limbs: 31 /50 points and ASIA sensory exam: light touch score: 96/ 112 points; pin prick score: 96/112 points.

Paraclinical examination

Lumbar spine radiography: narrowing of the intervertebral space L4-L5, L5-S1

Thoracic and lumbar column IRM (before surgery, see figure 1): right paramedian disc hernia L3-L4 with fragment migrated inferiorly, posterior to the L4 body, with fragment displaced at the posterior part of the spinal canal, compressing and displacing the dural sac.

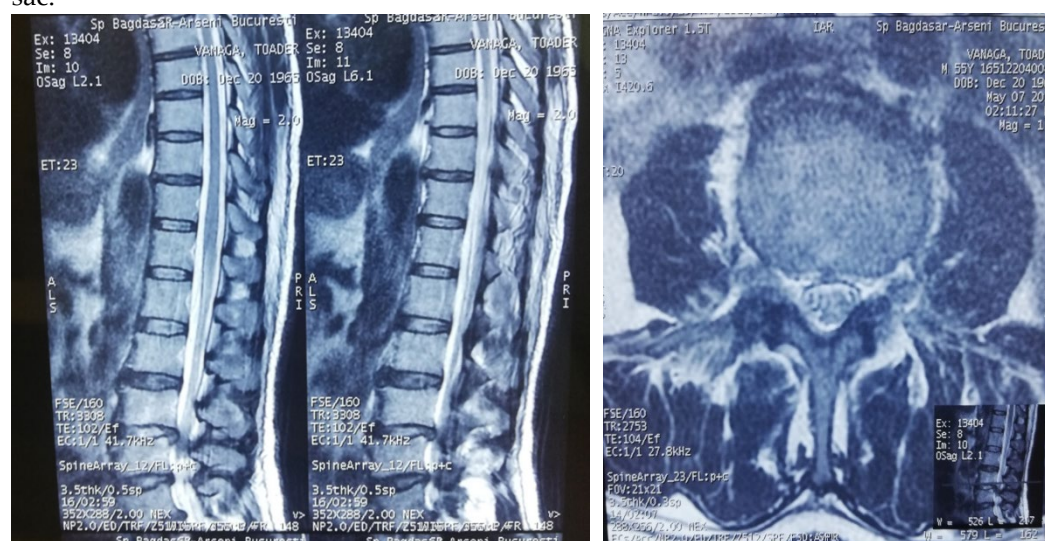


Figure 1 Spine IRM of patient

Diagnosis: AIS C paraplegia due to a paramedian and median lumbar disc herniation at L3-L4. Neurogenic bladder with Foley catheter. Neurogenic bowel.

Rehabilitation program.

General objectives:

1. Fighting neuropathic pain
2. Recovery of static, dynamic disorders and possible distal root muscle functional deficiencies
3. Regaining functionality that allows the patient self-care and locomotion
4. Improving the patient's psycho-cognitive, mentally and emotionally status
5. Socio-professional, family reintegration and improvement the quality of life

Means:

Diet and hygiene: rigorous hygiene of the post op wound; avoidance of soft drinks, of food that ferments (beans, cabbage, green peas etc.); normal intestinal transit, adequate hydration. Medication in this case was anticoagulation, neurotrophic and neuroprotectors, analgesia, hydro electrolytic equilibration.

Physiotherapy treatment:

Electrical stimulation (Exponential current) assisting the left plantar dorsiflexion pulse duration=500 ms, pause duration=4500ms, frequency of stimuli=12 imp/sec, total session duration= 2-4 minutes

LASER for the plantar level and lateral left calf, 4 points, doses 3j/cm², frequency 5Hz, probe area 1cm², power 62mW, time 1min/point.

Kinesitherapy whit the following kinetic objectives:

1. Improving posture and alignment of the body
2. Improving muscular tonus
3. Maintaining the articular mobility
4. Promoting motor function of the intermediate and distal segment of lower limb
5. Obtaining a good stability at the load-bearing articulations
6. Training of the orthostatism
7. Promoting gait and train it

Kinesitherapy means:

1. Reestablishing posture and alignment of the body: assisting plantar dorsiflexion with orthosis



Fig4: installation of the plantar orthosis in order to execute the kinetic program

2. Improvement of muscular tonus (hypotonia): with neuro-muscular facilitation techniques
3. Improving mobility: active, active-passive, passive mobilizations, including exercises with ergometric bike
4. Improving/promoting motor control (from proximal to distal): Kabath method
5. Improving muscular strength: active mobilization with resistance, isotonic
6. Promoting/establishing of orthostatism: exercises at the espalier training the knee blocking
7. Recovering the gait: exercises at the parallels; walking whit walking frame; walking whit forearm crutches

RESULTS

The patient benefited from a complex program of neuro-muscular rehabilitation and had a favorable evolution with an improvement of the final score of the evaluating scales. He regained the gait and the ability to climb stairs - assisted by the orthosis at left plantar dorsiflexion. At the discharge the patient has an AIS D diagnosis. Final ASIA motor exam: upper limb:50/50 points; lower limb: 47/50 points.

