

## Case presentation

# Long-term case management and outcomes in a young male patient with complete paraplegia post T4-T5 vertebral osteomyelitis and a previous documented thalamo-mesencephalic hemorrhage – case presentation

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**Abstract:** (1) Background: Vertebral osteomyelitis is an infection affecting the vertebrae, with a potentially devastating impact, which requires a prompt diagnosis established as quickly as possible to avoid complications such as neurological impairment, fractures, and chronic pain; (2) Methods: We reported a case of a 47-year-old male patient with multiple risk factors (high blood pressure, smoking, dyslipidemia, type II diabetes) and a history of right hemiplegia post a thalamo-mesencephalic hemorrhage, admitted to the Neuromuscular Clinic Division of The Teaching Emergency Hospital “Bagdasar- Arseni” (TEHBA) Bucharest, for complete paraplegia following a surgically treated vertebral osteomyelitis at T4-T5 level with spinal epidural abscess; (3) Results: The patient had an oscillating and long evolution, due to long-term antibiotherapy and the imperative of minimal mobilization periods, which eventually led to favorable results, with the recovery of motor function and the ability to perform his previous daily activities; (4) Conclusions: Proper management in vertebral osteomyelitis cases has a great impact on the evolution of the patient, increasing the quality of life, and preventing future complications. A multidisciplinary approach is essential for this type of complex case in order to achieve significant improvements.

**Keywords:** paraplegia, vertebral osteomyelitis, neurorehabilitation

## 1. Introduction

Vertebral osteomyelitis, spondylodiskitis, or spinal osteomyelitis, represents the invasion of pathogens into the vertebrae that could generate a life-threatening medical condition due to its silent evolution and the patient’s unpredictable clinical status. [1] Although several types of pathogens can be involved in this type of bone inflammation, it has been proven that the most common bacterium is *Staphylococcus Aureus* [2,3]. Three methods of dissemination can lead to bacterial invasion at the bone level: hematogenous (pediatric patients), contiguous (spine trauma; post-surgery and chronic (bone necrosis) [3,4]. Among the risk factors that stand out: advanced age, diabetes, immunosuppression, drug use, especially IV administered, history of spinal surgery, and chronic administration of corticosteroids. [1,5].

The diagnosis is built based on the following clinical and paraclinical landmarks: positive blood cultures for *Staphylococcus aureus* or other specific etiologic agents within the preceding 3 months; symptoms as febrile state and back pain; modified laboratory tests-

leukocytosis, elevation of Erythrocyte Sedimentation Rate (ESR) and C-reactive protein (CRP) - and Magnetic resonance imaging (MRI) findings that emphasize the spread of the infection of the intervertebral discs to the vertebral plates, accompanied by soft tissue edema or the collapse of the vertebral plates; [1,3,4,5,6] The differential diagnosis should not be disregarded. It optimizes the limit of the essential investigations area, but also it contributes to the initiation of specific therapy promptly. Among the pathologies considered in this case are: septic arthritis, Ewing sarcoma, non-bacterial osteomyelitis, vertebral compression fracture, and malignancy. [1]

The treatment of spinal osteomyelitis varies according to the severity and evolutive disease stage. Antibiotic therapy, specific to the pathogen involved, becomes indispensable, while surgical intervention is indicated only in special cases such as neuronal damage, massive destruction of the bone structure, presence of abscess, etc. The rehabilitation process becomes important in restoring the physical and mental capacity so that the patient can continue his previous lifestyle. [1,4] Proper management of spondylodiskitis is crucial to avoid complications such as fractures, disability, recurrence of infections, or chronic pain. [1]

## 2. Methods

Having the patient's consent, this paper presents the case of a 47-year-old male patient admitted to our Neuromuscular Rehabilitation Clinical Division with a motor deficit of paraplegia type T5 neurological level; sensitivity disorders – hypoesthesia – L1 neurological level; severe self-care and locomotor dysfunction.

This case presentation received the TEHBA Ethics Committee approval No 21858/26.06.2023.

Three weeks before the first admission to our division, the patient presented thoracic spine pain, followed shortly by rapidly progressive paraplegia and critical condition.