Evaluation of muscle strength on MRC scale (table1)

Table 1 Evaluation of muscle strength on MRC scale

INITIAL FORCE MUSCLE		FINAL FORCE MUSCLE
LOWER LEFT LIMB	L2=5/5	L2=5/5
	L3=3/5	L3=4/5
	L4=0/5	L4=4/5
	L5=0/5	L5=4/5
	S1=3/5	S1=5/5
LOWER RIGHT LIMB	L2=5/5	L2=5/5
	L3=5/5	L3=5/5
	L4=3/5	L4=5/5
	L5=3/5	L5=5/5
	S1=4/5	S1=5/5

DISCUSSIONS

Case particularity: The symptomatology caused by the disc herniation at the L3 level was, initially, suggestive of a cauda equina syndrome with neurogenic inflammation which generated a paraplegic motor deficit. After the remission of the inflammatory syndrome, it became clear which root has been affected, the left L4 root, which was generating a complete deficit of plantar dorsiflexion. The complex rehabilitation program (8) following the surgical intervention (9) contributed together for the good results emphasized for a patient diagnosed with paramedian disc hernia. The patient did not have a cord section syndrome (the spinal cord ends at the L2 level) and neither conus medullaris.

CONCLUSION

The interdisciplinary therapeutic approach, together with a specific, customized rehabilitation program for a patient with AIS paraplegia after a surgically treated disc hernia, had successfully improved the neuromuscular deficit and upgraded the patient's quality of life.

References

1. Walker BF, Muller R, Grant WD. Low back pain in Australian adults: prevalence and associated disability. *J Manipulative Physiol Ther.* 2004 May;27(4):238-44. doi: 10.1016/j.jmpt.2004.02.002. PMID: 15148462.
2. Steffens D, Maher CG, Pereira LS, Stevens ML, Oliveira VC, Chapple M, Teixeira-Salmela LF, Hancock MJ. Prevention of Low Back Pain: A Systematic Review and Meta-analysis. *JAMA Intern Med.* 2016 Feb;176(2):199-208. doi: 10.1001/jamainternmed.2015.7431. PMID: 26752509.
3. Seidler A, Bolm-Audorff U, Siol T, Henkel N, Fuchs C, Schug H, Leheta F, Marquardt G, Schmitt E, Ulrich PT, Beck W, Missalla A, Elsner G. Occupational risk factors for symptomatic lumbar disc herniation; a case-control study. *Occup Environ Med.* 2003 Nov;60(11):821-30. doi: 10.1136/oem.60.11.821. PMID: 14573712; PMCID: PMC1740425.
4. Zielinska N, Podgórski M, Haładaj R, Polgaj M, Olewnik Ł. Risk Factors of Intervertebral Disc Pathology-A Point of View Formerly and Today-A Review. *J Clin Med.* 2021 Jan 21;10(3):409. doi: 10.3390/jcm10030409. PMID: 33494410; PMCID: PMC7865549.
5. Ahsan MK, Matin T, Ali MI, Ali MY, Awwal MA, Sakeb N. Relationship between physical work load and lumbar disc herniation. *Mymensingh Med J.* 2013 Jul;22(3):533-40. PMID: 23982545.
6. Vialle LR, Vialle EN, Suárez Henao JE, Giraldo G. LUMBAR DISC HERNIATION. *Rev Bras Ortop.* 2015 Nov 16;45(1):17-22. doi: 10.1016/S2255-4971(15)30211-1. PMID: 27019834; PMCID: PMC4799068.
7. Cristina Daia- Examen local in recuperare, Ed Universitara, 2018
8. Schoenfeld AJ, Weiner BK. Treatment of lumbar disc herniation: Evidence-based practice. *Int J Gen Med.* 2010 Jul 21;3:209-14. doi: 10.2147/ijgm.s12270. PMID: 20689695; PMCID: PMC2915533.
9. Phan K, Dunn AE, Rao PJ, Mobbs RJ. Far lateral microdiscectomy: a minimally-invasive surgical technique for the treatment of far lateral lumbar disc herniation. *J Spine Surg.* 2016 Mar;2(1):59-63. doi: 10.21037/jss.2016.03.02. PMID: 27683697; PMCID: PMC5039847.