The clinical picture and the MRI performed certified the diagnosis of T4-T5 level osteomyelitis, which required surgery (laminectomy T4-T5 and right discectomy T4-T5) performed in the Neurosurgery clinic division.

Post-surgical wound culture was positive for *Staphylococcus aureus* MSSA.

From his personal pathological history, there are to be mentioned: high blood pressure, hypertensive microangiopathy, type 2 diabetes mellitus treated (oral hypoglycemic drugs), diabetic retinopathy, class III obesity, Parinaud syndrome, right hemiplegia post left thalamic-mesencephalic hemorrhage.

At admission in our Rehabilitation Clinic Division, the patient was afebrile, in a poor general state, conscious, and cooperative. The respiratory and cardiovascular examination was normal: BP = 147/90 mm/Hg; HR = 97 bpm, cardiac arrhythmia; Sp O<sub>2</sub> = 96% spontaneously. He had a distended abdomen, delayed intestinal transit time and normal micturition.

Neuro-mio-arthro-kinetic examination revealed that the patient was temporo-spatial oriented, without signs of meningeal irritation. He had a motor deficit of incomplete paraplegia AIS/Frankel C type T5 neurological level (muscle strength of right lower limb: 3/5 MRC – hip and knee; 2/5 MRC - ankle; muscle strength of left lower limb: 4/5 MRC) and right hemiplegia (muscle strength of right upper limb: 3/5 MRC -shoulder and forearm; 4/5 MRC -wrist. He also presented sensitivity disorders - hypoesthesia at the level L1-S1. The examination emphasized nystagmus (side to side), divergent strabismus (left eye), vertical gaze palsy (Parinaud Syndrome), mild central facial palsy, hyporeflexia of the lower limbs, and severe self-care and locomotor dysfunction. In terms of functionality, the patient kept resting in bed and tolerated posturing with the raised bed at 45 degrees.

Regarding the laboratory findings, the patients presented iron deficiency anemia( iron= 44 µg/dL, Hg=12.4 g/Dl (RI I=65-175 µg/dL; RI Hg= 14-18 g/dL), total hypoproteinemia

with hypoalbuminemia: Total protein= 6 g/dL; Albumin(Blood)= 3 g/dL ( RI TP= 6.4-8.2 g/dL; RI A= 3.4-5 g/dL) and biological inflammatory Syndrome: Fibrinogen= 530.5 mg/dL; VSH= 15 mm/h(RI F=169-515 mg/dL; RI VSH= 3-8 mm/h).

Thoracic spine CT of T4-T5 vertebrae and intervertebral disc proves an irregular, filiform, osteolytic bone structure, asymmetric reduction of the intervertebral space height, T4-T5 laminectomy, paravertebral soft tissue mass extended between the T4-T5 vertebrae on the right side, a collection of para fluid density (34 UH) – 34/14 mm and the densification of the posterior subcutaneous tissues at the level of the surgical approach area.[Figure 1]



**Figure 1.** Thoracic spine CT of T4-T5 vertebrae and intervertebral disc

Functional assessments [Table 1]:

- Assessment of achievements of daily function: Spinal Cord Independence Measure (SCIM) scale [7]
- Assessment of the spinal cord-injured patient: American Spinal Injury Association (ASIA) Impairment Scale
- Muscle strength: The Medical Research Council (MRC) Scale – modified
- Muscle spasticity: modified Ashworth scale; Penn spasm frequency scale
- Ambulation capacity: FAC scale
- Activities of daily living: Activities of Daily Living
- Quality of life: QOL (modified after Flanagan)

As a result of the anamnesis, the clinical examination performed and the paraclinical investigations, the following diagnosis was established: AIS/Frankel C paraplegia T5 neurological level post-T4-T5 spondylodiskitis with an intracanal abscess – surgically treated. Right hemiplegia, central facial palsy, and a Parinaud syndrome after a left thalamo-mesencephalic hemorrhage.

A complex rehabilitation program was implemented for the patient. The main objectives included mental status improvement, maximized physical abilities, stable general status, therapy of associated conditions, enhancement of QoL and familiar and social inclusion. Regarding the kinesiotherapy targets, we focused on the prevention of pressure sores and deep vein thrombosis, motor deficit improvement: progressive neuromuscular reeducation and muscle control increase, strengthening lower and upper limb muscles, minimizing the atrophy process of the lower body, improving self-care and overall functional ability. Concerning the physical therapy program, a series of exercises were performed by the patient both at the bedside - in the initial stage - and in the physical therapy room: body positioning and passive, passive-active, and active exercises for upper and lower limbs using various devices, for the training of the trunk, scapular, and pelvic girdles, every segment of upper and lower limbs. verticalization exercises. walking

exercises with hand support and also from the physical therapist; stretching to increase the range of movement.

Evolution: After 15 days of admission, due to the poor general condition of the patient, the back pain scored 6/10 on the VAS scale, the thoracic spine MRI with contrast findings (inflammatory changes - spondylodiscitis type at T4-T5 level, with paravertebral extension in the posterior thoracic area), the elevation of inflammatory markers (CRP= 100 mg/L) and the leukocytosis (WBC=13 x 10<sup>3</sup>/μL (RI WBC=4.8-10.8 x 10<sup>3</sup>/μL), but also to the impossibility of carrying out a maximal physiotherapeutic treatment, it was decided the urgency for a Neurosurgical consult and an Infectious Diseases consult. It accordingly was established the diagnosis of T4-T5 osteomyelitis. It was recommended 4 weeks of bed rest and antibiotic therapy: Vancomycin 1g/ 8 h IV, Cefort 2g/24 h IV – 21 days followed by Metronidazole 5 mg/ml every 8 h, IV.

After 4 weeks, MRI revealed an improved aspect of the spondylodiscitis-type inflammatory appearance at the T4-T5 spine level extended in the pre and posterior paravertebral area; the unchanged appearance of the myelopathic changes of the thoracic spinal cord. The patient had a favorable health status and a significant improvement in both physical and mental conditions.

### 3. Results

After 6 months of first admission, the locomotor and hand functionality evolution highlighted a motor deficit of an incomplete paraplegia type and a right hemiplegia type with complete muscle strength of 4/5 MRC for the right limbs and 4/5 MRC for the left lower limb. Regarding the functional assessments, the patient has developed an autonomy that includes transfer and toilet use, and hand grips with low muscle strength. The walking abilities are limited to tripod cane support. [Table 1]

**Table 1.** The evolution in terms of the functional assessments

	Admission	Discharge
AIS-motor score	71/100	90/100
AIS- sensitive score	211/224	220/224
SCIM	50/100	83/100
ADL	3/8	7/8
QoL	64/112	90/112
Asworth & Penn – lower limbs	0/16	0/16
FAC	0/5	4/5

### 4. Discussion

Our patient's medical disorders create a unified entity, defined by a complete cycle, which influences each other:

- diabetes influences the immune response and creates an important window for the disease to progress [8]
- the patient's history of hemorrhagic stroke and cerebrovascular malformations highlights the susceptibility to neuro-vascular events.
- the long recovery time influences the mental status of the patient, which can aggravate the course of his physical evolution

Surgical and conservative treatment for lumbar spondylodiscitis is effective. The prognosis seems to be good with conservative treatment including NSAID, physiotherapy (exercises), and a corset.

The rehabilitation program proved to be beneficial because it improved the lower limbs motor function due to the social inclusion of the patient through the development of new skills, customized to his needs, as well as by improving the psycho-cognitive status as a result of performing various types of movement, human interaction, and awareness of his evolution through them [9].

## 5. Conclusions

Following the rehabilitation nursing and the complex neuro-muscular kinesiotherapy program, the subject's evolution turned favorable with a significant improvement in his physical and mental state.

In terms of time, the period of the disease aggravation is inversely proportional to that of its healing. Therefore, special, rigorous medical care is necessary for a good prognosis. A prompt diagnosis and aggressive management are required to avoid catastrophic complications, by embracing a multidisciplinary approach.

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Written informed consent has been obtained from the patient to publish this paper

**Data Availability Statement:** Not applicable

**Conflicts of Interest:** The authors declare no conflict of interest.

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